An integrative multifactor systems approach to enhance the operational resilience and sustainability of the UK retail payments' organisational stakeholders

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i. Acknowledgements & dedications

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ii. Summary

The retail payment system in the UK and globally serves as the backbone for customer financial transactions, playing a crucial role in the daily operations of every country's economy. Previous research has primarily examined this payment ecosystem through an economic lens, overlooking an in-depth analysis of the organisational factors of stakeholders that enable them to navigate and overcome various disruptions from the perspectives of resilience and sustainability.

Strategic reports offer valuable insights into an organisation's key priorities, communicating vital information to customers, industry analysts, regulators, and shareholders/investors. However, these reports are often challenging to interpret due to convoluted text. Adopting a resource-based perspective, we present a novel systems approach to acquiring, categorising, and clustering organisational strategic factors, aiming to comprehend an organisation's priorities. An inductively developed factor dictionary is employed to scrutinise reports, promoting transparency and scalability in identifying and understanding an organisation's resources. In formulating this approach, strategic factors are classified and grouped based on target stakeholders, utilising a PESTEL classification and soft systems Systemigram visualisation and prose. The application of this approach is demonstrated through an analysis of the 2019 10-K reports of the five UK retail payment system stakeholders.

The results facilitate the identification of common, shared, and specific areas of focus and improvement, contributing to distinct operational resilience and sustainability attributes. At the retail payment system level, technological and customer-focused factors emerge as the most frequently cited categories, underscoring the optimisation of payment services, digitisation, and personalisation through the exploitation of customer data. However, more attention should be paid to cross-border, societal, and environmental services. Risk management policies, primarily driven by compliance requirements, are emphasised, indicating a potential inefficiency in an overly regulated system.

The research's notable contribution lies in developing a systems approach for identifying and comparing organisations' strategic factors. The use of a dictionary-based approach enhances transparency and reproducibility. This methodology can be extended to compare larger or different samples of stakeholders or previous reporting years, providing insights into temporal effects.

Keywords: strategic analysis, strategic reports, dictionary-based text analysis, categorisation and clustering.

iii. List of Figures

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v. Abbreviations

The abbreviations that are listed here, appear more than once in the thesis.

- AI – Artificial Intelligence
- ABC – Activity Based Costing
- ACH – Automated Clearing Houses
- API – Application Programming Interfaces
- ATM – Automatic Teller Machine
- BACS – Bankers' Automated Clearing System
- BIS – Bank for International Settlements
- BI – Business Intelligence
- BoE – Bank of England
- BPA – Business Process Architecture
- BYOD – Bring-Your-Own-Device
- B2C – Business-to-Consumer
- CAS – Complex Adaptive Systems
- CBDC – Central Bank Digital Currency
- CE – Circular Economy
- CERT – Computer Emergency Response Team
- CET1 – Common Equity Tier 1
- CHAPS – Clearing House Automated Payment System

- CMA – Competition & Markets Authority
- COSO – Committee of Sponsoring organisations of the Treadway Commission
- CPMI – Committee on Payments and Market Infrastructures
- CSR – Corporate Social Responsibility
- DCV – Dynamic Capabilities-based View
- DLT – Distributed Ledger Technology
- EDGAR – Electronic Data Gathering, Analysis, and Retrieval system
- EPC – European Payments Council
- EPS – Ecological Performance Standards
- ESG – Environmental and Social Governance
- EY – Ernest & Young
- FCA – Financial Conduct Authority
- FMI – Financial Market Infrastructures
- FOS – Financial Ombudsman Service
- FRF – Future Regulatory Framework
- FSA – Financial Stability Authority
- FSB – Financial Stability Board
- GAAP – Generally Accepted Accounting Principles
- GBP – Great British Pound

- GDP – Gross Domestic Product
- GDPR – General Data Protection Regulation
- GHG – Green House Gases
- GRI – Global Reporting Initiative
- HMT – HM Treasury
- HSBC – Hongkong and Shanghai Banking Corporation
- ICA – Interbank Card Association
- ICO – Information Commissioner's Office
- IFRS – International Financial Reporting Standards
- IIF – Institute of International Finance
- IMF – International Monetary Fund
- IoT – Internet of Things
- IPN – Integrated Payment Network
- IPO – Initial Public Offering
- ISO – International Standards organisation
- KPI – Key Performance Indicators
- KYC – Know Your Customer
- LDA – Latent Dirichlet allocation
- LEI – Legal Entity Identifier
- MD – Merchant Discount

- MiFID II – Markets in Financial Instruments Directive
- MoD – Ministry of Defense
- M&A – Mergers and Acquisitions
- NEC – Network Enabled Capability
- NFC – Near Frequency Communication
- NLP – Natural Language Processing
- NPA – New Payments Architecture
- OECD – Organisation for Economic Co-operation and Development
- ONS – Office for National Statistics
- OR – Operational Resilience
- OW – Oliver Wyman
- PESTEL – Political, Economic, Social, Technological, Environmental or Ecological, and Legal
- PIN – Personal Identification Number
- POS – Point of Sale
- PRA – Prudential Regulatory Authority
- PSD2 – Payment Services Directive Two
- PSR – Payment System Regulator
- PwC – Price Waterhouse & Coopers
- P2P – Peer-to-Peer

- QR – Quick Response
- RALF – Robustness, Agility, Leanness, and Flexibility
- RV – Relational View
- RBV – Resource-Based View
- RBS – Royal Bank of Scotland
- RTGS – Real-Time Gross Settlement
- RWA – Risk Weighted Asset
- SCA – Strong Customer Authentication
- SDG – Sustainable Development Goals
- SEA – Social, environmental and sustainability accounting and reporting
- SEC – Securities and Exchange Commission
- SME – Small and Medium Enterprises
- SoS – System of Systems
- SSM – Soft Systems Methodology
- SWOT – Strengths, Weaknesses, Opportunities and Threats
- TAM – Technology Adoption Model
- TCFD or TNFD – Task Force on Nature-related Financial Disclosures
- TEEPSE – Technological, economic, ethical, political, social, and environmental
- TQM – Total Quality Management

- TWh – Tera Watts per hour
- UN – United Nations
- UNEP FI – United Nations Environmental Program Financial Initiative
- UK – United Kingdom
- WB – World Bank
- 3BL – Triple Bottom Line

1 Introduction

Retail payment systems are essential in enabling monetary transactions for goods and services. These systems are underpinned by a socio-technical ecosystem that is complex by nature, as described by the Bank of England (2019b) and Urban and Wójcik (2019). Significant investments in resources, technologies, and innovative business models are requisite to sustain this infrastructure. Strategic investment and implementation plans are crucial, particularly when considering their potential to either enhance or disrupt existing payment modalities based on requisite functions and capabilities (Langley 2019).

The effectiveness of retail payment systems must be gauged against long-term objectives that address both present and anticipated customer needs. These requirements demand a congruence of strategic functions among stakeholders to deliver services efficiently and sustainably. The stakeholders, encompassing retailers, payment facilitators, regulators, and security firms, each play a vital role within this ecosystem. Retailers facilitate the exchange of goods and services for payment, while entities such as the government and banks—or their third-party suppliers like acquirers—offer the means of payment. This includes but is not limited to cash production, payment technologies such as cards, Point of Sale (POS) machines, and Automated Teller Machines (ATMs). Regulators ensure the system's integrity, and security companies manage the logistics of money distribution, especially in the case of tangible payments.

Payment methods within this system must cater to diverse customer needs. For instance, credit cards often benefit higher-income individuals who can settle debts promptly, thereby accruing rewards. Conversely, those with lower incomes might incur interest, which can lead to an unsustainable scenario for them and, by extension, the financial companies benefitting from fees and interest charges. Such disparities necessitate a thorough analysis to devise equitable payment policies. Credit crises have less impact in the UK than in the US, where banks have sometimes failed under the weight of customer debt (Stavins 2018).

Efficacy in this context refers to how well the system's objectives are being met, which ties into the business models employed. Banks offer various card schemes, each

designed to fulfil specific functions; debit cards provide access to one's funds, whereas credit cards offer a line of credit to be repaid later.

Efficiency pertains to the cost-effectiveness of the resources utilised across payment methods and business models. For example, cash transactions involve transportation costs, while digital payments incur fees for using communication networks and infrastructure.

To contextualise, consider India's 2016 demonetisation of high-value banknotes, an attempt to curb the black market and boost tax revenues by promoting digital payment adoption. This move proved disruptive in a society where less than half the population had bank accounts, showcasing a lack of cultural and technological preparedness (Dhananjay and Suresh Chandra 2015; Roy and Sahoo 2016; Goparaju 2017; Radhika 2018; Bughin and Woetzel 2019). Conversely, Sweden's transition towards a cashless society has been smoother due to effective coordination between government and private sectors, coupled with a technologically literate population. The UK's approach has been more cautious, adopting plastic banknotes for longevity while maintaining various payment methods without an explicit goal of becoming cashless (Bank of England 2019b).

In implementing retail payment methods, it is essential to align specific characteristics with the capabilities of the payment methods and business objectives. Key characteristics of a robust payment system include operational resilience and sustainability. Sustainability is framed within economic, social, and environmental parameters, whereas operational resilience is defined by robustness, agility, leanness, and flexibility (Purvis et al. 2016; Schoenmaker 2018). This research primarily focuses on the economic aspect, specifically business cycles and technological diffusion.

This introductory chapter has set the stage for the thesis. The following sections will cover the literature review, outline the philosophical underpinnings of the research, detail the research design including aims and methods, and discuss research ethics, validity, and reliability. The concluding section will provide an overview of the thesis content.

1.1 Research background

1.1.1 UK retail payment system environment

In the recent decade, the United Kingdom has emerged as a pivotal hub for financial technology (FinTech), trailblazing in payment business models since the mid-19th century with various credit and debit mechanisms. The payment system bifurcates into high-value payments, utilised predominantly by businesses, and low-value payments, encompassing retail transactions at national or regional levels. While high-value transactions often capture the headlines, the billions of low-value transactions underpinning the UK's retail payment system are crucial for everyday commerce, a fact that remains largely underappreciated by the general populace (Paysafe 2018; BNP PARIBAS and Capgemini 2019; UK Finance 2019b). The financial sector's growth in the UK has been organic, bolstered by the reputation and standards of British banks, with London maintaining its stature as Europe's financial nerve centre and the UK as the fifth-largest global economy by GDP (ONS 2019). Regulatory innovation has also been key, with initiatives like Open Banking enabling third parties to leverage financial data without compromising privacy (Puschmann 2017; Innovate Finance 2019; Open Banking Ltd. 2019).

The UK's payment system incorporates an array of methods and technologies tailored to customer preferences for speed, security, and convenience. The principal low-value payment technology, Real-Time Gross Settlement (RTGS), saw an annual transaction volume of 35 billion in 2020, amounting to an average daily exchange of over £750 billion. While bank transfers capture the bulk of the monetary value, cheques, and card payments—the staples of retail transactions—account for a smaller value but a higher volume of transactions. Notably, card payments alone amounted to £2.8 billion in daily transactions, representing over 50% of annual transactions, with cash payments at less than 20%. It is important to note that these figures may have been influenced by the Covid pandemic (Bank of England 2019b; UK Finance 2021). Despite this, retail payments are a cornerstone of the UK economy, with any technical disruptions posing significant economic and social risks due to potential decreases in consumer spending (UK Finance 2019b). This research concentrates on digital retail payments while also considering the significance of physical payments such as cash.

Understanding the operational intricacies of the retail payment system and the infrastructure it relies on is crucial. This entails a comprehensive examination of the resources and capabilities utilised, extending beyond technology to include social and environmental considerations that impact the system's long-term viability. Current innovations and the evolving business landscape demand fresh approaches, as illustrated by the sharing economy, which has necessitated a more distributed payment system to facilitate access to goods and services (Morozov 2018). In the UK, debit cards have overtaken cash since 2017 as the most prevalent payment method, with new technologies further integrating payments, such as mobile payments (Borzekowski et al. 2008; Yousafzai and Yani-de-Soriano 2012; Koulayev et al. 2016). This research focuses on the entities shaping the digital card payment landscape: consumers, banks, acquirers, payment networks, and merchants.

However, the UK payment ecosystem, encompassing various payment schemes, is not immune to risk factors that could disrupt any payment method, infrastructure, or the organisations that facilitate them (BACS 2016). Political shifts like Brexit or technological threats such as cyber fraud can affect consumer spending patterns and the reliance on electronic payment methods (Borzekowski et al. 2008; Kosse 2013; Barkhordari et al. 2017; Bansal et al. 2018). These factors bear significance for all stakeholders, influencing strategic initiatives aimed at enhancing the system's sustainability and resilience.

Prior research on payment systems has largely addressed socio-economic dimensions, focusing on fees and governance regulations, as well as consumer behaviours influencing payment method adoption within two-sided markets of customers and merchants (Bolt 2012; Bolt and Schmiedel 2013; Arango et al. 2015; Jonker et al. 2017). However, the broader industry dynamics have been primarily depicted by industry analysts, stakeholders, and practitioners (Hasan et al. 2013a; Bank for International Settlements 2017; The UK Cards Association 2017; Bansal et al. 2018; Bech et al. 2018; UK Finance 2018a; Bank of England 2019a; Innovate Finance 2019; Capgemini 2021).

Providing appropriate payment means is instrumental to bolstering a nation's economy and the welfare of its populace. However, with thorough analysis, the effects can be

manageable, as exemplified by the credit card situation in the US, which has disproportionately benefited the affluent. It is thus imperative to evaluate the specific factors of a country to ascertain the optimal blend of payment methods and their infrastructures to meet the burgeoning and complex payment.

1.1.1.1 The card industry in the UK

This section delves into the card payment system, dissecting both credit and debit card mechanisms which, despite their distinct functionalities, share a common infrastructure (The UK Cards Association 2017).

The concept of credit card payments took root in the United States during the 1950s, pioneered by the New York-based Diners Club. Initially, these charge cards were utilised as a form of credit by diners who would settle their bills monthly. The pilot program captivated 200 members and 27 restaurants, but by year-end, membership surged to over 20,000, marking a significant success. This uptake was partly due to the psychological effect of invisible spending, which led to increased consumption and deferred the sense of fiscal responsibility to month's end. However, this disconnection can precipitate considerable debt, a reality many modern users are acquainted with (Hedman et al. 2017).

In the UK, the advent of card payments in 1951 mirrored the Diners Club model. Barclays Bank introduced the 'Barclaycard' in 1966, initially to individuals and later to businesses in 1977. Debit cards emerged in 1987, a Barclays and Visa collaboration, marking a UK innovation. Concurrently, Barclays, along with Lloyds, the Royal Bank of Scotland, and the Bank of Scotland, launched the nation's first cash network, emphasising ATM access as a critical feature for debit card adoption. High street retailers were among the earliest to adopt the Diners Club model and to build a debit card payment infrastructure (Maier 1998; The UK Cards Association 2017).

The 1990s saw France introduce the chip-and-PIN system, a security feature that remains integral to card transactions. This method, which fostered consumer confidence, was later enhanced by Visa's two-factor authentication protocol within the Strong Customer

Authentication (SCA) framework, elaborated upon in subsequent sections of this thesis (Arvidsson 2014; Visa 2019a). By 1994, debit card ownership had proliferated across half of the UK population, a spread facilitated by the minimal requirement of holding a bank account. In 1995, debit card transactions eclipsed those of credit cards and, by 1998, outstripped personal cheque usage. Credit card expenditures were only outdone in 2001, and in a remarkable milestone in 2004, debit card use overtook cash transactions for an entire week (The UK Cards Association 2017).

The payment network concept was first implemented by American Express in 1963, quickly followed by Visa in 1976—originating from Bank of America's BankAmericard in 1958—and Mastercard in 1979, established by the Interbank Card Association (ICA) (Mastercard 2018). The 1980s welcomed these entities into the UK, often called the 'duality' due to their market presence. This era also introduced electronic point-of-sale (POS) terminals, which have proliferated from 1.2 million in 2009 to 2.4 million by 2017, signifying a substantial increase over half a century (Statista 2019). This brisk expansion underscores how card payment infrastructure has evolved, continually innovating to expedite and secure transactions (The UK Cards Association 2017).

The intricacies of the processes and roles performed by the organisations within the card payment system are depicted in Figures 1.1 and 1.2, with a comprehensive explanation in Chapter 2.

Card payment process – Sub-processes

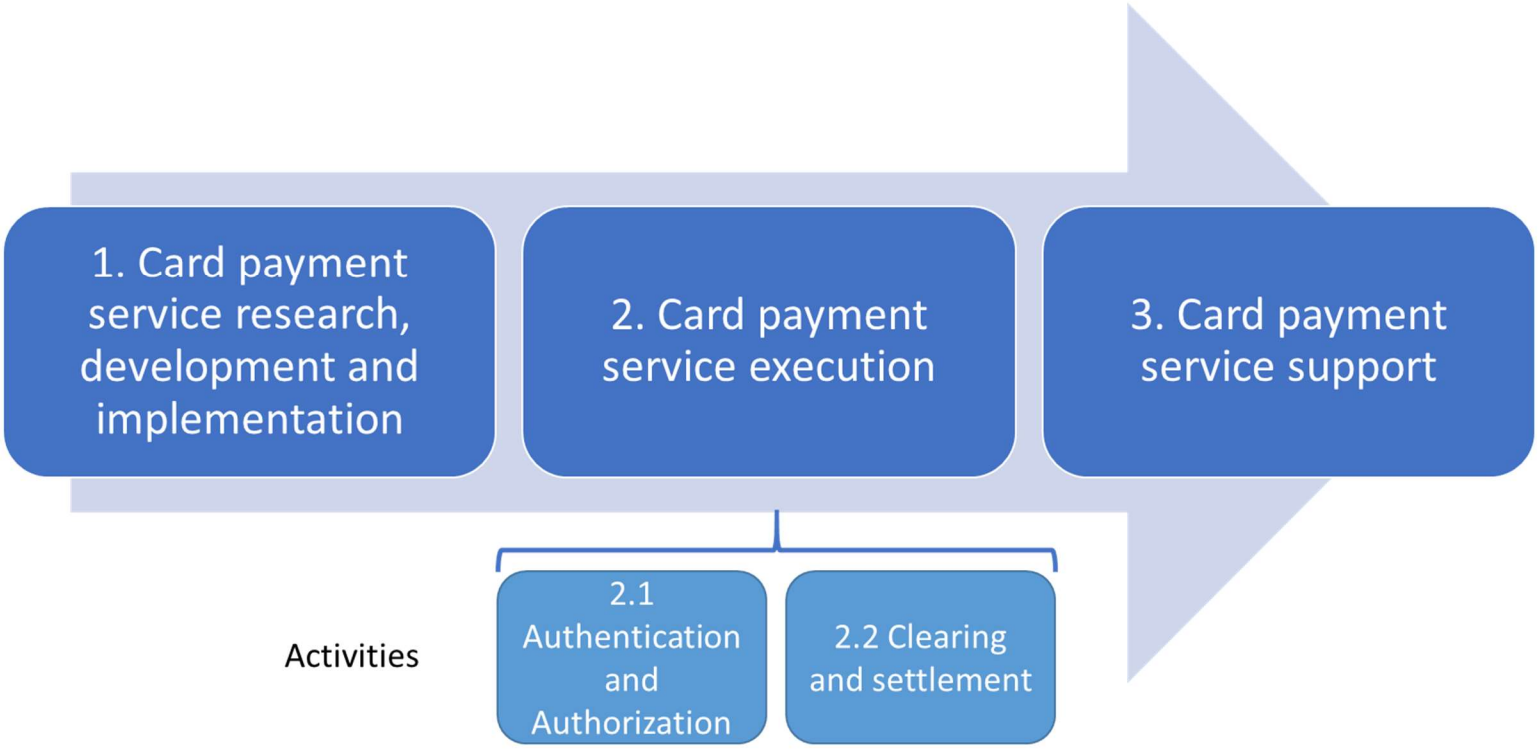


FIGURE 1.1 CARD PAYMENT SUBPROCESSES AND ACTIVITIES.

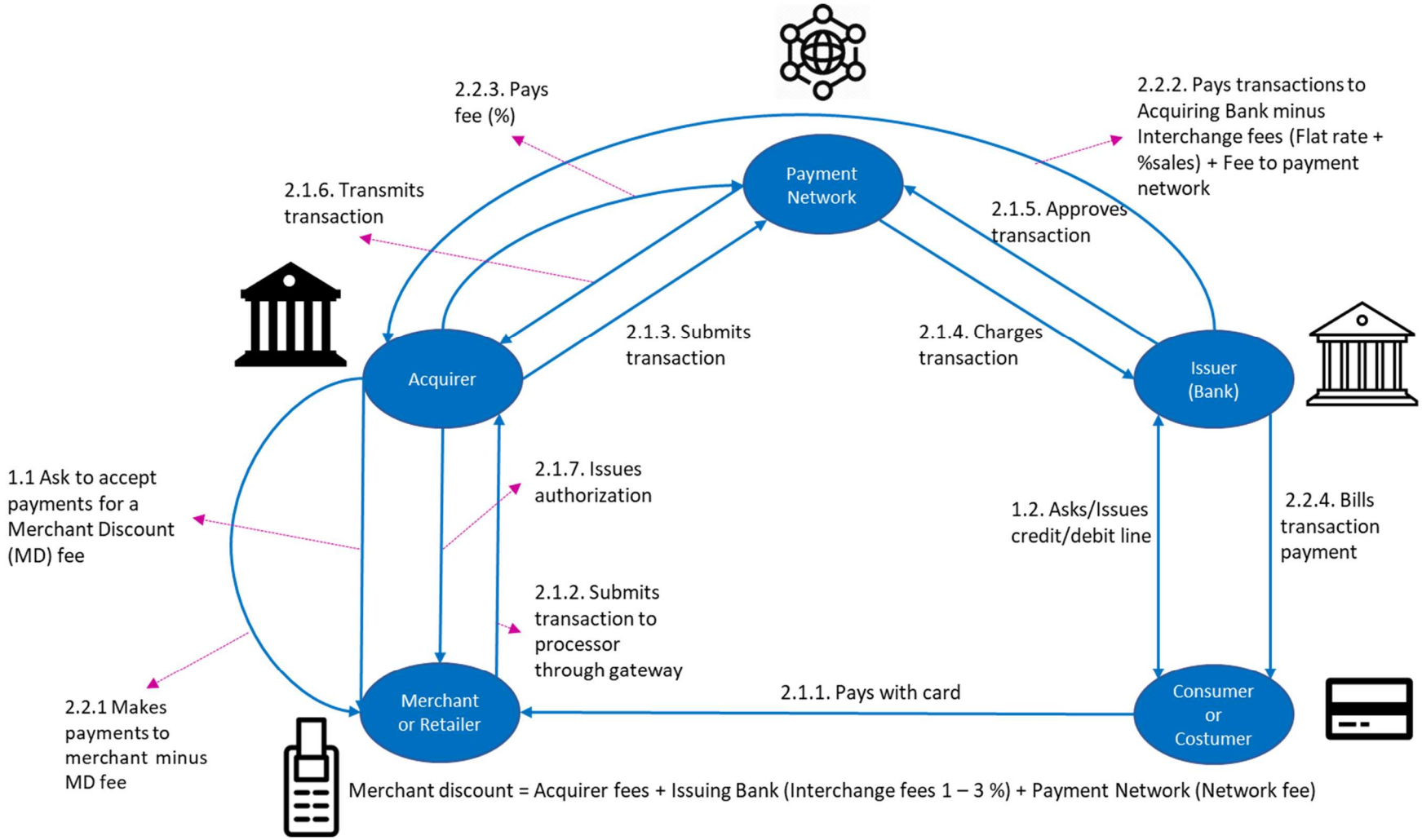


FIGURE 1.2 CARD PAYMENT ACTIVITIES (DETAILED).

1.1.2 Operational resilience

The UK retail payment system epitomises a two-sided market that demands resilience. This quality is multidimensional and increasingly vital in managing the complexities of modern socio-economic systems. Resilience has been linked to robustness, agility, and the capacity to adapt and renew in the face of various challenges (Walker and Cooper 2011; Purvis et al. 2016). Despite its complexity, resilience is conceptualised as a trait of complex adaptive systems, encompassing social, economic, environmental, and technological dimensions, viewed as an integrated, interdependent whole (Haimes 2018; Kazakov et al. 2020). Within the UK retail payment system, participants with diverse capabilities interact to achieve their financial, social, and environmental goals.

Quantifying resilience presents challenges, particularly from an empirical realist standpoint that tends to oversimplify systemic factors for mathematical modelling. A more nuanced approach involves evaluating the resilience of individual firms through their resources and capacities. Organisations rely on these to meet long-term sustainability goals effectively, efficiently, and efficaciously amidst a dynamic business landscape (Checkland and Poulter 1999; Folke et al. 2010; Soroka et al. 2020).

Carabine and Wilkinson (2016) suggest assessing resilience through risk governance frameworks. Environmental factors (such as PESTEL) can be linked to firm sustainability by identifying associated risks. Considering stakeholders' initiatives from a process-resource perspective, a holistic view can elucidate how environmental factors impact performance across economic, social, and environmental dimensions. International financial institutions like the IMF, BIS, and World Bank advocate for resilience strategies like scenario planning, stress testing, and horizon scanning to prepare for future financial events (Amanatidou et al. 2012; Government and Division 2015). In the UK, scenario planning has been the predominant non-predictive resilience strategy (Bank of England 2019b).

From a supply chain perspective, resilience is the dynamic ability to adapt to change and recover from disruptions, grounded in robustness, agility, leanness, and flexibility. Collaboration, integration, visibility, and security have gained importance as

manufacturers shift to cyber-physical systems that link machines with humans, as seen in retail payments (Giannetti and Ransing 2016; Morgan et al. 2019). Ensuring operational continuity is crucial given the dependency, connectedness, and control required over organisational processes (Ponomarov and Holcomb 2009; Pettit et al. 2010).

Innovation drives change but also introduces risks to business resilience. Balancing innovation with risk is pivotal; enhanced visibility and risk-sharing within a supply chain can fortify logistics capabilities and resilience. These goals can be achieved through improved relationships or network redesign (Durach et al. 2010). Risk management and benchmarking concepts can help organisations maintain business performance while managing appropriate risk exposure (Teece et al. 1997; Nutt 2000; Salunke et al. 2011; Sluyts et al. 2011; Scholz et al. 2012; Durach et al. 2015; Katsafados et al. 2021).

A resource-based view (RBV) and a dynamic capability-based view (DCV) are helpful for analysing stakeholders' innovation strategies (Barney 1991; Teece et al. 1997). Identifying key capabilities allows managers to understand their strengths and strategies effectively. In a global supply chain, collaboration, visibility, and flexibility are essential for managing complex, interrelated operations, thereby contributing to resilience (Pettit et al. 2010).

Sustainability and resilience are intertwined, with business performance needing to be operationally sustainable in the long term. Sustainable goals are increasingly regulated, with new practices and standards emerging to meet environmental and social demands (Subramanian et al. 2017; Hayes et al. 2019; Nedopil Wang et al. 2020). Organisations are developing capability-based frameworks to transition towards sustainable operations while preserving competitive advantage (Kleindorfer et al. 2005; Machado et al. 2017; Hayes et al. 2019). Financial sector resilience and sustainability are being addressed through a PESTEL framework (Kolios and Read 2013).

Politically and organisationally, a shift from empirical to critical realism is needed to structure companies for environmental and social outcomes. Sustainable practices are promoted, but often without a full lifecycle operational perspective (Li et al. 2017; Nedopil Wang et al. 2020; Popescu et al. 2021). The UK's green finance strategy, aimed at

meeting Net-Zero goals by 2050, is an initial step in creating industry guidelines, with climate risk regulations necessitating industry-government collaboration (Quelin et al. 2019; Barclays 2021; Ojo/Roedl 2021). However, Corporate Social Responsibility (CSR) initiatives need to catch up in definition and regulation (Worthington and Edwards 2000; Naher and Aya 2013; Bui et al. 2020).

ESG accounting and reporting, as mandated by the TCFD, are in nascent stages within financial firms. These reports encompass GHG emissions and CSR activities, necessitating operational strategies like Whole Lifecycle Analysis (WLCA) and Circular Economy (CE) considerations (Callahan et al. 2011; Álvarez Jaramillo et al. 2019; HM Treasury 2021).

Economically, green financial products fund sustainable activities, with digital apps enhancing resource efficiency and payment sustainability. Financial inclusion is supported through education and planning tools, integrating diverse social and cultural aspects (Klee 2008; Hasan et al. 2013b; UK Finance 2021). A proper sustainability taxonomy is needed to regulate markets (Steemis 2019; Pyka and Nocoń 2021). Community-oriented approaches foster local self-sufficiency, contingent on adopting suitable technologies (Yousafzai and Yani-de-Soriano 2012; Teoh et al. 2013; Oliveira et al. 2016a; Barkhordari et al. 2017; Olaleye et al. 2017; Bank of England 2020).

Data analytics improve financial service accessibility but necessitate robust data privacy controls (PWC 2016; Visa 2019a). Despite technology's potential, sustainability requires holistic, process-oriented approaches. Digital payments, for example, should be powered by verifiable green sources. The rapid pace of technology calls for a cultural shift and a move from centralised models to diversified, decentralised systems like Open Banking. However, international implementation is hindered by competition barriers and data format inconsistencies (Weiner and Wright 2009; Dodd 2018; Nelms et al. 2018; Open Banking Ltd. 2019; Bank For International Settlements 2020). Mobile apps have made payments more convenient, yet there is a need for appropriate education to foster adoption and use (Dahlstrom et al. 2014; Olaleye et al. 2017; Payments.com 2019b).

1.1.3 Sustainable payment system

Sustainability and resilience are connected, as the current business performance targets need to be operationally sustainable in the long term. Common sustainable goals have been established and have started to be regulated to normalise the existing market demand from an environmental and social perspective (Subramanian et al. 2017; Hayes et al. 2019; Nedopil Wang et al. 2020). Different sustainable practices and standards have been identified to cope with these new targets, based on local community development (i.e., Circular economy and Human Rights) (Machado et al. 2017; Schoenmaker 2018; Hayes et al. 2019; Azahara and González 2021). A group of organisations have worked on developing capabilities-based maturity frameworks to achieve the migration towards sustainable organisations and systems while maintaining organisational competitive advantage (Kleindorfer et al. 2005; Machado et al. 2017; Hayes et al. 2019). In the financial sector, different resilient and sustainable resources and capabilities have been identified from a PESTEL approach (Kolios and Read 2013).

From a Political and organisational approach, the ideological systems seem to be still relying on an empirical realist epistemology, while a critical realist approach should be taken to identify the structure that allows the companies to achieve the expected environmental and social results. As some companies are establishing or promoting, at least, sustainable results, without focusing on a life-cycle operational perspective (Li et al. 2017; Nedopil Wang et al. 2020; Popescu et al. 2021). Advances in finance have been made by establishing ethical approaches (i.e., Triodos bank). Their main downside is their capital-intensive implementation (Urban and Wójcik 2019). In the UK, the government seems to be establishing a green finance strategy from a regulatory perspective, as a first approach to establish industry guidelines, given the Net-Zero goals commitment by 2050 (HM Treasury 2021; UK Finance 2021). Climate risks seem to be the most common area where there are regulations reaching consensus but require industry and government collaboration (Quelin et al. 2019; Barclays 2021; Ojo/Roedl 2021). While the implementation of Corporate Social Responsibility (CSR) initiatives seems to be still quite behind and requires clear definition and regulation (Worthington and Edwards 2000; Naher and Aya 2013; Bui et al. 2020).

On the environmental, societal, legal, and ethical side, ESG accounting and reporting is being undertaken by financial companies. As required by the Task Force on Nature-related Financial Disclosures (TCFD), it is still in an early implementation phase (Callahan et al. 2011; Álvarez Jaramillo et al. 2019; HM Treasury 2021). These accounting and reporting principles consider Greenhouse gas (GHG) emissions and CSR activities. Nonetheless, their implementation requires some operational strategies, including but not limited to Whole Lifecycle Analysis (WLCA), Circular Economy (CE), resource efficiency, and different waste management practices. These practices must be considered as a whole with regenerative economy's production and consumption models (Wales. Welsh Assembly Government. 2009; Sani et al. 2021).

From a financial and economic perspective, different green financial products and services have been proposed to fund sustainable activities, such as green investment funds and mortgages and electric car loans (Innovate Finance 2020). The development of digital apps has helped with the resource efficiency and sustainability of payments. Financial organisations offer inclusive financial education and planning tools and are building an infrastructure integrating all social, cultural, and demographic aspects equally (Klee 2008; Hasan et al. 2013b; UK Finance 2021). However, a correct sustainability taxonomy for different products and services is needed to regulate the market (Steemis 2019; Pyka and Nocoń 2021). Community-oriented approaches are also being developed to allow the development of self-sustained local areas. Nevertheless, the right technologies must be developed, adopted, and used, considering the specific people's characteristics in each area (Yousafzai and Yani-de-Soriano 2012; Teoh et al. 2013; Oliveira et al. 2016a; Barkhordari et al. 2017; Olaleye et al. 2017; Bank of England 2020).

Data analytics have helped understand customers' needs and improve the accessibility of financial services (Johnson et al. 2007; Conboy et al. 2020; Shi et al. 2020). Nevertheless, it also implies that proper data privacy management and controls must be in place (i.e., PSD2 and SCA) to avoid any possible risk, such as fraud, which are standard within the retail payments industry (PWC 2016; Visa 2019a). Although technologies offer many possible solutions, a holistic process-oriented approach must be taken for them to be sustainable. For example, green sources can power digital

payments, but these are not easy to verify (Innovate Finance 2020). The fast pace of technologies implies high resource usage; therefore, a cultural change must be made. The payment system also relies on a centralised interoperable environment, which limits market competitiveness and evokes new diversified, decentralised, and disintermediated business models. This is the case of Open Banking, which allows the data exploitation and interoperability of the different technologies developed. Nevertheless, it has not been implemented from an international or cross-border perspective due to multi-jurisdictional competition barriers and the fragmented and truncated data formats of automated payment processing and reconciliation (Weiner and Wright 2009; Dodd 2018; Nelms et al. 2018; Open Banking Ltd. 2019; Bank For International Settlements 2020). The mobile apps development has made payments convenient, offering other financial services that allow organisations to be profitable, but the right education and advice must be provided for people to adopt and use them (Dahlstrom et al. 2014; Olaleye et al. 2017; Payments.com 2019b).

1.2 Epistemology and ontology

The use of epistemology and ontology is briefly justified in this section. From a conceptual perspective, epistemology is defined as how any person relies on to create new knowledge, including the different conditions, sources, and structure of the information. Ontology, on the other hand, is described as the way reality is perceived. Different people might understand reality from a specific perspective, creating subjectivity, especially on abstract definitions (Saunders et al. 2008).

In the financial industry, as an abstract environment, people tend to describe it from a deductive perspective. Explaining the account of specific situations through logical statements using mathematical language and methods and testing them with econometric techniques. In other words, people use models to describe reality with “measurable” or objective variables that are established in agreement with what they should represent (Lagoarde-Segot 2019).

Nonetheless, considering different environmental factors, both with established objective measures and others more subjective, such as this research entails. The method’s design

builds on a critical realist approach, which considers qualitative factors that cannot be explained concretely by mathematical methods but are outlined from an operational perspective, which allows the research to include all PESTEL environmental factors in the analysis of the payment system. For example, the different organisational risks identified are conceptualised in diverse ways by each organisation but target a common understanding, in most cases, having what is called “human agency” in an open-view system (Senge 1991). Subjectivity relies on people’s interpretations, and for the purpose of this thesis, the different factors considered will not be subject to a logical, quantitative interpretation. As acknowledged, some of them are fuzzy or difficult to quantify. However, overlooking any of them would lead to a more incomplete and less accurate model or system diagnosis (Größler et al. 2008)

1.3 Research aim and contributions

This research delves into the logistical structural complexity of the UK retail payment system (e.g., cash, card). Specifically, this research aims to *develop a whole systems approach to explore the alignment and coordination (i.e., common, shared, specific and missing factors) among the system players to understand the most influential payment ecosystem factors and possible areas of improvement towards the system’s resilience and sustainability*. In meeting the aim, the contributions are two-fold; first, developing an approach that allows identifying, categorising, clustering, and visualising the specific available organisational resources and capabilities, or strategic factors, by using a broad systems thinking approach (Forrester 1961; Barney 1991; Senge 1991; Teece et al. 1997; Checkland and Poulter 1999). Second, the application of the approach to the operation of the UK retail payment system, which considers the different PESTEL perspectives and stakeholders’ characteristics to determine the current mix of factors that contribute to operational resilience and sustainability goals (Ballou 2004; Walker et al. 2004; Kolios and Read 2013; Johnson et al. 2014). In Figure 1.3, the graphical description shows the different interactions described previously among all the players or stakeholders. This system requires a mix of strategic initiatives to develop the payment operations and establish an organisational culture. This mix determines the system’s sustainable characteristics from a triple-bottom-line perspective (i.e., environmental, social, and

economic). In the figure, the cardholder refers to the customer. The system also focuses mainly on the digital retail payment system stakeholders (i.e., online and mobile card-based payments), who provide physical payment methods (e.g., cash and checks).

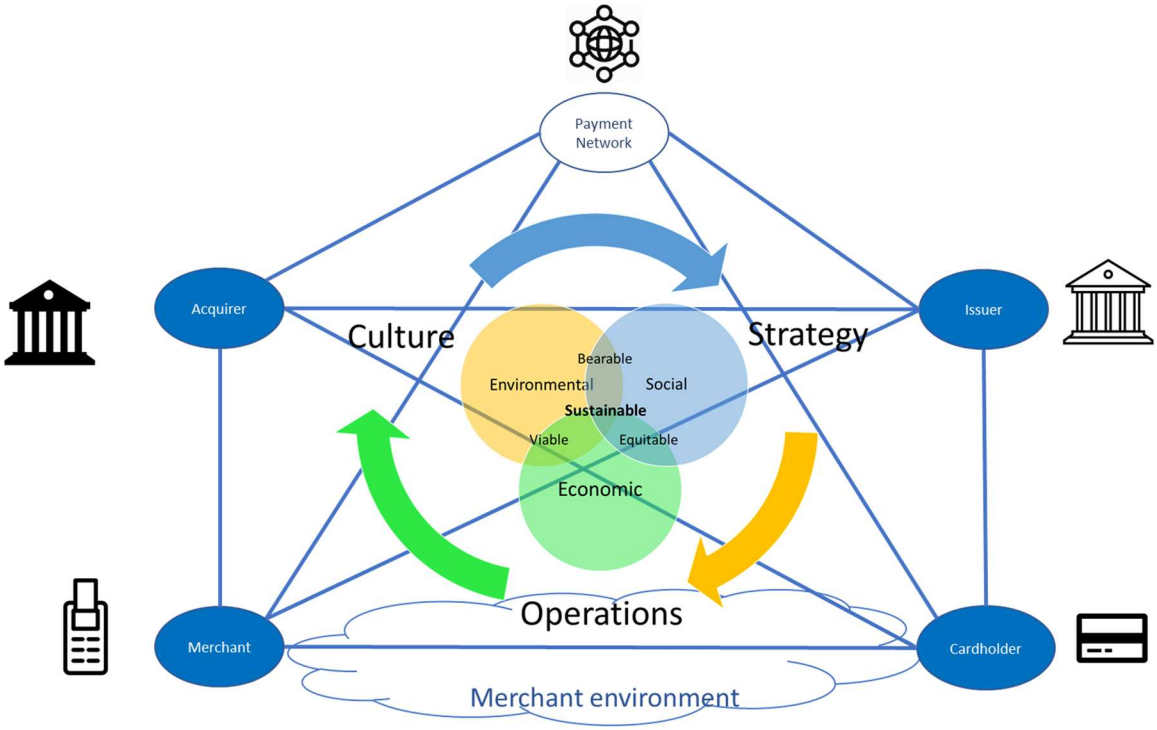


FIGURE 1.3 CARD PAYMENT SYSTEM MULTI-FACTOR APPROACH

Therefore, in considering the use and adoption of the different methods, technologies, and practices, defined as strategic factors, the two main research questions are:

- How may a systems approach be developed and exploited to identify and categorise the stakeholders' inter-organisational strategic factors contributing to the UK's retail payment operation?

- How may the systems approach be extended via clustering and visualisation techniques and applied to determine areas of improvement to the UK retail payments system's operational resilience and sustainability (economic, social, and environmental)?

1.4 Overview and structure

As outlined in Figure 1.4, this thesis is organised in the following chapters. The research aim, questions, and contributions were presented in this first chapter. In the second

chapter, the literature review starts with a broad overview of the UK's payment industry, existing evaluation approaches (RQ1), and the relevant factors that contribute to a system's resilience and sustainability (RQ2), including the relevant previous research done by academics and industry practitioners that validate the existing research gaps and helped to shape both research questions and contributions. The third chapter provides an overview of the different research theories and methods used for the development of the proposed system approach (RQ1). Then, in the fourth chapter, the integrated systems approach for the analysis of complex business systems, in the case of this thesis, the UK retail payment system, is outlined. This approach or method is through which the strategic initiatives or factors are obtained, and the categorisation and clustering are done, then different diagrams, including Systemigrams, are used to present the results (RQ2). Later, the results are explained in the fifth chapter, and some general insights that contribute to answering RQ2 are included. In the sixth chapter, both RQs and contributions are discussed based on the evidence obtained from a methodological perspective (RQ1) and from the specific insights obtained (RQ2). The research limitations are acknowledged, and further research is identified. Finally, in the seventh chapter, the conclusion summarises this research's outcomes in satisfying the research aim, answers to the research questions, and highlighting the contributions. It also highlights the limitations and implications for future research.

FIGURE 1.4 THESIS OUTLINE DIAGRAM

2 Literature Review

In this chapter, first, the UK retail payment system's background and relevance are presented, focusing on digital payments, especially those made by card and mobile. This is to provide a general understanding of the system being analysed and the UK economy implications in case of an operational disruption. Then, operations management pertinent literature related to systems' resilience and sustainability is summarised. The applicable principles were used as a starting point to determine the payment system factors to operational resilience and long-term sustainability. Finally, following these guiding principles, an overview of the different relevant factors, comprised of different resources and capabilities contributing to the payment system's resilience and sustainability found in the academic and industry literature, is presented from a PESTEL perspective.

Overall, this chapter intends to provide the building blocks and capture the current state of analysis, insights, and findings of the UK retail payment system regarding operational resilience and sustainability, which are considered a baseline to compare and discuss with the research method's findings.

2.1 UK retail payment system background

In this sub-section, the relevant industry and academic literature on the UK retail payment system is presented, providing the retail payment system's importance to the UK economy, and showing some operational challenges regarding resilience and sustainability. Given its technological relevance and adoption, this literature has focused mainly on card payments' academic and industry research.

As a sign of this, in 2017, as reported by UK Finance (2018), one of the main UK financial regulators, debit card purchases exceeded cash transactions for the first time in volume and value. Related to the volume, the difference between the two payment methods was around 100 million transactions: 13.2 billion card transactions to 13.1 billion in cash, each was roughly a third of all UK payment transactions. From a countrywide viewpoint, it is between 1 and 2 more purchases per person across the British population (66 million). Despite this marginal difference, the current statistical behaviour shows that digital

payment technologies will continue to grow from 44% in 2020 to more than 50% in 2027, of which 36% to 40% will be contactless payments. However, this projection was already surpassed in 2021, as digital payment transactions were over 50% due to the COVID-19 pandemic (UK Finance 2021). These changes in behaviour affect the payment environment and, therefore, the whole UK financial environment.

Previous researchers have investigated the factors that affect the adoption and use of one or more payment methods. As well as the factors involved when selecting the different payment methods to purchase, a phenomenon known as multi-homing. If given the option to pay with cash and a with debit card, supposing the customer has both payment methods readily available, what influences the decision to pay with one or the other? These studies have focused mainly on the technologies involved (i.e., cards' chips, mobile phones, smart watches, etc.), and on some consumer behaviour-defined attributes, such as ease of use, speed, and safety. They are targeting specific consumer socio-economical groups, such as early adopters. Typically, younger, and higher-income people tend to adopt these technologies faster (Rysman 2007; Yousafzai and Yani-de-Soriano 2012; Arvidsson 2014; Wang and Wolman 2016; Hedman et al. 2017).

Nonetheless, this research studies consumers from the stakeholders' perspective. By defining a retail payment system (Figure 1.3), it intends to have a holistic approach, or systems approach, that considers the different stakeholders' perspectives (i.e., banks, payment networks, etc.). To identify the stakeholders' organisational strategic factors (i.e., PESTEL analysis) used to provide the retail payment system, which promotes the adoption of the payment technologies (Forrester 1961; Senge 1991; Checkland and Scholes 1999; Kolios and Read 2013).

The UK financial system has been characterised as innovative and forward-looking, offering different payment methods (i.e., cash, card, checks, etc.), along with the introduction of new technologies, more recently in the period from 2012 to 2022, such as mobile payments, and regulations to provide and improve financial services (i.e., Payment Service Directive 2 – PSD2) (Bansal et al. 2018; UK Finance 2018b). However, it was not until the 1950s that different financial needs and opportunities started to be addressed

with robust digital business solutions according to the payment's specific characteristics. These payment technologies started with telephone bank transfers and the use of monthly-paid consumer credit charge cards by businesses instead of using credit letters (Batiz-Lazo and Del Angel 2018a).

From this time, cards became the most frequent digital retail payment method, allowing financial services growth and personalisation through data-based initiatives, such as Open Banking and FinTech. Open Banking allows third-party organisations access to customers' financial data from banks and other financial institutions, using application programming interfaces (APIs). Financial technology, or Fintech, is any technology used to automate or digitise financial services (Raconteur 2018). Although this new type of technology brings convenience, it also brings some risks. Therefore, the British financial regulators and government have carefully provided an integral governance framework. They allow customers to pay securely and quickly and avoid fraud and privacy issues. Nevertheless, technological risks remain to be a relevant problem from all the digitisation of the different activities in our modern world (UK Finance 2018b; Innovate Finance 2019; Open Banking Ltd. 2019)

2.1.1 UK's economic background

An understanding of the retail payments industry within the UK can be deepened by examining key macroeconomic factors. With a population of approximately 66.04 million, the UK ranks as the 44th most densely populated nation out of over 260, with 275 inhabitants per square kilometre, placing it in the top 20% for population density (ONS, 2019). Such density presents unique challenges in governance, regulation, and the tailoring of services to diverse needs.

Economically, the UK stands as the fifth largest globally, boasting a GDP of $2.825 trillion USD and a growth rate of 1.4% in 2019. The GDP's composition—encompassing production, earnings, and expenditure, adjusted for imports and exports—reflects the economy's scale. Yet, the UK's contribution to global GDP is a modest 3.29%, trailing the United States, China, Japan, and Germany (World Bank, 2019a). Post-Brexit referendum trends show a gradual GDP growth decline, exacerbated by the 2020 pandemic's

profound impact (ONS, 2019; UK Finance, 2021), possibly signalling a retail downturn, particularly in card transactions (The UK Cards Association, 2017).

Interest rates have remained at a stabilising 0.75% since 2019, after a historic low post-Brexit vote, aimed at boosting spending (Bank of England, 2019a). These low rates encourage credit and discourage savings, thereby stimulating economic activity (Fair, 2005; The UK Cards Association, 2017; Bansal et al., 2018).

On the business front, the UK is the ninth easiest country for doing business, as per the World Bank (2019b), reflecting operational efficiencies and investment attractiveness. Additionally, the burgeoning sharing economy, exemplified by services like Airbnb, Uber, and Nextbike (Morozov, 2018), has thrived, supported by the UK's robust card payment infrastructure, and is projected to escalate to £25 million by 2025 (The UK Cards Association, 2017).

In the socio-political domain, Brexit is no-deal spectre cast uncertainties; however, the anticipated adverse impacts on consumer spending were less severe than expected. A slight decrease in consumer spending in early 2019 contrasted with a strong overall expenditure of £342 billion and an improved unemployment rate, from 8.9% in 2011 to 3.8% in 2019, signalling a stable economic environment (ONS, 2019; UK Finance, 2019b).

While the UK excels in various economic indicators, it must navigate the complexities of political, social, and cultural influences on consumer behaviour. Accordingly, the payment systems must evolve. Integral to this landscape are the six main payment schemes in the UK, which, although not widely known, underpin transactions across all payment modalities and financial institutions (BACS, 2016).

- *Link*: Facilitates consumers' access to cash through the UK’s ATM network.
- *Paym*: The UK’s mobile payment service, offering a central mobile phone directory and allowing mobile payment exchange.

- *Faster Payments*: Offers real-time credits through online, telephone, and mobile applications.

- Bankers' Automated Clearing System *(BACS)*: Transfers regular bulk file-based credit payments and Direct Debits.

- *Cheque and Credit Clearing Company (C&CCC)*: Processes and settles cheques and other paper payment instruments.

- *Clearing House Automated Payment System (CHAPS)*: Offers same-day high-value payment system, including wholesale and retail payments in the UK. These payments are settled individually every day in the central bank funds. The Bank of England is the UK's central bank.

This research's scope necessitates comparing transaction volumes across various payment methods. A study of the 2017 and projections for 2027 data highlights the dominance of debit cards as the primary consumer payment method, superseding cash and direct debits, as depicted in Figure 2.1. The trend observed in 2020 corroborates this finding, indicating that digital payments constitute over 60% of all transactions (UK Finance 2018a; UK Finance 2018b; UK Finance 2021).

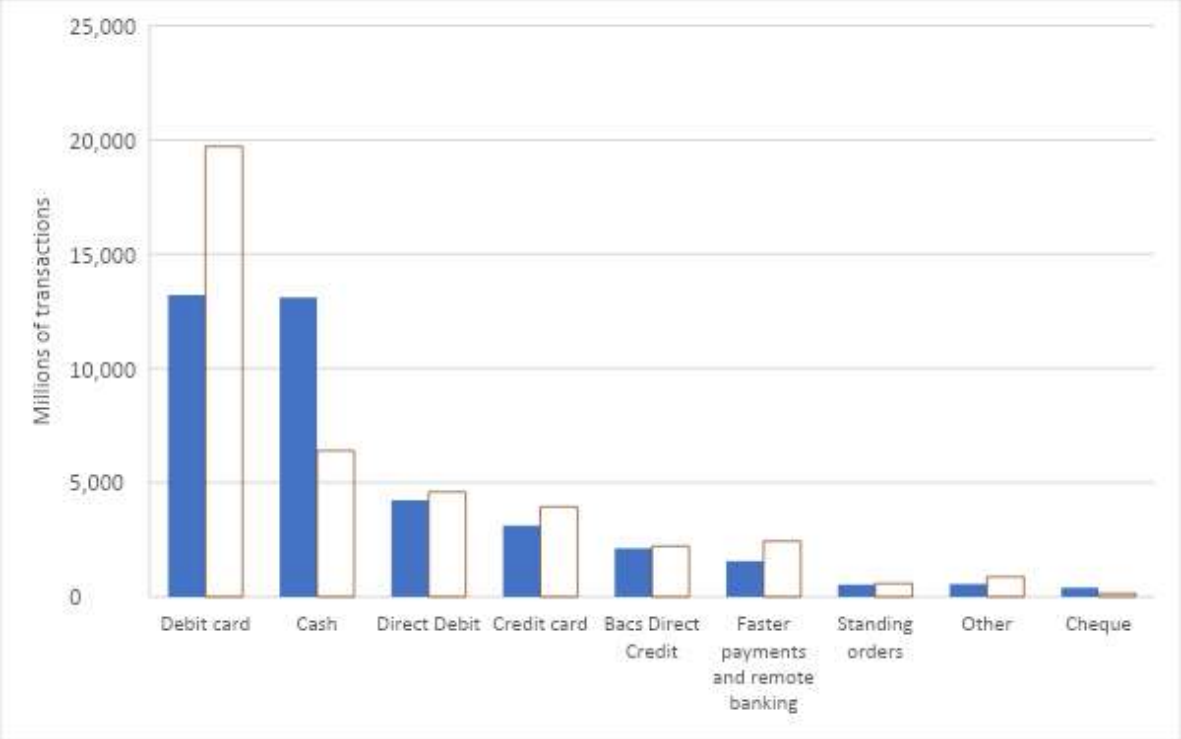
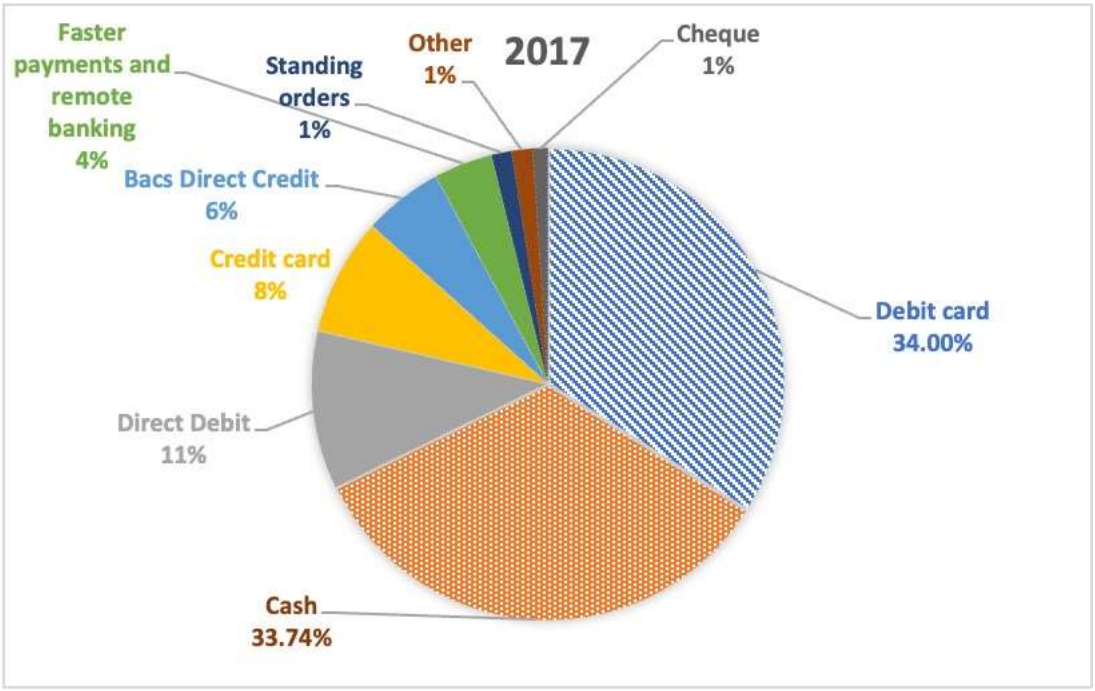


FIGURE 2.1 2017 VS PREDICTED 2027 PAYMENT TRANSACTIONS IN MILLIONS BY METHOD (UK FINANCE 2018A).

Furthermore, Figure 2.2 reveals that in 2017, debit cards and cash accounted for two-thirds of all payments. This pattern persisted into 2020, with projections for 2027 suggesting that debit cards will subsume the share previously occupied by cash, potentially constituting half of all transactions (Borzekowski et al. 2008; Koulayev et al. 2016; UK Finance 2018b).



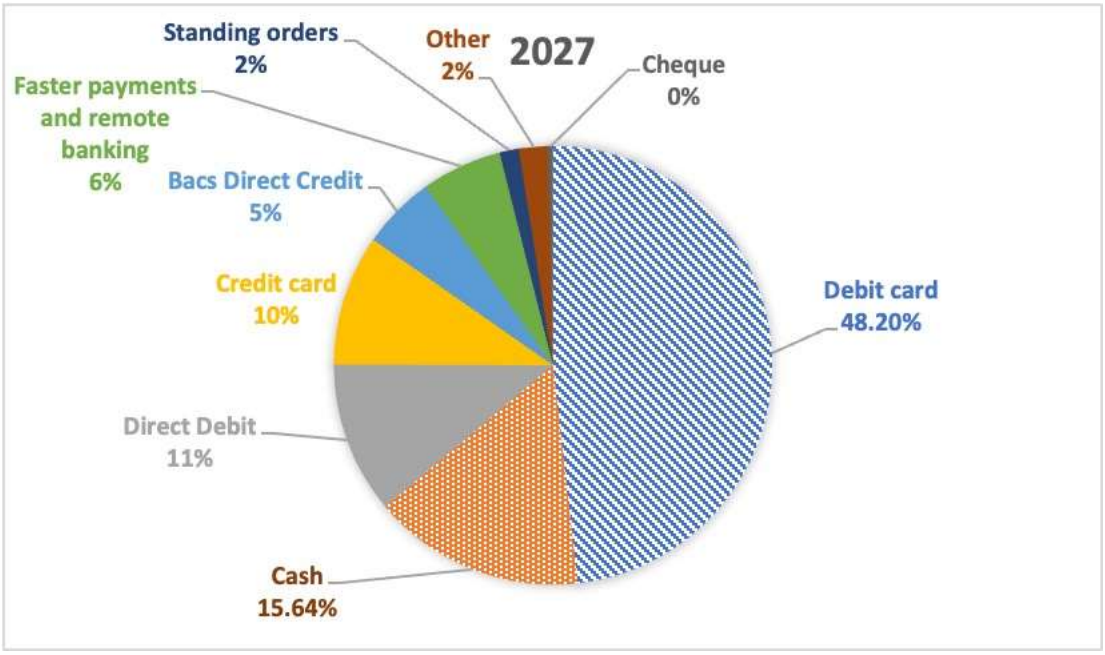


FIGURE 2.2 2017 VS. PREDICTED 2027 PERCENTAGE OF TOTAL PAYMENT TRANSACTIONS BY METHOD (UK FINANCE 2018B)

In 2017, the UK saw a staggering 38.8 billion payments made, totalling £155 trillion, which is nearly 55 times its GDP. By 2020, this number had increased marginally by 2% due to the pandemic. A significant 90% of these payments, in terms of value, were consumer

transactions amounting to £90 trillion—58% of the total payments' value. Of these payments, spontaneous consumer purchases accounted for approximately 8% of these payments, while the remaining 15% were for regular bills and commitments. Debit card transactions were notably prevalent, totalling 13.2 billion, constituting a third of the UK's total transaction volume, albeit only 0.32% of the value at £500 billion. That year, 98.2 million debit cards were issued—nearly three cards per cardholder—among 33 million cardholders, leading to an average annual spend of £5,000 per card, or £15,000 per cardholder (Bank of England, 2019b; Innovate Finance, 2019; UK Finance, 2021). The issuance of cards is directly linked to business growth strategies, as a greater number of cards in circulation typically leads to an increase in transaction frequency (Bech et al., 2018).

In the final quarter of 2017, for the first time, debit cards overtook cash as the UK's preferred payment method. Approximately 98% of the population currently owns a debit card, primarily used for everyday transactions. The convenience and security offered by card technologies, particularly contactless payments, have augmented their appeal, increasing both the volume and value of transactions. By 2021, the limit for contactless transactions was set at £100, reflecting confidence in the security of these transactions and their growing ubiquity in the retail landscape. Projections suggest that 2027 debit card use will surge by 49% to 19.7 billion transactions (UK Finance, 2019b; UK Finance, 2021).

The Bank of International Settlements (2019) notes an increase in card usage corresponding to the number of cards held. The Committee on Payments and Market Infrastructures (CPMI) reports that the average number of payment cards per person in the UK increased from 1.1 in 2007 to 2.8 in 2020, which is mirrored by a 7% growth in the number of issued cards in 2020, rising to 175 million, with debit cards specifically witnessing a 40% increase to 98.2 million (UK Finance, 2021).

Globally, the average card usage per person has risen from 60 transactions annually in 2000 to 85 by the end of 2019. Advanced economies see even higher usage, with individuals in countries like Australia, Korea, Sweden, and the United States using cards

over 300 times yearly. At the same time, the UK is close behind at 310 transactions annually, which starkly contrasts emerging markets such as Mexico and India, where the figure is closer to 25 (Bank for International Settlements, 2019; UK Finance, 2019b).

The value of card payments as a percentage of GDP has also increased from 13% in 2000 to 30% in 2019. Card payments accounted for nearly 40% of GDP in the UK, with debit cards making up 80% of this payment value in 2017. By 2020, the value of card payments had reached approximately 50% of the UK's GDP (UK Finance, 2021).

Consumer behaviour in the UK between 2016 and 2020 showed a shift from credit to debit cards, particularly for retail and grocery shopping. Debit cards accounted for 53% of the nearly £400 million spent in retail in 2017, with credit cards at 24% and cheques covering the remaining 23%. The pandemic saw these figures rise sharply, approaching £1 million, though the proportion of spending per payment method remained relatively unchanged (The UK Cards Association, 2017; UK Finance, 2021). British consumers favour standing orders and direct debits for other payments, such as rent and utilities (UK Finance, 2019b). The preference for payment methods varies internationally and is influenced by each country's specific infrastructure, necessitating global regulation to ensure comparability and assess the creditworthiness and risk of individuals and organisations (Acheampong & Elshandidy, 2021).

Since 2017, there has been a decline in cash usage, with debit card transactions growing by 25% to over 50% of all retail transactions by 2020. This shift is partly due to the rise in contactless payments and investment by retailers in payment technology, allowing for a wider acceptance of card and contactless methods. Contactless payments constitute 27% of all retail payments (UK Finance, 2019b; Edge et al., 2021; UK Finance, 2021).

Digital wallets, while a form of mobile payment, continue to depend on the established card payment infrastructure, requiring the input of a credit or debit card. Common mobile wallets like Apple Pay, Google Pay, and Samsung Pay have been embraced by 75% of Britons, with usage frequency increasing to once every two weeks in 2020. Adoption rates for other devices like smartwatches and smartphones are also noteworthy, with half of smartwatch users and 56% of smartphone users making payments using their devices.

Unlike in some African nations, where mobile payments are not contingent on having a bank account, the UK's system still primarily relies on traditional banking infrastructure (Bech et al., 2018). Advantages of digital wallets include security features like biometric verification, although they largely depend on visual verification technologies (Raconteur, 2018). One of the main advantages of digital transactions is the time saved by bypassing the need for password entry, particularly for contactless debit card transactions under £100 (UK Finance, 2021). Digital payments are poised for growth but remain anchored to the card payment infrastructure, which will be expounded in the following section.

2.1.2 Breaking down the card payment process

The digital card payment process for retail transactions, which constitutes the core of this research, operates through a sophisticated exchange of communication messages among a network of stakeholders, effectively replacing the need for physical cash exchanges. To fully comprehend the intricacies of this network, it is imperative to analyse the strategic long-term initiatives pursued by the various stakeholders within the network.

The card payment mechanism is deceptively straightforward, depicted in Figure 2.3. Here, an acquiring organisation equips a merchant with a Point of Sale (POS) system, enabling card acceptance in exchange for a transaction fee—typically ranging from 1 to 3% in the UK, known as the merchant discount (MD) rate (Gilmore, 2018). This POS terminal interfaces with the UK's Financial Market Infrastructures (FMI), as designated by the Bank of England, which includes significant payment networks such as Visa and Mastercard. Visa dominates the market share with 85%, followed by Mastercard at 14%, and Amex at a marginal 1% (The UK Cards Association, 2017).

A customer's transaction, authenticated by a PIN security code, is routed through this payment network to the card's issuing bank for validation, such as confirming sufficient funds for a debit card. The network then communicates the outcome to the merchant (Bank of England, 2019b).

Settlement of funds between buyer and merchant accounts through the central bank occurs at predetermined times. The Bank of England serves as the clearinghouse, reconciling all participants' debts (Bank of England, 2019b). The MD fee is apportioned

among the triad of retail payment system stakeholders: the acquirer, payment network, and issuer bank, with the issuer often receiving the largest share, followed by the acquirer, and finally, the payment network (Gilmore, 2018).

These entities—the acquiring bank or third party, the payment network, and the issuing bank—are collectively termed an Integrated Payment Network (IPN). While this system appears operationally sound, the interaction of various stakeholders and external factors contribute to the system's overall resilience and sustainability.

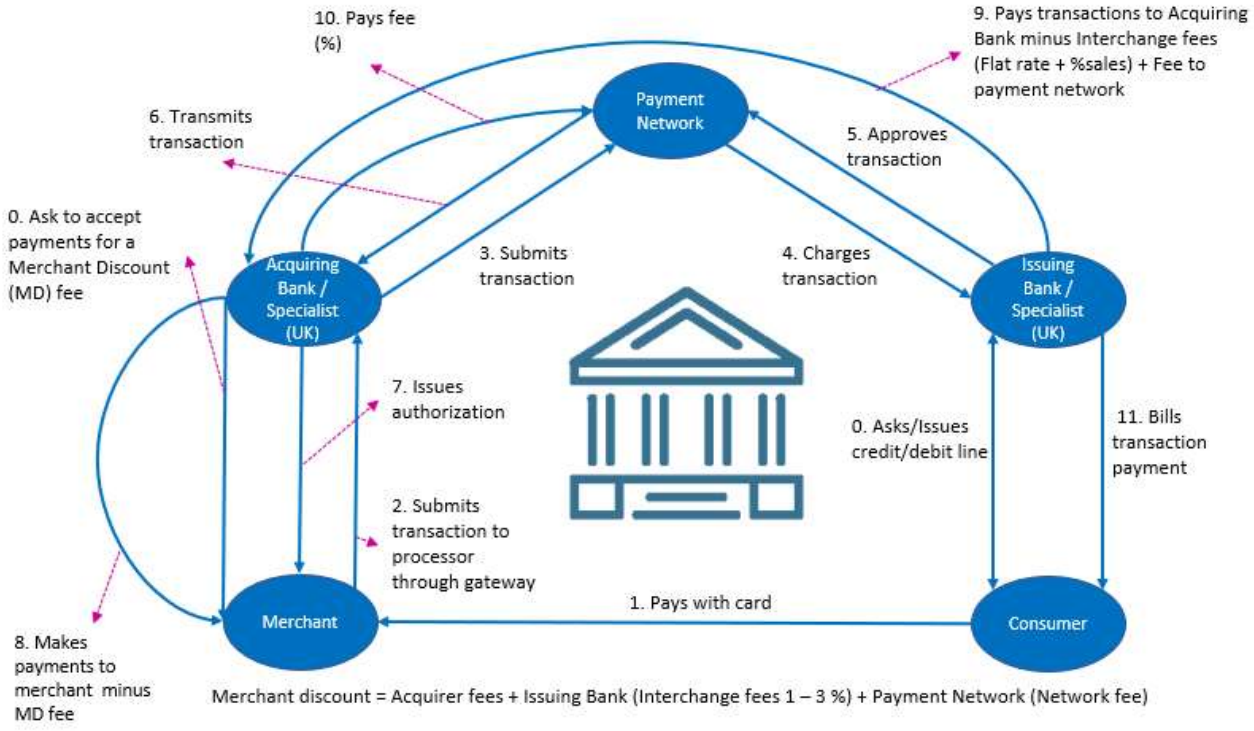


FIGURE 2.3 CARD DIGITAL PAYMENT PROCESS

2.2 Operations management approaches to system resilience and sustainability

As seen in the previous section, the retail payment system is crucial to the UK's economic fabric, enabling transactions through diverse mediums such as cash and cards. Acknowledging this system's need for resilience is paramount. To appraise its robustness

and sustainability effectively, drawing on system theory, supply chain management, and operations management is essential.

2.2.1 Systems' resilience theoretical insights

Resilience is articulated within systems theory as the capability of socio-ecological systems—viewed as integrated and interdependent units—to endure and adapt, often characterised as complex adaptive systems (CAS). it is vital to recognise criticisms of general systems theory which suggest it may veer towards methodology at the expense of being a comprehensive theory or explanatory model. This criticism centres on the simplification of reality when system boundaries and components are defined to construct scientific problems (Alexander, 2013).

The working definition of systems' resilience for this study is the ability of a system, community, or society to withstand, adapt to, and recover from hazards efficiently, safeguarding and restoring its essential functions (Alexander, 2013). This resilience concept includes processes such as resistance, recovery, reorientation, and renewal, as Soroka et al. (2020) noted. Holling (1973) interprets resilience as the persistence of relationships within a system, or the system's ability to absorb changes and maintain functionality post-disturbance, highlighting adaptability over stability (Walker et al., 2004; Coetzee et al., 2016).

CAS are inherently non-linear, where minor variations can lead to significant outcomes. These systems are underpinned by hierarchy, emergent behaviours that manifest through the interaction of parts, feedback loops facilitating communication and adaptation, and context-based responses that dictate a system's equilibrium (Coetzee et al., 2016; Snowden and Boone, 2017; Jain et al., 2018). Holling (1973) also introduced a system dynamics approach that conceptualises 'capital' in various forms—financial, organisational, and biophysical—which is crucial for assessing stakeholder perspectives in the retail payment system (Walker and Cooper, 2011).

To thoroughly comprehend and quantify systems' resilience, a practical methodology is required to inform the development of relevant policies and programs. Scholars suggest

evaluating the resilience of individual and organisational components, delineating their resources, capabilities, and interplay across different scales. These interactions are pivotal for the system's adaptability and ability to reconfigure in response to the changing environment. Assessing how these elements evolve under stress is essential for long-term sustainable development and aligning goals with favourable socio-economic outcomes, such as profitability and cost-efficiency (Folke et al., 2010; Coetzee et al., 2016; Soroka et al., 2020).

Moreover, the V-model represents a further concept from systems thinking—the system life cycle—. This model marries top-down and bottom-up approaches in systems engineering, integrating technical and social aspects assessment throughout a system's life cycle. This life cycle includes stages from feasibility to decommissioning (see Figure 2.4), which are instrumental in predicting the system's structural evolution across diverse future scenarios (Jain et al., 2018; Amanatidou et al., 2012).

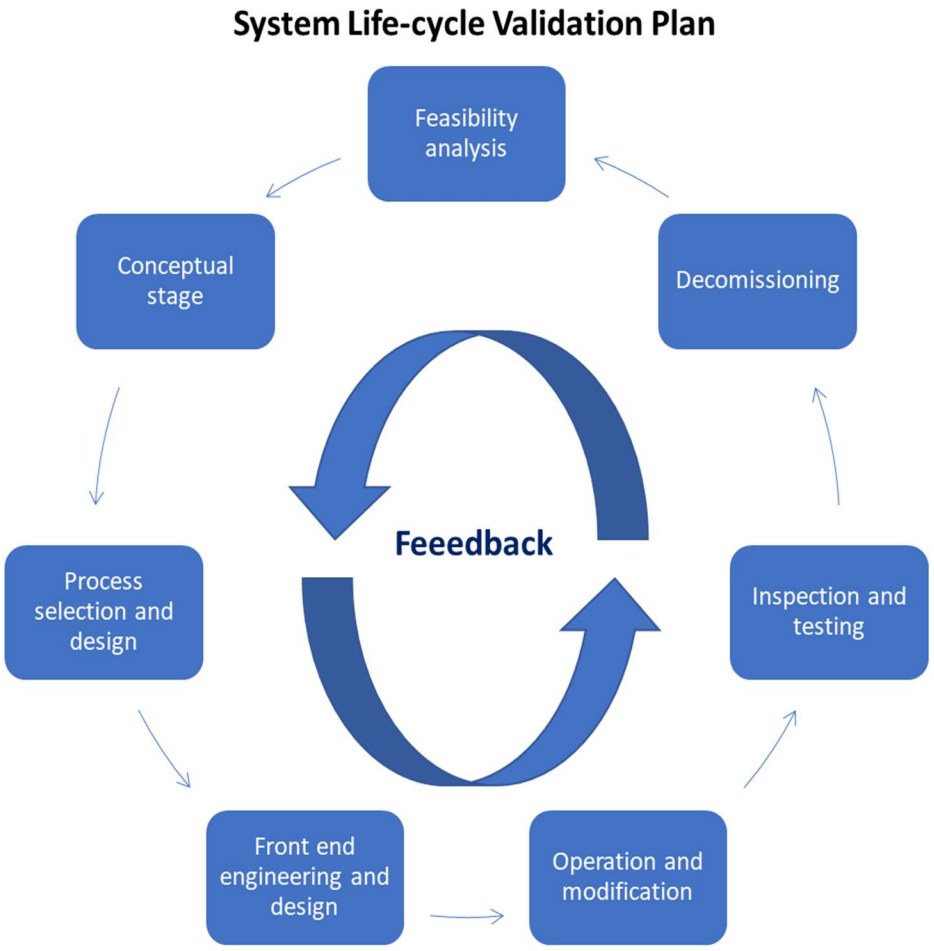


FIGURE 2.4 SYSTEM LIFE CYCLE MODEL (JAIN ET AL. 2018).

The concept of interdependent and interconnected (I–I) complex Systems of Systems (SoS), akin to complex adaptive systems (CAS), hinges on the assessment of risk within its ever-evolving core components. These components are subject to the dynamic rules and shifting realities of each subsystem and the system as a whole. They have been categorised as follows: (a) goals and objectives, (b) stakeholders, decision-makers, and interest groups, (c) organisational, political, and budgetary frameworks, (d) redistribution of pivotal personnel and resources, (e) implementation of emerging technologies, and (f) specifications, delivery, and client interaction (Haimes 2018; Homburg et al. 2020). Other scholars have assessed these components by their systemic risk contribution, underlining the need to pinpoint critical infrastructure, resources, and assets, collectively termed

CIKRKA. Identifying these elements is essential for crafting sophisticated models to anticipate risks, pinpoint vulnerabilities, bolster resilience—particularly cyber-resilience—mitigate fragility, and foster culturally attuned perceptions (Gheorghe et al. 2018; Leo 2020). Specific risks such as cybersecurity, data management, and climate-related financial risks have been emphasised due to their significant impact and potential repercussions (Giocoli 2014).

In response to these risks, organisations have cultivated various risk management functions. These include information collection and distribution to detect risks, resource mobilisation and distribution, skill enhancement, capacity building, and leadership to guide risk management strategies. Collaboration with other entities is crucial for sharing information and strategies. Equally critical is enforcing laws or policies and resolving conflicts to mitigate recurring risks (Carabine and Wilkinson 2016).

Global financial bodies like the International Monetary Fund (IMF), the World Bank (WB), and the Bank for International Settlements (BIS) have incorporated resilience into their crisis management, financial deregulation, and development economics strategies. They are shifting policies to pre-empt critical future events, assessing societal needs, and pinpointing areas requiring policy formulation. Governments, for their part, claim that they cannot predict or forestall such events but can only 'build resilience' to adapt to them (Amanatidou et al. 2012; Government and Division 2015). This approach to 'socio-ecological resilience' sets the groundwork for a general systems theory that weaves together societal, economic, and environmental strands. It is characterised by a cycle of rapid growth, "r", followed by a conservation phase, "K", inevitable collapse, "Ω", and subsequent reorganisation into a new phase of growth, "α" (Walker and Cooper 2011). These stages mirror the 'boom and bust' business cycles, as identified by previous scholarship (Purvis et al. 2016).

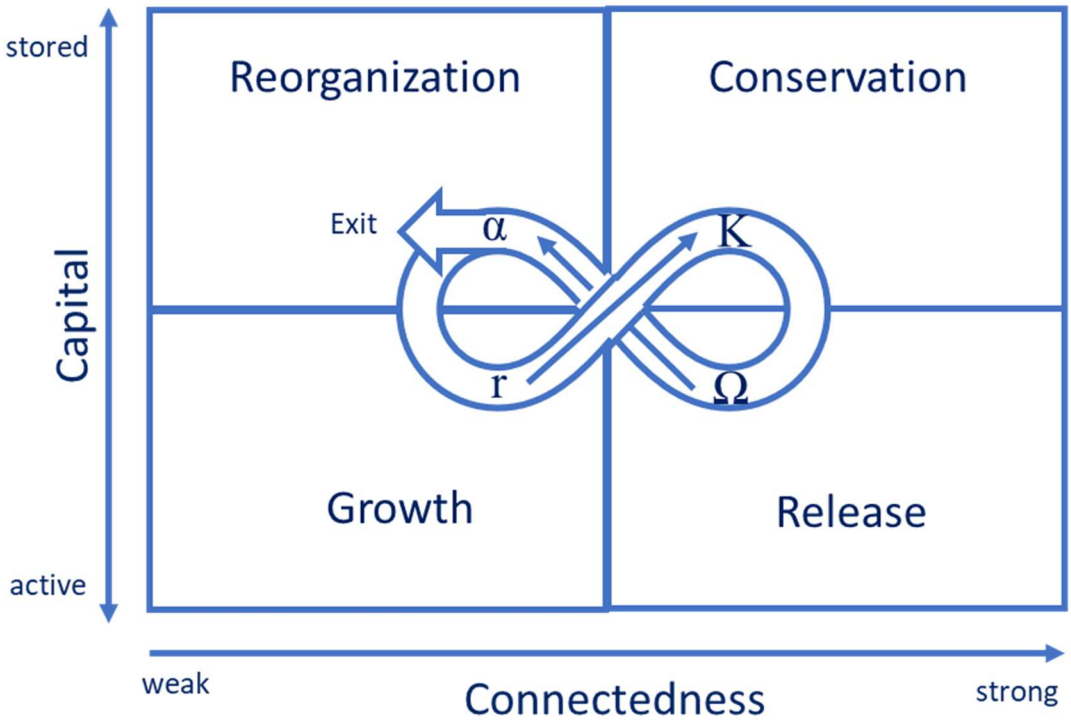


FIGURE 2.5 HOLLING'S RESILIENCE CONTINUAL ADAPTIVE CYCLES OF RAPID SUCCESSIONAL GROWTH (WALKER AND COOPER 2011)

The Bank of England's Financial Stability Authority (FSA) is pioneering the use of innovative, non-predictive futurological methods for crisis management, including scenario planning. This technique utilises subjective expectations and counterfactual reasoning to envision potential future market scenarios (Bank of England 2019b). This approach acknowledges the inherent impossibility of perfectly forecasting future global states, both empirically and logically. Consequently, there is an imperative to accurately diagnose (for instance, through the Quick Scan method (Mello et al. 2017)) future investment decisions, drawing from science-driven research to enhance the structural resilience of critical infrastructures, such as cyber resilience. This technique aims to bolster the operational resilience of organisations, government bodies, and private sector entities in crises.

However, resilience thinking should not be confined to the paradigms of complex systems theory, which traditionally focuses on the system's components and their interrelations. It must also account for the unforeseen external environmental influences—the 'unknown

unknowns'—that challenge established systems theory principles. This counter-systemic thinking acknowledges the current confines of system theory, recognising that resilience in practice extends beyond theoretical constructs (Naim et al. 2002; Walker and Cooper 2011; Snowden and Boone 2017; Parreiras et al. 2019; Leo 2020; Paul and Zhang 2020).

2.2.2 Supply chain resilience theoretical insights

To enrich the literature on systems theory resilience, this segment delineates various concepts of supply chain resilience and traces their evolution within the context of the contemporary digitisation of systems.

Industry 4.0, the fourth industrial revolution, heralds a complete digital overhaul of many manufacturing activities. These advanced manufacturing systems are typified by cyber-physical systems capable of interoperation through networked connections and human interfaces within sophisticated smart factory settings. This digital revolution presents a significant opportunity to augment existing continual improvement processes by harnessing in-process data to forge new knowledge and empower real-time decision-making capabilities (Giannetti and Ransing 2016; Morgan et al. 2019). These principles provide various lenses through which supply chain resilience is examined, defining its associated concepts and attributes.

Purvis et al. (2016) posit that resilience in a supply chain is the dynamic capacity to embrace change, revert to or transition into a new state, prepare for unforeseen events, respond to disruptions, and recover from them to mitigate uncertainty and any consequential opportunity costs (Shukla et al. 2011). This notion of resilience is framed within the RALF paradigm—Robustness, Agility, Leanness, and Flexibility—each attribute underpinning the foundation of a resilient system:

- Robustness is the supply chain's ability to withstand change without modifying its original stable structure, resisting disruptions through redundancy or swift implementation of contingencies.

- Agility pertains to a firm's capacity to manage unanticipated changes stemming from market demands or customer preferences.

- Leanness ensures the streamlining of processes to deliver customer value efficiently, eradicating waste in effort, time, and resources.

- Flexibility is the adeptness to adjust to diverse conditions with minimal detriment to time, effort, cost, or performance.

However, resilience is not unidimensional; attributes like collaboration, integration, visibility, and security are equally integral due to their multifaceted and context-specific nature (Han et al. 2017). Resilience enables processes to attain a state of reliability by maintaining operational continuity with an optimal level of connectivity and governance over its structure and functions. The pertinent questions are: How does one achieve a stable state conducive to resilience? What capabilities are essential for this development? (Ponomarov and Holcomb 2009; Pettit et al. 2010).

Building upon this supply chain risk management literature, this framework integrates robustness as a supply chain's resistance to change, often termed rigid flexibility, and prescribes a range of foreseen events the supply chain can withstand (Durach et al. 2015; Purvis et al. 2016). From the dynamic capabilities view (DCV), risks are seen as vulnerabilities due to their inherent potential for change, necessitating continual risk management and occasionally the acquisition of innovative capacities to stay competitive (Teece et al. 1997; Salunke et al. 2011; Sluyts et al. 2011; Scholz et al. 2012; Katsafados et al. 2021). A robust supply chain is reputed to enhance business performance directly, whereas its agility appears to have only an indirect effect (Durach et al. 2015). In some instances, capabilities are defined through benchmarking and strategic decision-making, including new product launches, corporate restructurings, and expansion into international markets (Nutt 2000; Nutt 2001).

Resilience and robustness are proposed to be quantifiable in terms of time, cost, and quality. Robustness mainly necessitates identifying and prioritising manageable risks by establishing specific controls to avoid onerous processes. Organisations have developed risk control frameworks to diminish systemic or supply chain risks (e.g., COSO 2004) (Pettit et al. 2010). Conversely, resilience strategies extend beyond mere control, implementing continuity plans for known events. The risk-based approach of the

ISO9001:2015 standard compels organisations to categorise outputs as acceptable or unacceptable and address risks and opportunities to minimise negative impacts and enhance process optimisation (Giannetti and Ransing 2016). Effective risk management strategy, particularly when resources are scarce, often involves prioritisation based on the impact or likelihood of risks (Pettit et al. 2010; Purvis et al. 2016). Nevertheless, innovation remains a primary driver of environmental change in business, crucial for maintaining competitiveness. The challenge lies in striking a balance between innovation—or process improvement and reengineering in supply chain parlance—and risk exposure (Porter 1996).

The more risks are shared within a supply chain, supported by ongoing risk analysis and top management backing, the stronger the correlation between logistics capabilities and the resilience and robustness of the supply chain. In today's global landscape, supply chains, by nature, possess high levels of connectivity. They must foster robust capabilities in collaboration, visibility, and flexibility to manage their intricate web of interrelated activities effectively (Pettit et al. 2010). Enhanced visibility, for instance, can be achieved through improved relationships or redesigning the network to include optimal communication points (Durach et al. 2015). Thus, this research adopts an approach that analyses stakeholders' initiatives and risks through a holistic process-resource perspective.

Resilience is intrinsically linked to significant environmental aspects—ecological, social, psychological, economic, and organisational. As environmental changes occur, encapsulated by the Political, Economic, Social, Technological, Ecological, and Legal (PESTEL) framework, supply chains grow in complexity and vulnerability, exposing them to an array of risks (Kolios and Read 2013).

Drawing from Barney’s (1991) resource-based view (RBV), the focus is on identifying the physical, human, and organisational resources or capabilities that enable an organisation to achieve resilience, efficiency, sustainability, and effectiveness. A firm's competitive edge is derived from managing a bundle of valuable, rare, inimitable, and non-substitutable resources (Porter 1996; Porter 2008). Two extensions of RBV are

considered: the Relational View (RV), which posits that critical resources may extend beyond firm boundaries and be embedded in inter-firm routines and processes, such as information-sharing and system integration, leading to increased interactions and complexity (Han et al. 2017); and the Dynamic Capabilities View (DCV), which recognises the necessity of integrating, building, and reconfiguring internal and external competencies to stay ahead of market shifts (Teece et al. 1997; Warren 2005).

2.2.3 Operations Management sustainability principles

Discussing resilience today inevitably leads to a dialogue on sustainability. They are intrinsically linked—organisational performance targets must be sustainable over the long haul, and operational processes must be resilient enough to sustain them. The principal hurdles in achieving sustainable operations management arise from a deficiency in knowledge, transparency, and the integration of practices within global organisations, especially in light of the ambitious sustainable performance targets set forth. The United Nations Sustainable Development Goals (SDGs) represent the apex of such targets, formulated after assessing environmental and social impacts, including resource scarcity, ecological footprints, and climate change. However, these SDGs are often seen as unattainable with current service level agreements and consumer demands that necessitate a robust level of resilience alongside assured long-term sustainability. This gap underscores the necessity for market regulation to strive towards these goals and cultivate feasible organisational commitments (Subramanian et al. 2017; Hayes et al. 2019; Nedopil Wang et al. 2020).

Addressing these challenges entails adopting environmental practices that curtail the supply chain's reliance on virgin material resources and minimise waste. Business strategies pivot towards product design and manufacturing, embracing regenerative design and resource efficiency, using non-toxic materials, and advancing a circular economy (CE) that promotes reducing, reusing, remanufacturing, and recycling materials. This approach also entails reducing energy consumption and switching to renewable energy sources. On the social front, practices include upholding robust, safe, and equitable working conditions, eradicating child and forced labour, and fostering diversity,

equality, and non-discrimination. Organisations are encouraged to invest in local communities, bolster transparency, and adhere to anti-corruption and anti-competitive statutes through diligent tracking and reporting of activities (Machado et al. 2017; Schoenmaker 2018; Hayes et al. 2019).

The implications of environmental and social issues demand a formidable degree of socio-ecological resilience—a concept that suggests organisations can evolve positively through disturbances, implementing closed-loop material flows and reverse-engineered supply chains that are ecologically and socially beneficial (Kleindorfer et al. 2005; Hayes et al. 2019). Some organisations endeavour to integrate a sustainable activity taxonomy to achieve low or zero carbon emissions—carbon zero transition—and are establishing Ecological Performance Standards (EPS) to bolster their environmental practices (Azahara and González 2021).

Leveraging the resource-based view (RBV) and systems theory, Machado et al. (2017) have pinpointed sustainable capabilities within a maturity-based framework, acknowledging the complexity and unpredictability of organisational networks over time. They outline five levels of maturity and the various interconnected resources and capabilities—factors in the context of this thesis—that contribute to building a Business Process Re-engineered (BPR) sustainable organisation, as viewed through the triple bottom line lens: people, profit, and planet (See Figure 2.6) (Kleindorfer et al. 2005; Hayes et al. 2019). This framework accepts that adaptation is essential to cultivate long-term organisational sustainability.

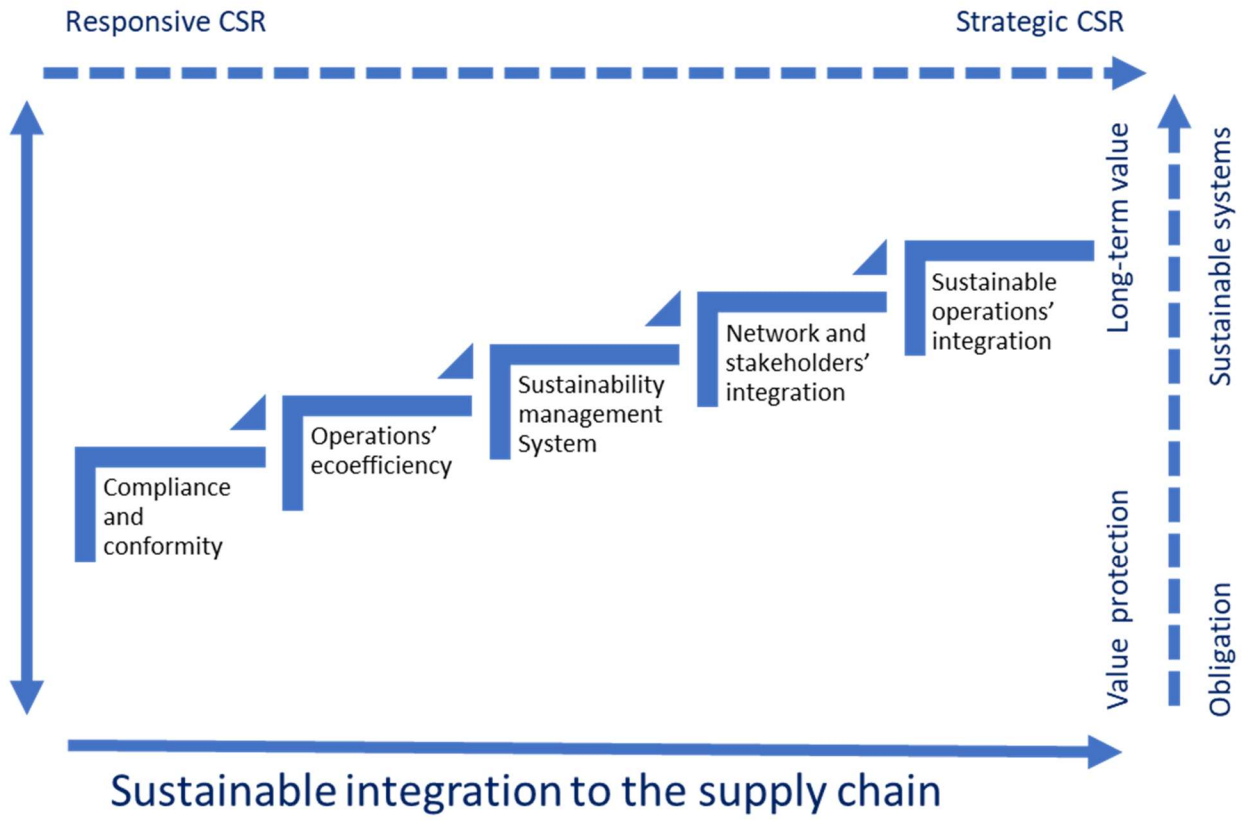


FIGURE 2.6 MATURITY LEVELS FOR SUSTAINABLE OPERATIONS WITH GENERIC GOALS (MACHADO ET AL. 2017)

Kleindorfer (2005) identified a progression in organisational capabilities, from internal focus to external alignment, fostering not only adherence to industry standards but also enhancing operational abilities to secure a competitive edge.

The sustainable operations management literature references several key capabilities for improvement (Walker et al. 2014):

- Corporate Social Responsibility (CSR) and the Triple Bottom Line (3BL) ethos.

- Eco-design initiatives include recycling, responsible purchasing, performance metrics, and risk management strategies, notably those addressing reputational and environmental harm.

- Integration of lean and green principles in products and processes, alongside concerted efforts to curtail waste, reduce carbon emissions, and spearhead energy conservation measures.

- Implementation of reverse logistics and the management of closed-loop supply chains.

- Promotion of ethical product lines and the advocacy of fair trade.

- Application of a Resource-Based View (RBV) to sustainable supply chain management and transaction cost economics, including remanufacturing practices.

- Adherence to standards set by the International Standards organisation, such as ISO9000 and ISO14001, as well as Total Quality Management (TQM) and compliance with international agreements like the Kyoto Protocol.

- Commitment to equity and the enhancement of employee well-being through human resource practices.

These various practices underscore sustainability's critical role in bolstering the resilience of operational processes.

2.3 Relevant factors contributing to the system’s resilience and sustainability

Contemporary systems must embed sustainability within their long-term objectives, incorporating various risks into capital and financial planning. This approach is essential for the resilience and sustainability of payment systems (Karapandza 2016; Accenture 2019; Oliver Wyman 2020; IIF and EY 2021). Accordingly, this study presents prior research on factors contributing to the resilience and sustainability of payment systems, utilising an adapted PESTEL framework to classify the diverse factors identified in the literature (Kolios and Read 2013). The background of these factors will be instrumental in evaluating and contrasting the findings of the proposed method.

2.3.1 Political and organisational

On the political or ideological front, an epistemological challenge in understanding financial activities has been spotlighted by Lagoarde-Segot (2019). Traditional empirical realism, relying on deductive reasoning from mathematical theories and econometric models, often lacks grounding in tangible reality. A shift is proposed towards a critical realist perspective that appreciates human agency and the complexity it introduces to financial systems. This view advocates for impactful investments to be determined through comprehensive diagnostics employing holistic measures, such as whole life cycle analyses, to ascertain economic relevance for both, corporations, and communities.

it is argued that systems and their sub-components should evolve to incorporate bespoke, adaptive performance measures that account for operational, environmental, and social dimensions. Effectiveness for one organisation may not translate to another, necessitating the development of systems through both inductive (top-down) and deductive (bottom-up) approaches (Li et al. 2017). However, there is a trend where organisations rebrand financial instruments under sustainability labels without true reengineering for community-specific needs, an act termed 'greenwashing'. Such actions lack adherence to community-oriented approaches like the UN Sustainable Development Goals and miss incorporating a life-cycle perspective, offering instead generic solutions (Nedopil Wang et al. 2020; Popescu et al. 2021).

Triodos Bank serves as an exemplar of a sustainable organisation challenging the empirical realist paradigm in finance. As an ethical European bank, it funds renewable energy, micro-credit, and fair-trade projects, focusing on Socially Responsible Initiatives (SRI). Triodos operates in a niche market with specialised scrutiny of financial provisions tailored to individual projects and community requirements. This rigorous due diligence is capital intensive and curtails the number of projects, potentially increasing default risk. The bank's modest scale operation impacts financial profitability, highlighting the need for robust sustainability frameworks for growth (Urban and Wójcik 2019).

In response, the UK has seen initiatives like the Task Force Climate Financial Disclosures (TCFD) to align operational statements with sustainability practices. The UK's green

finance strategy, inclusive of a green taxonomy and Environmental Societal Governance (ESG) frameworks, supports these efforts alongside international guidelines like the UN's Sustainable Bond Guidelines and Principles for Responsible Investment (PRI) (Nedopil Wang et al. 2020; HM Treasury 2021; Popescu et al. 2021). The vision for 2030 from UK finance envisions modern, resilient, and secure payment systems fostering competition, innovation, and choice.

Furthermore, financial institutions endorse the Principles for Responsible Banking and a Net Zero economy by 2050 (Innovate Finance 2020; Barclays 2021). While sustainability goals are clearly outlined, the mechanisms for their implementation remain under development, necessitating a systems approach for customisation to specific needs.

Regarding risk management, sustainability risks have been identified, with climate risks bifurcated into physical risks from weather and climate changes and transition risks associated with shifting to a low-carbon economy (Barclays 2021; Ojo/Roedl 2021). Other risks include regulatory changes, supply chain costs, product and technology demands, legal litigations, and reputational risks—such as those from greenwashing. There is also liquidity risk, which stems from challenges securing funding for sustainable activities (UK Finance 2021).

To mitigate identified risks, industry analyst reports highlight the necessity of a common risk and compliance management capability, including vulnerability detection and risk mapping (IMF 2019a; Steemis 2019; KPMG 2020; Deloitte 2021; IIF and EY 2021). Control measures are essential, with auditing and monitoring providing oversight for various financial activities, such as deal management, conflict checking, approvals, and meticulous tracking of financial reports (Raconteur 2018; Deloitte 2021). Other preventative measures include stress testing, cyber exercises, and desk simulations (Bank of England 2019a; KPMG 2020; Deloitte 2021; IIF and EY 2021).

A significant risk identified is the network effect, synonymous with systemic risk, which pertains to a chain reaction within the interconnected network of customers, producers, and providers. While such networks facilitate transactions, they can also introduce risks if third-party involvement or outsourcing creates dependencies (Gheorghe et al. 2018;

KPMG 2020; Leo 2020; Vives 2020; Deloitte 2021; IIF and EY 2021). Additional concerns include tax avoidance, Brexit, international trade tariffs potentially leading to trade wars, and the pandemic's ongoing impact (IMF 2019a; World Bank 2019b; Bank of England 2019a; KPMG 2020; Vives 2020; IIF and EY 2021).

Collaboration is a crucial resource, achievable through public-private partnerships, alliances, and joint ventures. Such collaborations aim to establish value-creating activities, with knowledge-sharing and leadership skills being among the most common benefits. Public sector partnerships can enhance organisational activities, and the experience and knowledge gained can aid in risk sharing, financing, operational technology, optimisation, and task grouping (Quelin et al. 2019). The United Nations Environmental Program Financial Initiative (UNEP FI) is one such collaboration, involving members from across the financial industry and aiming to steer financial services towards a sustainable economy (Urban and Wójcik 2019).

To ensure sustainability, industry policy analysts recognise the importance of long-term strategies and complementary short-term goals concerning the UN Sustainable Development Goals, among other sustainability metrics (IIF and EY 2021). Increased supervisory and macroprudential oversight are also acknowledged as necessary for resilience and sustainability in the financial system (IMF 2019a; KPMG 2020). Financial organisations focus on regulatory frameworks emphasising collaboration, intervention, and supervision to foster an agile and flexible industry environment (KPMG 2020; Deloitte 2021; IIF and EY 2021).

Corporate finance acknowledges the concept of sustainable returns, although difficult to achieve due to standardisation and scaling challenges. However, financial statement indicators can measure sustainable performance and competitive advantage. Debt management and employee ownership enhance sustainability and long-term business development compared to short-term capital investor interests. Innovative models, such as debt provision, loan contracts, and collaborative supply chain innovation, balance environmental, social, and financial performance, particularly when implementing Circular Economy (CE) and Corporate Social Responsibility (CSR) practices. However, these

require clear definitions, implementation, and regulation, especially regarding fiscal support policies for industrial symbiosis (Worthington and Edwards 2000; Naher and Aya 2013; Bui et al. 2020).

Digital regulation has also increased, with Open Banking and the Payment Service Directive 2 (PSD2) allowing third-party access to customer transaction data. Financial companies are subject to stringent information disclosure regulations, and the emergence of digital banks has increased industry competition. The gig and sharing economy and RegTech solutions further fuel this evolution (Raconteur 2018; Accenture 2019; Steemis 2019; Vives 2020; IIF and EY 2021).

When we look at internal capabilities, the emphasis is on human capital and work structure, targeting high-quality education and advanced cognitive and socio-behavioural skills. Recruitment programs, particularly in digital and engineering, aim to enhance digital capabilities (Raconteur 2018; Accenture 2019; Cox et al. 2019; Gartner 2019; Langley 2019; IIF and EY 2021).

New business initiatives in financial institutions include brand development, marketing, and loyalty programs, emphasising environmental and social initiatives. Customer-centric services, such as personalised financial services, are becoming increasingly prevalent. Financial services tailored to specific sectors like healthcare are expanding, with data-driven innovations like Insurtech. Other areas of development include financial health and education, retail, and SME-specific services, such as supply chain finance. Investments are being made to standardise and digitise payment infrastructures, particularly cross-border payments (World Bank 2019b; Deloitte 2021). Geographically, Asia is highlighted by analysts as a region of interest for investment due to its rapid economic growth and appeal to international investors (IIF and EY 2021).

2.3.2 Economic and Financial

Within the financial sector, there is a robust offering of traditional products and services. However, there has been a burgeoning development of resilient and sustainable financial products relevant to the retail payments system.

Credit and debt management strategies are evolving to include various forms of green debt or underwriting targeted at sustainable activities (e.g., ESG) and industries like trade or innovation. These are being crafted for both individuals and companies, with specialised debts for purchasing eco-friendly household products that reduce energy consumption being one example (Innovate Finance 2020; Barclays 2021).

In the insurance realm, eco-labelled appliance policies encourage repair over replacement. Adaptations in car insurance consider shared and electric vehicle usage for better pricing. The real estate market is also responding; investment, insurance, and mortgage products are accelerating energy-efficient renovations, such as transitioning from fossil fuels to renewable energy sources (Innovate Finance 2020; Barclays 2021). Additional support mechanisms, like guaranteed schemes, are being implemented by governments to assist with mortgage payments in financial crisis scenarios (Calomiris et al. 2004).

Consumer banking is seeing the rise of digital wallets and electronic payments, including budgeting tools that help users transition from cash to improve financial planning and efficiency. Such behavioural shifts can have positive macroeconomic effects due to the faster dynamics facilitated by these technologies (Klee 2008; Hasan et al. 2013b). Green retail banking solutions are emerging, allowing consumers to define preferences for environmentally and ethically compliant products and services.

Asset and wealth management areas are noted for their profitability in the financial services sector. In capital markets, investments are steered towards less risky ventures promoting green technologies and services, including those with low or no carbon emissions. Efforts to become more resilient and sustainable include reducing investments in risk-weighted assets known for higher risk or illiquidity. Ethical pension schemes are shifting towards investments in organisations with green practices and are encouraging financial health among employees through savings schemes (Holmes et al. 2019; Innovate Finance 2020; Barclays 2021).

Commercial banks are innovating by linking loan interest rates to businesses that meet sustainable performance targets, such as net-zero emissions. However, integrating social

goals is complex due to measurement and standardisation challenges (Urban and Wójcik 2019; Innovate Finance 2020). Implementing a sustainable finance taxonomy is gaining traction, aided by technological advancements. Current capital requirements restrict banks' investment in environmental and social projects due to default risks, prompting calls for deregulation or regulatory adaptation. Sustainable investments could be facilitated through various bonds issued by investment funds, pension funds, insurance companies, and public funds at all societal levels (Steemis 2019; Pyka and Nocoń 2021). Costs associated with investment activities, like IPOs and bond issuance, are expected to decrease as these become more standardised and regulated (Cox et al. 2019).

Financial firms also partner with fintech firms, sharing best practices, providing open data, and enhancing supply chain transparency. Mortgage and property buying solutions are being revolutionized through technology, which is also expected to lower transaction costs (Accenture 2019; Gartner 2019; Vives 2020; IIF and EY 2021). Ultimately, to address the financial risks incurred from sustainability challenges such as climate change, there is a pressing need to change ideology and management models to quantify new operational risks (Pyka and Nocoń 2021).

2.3.3 Socio-cultural and demographical

Education emerges as a fundamental cultural challenge in the financial resilience and sustainability literature. Firms invest in educational marketing to enhance the public's understanding of essential financial services. However, the effectiveness of such education is contingent upon the socio-cultural and demographic nuances of each locality. Financial institutions must tailor their approaches to resonate with the community's distinct interests. For instance, local communities' preference for local investment necessitates a community development approach. Moreover, as financial services increasingly go digital, tech investments by these companies need to incorporate customer education programs that effectively target technology adoption based on customer needs (Alderman 2018; Urban and Wójcik 2019; Barclays 2021).

Organisations are also prioritising financial inclusion, championing initiatives that address service equality across gender, ethnicity, and demographic divides, with particular

attention to women's empowerment and banking the unbanked communities (Cox et al. 2019; IMF 2019a; Vives 2020).

Studies examining the mobile payments ecosystem through a technology diffusion theory lens have identified various factors influencing customer adoption and usage, including compatibility, innovativeness, performance expectations, effort anticipation, social influence, hedonic motivation, and perceived value (Oliveira et al. 2016b; Nelms et al. 2018). Additionally, perceived security and privacy (e.g., GDPR), user-friendliness, speed, inclusiveness, resilience, and other factors like scalability and interoperability are deemed critical, particularly among social media users, who provide rich data for analytics (Yousafzai and Yani-de-Soriano 2012; Teoh et al. 2013; Oliveira et al. 2016a; Barkhordari et al. 2017; Olaleye et al. 2017; Bank of England 2020).

BigTech platforms have been harnessed by financial companies to query social media and digital communication applications, enabling the analysis of users' search histories or connections. Such insights assist financial organisations in customising services, adjusting pricing models, and conducting personalised credit assessments (Vives 2020). Business analytics platforms offer access to extensive data that can refine customer targeting, gauge marketing efficacy, customise experiences, and develop personalised risk profiles. They also promote information sharing with third-party suppliers and can address societal concerns, enhancing customer well-being. However, there is ongoing debate regarding the alignment of companies' interests with societal impact. For instance, the design of AI algorithms has sparked concerns over potential biases that could shape consumer preferences. Recognising these consumer implications, there is a call for appropriate regulation to oversee commercial activities that could influence the sustainable development of communities (Johnson et al. 2007; Conboy et al. 2020; Shi et al. 2020).

2.3.4 Technological and Methodological

While digital technologies bolster operational resilience, assessing their sustainability impact remains challenging. Cutting-edge technologies like blockchain, AI, cloud storage, and big data are data-intensive, resulting in significant energy consumption. For instance,

Bitcoin's energy usage exceeds Belgium's, at 100 TWh annually. This new energy demand prompts a need for renewable energy and more efficient energy utilisation to maintain service levels (Innovate Finance 2020). Additionally, modernising legacy systems, burdened by outdated practices, is essential to enhance the energy efficiency of data centres and the infrastructure underpinning back office and trading systems (Raconteur 2018; Accenture 2019; Oliver Wyman 2020; Vives 2020; Deloitte 2021).

The adoption of Bring-Your-Own-Device (BYOD) policies by some companies aims to cut costs. However, it necessitates interoperability across customer and colleague operating systems (Raconteur 2018). In response to these technological and operational demands, many companies are formulating data management strategies focused on cost reduction, aiming to streamline processes while maintaining the integrity and efficiency of data-centric operations (Raconteur 2018; Accenture 2019; Bank of England 2019a; Oliver Wyman 2020; Deloitte 2021).

In the realm of payments, a traditional fee-based model has long prevailed. However, new market entrants, leveraging digital platforms and novel data sources, are vying to revolutionise this model, challenging the incumbents. Legacy payment systems include limited capacity devices and infrastructures, such as cash (i.e., cash logistics), checks (i.e., check clearing), debit and credit plastic cards infrastructures (i.e., Visa, MasterCard, American Express, and Discover), and wire transfers (i.e., Western Union) (Bolt and Schmiedel 2013; Nelms et al. 2018). The legacy payment systems, characterised by cash handling, check processing, and card infrastructures, are being confronted by web3's diverse, decentralised, and disintermediated models. These models support established platforms like PayPal and facilitate cryptocurrency transactions, defying traditional, centralised payment systems (Weiner and Wright 2009; Dodd 2018; Nelms et al. 2018).

These players include companies that provide telecoms, payment software and hardware for point-of-sale (POS), data analytics, marketing, and other big multi-service tech companies, like Google, Apple, Meta, and Amazon (GAMA). Now, new diversified, decentralised, and disintermediated business models are being created under the sharing or peer economy structure, a concept known as web3. Allowing the operation of existing

payment platforms, like PayPal, and the exchange of cryptocurrencies, such as Bitcoin. These payment technologies do not rely on traditional government-backed currencies, challenging the traditional centralised dominant payment system (Weiner and Wright 2009; Dodd 2018; Nelms et al. 2018). Nevertheless, companies in the payments space are still investing intensively in the infrastructure of traditional payment methods to avoid transition risks.

Despite the rise of these innovative models, substantial investments continue in the infrastructure of conventional payment methods to mitigate the risks associated with transition. Firms are committed to maintaining ATMs, POS systems, banking applications, and physical branches, even as they explore and integrate advancements like decentralised cloud services and 5G edge computing. The strategic goal behind these investments is to manage and eventually minimise the costs tied to traditional infrastructures, anticipating a future where digital platforms might render these systems redundant (Raconteur 2018; Accenture 2019; Bank of England 2019a; Cox et al. 2019; Gartner 2019; PwC 2019; Oliver Wyman 2020; Deloitte 2021).

The emergence of new business models, spearheaded by Fintech, BigTech, and innovative payment technology start-ups, are carving pathways to a more sustainable economy. These entities are seizing opportunities to analyse carbon emissions across industrial supply chains and consumer usage through big data analytics (Raconteur 2018; Accenture 2019; PwC 2019; Oliver Wyman 2020; Vives 2020; IIF and EY 2021). The use of business intelligence technologies such as AI and Machine Learning is yielding valuable social and environmental insights (Raconteur 2018; Accenture 2019; Bank of England 2019a; PwC 2019; Oliver Wyman 2020; Vives 2020; Deloitte 2021; IIF and EY 2021). Blockchain technology is being employed to track energy consumption and material resource transactions, facilitating accurate trading, accounting, and settlement processes. Open Banking initiatives and finance plug-ins offer the potential to link diverse procurement and payment management platforms, enabling a holistic view of consumer contributions to sustainability goals, underpinned by clear Key Performance Indicators (KPIs) (Raconteur 2018; KPMG 2020; IIF and EY 2021).

Additionally, embedded financial technologies like IoT are being integrated with consumer products to monitor energy usage, with the potential for monetising savings through P2P or B2C models, incentivising consumers (PwC 2019; Barclays 2021; Deloitte 2021). In the sphere of financial education, the deployment of robotic technology is facilitating the provision of robo-advice, streamlining customer decision-making processes (Raconteur 2018; IMF 2019a; PwC 2019; World Bank 2019b; Vives 2020; Deloitte 2021).

This section also highlights payment technologies available in the UK that support the activities mentioned above, focusing on local and cross-border transactions. Cross-border payments face challenges, including reliance on fee-based infrastructures like RTGS services and the SWIFT network, which dominate global financial messaging. However, innovations like Central Bank Digital Currencies (CBDC), built on blockchain's Distributed Ledger Technology (DLT), are poised to disrupt this space with enhanced standards for exchanging money and verifying transactions (Raconteur 2018; Bank of England 2019a; Langley 2019; PwC 2019; Steemis 2019; KPMG 2020; Vives 2020).

For credit and debit card payments, systems such as the UK's Bankers' Automated Clearing System (BACS) and Automated Clearing Houses (ACH) are prevalent. Mobile payment systems like Paym offer digital alternatives, enabling direct account transfers and identifying recipients via phone numbers. These technologies represent a shift towards more accessible and integrated payment solutions (Weiner and Wright 2009; Payments.com 2019a; Bank of England 2020; UK Finance 2021).

The payment sector's evolution towards multi-channel and omni-channel digital solutions has markedly enhanced user experience, offering swift, convenient, and secure transactions. Services like bill payments, account transfers, and contactless point-of-sale purchases are now facilitated by Near Field Communication (NFC) technology, which enables seamless communication between devices and supports frictionless transactions (Raconteur 2018; UK Finance 2021). Other digital services are banks’ digital account access, digital card storage (i.e., mobile wallets), merchants’ bills’ split, personal and charity gifts, capital budgeting, stock investment, targeted advertisements, discounts, promotions, and rewards. Digitisation also allows financial organisations to reach

customers through digital marketing and social media (Raconteur 2018; World Bank 2019b; KPMG 2020; Deloitte 2021; IIF and EY 2021). The latter services mentioned serve to engage customers and potentially shape consumer behaviour towards sustainable practices (Dahlstrom et al. 2014; Olaleye et al. 2017; Payments.com 2019b).

Smartphones have become conduits for financial services, with banking apps providing functions from payment execution with digital wallets like Apple or Google Pay to peer-to-peer (P2P) lending and personalised credit options (Raconteur 2018; Accenture 2019; Bank of England 2019a; Gartner 2019; Steemis 2019; Oliver Wyman 2020; Vives 2020; Deloitte 2021; IIF and EY 2021).

Moreover, social media platforms are increasingly used for e-commerce transactions, enabling P2P payments, a trend bolstered by the accessibility of QR code technology for low-value transactions (Accenture 2019; Gartner 2019; IMF 2019b; Langley 2019; Bank of England 2020; Vives 2020).

Advancements in authentication technologies, such as biometrics, leverage fingerprints, facial and voice recognition, and secure user identity, with voice technologies employing natural language processing to refine customer preferences and enhance service personalisation (Raconteur 2018; PwC 2019). These developments streamline payments and play a crucial role in safeguarding user data and building trust in the digital payment ecosystem.

These technologies have allowed debit cards to take over cash and check payments (UK Finance 2021). Providing real-time or fast payments and speeding up other services that improve risk or fraud detection (Vives 2020; Deloitte 2021; UK Finance 2021). Nonetheless, some challenges come from governance, security, liability, standards, communications, regulation, and legal perspectives. As well as offering free and widely accessible payment methods, such as cash, for those personal customers who continue to need it. Any disruption on the payment rails of the existing financial infrastructures could create a major disruption, affecting the systems' efficiency and creating chaos, especially for modest players, such as Small and Medium Enterprises (SMEs). Yet, the literature studied recognises trade-offs between robustness and efficiency, which can

only be maximised to a certain level (Shukla et al. 2011; Wang et al. 2018; Bank of England 2020; UK Finance 2021; Paymentsforum.uk). Accordingly, financial companies have implemented fraud protection and detection technologies to reduce disruptions, like financial crime, which is still quite common and affects the payment' users' trust in digital technologies (Raconteur 2018; Bank of England 2019a; IIF and EY 2021). Some identified common cyberattacks or cyber risks are created by hackers, cybercriminals, and the dark web (Raconteur 2018; Bank of England 2019a; KPMG 2020; Deloitte 2021; IIF and EY 2021).

Companies have also focused on business continuity and contingency plans by investing in backup or redundant systems that reduce disruptions and improve recovery times (KPMG 2020; Deloitte 2021). Other efforts have taken the efficiency or simplification approach. Mainly encouraged by cost reduction, organisations have implemented project management, process improvement, and business maturity assessment frameworks (KPMG 2020; Vives 2020; Deloitte 2021; IIF and EY 2021). Likewise, using resources to assess the different professional standards and share best practices creates common specifications that allow standardised operations and reporting that improve the payments system's resilience and sustainability (Bank of England 2019a; KPMG 2020).

2.3.5 Environmental and Societal

To substantiate their commitment to environmental and societal sustainability. Beyond the standard financial statements—balance sheet, income statement, and cash flow statement—there is a growing trend towards voluntary sustainability reporting. These ESG (Environmental, Social, and Governance) and CSR (Corporate Social Responsibility) reports, though not yet standardised, are becoming more prevalent (IMF 2019b; IIF and EY 2021).

Environmentally, organisations are detailing their contributions and the risks they face from environmental challenges like climate change and the transition to a low-carbon economy. These disclosures are increasingly driven by initiatives such as the Task Force on Nature-related or Climate Financial Disclosures (TNFD or TCFD), backed by

international governments and financial organisations (IMF 2019b; Steemis 2019; KPMG 2020).

On the social front, disclosures range from modern slavery to international development, encompassing philanthropic and not-for-profit initiatives, social protection, and payroll-based insurance models (Raconteur 2018; World Bank 2019b). Governance-wise, there is a push towards investing in mechanisms to provide evidence of, control, and comply with these emerging standards and regulations. However, gaps remain, particularly in governance related to environmental and societal issues (Álvarez Jaramillo et al. 2019; HM Treasury 2021).

The most discussed environmental initiatives in the literature include circular economy, resource efficiency, and waste management solutions. These cover consumption methods, product and service design, and industrial symbiosis discussions to enhance material recyclability, waste prevention, and energy resource management (Welsh Assembly Government. 2009; Sani et al. 2021). However, barriers persist due to entrenched linear systems and a lack of collaboration within the financial value chain, whether public or private. Additional obstacles to integration include risk aversion, market accessibility of materials, limited regulatory frameworks, and the technological capabilities required to ensure high quality in remanufactured products (Quelin et al. 2019; Sani et al. 2021).

At a broader scale, challenges encompass a scarcity of resources, both human and financial, high initial investment costs for sustainability measures, and a lack of expertise, alongside well-documented barriers to organisational change (Álvarez Jaramillo et al. 2019).

2.3.6 Legal and Ethical

The UK financial system, particularly the payments system, is undergoing substantial changes to enhance its resilience and sustainability. Stakeholders have initiated various actions in response to challenges and limitations, with the UK government playing a pivotal regulatory role through investments and taxation policies. The primary regulatory

bodies for the UK payments industry include the Bank of England (BoE), the Financial Conduct Authority (FCA), and the Payment System Regulator (PSR). Additionally, the HM Treasury (HMT), the Financial Ombudsman Service (FOS), the Competition & Markets Authority (CMA), and the Information Commissioner's Office (ICO) are also influential public entities (UK Finance 2021).

These regulators are collaborating on projects such as the HMT's Payments Landscape Review and Future Regulatory Framework (FRF) Review and the PSR's New Payments Architecture (NPA), aiming to align the industry with the factors discussed in previous sections. However, financial organisations often see regulation as an expense related to compliance, reporting, or risk. The regulatory agenda demands expertise, with non-compliance leading to significant costs from fines and contractual obligations (Zhou et al. 2007; Japp and Kusche 2009).

In the environmental sphere, UK regulators have mandated ESG and climate-related financial disclosures from 2023, with the TCFD developing ESG standards supported by the International Financial Reporting Standards (IFRS). Efforts to create a green taxonomy are underway to identify environmentally sustainable activities and products, set sector-relevant Science-based Net Zero targets, and establish processes to measure and monetise climate-related risks. Stress testing frameworks based on cloud computing simulations are mentioned as a key risk management tool to evaluate the impact of climate risks on the UK's financial system (Innovate Finance 2020; Barclays 2021; HM Treasury 2021; IFRS Technical Readiness Working Group 2021).

Collaborative systemic models are being integrated to adapt quickly to business environment changes and to identify system vulnerabilities. The 2008–2009 crisis led to the identification of Global Systemically Important Banks (G-SIBs) by the Financial Stability Board, new bank capital requirements as per Basel III, and the implementation of the Markets in Financial Instruments Directive (MiFID II) (Urban and Wójcik 2019). These frameworks are designed to be robust, evidence-based, and supportive of a transition to global operations (HM Treasury 2021; Kalifa 2021).

To support regulatory compliance, financial protocols, and standards such as the Generally Accepted Accounting Principles (GAAP) and the Greenhouse Gas (GHG) Protocol Corporate Value Chain Accounting and Reporting Standard (Scope 3 Standard) are being developed. These establish requirements and guidelines for GHG emissions reporting to enhance efficiency, innovation, customer loyalty, stakeholder relations, and organisational differentiation (Callahan et al. 2011; Barclays 2021).

Significant strides have been made in the social realm with investments in CSR committees and operations reporting, aligning with the Global Reporting Initiative (GRI) consortium. These endeavours draw upon rule-setting practices, including codes of conduct and guidelines; monitoring through rankings, accreditation, and audits; and agenda-setting that fosters forums for the dissemination of ideas and recommendations, such as the Climate Financial Risk Forum (Vigneau et al. 2015; Oliveira et al. 2016b; Barclays 2021). Furthermore, the SEA standards have been developed to incorporate a tangible sense of social justice, addressing labour practices, working conditions, human rights, and product responsibility (Gray 2006). The sustainable finance sector, consequently, is tasked with elevating knowledge and responsibilities among companies and investors to offer comprehensive services spanning corporate finance, competitive advantages, investment practices, stakeholder engagement, and supply chain ethics within frameworks like environmental accounting and RBV (Bloxham 2011; Bui et al. 2020).

In governance and data management, frameworks are evolving to accommodate the complexities of Big Data and standardised Open Banking analytics (Innovate Finance 2020). The Payment Services Directive (PSD2) establishes primary guidelines to improve practices and provide more data privacy on financial services, such as rules and standards to enhance consumer protection (PWC 2016; Barclays 2019).

For example, the Strong Customer Authentication (SCA) protocol focuses on digital fraud and crime reduction to enhance the consumer payment experience. The protocol requires paying users two out of the three attribute verification methods based on knowledge (something you know as a password), possession (something you have as a card), and

inherence (something you are, verified by biometrics, as a fingerprint). Some common data management risks include unauthorised payments or authorised push payment scams, technical errors, such as payment duplications or delays, matched with the payee or payment system insolvency. Digital technologies are trying to reduce these risks, focusing on anti-money laundering, such as Know-Your-Customer (KYC), which could help with fraud reduction (Visa 2019a; UK Finance 2021). KYC is a mandatory user verification process performed when people open accounts and is done periodically over specific time periods.

Nevertheless, the widespread use of digital platforms has allowed the impact of specific threats, which are sometimes shared by different companies through a supply chain or a network, especially looking at the financial system. Therefore, there is a need to increase the coordination among the different stakeholders to reduce the information gaps (Taylor 2016).

Regarding payment standards, some of the relevant operational resilience and sustainability factors are interoperability, innovation, and competition. Some best practice standards, such as ISO20022 and ISO8583, encourage cloud services and Application Programming Interfaces (API), considering a market-wide perspective and different payment methods and types. These standards ensure transparency and effectiveness to avoid payment friction and costs. Therefore, cross-industry working groups have been established to consider opportunities for development and governance. One of the main regulatory developments was Open Banking, which allows shared industry data to develop better services by different participant organisations (UK Finance 2021).

Cross-border payments are another focal point, with the Financial Stability Board (FSB) coordinating efforts to create an integrated international payment system. They have established the building blocks to develop a road map towards integrated and seamless international payments alongside the Committee on Payments and Market Infrastructures (CPMI) and European Payments Council (EPC). Here, some main challenges are multi-currency funding costs, lowering multi-jurisdictional competition barriers, fragmented and truncated data formats of payment processing and automated reconciliation, where Legal

Entity Identifiers and common protocols for data exchange could improve data quality. Other issues found include complex compliance checks, real-time processing based on time zone operating hours, and long transaction chains as part of the infrastructure direct connections, which could lead to the exploration of new technologies, such as CBDCs, from the current existing SWIFT dominant network (Bank For International Settlements 2020).

Financial analysts emphasise that personal information management—encompassing data privacy, GDPR compliance, trust, and consumer protection—is crucial for developing a resilient payment system (Raconteur 2018; Accenture 2019; Gartner 2019; Steemis 2019; World Bank 2019b; KPMG 2020; IIF and EY 2021). However, the success of these measures hinges on industry-wide financial education and inclusion strategies, enhancing customer protection, choice, reliability, and security. Regarding infrastructure, the UK government has pledged £5 billion to extend gigabit-capable broadband to the nation's most remote regions, underscoring the importance of digital connectivity in this landscape (UK Finance 2021).

2.4 Literature review conclusion

The UK retail payment system is integral to the nation's economy, and its complexity cannot be overstated. Disruptions in this system have the potential to impact a significant volume and value of daily retail transactions. Insights from operations management, focusing on resilience and sustainability, can enhance the system’s operational resilience and ensure its longevity. Adopting a Complex Adaptive Systems (CAS) and socio-technical system perspective provides a comprehensive analysis of the system's resilience and sustainability, incorporating various viewpoints and identifying attributes like those in the RALF framework, grounded in a resource and dynamic capability-based approach.

Despite the valuable contributions of existing literature, gaps remain in our understanding of the resources and capabilities that bolster the resilience and sustainability of the UK retail payment system. In the context of this research, preliminary factors, along with associated opportunities and risks, have been identified through a literature review.

Politically and ideologically, some initiatives have yet to embrace a process-based or operational analysis fully. However, progress is being made as more initiatives adopt scenario-based and stress-testing methods. Economically, the financial services crafted are resilient and boast technological innovation. Nevertheless, they fall short of sustainability, with sociocultural and environmental impacts not fully integrated into the design of payment system services. There is a pressing need for companies to enhance accountability by providing greater transparency about their operations and aligning performance goals with emerging holistic standards and frameworks.

This synthesis of the UK retail payment system's current state in terms of operational resilience and sustainability sets the stage for the forthcoming methodology in Chapter 3. The next step is to extract, categorise, and cluster the strategic factors from UK payment system stakeholders' public reports. This analysis will then be juxtaposed with scholarly perspectives to assess the alignment level of capabilities or factors highlighted by the literature.

3 Research method development and design

This research interweaves systems and Resource-Based View (RBV) theories to formulate an initial framework as delineated in preceding chapters. The proposed framework will assist in achieving the research's goal of applying a systems approach to discern, extract, categorise, and aggregate organisational factors, including resources and capabilities, from the business sections of corporate reports (Barney 1991; Teece et al. 1997). Drawing from complexity theory, this method is envisaged as a decision support system or diagnostic instrument, facilitating comprehension of an organisation's alignment with various imperatives such as competitive advantage, sustainability, risk preference, or operational resilience in response to environmental shifts (Weerawardena and Mavondo 2011; Lee and Hong 2016; Morgan et al. 2019; Leo 2020; Lee 2022).

The identification of factors will be conducted via a dictionary-based text analysis of stakeholders' public reports, aiming to spotlight commonalities, shared elements, and specifics pertaining to their resilience and sustainability (Naim et al. 2003; Homburg et al. 2020). The strategic factor dictionary is inductively crafted from select stakeholder reports and then applied expansively to analyse additional documents, ensuring a systematic and extensible modus operandi for elucidating an organisation's factors (Humphreys and Wang 2018). Introducing an innovative procedure, the strategic factors are sorted and clustered by stakeholder groups (e.g., customers, colleagues, regulators) and categorised within a bespoke PESTEL framework (Kolios and Read 2013). Furthermore, Systemigrams are constructed, employing a Soft Systems Methodology (SSM) visual technique to depict the intricate narratives of systems. These diagrams synthesise the strategic factors common to payment systems and their congruence with sustainability and resilience objectives (Blair et al. 2007a).

The validity of these factors will be corroborated by juxtaposing them against existing reports from the payments and financial industry. The study uses the aforementioned methodologies to elucidate how each factor's alignment variability contributes to the system's overall resilience and sustainability. This method also serves to delineate current lacunae or enhancement prospects, respecting various e-principles (efficiency,

efficacy, effectiveness, etc.), and to inform scenario planning and roadmaps used by industry stakeholders and analysts (Checkland and Poulter 1999; Pagani and Fine 2008). Lastly, the findings will be deliberated within the context of the extant literature on operational resilience and sustainable finance, mapped against the CERT® Operational Resilience Framework (Caralli et al. 2010).

Subsequent subsections will expound upon the research background that underpins the systems approach adopted for analysing the UK retail payment system.

3.1 Applied theories

3.1.1 Systems theory

To elucidate the research questions, this study advocates a systems thinking framework, employing systems theory as an analytical lens. Systems theory, with its diverse applications across fields like logistics management, offers valuable insights into the workings of the retail payment system, which is crucial for facilitating payment exchanges (Größler et al. 2008; Lindskog 2012). This research harnesses systems theory to dissect the retail payment system, focusing on its logistical intricacies.

The components of systems theory unfold in three distinct yet interconnected phases: 1. Soft Systems Methodology (SSM), 2. System Dynamics, and 3. Systems Engineering, as depicted in Figure 3.1. The methodological scaffold of this research is anchored in SSM, which is adept at unravelling strategic factors within organisations (Naim et al., 2003).

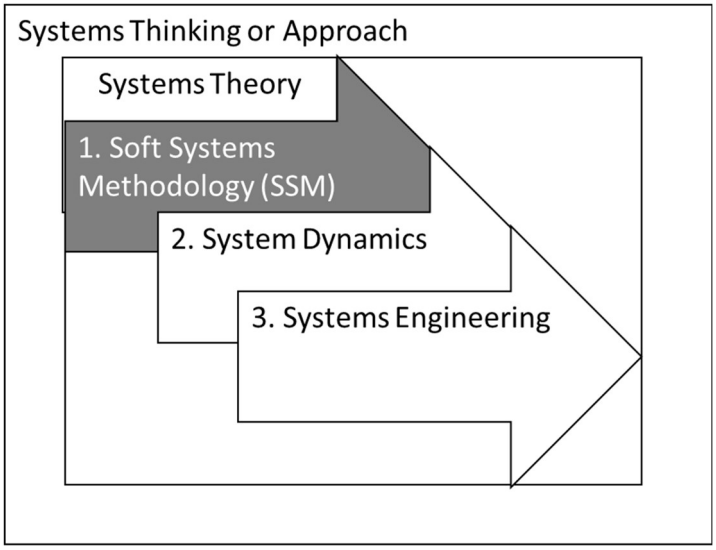


FIGURE 3.1 SYSTEMS THEORY STAGES

While the financial sector has seen limited application of systems approaches—specifically, analyses revolving around credit card economics and financial risks aiming to amplify revenue streams (Ratha 1997; Strohhecker 2005; Starr and Els 2013)—the logistics field is rife with systems theory applications geared towards enhancement, including supply chain and project management, and fostering innovation (Naim et al. 2003; Größler et al. 2008; Lindskog 2012). A seminal study in the telecommunications sector, which sought to pinpoint the environmental variables influencing consumer adoption of mobile 3G technology, is particularly pertinent. Here, future scenarios for 3G were constructed primarily from expert insights via focus groups and corroborating industry reports (Pagani and Fine 2008).

Drawing inspiration from the aforementioned study, the present research delves into the alignment and interaction among stakeholders within the retail payment ecosystem, employing the Resource-Based View (RBV) as explicated in Section 3.1.2. With a comprehensive grasp of the general factors at play, policy initiatives can be crafted to align with the payment system's objectives, measuring their impact in terms of efficacy, efficiency, and effectiveness. However, the ultimate goal of any policy should be to fortify the system's resilience and sustainability, utilising a gamut of systems thinking principles and methodologies (Checkland and Scholes 1999). This pragmatic approach and its

associated methodologies, in concert with the research queries posed, underscore the significant contributions of this thesis.

3.1.2 RBV theory

organisations must craft innovative strategies to navigate the ever-shifting market dynamics—ranging from business cycles to technological advancements—as part of their competitive evolution. Such strategies require precise strategic alignment to achieve differentiation and sustain competitiveness. Within the Resource-Based View (RBV), various elements—technological, knowledge-based, managerial, human, and physical assets—play pivotal roles in shaping these strategies (Barney 1991; Porter 1996). Mintzberg (1978) suggests that a strategy is discernible within the continuum of resource-influencing actions. Despite the distinctiveness of each stakeholder, there may be shared actions across an industry, like the UK retail payments sector explored in this research.

This study incorporates two RBV extensions: the Relational View (RV), where crucial resources transcend firm boundaries to form inter-organisational processes, and the Dynamic Capabilities View (DCV), which probes the agility and resilience of organisations amidst market fluctuations (Teece et al. 1997; Gold et al. 2010). In essence, strategic factors are instrumental in attaining performance targets within a competitive milieu (Porter 1996).

Employing RBV and DCV frameworks (Barney 1991; Teece et al. 1997), the identified factors are regarded as resources or capabilities with a clear conceptual boundary. Warren (2005) elaborates that RBV encompasses all factors—assets to knowledge—under a firm's control, facilitating strategy formulation and execution. Lasting and inventive competitive edges stem from valuable, scarce, inimitable resources and are bolstered by organisational processes that integrate and reconfigure them to craft novel, value-adding strategies, aligning with DCV (Salunke et al. 2011). It is generally accepted that tangible resources alone are insufficient for performance since competitors can replicate or acquire them. This research categorises resources or factors using the PESTEL framework (Kolios and Read 2013), correlating with stakeholders outlined in corporate reports and contrasted with industry analyses.

As introduced in Chapter 1, this research is dedicated to developing a diagnostic tool that offers an integrated strategic overview of an ecosystem—in this case, the UK retail payments system and its stakeholders. It focuses on aligning factors with operational resilience and sustainability, identifying potential enhancements. These factors encompass a range of organisational resources and capabilities, also accounting for environmental risks that may impact system resilience (efficiency and efficacy) and sustainability (effectiveness) (Checkland and Scholes 1999). To achieve this, strategic initiatives aligned with performance goals in a competitive landscape are gathered, categorized, and clustered (Porter 1996). Applying systems thinking drawn from horizon scanning techniques suggests identifying involved factors and their goal congruence regarding resilience and stakeholder coordination (Milling 1996). Thus, this research posits that firms disclose specific investment drives, termed strategic factors here, to fulfil their objectives in their publicly mandated strategic reports.

3.2 Strategic reports and content analysis

3.2.1 Strategic reports

Building upon the methodologies of prior studies, the utilisation of interviews and focus groups was initially contemplated to discern strategic factors (Pagani and Fine 2008; Sanchez-Rodrigues et al. 2010; Yousafzai and Yani-de-Soriano 2012). However, alternative methods were sought due to the constraints imposed by the Covid-19 pandemic. Given the research's resource constraints, content analysis emerged as a pragmatic and resource-efficient choice; it entailed an in-depth examination of the 2019 annual reports (10-K) of prominent UK retail payment system stakeholders.

Strategic reports are the chosen medium for identifying strategic initiatives or factors, providing insights into an organisation's priorities, and informing a diverse audience, including customers, industry analysts, regulators, and investors. Yet, these reports can be challenging to decode due to their complex language (Humphreys and Wang 2018). This research introduces a novel method leveraging the Resource-Based View (RBV) and Dynamic Capabilities View (DCV) to extract, categorise, and cluster organisational strategic factors, aiding in the comprehension of organisational priorities (Barney 1991;

Teece et al. 1997). The extracted factors are organised and visualised within a tailored framework to elucidate stakeholders' strategic orientation concerning operational resilience and sustainability in environmental, social, and economic domains.

The ensuing sections will elucidate the composition, structure, and pertinent investigations of strategic plans, grounding the rationale for their selection as the analytical focus of this research. Strategic reports, specifically 10-K annual filings, serve as a communication conduit for banks and other publicly listed entities to delineate strategic initiatives to their shareholders and broader society. These documents modulate the strategic congruence between an organisation's objectives and its resources or capabilities in response to market shifts (Law 2016; SEC 2021). In jurisdictions like the USA and the UK, instruments such as 20-F and 10-K reports, alongside press releases, are mandated by regulatory bodies like the SEC and FCA to guide market priorities and mitigate significant risks, including unforeseen high-impact events, also known as "black swans" (FCA 2019b). Consequently, enhancements in the narratives and efficacy of these reports have been recently instituted (CFA Institute 2013). The reports' business section provides a comprehensive overview of a company's operational strategies and is pivotal for structural, readability, and disclosure analysis (SEC 2021).

As outlined by the Oxford Dictionary of Business and Management (2016), the strategic plan serves as a blueprint for an organisation to navigate market opportunities and adapt to evolving conditions, ensuring its objectives and capabilities remain in harmony. As delineated by Bryson and Alston (2011), the structure of a strategic plan encompasses:

- The endeavour's purpose, articulated through a succinct mission and established mandates.
- A vision outlining the aspirational state to be realised in the future.
- Key strategies, which are the actions or approaches for organisational transformation.
- Timelines and milestone dates.

- Designated responsibilities and stakeholders involved.
- Stipulated requirements and quantifiable goals (inputs, outputs, and performance metrics).
- Values that underpin daily operations.
- Constraints and boundaries, inclusive of potential scenarios.
- Allocation of resources, spanning materials, personnel, and technology.

Michael Porter (1996) further elaborates on these elements, identifying them as drivers of market dynamism, propelled by business diffusion through imitation or innovation and the incorporation of novel technologies. This dynamism necessitates that an organisation's activities strategically align with its objectives to foster distinctiveness and sustainable profitability, which could be rooted in varied positioning strategies (e.g., variety-based, needs-based, and access-based). Competitive edge emanates from an intricate system of activities, where their synergy significantly trims costs or bolsters uniqueness. The strategic essence lies in defining, communicating, and integrating the company's distinctive position, making necessary trade-offs, and fostering coherence across activities. As Mintzberg (1987) suggests, strategy is a pattern in the continuum of decisions, reflecting how an organisation perceives its milieu and relative market standing.

For an in-depth comprehension of the strategic plan, it is imperative to identify the pertinent factors within its structure (Porter 1996). Therefore, a meticulous analysis of stakeholders' strategic plans is paramount for grasping the environmental strategic initiatives pertinent to the payment system, focusing on resources, capabilities, market coordination, and alignment of factors.

The 10-K reports of publicly traded companies, overseen by the U.S. SEC and its UK counterpart, are mandated for organisations with a shareholder base of over 500 and assets exceeding $10 million to be filed within 60 to 90 days post fiscal year-end (Li 2010; Lee and Hong 2016; FCA 2019b). These reports are subject to content analysis by

industry stakeholders, who often parse forward-looking statements to gauge market trajectory (Jizi et al. 2014; Karapandza 2016). Academic research also values these reports, especially the Management Discussion and Analysis section, as a rich resource for study (Balakrishnan et al. 2010; Li 2010; Karapandza 2016; Hájek 2018).

The content and structure of strategic plans are acknowledged for their capacity to furnish a rich trove of organisational resources and capabilities. Research indicates that more comprehensible reports correlate with superior firm performance, a trend evident in the strategic disclosures of leading UK retail payment system stakeholders, which scholars have identified as a source of structured organisational intelligence (Srinivasan et al. 2015; Lee and Hong 2016). Nonetheless, concerns linger about the veracity and depth of information in 10-K reports, particularly those from underperforming firms, given their often-vague language and lacklustre disclosure (Li 2010; Gandhi et al. 2019).

While regulated, the standardised format of 10-K reports might be perceived as too rigid and non-specific, lacking the flexibility to reflect the unique characteristics of individual organisations, such as sector, size, or geographic location (Abraham and Cox 2007; SEC 2021). These reports typically comprise sections tailored to distinct stakeholder groups, facilitating the identification of specific audience-targeted objectives. Efforts to refine strategic report content aim to avert market crises, foster information exchange, and meet the burgeoning demands of corporate environmental and social responsibility (Cummins and Bawden 2010; Jizi et al. 2014).

The complexity of report narratives, even when accompanied by disclaimers, poses a risk of conflating concrete strategies with speculative projections (Srinivasan et al. 2015). Information asymmetry is also a pivotal issue, evidenced by studies showing limited disclosure of known foreign exchange risks by management in US and UK companies' annual reports. UK firms generally offer more expansive disclosures on risk and anticipatory information (Abraham and Cox 2007). The Fog index often gauges textual density within reports, affecting the amount of information conveyed. Firms with denser reports often surpass their peers, particularly regarding predictive prowess (Landrum 2008; Balakrishnan et al. 2010).

This thesis enriches academic inquiry through its novel methodology, leveraging text mining within strategic reports to assess organisational strategic factors. Text analysis, often a laborious and subjective task, is refined here through a dictionary-based content analysis, enhancing reproducibility and precision, thus streamlining the process. This methodology offers scalability, enabling comparative analysis across broader stakeholder samples or over different reporting periods to discern temporal dynamics, as elaborated in subsequent sections.

3.2.2 Content analysis

In the pursuit of extracting strategic factors from organisational reports, text analysis techniques are a pivotal tool. Historically, operations research has applied text analysis in various capacities. One methodologically analogous approach to this study involves horizon scanning, integrating stakeholder interviews, online surveys, and workshops under Group Model Building frameworks, leading to a multifaceted resource workforce planning framework. This approach, although rooted in primary data sources, mirrors the logical progression of this secondary source-focused research (Willis et al. 2018).

Horizon scanning in prior research has entailed systematic identification of potential threats and opportunities that might affect workforce demands, akin to how this study identifies strategic factors impacting resilience and sustainability from strategic reports. Factors are prioritised based on their prevalence in discussions, much like the attention they garner from stakeholders in this context. Narratives or 'short stories' then emerge, painting pictures of potential future impacts, drawn from industry reports, paralleling the Delphi method's structured expert consensus approach. System dynamics are utilised to project variations in workforce numbers and competencies across scenarios, informing policy implications (Willis et al. 2018).

Other scholars have merged resource maps with agent-based frameworks, utilising regulatory documents for thematic analysis to pinpoint key resources and agents. These methodological insights inform the current research design, although some are reserved for future studies (Kazakov et al. 2020).

Building on previous methodologies, this research zeroes in on text analysis to pinpoint strategic factors from secondary data sources. There are two primary branches of text analysis: form or structural analysis, which quantifies language elements, and subjective or meaning-oriented analysis, which interprets the sentiment within texts.

Form analysis involves quantifying routine words, tracking the evolution of keywords, and identifying the influence of specific authors, providing a structural perspective of the text's content. Meanwhile, sentiment analysis delves into the underlying narratives and themes, revealing the text's emotional undertone—positive or negative. Merging these approaches, dictionary-based text analysis, or the bag-of-words model, discerns both the frequency and connotations of specific terms within the strategic reports, creating a multifaceted view of the text.

This dual approach allows for a comprehensive analysis of strategic reports, facilitating the extraction of strategic factors by combining the quantitative tracking of specific words with the qualitative assessment of the text's sentiment. This methodological framework, grounded in the works of Smith and Taffler (2000), Furrer et al. (2008), Karapandza (2016), and Leo (2020), sets the stage for a nuanced understanding of the strategic factors at play.

In his foundational work on text analysis, Mayring (2000) posits that defining and delimiting the material for analysis is crucial. This delimitation includes specifying strategic reports, academic papers, or transcripts as sources, and pinpointing the precise subject matter. The subsequent content analysis builds upon these defined formal characteristics, constructs, or factors.

Srinivasan (2015) expands on this by identifying five distinct meaning-oriented approaches for analysing strategic annual reports. These range from subjective analyst ratings and disclosure index studies to thematic content analysis, readability studies, and linguistic studies. Each approach seeks to uncover different layers of the text, such as the breadth of information disclosed, narrative quality, and communicative efficacy.

Humphreys and Wang (2018) suggest that this subjective content analysis is often supplemented by form or structural analysis, using quantitative methods like structural equation modelling to enhance understanding.

In the present research, the concrete references—or strategic initiatives and factors—are clearly defined and delineated. Keywords representing these factors are identified, ensuring they are mutually exclusive and collectively exhaustive. The frequency of these keywords is then measured. Categories for analysis, informed by structural dimensions, are applied to the strategic reports, classified under the PESTEL framework, which allows for a comprehensive environmental scan.

A variety of methodological approaches can be utilized to assess strategic reports. The process often begins with concept or word identification, leveraging stem words or synonyms, followed by categorisation. This categorisation can adopt either an inductive approach, building categories from the coding itself when little prior work exists, or a deductive approach, exploring established categories from literature—for instance, different aspects of service quality such as customer service quality, online service systems quality, and service product quality.

Seuring and Gold (2012) advocate a two-step process in developing analytic categories. Initially, a framework of categories and dimensions is set up based on existing theory, and then these categories are refined inductively during the coding process. This approach facilitates the extraction of factors or dimensions, like service quality in internet banking, which is related to customer satisfaction (Jun & Cai, 2001), or the categorisation of sentences containing information on initiatives into specific risks (Abraham & Cox, 2007).

To ensure objectivity, the coding process typically involves multiple coders. Different methods are used, from hand-coded sampling and individual word count to advanced automated systems employing Artificial Intelligence (AI). Osborne and colleagues (2001), for instance, used software to tally themes in shareholder letters, ensuring that words with multiple meanings are accurately interpreted. Despite being less common in management

research, AI systems offer a promising avenue for analysis (Short & Palmer, 2008; Balakrishnan et al., 2010).

However, text analysis is not without limitations. Subjectivity in coding can skew the emphasis towards certain areas. For example, in a coding exercise of CSR reports (Tate et al., 2010), the researchers overview the coded themes but focus only on strategies from more influential organisations, potentially overlooking specific capabilities developed to enhance these themes and how they link to particular goals and risks. Despite these limitations, such methods are instrumental in identifying general trends and themes associated with strategic initiatives and are particularly useful when conducting the analysis.

3.2.3 Dictionary-based text analysis

Content analysis, a pivotal technique in research, delves into the identification and categorisation of words or concepts, often utilising stem words or synonyms for the initial identification. The categorisation process can follow either an inductive or deductive path, the choice of which hinges on the extent of existing literature. The deductive approach is theoretically grounded, probing predefined categories derived from related research. In the banking sector, for instance, sentiment analysis often leverages a standardised dictionary known as Diction, which has been referenced in various studies (Davis et al. 2012; Khadjeh Nassirtoussi et al. 2014; Kawamura et al. 2019; Katsafados et al. 2021). Inductively, categories emerge from the analysis of content, illustrated by Abraham and Cox (2007), who developed risk factor categories for banking, and Jun and Cai (2001), who identified service quality facets in internet banking related to customer satisfaction.

Dictionary-based text analysis, also called word list text analysis, streamlines content analysis by scanning documents for specific phrases or words to infer theoretical constructs. This text analysis can be executed manually or through automation. Financial research frequently employs dictionary-based sentiment analysis, relying on established dictionaries. Additionally, supervised machine learning has been utilised to decipher strategic reports (Acheampong and Elshandidy 2021), while Latent Dirichlet Allocation

(LDA), an AI algorithm, is harnessed for explorative topic discovery within text analysis (Eskici and Koçak 2018).

The scholarly consensus acknowledges certain limitations inherent to text analysis, yet various methodologies attempt to mitigate these issues. To enhance the stability and reproducibility of manual coding, a temporal gap—typically not less than three months—is recommended, alongside employing multiple coders to achieve a coding agreement benchmark, often gauged by Krippendorff's alpha index, aiming for at least a 70% consensus (Smith and Taffler 2000). To ensure accuracy and reliability, thorough verification of the meanings of chosen words and phrases post-dictionary implementation is essential (Smith and Taffler 2000; Seuring and Gold 2012). Notably, the subjective nature of coding may skew the analysis, often giving undue emphasis to more influential organisations (Tate et al. 2010). Text analysis quantifies companies' public disclosures, spanning various mediums, from formal reports to social media (Landrum 2008).

One may conduct interviews after extracting factors from stakeholder documentation to validate text analysis outcomes. Kazakov (2020) employed this approach, engaging with stakeholder representatives and independent experts to corroborate text analysis findings. Other validation techniques strive to link coded data to organisational performance metrics gleaned from various disclosures, potentially correlating strategic decision-making tactics with their success and frequency of usage (Nutt 2000; Nutt 2001). Further correlations have been explored in the realms of credit risk, M&A likelihood (Acheampong and Elshandidy 2021; Katsafados et al. 2021), disclosure quality (Haniffa and Hudaib 2007; Li 2010; Jizi et al. 2014; Ajibolade and Oyewo 2017), and financial market distress (Gandhi et al. 2019). In the context of this research, factor analysis was not substantiated through interviews or correlation assessments, delineating an area for methodological enhancement. However, the coding analysis was reiterated with a three-month interval and cross-referenced against industry analyst reports for validation.

3.2.4 Coding categorisation and clustering

In coding categorisation, various frameworks and approaches have been employed to organise factors systematically. Willis et al. (2018) utilised the TEEPSE framework,

encompassing technological, economic, ethical, political, social, and environmental categories, to cover a broad spectrum of internal and external organisational factors related to workforce considerations.

Conboy et al. (2020) identified dynamic capabilities—sensing, seizing, and transforming—categorised across four dimensions: technology, structure, process, and people. They incorporated six analytics characteristics (volume, velocity, variety, variability, veracity, and visualisation) in their case study interview, demonstrating analytics' positive influence on the micro-foundations of dynamic capabilities.

In the realm of decision-making, Parreiras et al. (2019) analysed factors influencing decisions in a university research funding program, considering elements like program budget, research areas, inter-disciplinary interaction, and evaluation process efficiency. They categorised factors based on impact perspectives, including scientific, technological, social, economic, environmental, demand, and entrepreneurship.

Nutt (2000) examined strategic decision-making by analysing a database of decisions from various companies, categorising them by type (technology, reorganisation, control, etc.) and assigning specific attributes to each (stakes and interests, precedents, innovation necessity, confidentiality, effort scale, and time required).

Theißen and Spinler (2014) presented a decision-making framework for supplier selection based on clustered criteria like profile, competencies, environmental performance, and operational impacts. From a Resource-Based View (RBV), Shapiro (1999) applied an Activity-Based Costing (ABC) approach to assess company cases, classifying a firm’s resource profile into categories such as physical, human, financial, IT, and so forth, and utilised mathematical programming models to optimise costs.

In this study, strategic initiatives are pinpointed and classified according to PESTEL environmental factors, with distinctions made by payment system stakeholders. This categorisation aligns with the broader environmental context in which these organisations operate and interact.

3.3 Visualization and comparison

To offer a synthesised perspective of the strategic factors discerned, the study harnesses the Systemigram methodology in tandem with the strategic "Playing to win" framework, enabling an evaluation of the factors dynamic influence on strategic aims such as resilience and sustainability. Systemigrams facilitate the distinction of various strategic components — objectives, strategies, capabilities, and market targets — in line with modified research guidelines derived from an assortment of cases and sources (Clegg and Boardman, 1996; Blair et al., 2007b; Boardman and Sauser 2008; Lafley and Martin, 2013).

This section summarises a compilation of different sources or cases that used the Systemigram as a problem definition tool. In **Appendix D,** a comparative table was developed to show different guidelines from the different sources and research-adapted guidelines were developed to be applied to this research.

Systemigrams are recommended as a tool for visual synthesis, akin to expansive diagrams that delineate structured and directional insights. They prove particularly effective when comprehending a complex engineering system is confined within a broader socio-technical and complex adaptive system, incorporating social, technological, and economic factors (McDermott et al., 2015). They also play a crucial role in visualising the policies that foster the future system's aims, like resilience and sustainability.

The efficacy of Systemigrams transcends mere visualisation; they assist in decoding the nexus of interconnected and interrelated factors, with their effectiveness rooted in neuropsychological science. This method aids in capturing and conveying strategic intentions efficiently, especially to executive or project teams, through iterative refinement until a strategic narrative emerges clearly and coherently. Moreover, they act as a barometer of an organisation's maturity level, mapping out the alignment of human skills, knowledge, and aptitudes with corresponding tasks (Blair et al., 2007b).

By adopting multi-level modelling, Systemigrams portray subsystems and project a systemic objective — reflective of environmental sustainability, social responsibility, equity, and resilience — while providing a dynamic, temporal vista that encompasses historical events, current states, and prospective projections (McDermott et al., 2015).

The research employs Systemigrams within a general enterprise architecture model to offer a comprehensive systems perspective, typically curated through expert workshops. This model transcends traditional structural and behavioural depictions by incorporating six distinct views:

1. **Contextual**: Adds a layer of context to facilitate understanding and navigation of change; including challenges, issues, problems, risks, and opportunities the system may face.

2. **Knowledge**: Focuses on generating new knowledge through research, data, models, ideas, and so forth, enhancing the system's informational foundation.

3. **Temporal**: Defines multiple potential futures, scenarios, use cases, and environments, offering a forward-looking dimension to the system's design and operation.

4. **Managerial**: Addresses the evolving aspects of business management, ensuring that the system remains relevant and adaptive to business needs.

5. **Strategy**: Involves crafting a new architecture with comprehensive plans, metrics, goals, and visions that align with the strategic direction of the enterprise.

6. **Perceptual**: Ensures alignment across different stakeholder perspectives, harmonising the various viewpoints within the enterprise's strategic framework.

These multifaceted views, depicted in Figure 3.3, are essential for creating a robust and responsive system attuned to the enterprise environment's dynamic nature. They inform decision-making, strategic planning, and system optimisation in alignment with the overarching objectives of resilience and sustainability.

Moreover, Systemigrams serve as a tool to delineate the various levels that compose the ecosystem of a domain. They commence at the foundational level with work practices that organise people and resources systematically. The structure of a Systemigram is as follows:

1. **Foundation**: It starts with the work practices that underpin the system, focusing on how individuals and resources are coordinated and utilised to perform specific tasks.

2. **Operations**: Building upon the foundational practices, the delivery operations or processes are established, which translate into tangible infrastructure, products, or services.

3. **Structure**: The organisation's structure emerges at the top level, framed by the processes and practices below. This structure is responsible for delivering specific outcomes to consumers and fulfilling the mission or operational goals of the business.

As Rhodes and Ross (2010) and McDermott et al. (2015) describe these layers work in harmony to form a comprehensive ecosystem, ensuring that each level supports the next, culminating in a practical and goal-oriented organisation. Systemigrams map out the current state and guide the design and implementation of new structures and processes, fostering innovation and adaptation in line with the strategic objectives.

A socio-technical modelling framework, like the Systemigram, is instrumental in delineating the broader system impacts within a specific context or set of system boundaries. It bridges the gap between the rapid pace of technological diffusion and the more deliberate process of policy and legal adaptation, a notable consideration pointed out by McDermott et al. (2015).

In the UK payment system context, the Systemigram could facilitate the following:

- Situation Analysis: It identifies and validates the current state of the payment system's ecosystem by engaging with all stakeholders.

- Key Initiatives Identification: It highlights the primary initiatives influencing the payment system, providing a strategic overview.

- Incentive and Regulation Mechanisms: It helps conceptualise incentives that act as self-regulation mechanisms to promote desired behaviours within the payment system.

- Process Documentation: It documents real processes, thus providing a clear understanding of operational workflows.

- Enterprise Architecture Extension: It extends the enterprise architecture to include various facets of the payment system, encompassing its complexity and interactions.

- Financial Flows: It maps out the flow of money and resources, which is critical for understanding the financial dynamics within the payment system.

By employing a Systemigram as outlined by Boardman and Sauser (2008), stakeholders can visualise the interconnected components of the payment system, thereby facilitating informed decision-making and policy development. This approach provides clarity and ensures that every aspect of the system is considered in the pursuit of resilience and sustainability.

To provide some context, the Systemigram emerged as a tool for defining problems, conceived by John Boardman in 2005. It was designed to identify significant strategic initiatives within organisations or projects, as elucidated by Blair et al. in 2007. The Systemigram finds its application in the analysis of Complex Human Activity Systems of Systems (SoS), as expounded upon by Checkland and Poulter in 1999, and aligns with Peter Senge’s concepts of complex socio-technical capability and dynamic complexity from his 1991 work.

Originally, the Systemigram was employed by the UK Ministry of Defence (MoD) as part of their Network Enabled Capability (NEC) initiative. The NEC's mission was to generate agile military and non-military effects through a comprehensive network of networks,

demonstrating the Systemigram's utility in mapping complex and interconnected operations. This application underscored the Systemigram's potential for facilitating the understanding and management of intricate systems, particularly within large-scale and multifaceted organisations like the MoD.

In a subsequent study, Boardman and Sauser (2008) expanded their research by employing Systemigrams to address integration challenges within socio-technical and socio-political systems. Their primary finding underscored the imperative need for collaborative engagement when conveying strategic intent. A noteworthy example of their work in action was its application in the context of the European IT project known as Atmosphere (Boardman and Sauser 2008).

Furthermore, the study examined various diagramming techniques as potential alternatives to Systemigrams. These included rich pictures, also called problematic diagramming, Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, results grouping and ranking, cognitive maps, and the Ishikawa diagramming technique (Blair et al. 2007). Notably, two modelling approaches emerged as particularly relevant for integrating Soft Systems Methodology (SSM). The first involved the incorporation of SSM into Petri net theory models, a process-oriented mathematical modelling language (Sagoo and Boardman 1998). The second approach integrated SSM with Viable Systems Modelling, an organisational structure-oriented technique rooted in cybernetics (Bustard et al. 2005).

Initially, the Systemigram recognises an evolution process, defining three phases (Boardman and Sauser 2008), as shown in Figure 3.2.

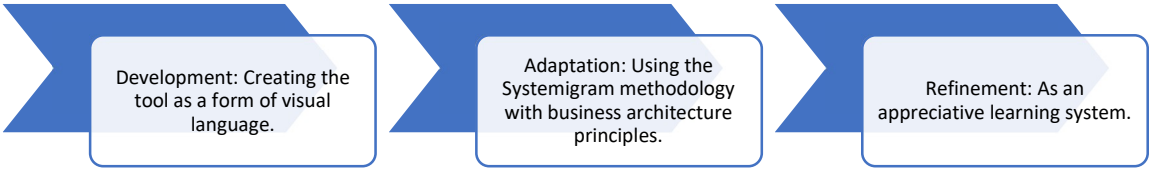


FIGURE 3.2 SYSTEMIGRAM EVOLUTION PHASES

One of the primary strengths inherent to Systemigrams is their exceptional traceability. In contrast to other diagrammatic methods that tend to be memoryless, capturing specific ideas or words briefly before moving on to the next isolated piece of knowledge, Systemigrams excel in preserving the complete train of thought. This capacity is particularly invaluable as it allows for the integration of ideas, rather than adhering solely to linear thinking patterns.

The essence of a Systemigram lies in its aspiration to seamlessly blend prose and visual elements, leveraging principles grounded in neuropsychology. This approach, in turn, facilitates the efficient capture and communication of strategic intent within organisations. Consequently, it establishes a robust framework for comprehensive requirements definition and understanding. In principle, Systemigrams transform the positivistic ontology of words and pictures into a phenomenological ontology, thereby fostering meaningful dialogues.

The creation process of Systemigrams involves a meticulous iterative refinement until a comprehensive and coherent strategy materializes (Blair et al. 2007).

Development process

The creation of a Systemigram necessitates a concise prose of fewer than 2,000 words. It adheres to a positivist perspective, embracing a goal-oriented, reductionist approach. Adopting a top-down viewpoint, this method involves breaking down high-level goals into specific objectives. Each objective is assigned to an individual responsible for its

execution, and in collaboration with other stakeholders, the necessary outputs are determined to achieve these objectives, as outlined by Blair et al. (2007).

For the purpose of this study, a reverse engineering approach was applied to develop the Systemigram. It began with the identification of strategic factors, categorizing and clustering them, and subsequently connecting them to overarching goals such as sustainability and operational resilience. The logical flow of the Systemigram drew inspiration from Checkland's Systems Thinking and Systems Practice diagram, specifically the Human Activity System (HAS) (Checkland and Poulter 1999).

The Systemigram approach advocates an "ends, ways, means" methodology, adapted in this research as "means, ways, end." It involves a sequential description of both the initial state and the desired end state. The prose statement outlines how these objectives may be accomplished and concludes by specifying the necessary resources (Blair et al. (2007). However, Soft Systems Methodology (SSM) acknowledges that the end-means approach may not always suit every situational problem. In some instances, other equally significant goals come into play, such as managing ongoing relationships over time (Checkland and Poulter 1999).

The Systemigram process hinges on accurately capturing and translating strategic vision and organisational needs into requirements. This step establishes the operational context for system development. The translation process entails collecting, analysing, understanding, and integrating all elements from stakeholders, culminating in a coherent set of requirements. This integration often leads to the emergence of dynamic complexity, or what can be referred to as a "mess." This research involved utilising organisations' strategic reports to extract requirements or factors through dictionary-based text analysis. Subsequently, an abductive process was employed to construct an aggregated level that integrated common factors within stakeholder groups (e.g., banks, retailers) and the broader retail payment system (Blair et al. 2007a).

Throughout the development of the prose, strict guidelines are established to capture strategic initiatives, not merely tactical procedures. The prose must encompass all

perspectives from the various stakeholders, as evident in this research focusing on the analysis of strategic reports.

Adaptation process

In the adaptation process, the resulting product is referred to as the "Boardman Soft Systems Methodology." This methodology seamlessly integrates project management and concurrent engineering practices, facilitating a comprehensive comparison and alignment of different organisational business process architectures. As previously mentioned, this product holds the potential to assess the existing baseline and strategically plan specific projects to bridge any gaps. It is a valuable benchmark for assessing competencies' and capabilities' maturity, particularly concerning the PESTEL perspective (Clegg and Boardman 1996; Blair et al. 2007a; Kolios and Read 2013).

It is important to note that the scope of this research does not encompass this particular process. Nonetheless, understanding the final purpose of the Systemigram underscores its relevance within the broader context.

Refinement process

Moreover, the concept of a storyboard is introduced during the refinement phase. This involves the selection of scenes or subgroups that effectively delineate each strand of strategic intent, resulting in a learning system infused with colour, flow, and texture. The approach draws upon Gestalt's principles of perception of good figures, serving as a foundation for creating a well-structured mapping reference. These principles encompass similarities, closure, proximity, continuation, and symmetry (Blair et al. 2007b).

It is worth noting that while this research adopts the storyboard concept, its application differs from providing a progressive change in the system. Instead, it is utilized to present the various factors in an organised manner systematically.

3.3.1 Factors' systemigram development process

The subsequent paragraphs provide a more in-depth depiction of the adapted Systemigram development process. To begin, the prose plays a pivotal role in

encapsulating the strategic essence of the system in words. This practice involves delving into the system's mission, motivation, and structure, mirroring the approach applied to strategic reports. This analysis is rooted in a comprehensive examination of both the syntactic and semantic relationships present within the words.

As part of this meticulous process, the prose is systematically deconstructed into meaningful segments or building blocks. These segments are represented by noun phrases, highlighting significant components, while the connections between them are vividly illustrated through prepositional and verb phrases. This structured approach, as outlined by Blair et al. (2007a), forms the bedrock of Systemigram development.

The Systemigram's building principles are summarised here, based on the adaptations used for this research. First, for the 2000-word or less prose development, the steps to follow are (Blair et al. 2007a):

- Interpret the original structured text, or strategic reports' extracted factors, as a diagram, using a common business architecture.
- As mentioned, the prose relates to the strategic intent, not procedural tactics. It should be validated by people with a balance of literary genius and domain expertise, as it has been done by the organisations supervising the strategic reports' content (i.e., SEC and FCA).
- It should focus on building a 2000-word or less prose or executive summary.
- The grammar and syntax must be revised carefully, as it affects the relationships among the building blocks.
- The top-level requirements or goals should be stated. Most companies researched state the resilience and sustainability of their business models in the strategic reports.

These guidelines were followed for developing the Systemigram graphic:

- The whole graphic must fit on a single page, from the top left to the bottom right.

- The key strategic factors are noun phrases specifying people, organisations, groups, artefacts, and conditions as unique nodes.
- The relationships between these nodes will be verb phrases (occasionally prepositional phrases), indicating transformation, belonging, and being.
- Nodes must be unique and not repeat themselves.
- The main diagram flow, or mainstay, should be diagonal, from top left to bottom right. The main components mentioned are motivation, mission and how it will be accomplished. Answering the questions why, what, and how.
- Texture and colour must be used to describe subfamilies of strategic factors, for example.
- To validate the Systemigram graphic, it must be reverse engineered to verify the original text.

The Systemigram creation process underwent a comprehensive revision by other authors through iterative refinement. This revision was exemplified in the development process of the Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE) project. In this particular case, Systemigrams served as a valuable tool for gaining a profound understanding of the system context surrounding the technologies being developed within a broader enterprise or organisation.

To facilitate a more streamlined refinement process in this instance, a software tool known as Systemitool was employed. This software proved instrumental in enhancing efficiency and effectiveness during the Systemigram development phase. Some relevant insights from the Systemigram development process are mentioned here (Squires et al. 2010):

1. **Generate an Initial Diagram from Established Prose:** Commence by crafting an initial diagram rooted in the insights gleaned from established prose. This diagram serves as a visionary representation of the entire project or organisation, drawing inspiration from elements found in the project charter or strategic reports.

2. **Comparison with Systemigram Development Rules and Updates**: Following the creation of the initial diagram, conduct a rigorous comparison with the established rules of Systemigram development. This step ensures alignment with the fundamental principles of Systemigram construction. In this process, particular attention is paid to these rules' value, emphasising their facilitative role rather than being seen as constraints. Moreover, these rules are meticulously grounded in extensive research, and they are intentionally designed to foster the modeller's intellectual flexibility.

Additionally, several specific rules come into play:

- The upper left corner of the diagram should feature a title that succinctly describes its purpose. At the same time, the lower right-hand node is dedicated to representing the system's overarching goals.
- Relationships should not terminate at nodes within the middle of the diagram.
- Node relationships can take the form of phrases, for example: "Node A develops the ability of Node B."
- The inclusion of grouping nodes or nodes housing multiple components is permissible.

3. **Validation with Stakeholders and Iteration:** Achieving consensus with stakeholders is pivotal in validating the Systemigram. Multiple iterations may be necessary to ensure strict adherence to the established rules and to align with the precision and effectiveness levels outlined in the stakeholders' strategic reports. Given the potential complexity of Systemigrams, a storyboard approach is recommended to present them in a more digestible format, preventing them from becoming overwhelming.

4. **Strategic Story Creation:** A Systemigram matures when its nodes and relationships effectively convey a compelling narrative. Consequently, the diagram should be read sequentially to reveal this strategic story, presented incrementally through streams. The order of these streams should first address the "what" and "why" aspects before delving into the "how." This approach ensures that the Systemigram conveys a coherent and

comprehensive narrative that encapsulates the strategic essence of the project or organisation.

Understanding the Systemigram development rules upfront is paramount, as emphasised by McDermott et al. (2015). These rules are a compass for making informed decisions throughout the diagramming process. The methodology at hand addresses the intricate challenge of comprehending the evolution of a complex system within the broader socio-technical and socio-economic context of a Complex Adaptive System (CAS). It considers a multitude of factors, spanning the social, technological, and economic realms, all converging to inform policymaking implications for the resilience and sustainability of a system. This inquiry focuses on determining the policies necessary to foster and enforce sustainability within future systems.

As previously mentioned, the need for more existing models to estimate change within complex environments necessitates a multi-level modelling approach. This approach involves the representation of subsystems, all driven by a systemic intent focusing on sustainability and operational resilience. An integral insight derived from this iterative process, conducted through qualitative soft systems modelling, is the provision of the valuable groundwork for subsequent research and the development of quantitative models. This further exploration incorporates expert viewpoints and undergoes validation, often involving methods such as interviews or focus groups (McDermott et al. 2015).

A comprehensive enterprise architecture model was the foundation for shaping the structure of various enterprise levels within the payment system. This model adopted a broader systems perspective, encompassing the conventional structural and behavioural representations and incorporating contextual, temporal, perspective-based, and managerial or governance views. Figures 3.3 and 3.4, borrowed from earlier studies (Rhodes and Ross 2010; McDermott et al. 2015), aptly illustrate these concepts, providing visual clarity to the multifaceted approach applied in understanding and defining the payment system's intricacies.

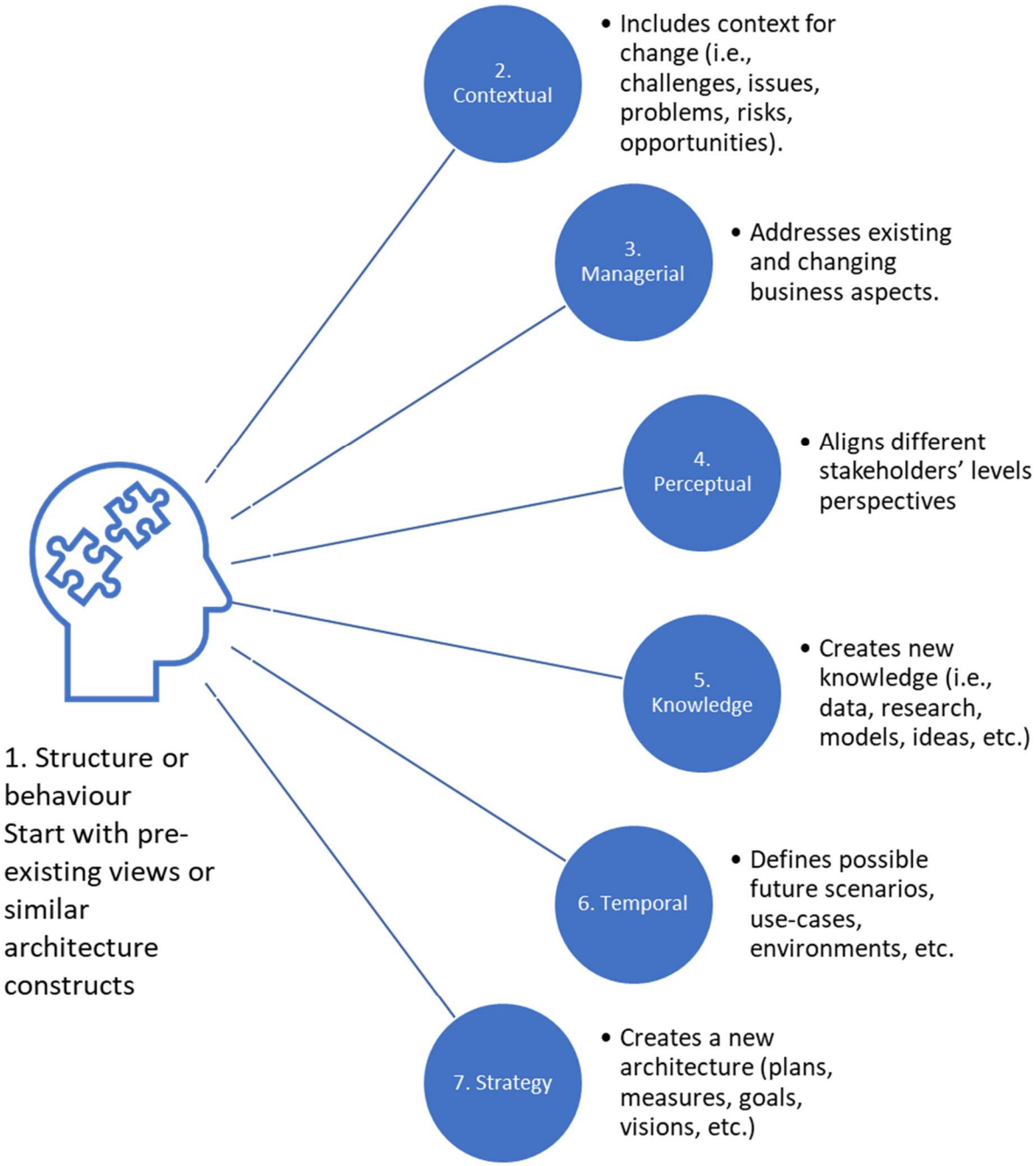


FIGURE 3.3 PROCESS MODEL FOR ADDRESSING WIDER SYSTEM VIEWS

The Systemigram's stream flow development drew upon a generalised enterprise architecture model, explicitly focusing on the various building block levels that construct the domain ecosystem. This approach commenced from the foundation, grounded in work practices that intricately organise people and resources in precise configurations. Subsequently, it created delivery operations or processes, manifesting as infrastructure, products, or services. Ultimately, it culminated in the definition of the system's or organisation's structure, aimed at delivering specific consumer outcomes in alignment with the mission or business operational objectives (Refer to Figure 3.4 for a visual representation of this concept) (Rhodes and Ross 2010; McDermott et al. 2015).

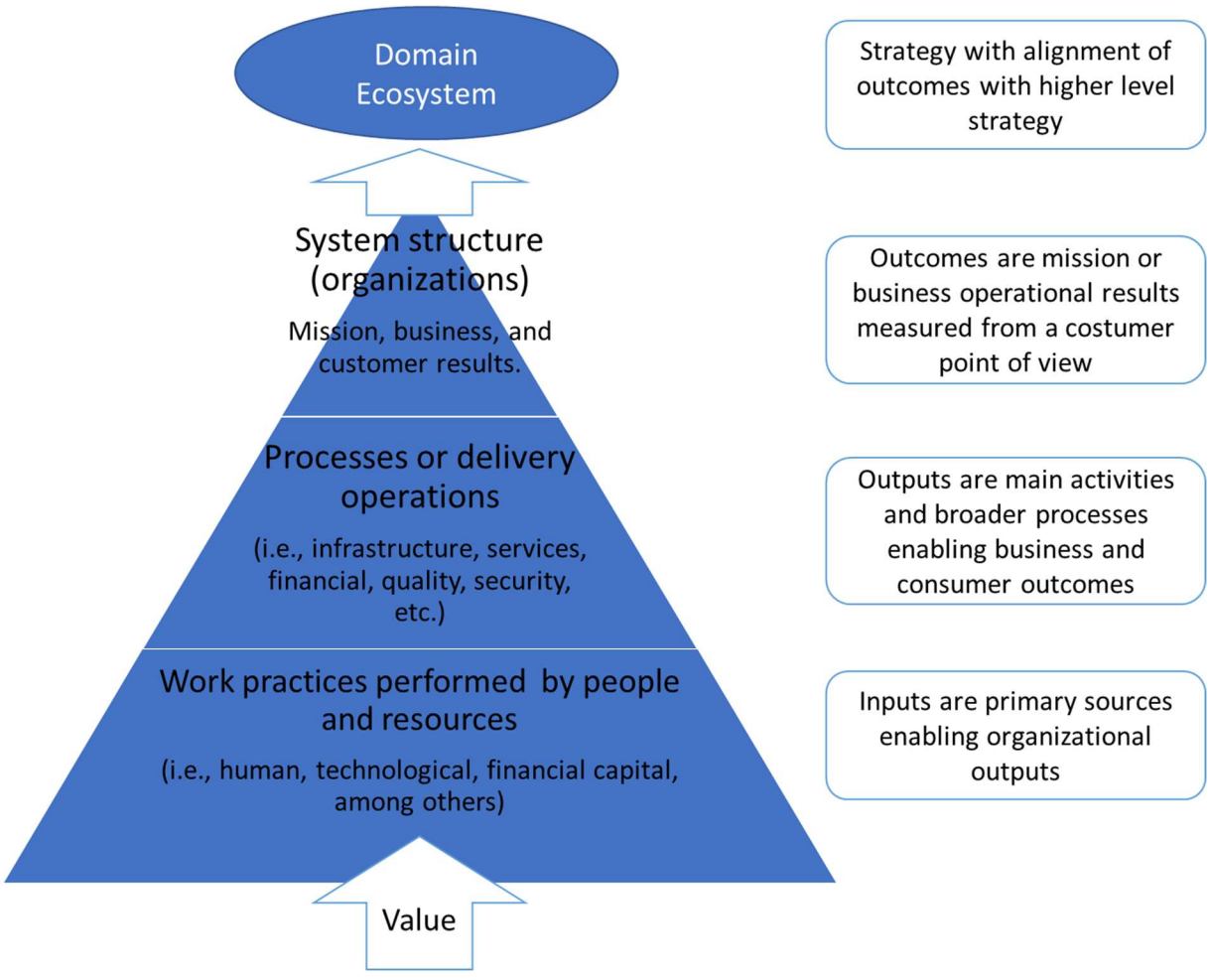


FIGURE 3.4 GENERALIZED ENTERPRISE ARCHITECTURE MODEL

This multi-level modelling methodology is elucidated as follows (McDermott et al. 2015):

1. Defining the Central Question: The process begins by articulating a central question of interest, which in this case corresponds to the research questions in the study. This question is validated and refined through consultations with experts from both industry and academia, substantiated by thorough background research.

2. Qualitative Visualization: Qualitative visualisations, exemplified here by Systemigrams, are generated from narratives. These visualisations serve as a means of analysing and identifying gaps or trade-offs within the system.

3. Future Quantitative Modeling: As a potential subsequent step, the methodology contemplates the creation of quantitative models, employing approaches such as System Dynamics and Engineering. This transition from qualitative to quantitative modelling can offer a deeper understanding and more precise insights into the system's dynamics.

4. Multiple Entry Points and Inputs: It is crucial to note that the application of Systemigrams should account for multiple entry points and inputs to capture all components and behaviours of the system effectively. This comprehensive approach ensures a holistic representation of the system's complexity.

The primary outcomes derived from utilising a generalised multilevel enterprise architecture model pertain to identifying the system's intricate components and their interactions. These outcomes should precisely define operational deliverables and associated measures, ultimately reflecting the alignment with stakeholders' objectives and interests. In the subsequent phases of the analysis, there is an opportunity to explore the development of future scenarios by implementing and modelling various policies. This forward-looking approach enables an in-depth examination of potential future environments. In doing so, it becomes possible to identify control mechanisms stemming from the myriad interdependencies within the system. This analysis is crucial for assessing the system's vulnerability and examining the network's resilience and susceptibility to potential disruptions (McDermott et al. 2015).

This study, therefore, represents a foundational step in the broader endeavour to evaluate the structural vulnerability of the payment system.

The culmination of an extensive literature analysis for creating the Boardman Soft Systems Methodology (SSM) has yielded a structured framework for developing a Systemigram, as outlined by Sivadasan and Sauser (2009). The Systemigram development process is initiated from step two within the iterative or refinement process, with the following steps highlighted in Figure 3.5:

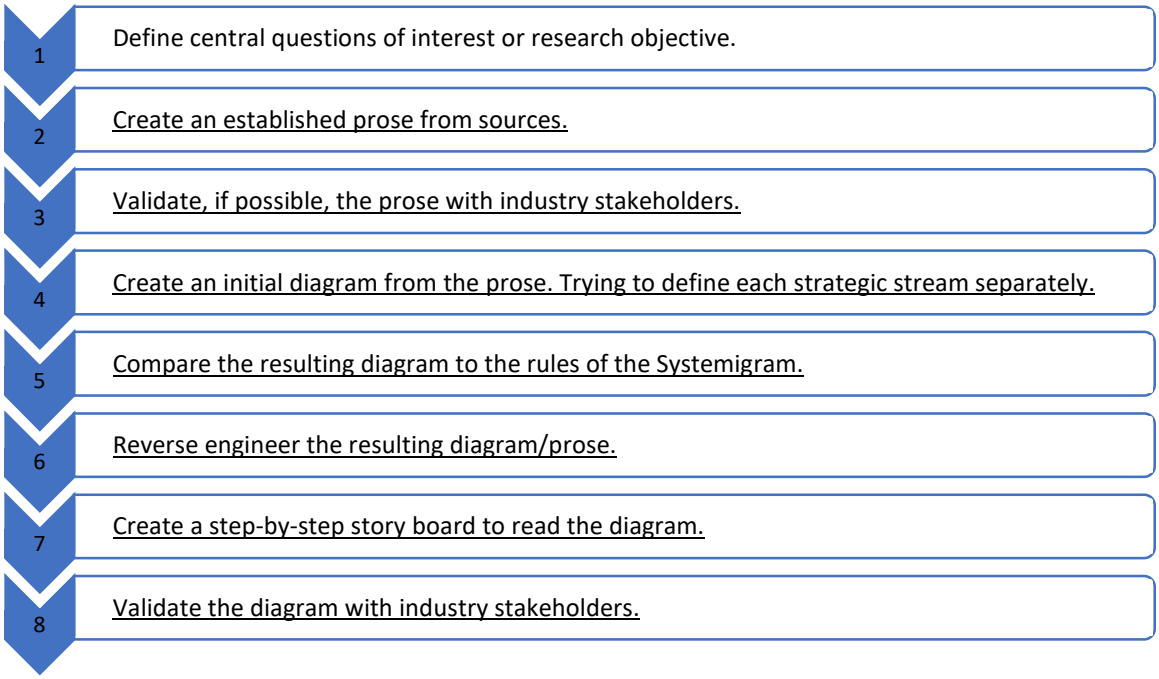


FIGURE 3.5 SYSTEMIGRAM DEVELOPMENT STEPS

A comprehensive comparison was conducted among various authors, resulting in the selection and integration of pertinent guidelines. As previously mentioned, a detailed account of this comparative process can be found in Appendix D.

- Capture strategic intent, not procedural tactics.
- Be well-crafted, including the author's and reader's perspective.
- Include facilitation and dialogue with all stakeholders, if possible.

- The analysis is broken down into significant parts or nodes (noun phrases) and relationships (prepositional and verb phrases). Some recommendations are:

- High-level goals are broken down into specific objectives, each with an owner, who is responsible for delivering, in conjunction with other stakeholders, the outputs required to achieve these objectives.

    - Use a “Ends, ways, means” approach when possible.

    - The strategic vision and user needs must be captured and accurately translated into requirements, establishing the operational context for system development. The translation process entails all “social” elements from the stakeholders to be collected, analysed, understood, and integrated into a set of coherent requirements faithful to the perceived intent of the original strategy. To achieve this last activity, the strategic plan can be grouped according to the conforming elements (Bryson and Alston 2011): Vision, Mission, Strategic Initiatives, Resources, Products and Services and Business Risks.

    - The strategic initiatives, also called business requirements, can be categorised using an Enterprise Architecture (EA) building blocks approach by identifying the strategic targets and breaking down the initiative-specific attributes.

- Once this structuring process is done, the Systemigram prose and graphic can be developed.

The Systemigram graphic integrated rules or recommendations are:

- Entities: Nodes and links (linking nodes’ inputs and outputs).

- Direction: The upper left corner starts with the diagram description, and the lower right-hand node represents the system’s purpose.

- Size: 1 single page.

- The ratio of nodes to links is 1.5.
- No cross-over of links.
- Colours used to draw attention (Nodes' families or transformation process in a single thread).

The integrated nodes' characteristics are the following:

- Noun phrases that specify key concepts, and noun phrases, that specify people, organisations, groups, artefacts, and conditions.
- Connection nodes, or any node with multiple nodes inside, collect nodes belonging to a specific group.
- Systems should only be shown in one place, having no repeated nodes.

The link characteristics are mentioned here:

- Separate each strand of strategic intent.
- Represent relationships and flow between nodes (input-output).
- There should be a storyboard concept using carefully selected scenes or subnetworks.
- The relationships between these nodes will be verb phrases, sometimes prepositional phrases (relationship-node-relationship). They indicate transformation, belonging, and being. These relationships will not always represent a cause-effect relationship.
- A relationship should not end at a node in the middle of the diagram.

One notable evolution in this adaptation of the Systemigram methodology is allowing nodes to possess multiple inputs and outputs, enabling a more comprehensive capture of all system components and behaviours. While this enriched representation can pose challenges regarding readability, applying the storyboard technique is a practical solution.

The "Playing to Win" decision-based framework was leveraged to ensure an iterative and structured approach. This framework facilitated classifying the various identified factors and constructing a cascading strategy decision process rooted in enterprise architecture principles. Refer to Rhodes and Ross (2010), Lafley and Martin (2013), and McDermott et al. (2015) for further insights into this framework.

Additionally, a matrix was devised to facilitate the visualisation of Systemigram factors. This matrix aids in categorising the different factors following the established definitions, as exemplified in Figure 3.6. This classification approach streamlines the Systemigram development process and enhances clarity and consistency.

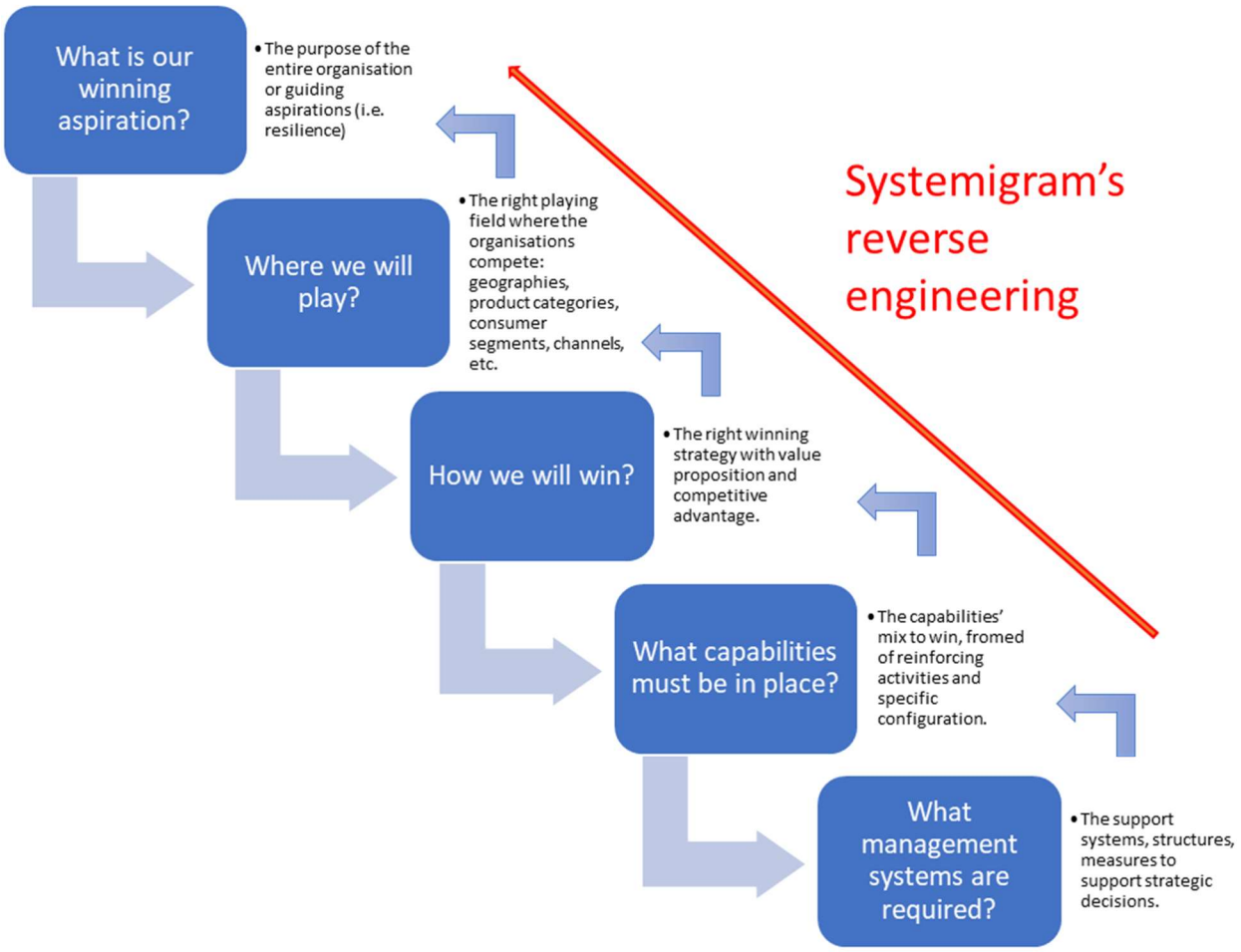


FIGURE 3.6 REVERSE ENGINEERING THE "PLAYING TO WIN" DECISION-BASED FRAMEWORK PROCESS FOR EXPLOITATION IN SYSTEMIGRAMS

Subsequently, a matrix was meticulously crafted to facilitate the visualisation and categorisation of Systemigram factors, aligning them with the predefined definitions. This matrix is a valuable tool for organising and structuring these factors, ensuring a systematic approach to their representation.

Table 3.1 presents a selection of illustrative factors, providing concrete examples that further elucidate the classification process.

	Management Systems (Support Infrastructure)	Capabilities (Process)	How we will win? (Strategies)	Where we will play? (Target Markets)	Winning aspirations (Goals)
Definition	Support systems structures, and measures	Set of reinforcing activities and specific configuration	Value proposition and competitive advantage	Geographies, product categories, customer segments, channels, vertical stages of production	Purpose or guiding aspirations (What?)
Example Factors	- Training & skilling -Enterprise Risk Management Framework - Performance management (Assessment, reports, review, &statements) - Data management - Events & Meetings - Partnerships Alliances	-Costumer Membership & Rewards programs -Community financial education	-Regulator collaboration & compliance -Strategic commitments -Credit focus	-Trade focus -UK, Europe & International -Technology & innovation focus -Income based focus	-ESG approach -Economic & Financial focus -Operational Resilience

TABLE 3.1 "PLAYING-TO-WIN" DECISION-BASED FRAMEWORK CATEGORISATION WITH EXAMPLES

For the Systemigrams' development, the specific factors are mentioned in *italics* and Capitalized. Grouped factors are mentioned in **bold** letters and explained in different

paragraphs with more detail. There is a code of colours (see Figure 3.7) to identify the different building blocks or factors and symbols to refer to those factors that contribute specifically to a defined target (see Figure 3.8). Key insights can be obtained from the cluster analysis, as discussed in the Results section. The Systemigram graphics appear in different figures to exemplify a storyboarding technique, to be able to read it alongside the prose. With each paragraph written, there appears a new figure progression, as it was proven difficult to read the whole graphic at once, so a storyboard approach is proposed as recommended by the authors (Blair et al. 2007a).

For this research, in the Systemigram development, specific factors are denoted in *italics* and CAPITALISED, while grouped factors are highlighted in **bold**. To provide a comprehensive understanding, each set of grouped factors is explained in separate paragraphs. Using a colour code (refer to Figure 3.7) assists in identifying distinct building blocks or factors, and symbols (refer to Figure 3.8) are employed to reference factors contributing to defined targets. Key insights are derived from cluster analysis, as elaborated in the Results section.

To enhance readability, the Systemigram graphics are presented in various figures, adopting a storyboard approach. This method allows for a step-by-step reading experience alongside the prose. Each new paragraph is accompanied by a new figure progression, mitigating the challenge of comprehending the entire graphic at once—a recommended practice by the authors (Blair et al. 2007a).

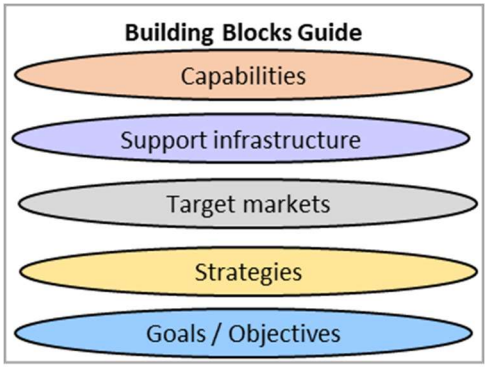


FIGURE 3.7 SYSTEMIGRAM BUILDING BLOCKS (FACTORS) GUIDE

FIGURE 3.8 TARGETS' SYMBOLS

3.3.2 Factors' operational resilience classification and contribution

Following the visualisation process, strategic factors are categorised based on their alignment with the CERT® Enterprise Resilience framework areas (Caralli et al. 2010) and RALF model attributes (Purvis et al. 2016), specifically in the context of operational resilience. These classifications adhere to specific definitions and contributions derived from Complex Adaptive Systems (Folke et al. 2010; Walker and Cooper 2011; Alexander 2013; Coetzee et al. 2016; Kazakov et al. 2020; Soroka et al. 2020).

In this research, resilience is defined as the capacity to anticipate, endure, adapt, and transform in response to internal and external uncertainties (Falasca et al. 2008; Ponomarov and Holcomb 2009; Jain et al. 2018). Enhancing resilience involves identifying critical capabilities through risk analysis (Carabine and Wilkinson 2016) and delineating resilience strategies or responses (Coetzee et al. 2016; Haimes 2018). These measures contribute to achieving long-term sustainability (Gold et al. 2010; Tate et al. 2010; Weerawardena and Mavondo 2011; Walker et al. 2014; Subramanian et al. 2017).

Various operational resilience frameworks exist, with resilience often associated with attributes like robustness, agility, leanness, and flexibility (Purvis et al. 2016). Resilience can be characterised as either unbalanced, marked by excessive risk, and eroded profitability, or balanced, leading to improved performance.

One commonly mentioned attribute in resilience literature is "robustness," defined as a supply chain's ability to withstand change without altering its initial stable configuration, often called "rigid flexibility." Robustness is closely linked to the capacity to predetermine

the range of events or the number of risks that a supply chain or the organisations within it can effectively manage (Durach et al. 2015; Purvis et al. 2016).

In the RBV perspective, risks are defined as vulnerabilities characterised by their dynamic capacity to change, necessitating ongoing management efforts (Scholz et al. 2012). A robust supply chain, preferred by managers, directly and positively impacts business performance, while the effect of agility tends to be indirect (Durach et al. 2015).

Operational resilience and robustness within supply chain contexts can be quantified concerning time, cost, and quality parameters. This quantification aids in the identification of robustness requirements and the prioritisation of risks, laying the groundwork for the development of necessary control mechanisms. The intricacy of this process is exemplified by reference to the implementation of the COSO framework (Pettit et al. 2010).

Operational resilience, however, transcends the mere identification of risks and the establishment of continuity plans; it encompasses the ability to maintain operations in the face of disruptive events. The strength of the relationship between logistics capabilities and the resilience/robustness of supply chains is positively correlated with a higher degree of risk sharing within the supply chain network. This correlation is supported by ongoing risk analysis and unwavering commitment from top management. Strategies to enhance visibility may entail fostering improved relationships and undertaking network redesign efforts (Durach et al. 2015).

Fundamental components such as collaboration, integration, visibility, and security should be inherently woven into the fabric of resilience strategies. This integration should be coupled with a steadfast commitment to ensuring continuity of operations at the desired level of connectedness and control over structure and function, per insights from Ponomarov and Holcomb (2009), Pettit et al. (2010), and Durach et al. (2015).

Viewed through a broader strategic lens, resilience within regional economies encompasses attributes such as resistance, recovery, reorientation, and renewal. This multifaceted nature of resilience poses challenges in terms of operationalisation and

measurement. When considered within the broader context, resilience aligns with systems thinking, drawing from the social-ecological system literature, and is regarded as an integrated and interconnected complex adaptive system concept (Soroka et al. 2020).

To evaluate various resilience attributes systematically, the CERT® Resilience Management model from Carnegie Mellon University (Caralli et al. 2010) is recommended. This model delineates areas and sub-areas pertinent to resilience and their respective impacts on resilience attributes, in accordance with the RALF framework (Purvis et al. 2016). Detailed contributions of each operational resilience attribute to the model can be found in Table 3.2 and Appendix F, marked with an ‘X’.

N	CERT process areas	Flexib.	Agility	Lean.	Robust.
1	Engineering				
1.1	Asset Definition and Management	X	X	X	X
1.2	Controls Management		X		X
1.3	Resilience Requirements Development	X	X	X	X
1.4	Resilience Requirements Management	X	X	X	X
1.5	Resilient Technical Solution Engineering	X	X		
1.6	Service Continuity	X	X		
2	Enterprise Management				
2.1	Communications	X	X		X
2.2	Compliance	X	X		X
2.3	Enterprise Focus	X	X	X	X
2.4	Financial Resource Management	X	X		X
2.5	Human Resource Management	X	X	X	X
2.6	Organisational Training and Awareness	X	X	X	X
2.7	Risk Management	X	X	X	X
3	Operations				
3.1	Access Management	X	X	X	X
3.2	Environmental Control		X		X
3.3	External Dependencies Management	X	X	X	X
3.4	Identity Management	X	X	X	X
3.5	Incident Management and Control	X	X	X	X
3.6	Knowledge and Information Mgt.	X	X	X	X
3.7	People Management	X	X		X
3.8	Technology Management	X	X	X	
3.9	Vulnerability Analysis and Resolution	X	X		X
4	Process Management				
4.1	Measurement and Analysis	X	X	X	X
4.2	Monitoring	X	X		X
4.3	Organisational Process Definition	X	X	X	X
4.4	Organisational Process Focus	X	X	X	X

TABLE 3.2 CERT RESILIENCE AREAS AND SUB AREAS CAPABILITIES

To validate the results, a comparative analysis was conducted by juxtaposing the strategic factors identified in this study with operational resilience and sustainability reports issued by financial industry analysts. A comprehensive list of these reports is detailed in Appendix E, encompassing publications from reputable sources such as Accenture (2019), Bank for International Settlements (2019), Cox et al. (2019), Gartner (2019), IMF (2019a), Innovate Finance (2019), PwC (2019), Steemis (2019), World Bank (2019b), KPMG (2020), Oliver Wyman (2020), Vives (2020), Deloitte (2021), and UK Finance (2021).

The process involved manual coding to extract strategic factors explicitly mentioned by industry analysts in their reports. Subsequently, these factors were systematically compared with those derived from stakeholders' strategic reports within the UK retail payment system. Both sets of factors were meticulously categorised and clustered according to the PESTEL and CERT resilience frameworks. Detailed results and findings are presented in the dedicated chapter.

Incorporated within this comparison is a validation procedure, akin to a credibility check, aimed at ascertaining the degree of overlap between the strategic factors identified from the two sources. As previously indicated, a robust factor reliability assessment necessitates that the identified frequencies align with a minimum of 70% of the total strategic factors identified across different sources (Smith and Taffler 2000). A single coder carried out this validation exercise to ensure the consistency and reliability of the findings.

3.4 Research design

The finance world increasingly relies on resilient and sustainable systems, especially within the complex landscape of payment systems. In this thesis, we embark on a comprehensive exploration of operational resilience and sustainability in the context of the UK retail payment system. This research is structured into distinct chapters, each contributing to a holistic understanding of the challenges and opportunities within this critical domain.

Chapter 2 - Literature Review

The Literature Review delves into the fundamental background of the UK payment system and its stakeholders, underpinned by key concepts from systems theory. Additionally, this chapter synthesises insights from a multitude of sources, including academic and industry analysts, to outline the interconnected factors that shape the resilience and sustainability of payment systems.

Chapter 3 - Research Method Design and Development

Chapter 3 lays the groundwork for our research methodology. It elucidates the foundational principles that underpin our approach, providing a robust framework for our subsequent analyses.

Chapter 4 - Systems Approach for Financial System Analysis

Chapter 4 delves into the practical aspects of our research, detailing the methodology for collecting and processing relevant reports. Introducing the techniques of dictionary-based text analysis and clustering, visualisation, and comparison all crucial components of this research process.

Chapter 5 - Results

Chapter 5 presents the culmination of our efforts, offering insights into the analysis of individual banks and the UK retail payments system. It explores the alignment and identifies operational resilience and sustainability gaps, highlighting common, shared, and specific factors.

Chapter 6 - Discussion

The Discussion in Chapter 6 offers a critical analysis of the findings. Comparing the results with existing academic and industry literature facilitates a deeper understanding of our research outcomes and their implications.

Chapter 7 - Conclusions

Finally, in Chapter 7, the journey ends with a comprehensive summary of our thesis. We are distilling the key findings and reflecting on their significance in the context of operational resilience and sustainability within the UK retail payment system.

This structured approach guides this thesis exploration, ensuring a systematic examination of critical factors underpinning financial systems' stability and viability in an increasingly complex and interconnected world. For an overarching view of the research design and methodology, refer to Figure 3.9.

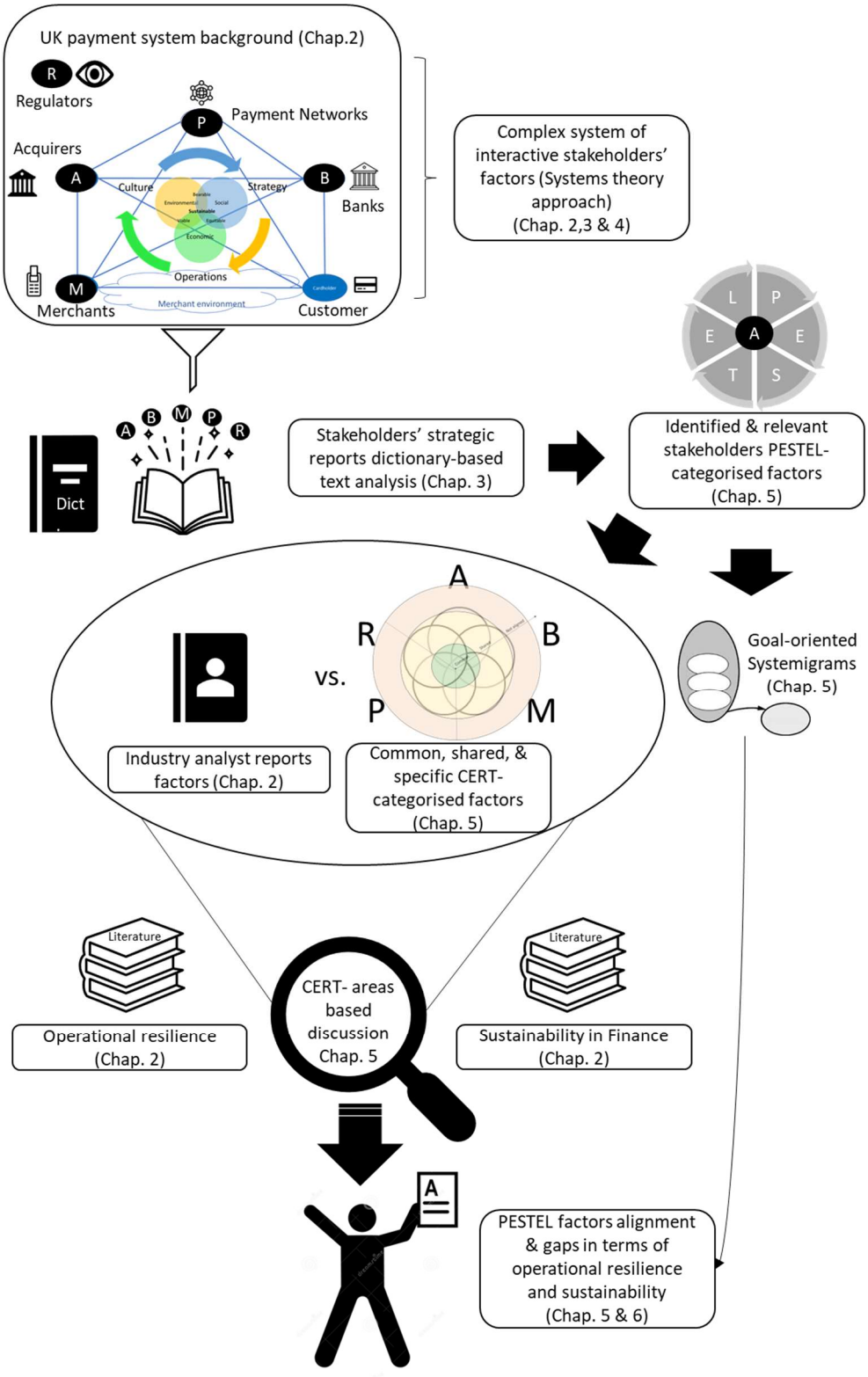


FIGURE 3.9 RESEARCH DESIGN DIAGRAM WITH RELEVANT CHAPTERS

3.5 Reliability, validity, and ethics

From a critical realistic perspective, the strategic reports are secondary sources from different industry stakeholders and analysts. Therefore, these sources are considered accountable regarding trustworthiness, representativeness, and transparency (Homer 1996; Saunders et al. 2008). In this chapter, all the methods are described thoroughly along with the results sections, showing all the procedures followed and other information that gives the complete context in the Appendices. This description establishes traceability and demonstrates the research design's logical reasoning (Bryman, 2016).

The established methods account for internal validity as shown by the appropriate reliability tests performed after developing the dictionary-based text analysis. While the external validity is acquired by comparing with the different industry analyst reports, as shown in the discussion that tries to validate all findings (Homer 1996; Saunders et al. 2008).

This research aims to demonstrate an unbiased approach by identifying the different resources and capabilities within the defined payment system without any biased direction due to the exploratory nature of the critical analysis performed (British Sociological Association 2007). The strategic reports selected were obtained considering the representativeness of the UK payment system, where the organisations selected have a high market representation of the factors being developed by the different stakeholders and classified with PESTEL categories. Of course, there are some limitations regarding the inferences from the data available and the coding interpretation while using keywords to identify them and bring some transparency (Currivan and Gilbert 1994). Therefore, the results are presented without any manipulation, even if these findings do not align with the factors reported by industry analysts (Homer 1996). The primary purpose of this doctoral research is to diagnose the industry factor alignment and possible gaps, according to the implementation of organisational initiatives (factors), to improve the market operational resilience and long-term sustainability.

4 Systems approach to the analysis of complex business systems

This chapter introduces a methodology for the systems approach that allows an integrated ecosystem strategy, examining the UK's retail payment systems and the alignment of stakeholder factors with operational resilience and sustainability. It considers organisational resources and capabilities, as well as environmental risks that may impact system resilience—efficiency and efficacy—and sustainability—effectiveness, drawing on Checkland and Scholes (1999). The methodology involves gathering, categorising, and clustering strategic initiatives that support performance objectives in a volatile competitive landscape, according to Porter (1996). Adopting a systems perspective influenced by horizon scanning techniques, the proposed method identifies and aligns factors with their corresponding goals (Milling, 1996). Companies document their strategic initiatives, referred to as 'factors' in this context, in strategic reports to achieve their objectives.

Strategic reports, notably 10-K filings, are utilised by banks and other market-listed entities to communicate their strategic directions to shareholders and other stakeholders, adjusting the strategic congruence between a firm's objectives and its resources or capabilities in response to market dynamics (Law, 2016; SEC, 2021). This research employs a Resource-Based View (RBV) and Dynamic Capabilities View (DCV) to devise a method for identifying, extracting, categorising, and clustering organisational factors from the business sections of these reports (Barney, 1991; Teece et al., 1997). From the vantage point of complexity theory, the method serves as a decision support or diagnostic tool, assessing an organisation's factor alignment with various mandates, including competitive advantage and operational resilience amidst environmental shifts (Weerawardena and Mavondo, 2011; Lee and Hong, 2016; Morgan et al., 2019; Leo, 2020; Lee, 2022).

Previous researchers have analysed strategic reports' textual data to determine their predictive value on market performance, establishing content analysis as a vital supplementary method to quantitative analysis (Balakrishnan et al., 2010; Mishra et al., 2020). The focus has predominantly been on information disclosure, readability, and sentiment analysis, employing both manual and automated coding techniques based on

word identification to associate with various concepts or factors, such as customer value propositions. The literature on content analysis typically assigns factors to positive or negative sentiment categories (Loughran and McDonald, 2015). In this study, a dictionary of factors is formulated to search strategic reports using an inductive approach, identifying factors from recurrent words and phrases within the reports. The inherent challenges in analysing 10-K reports include issues with readability, standardisation, symmetry, and complexity (Humphreys and Wang, 2018).

Content analysis techniques, while in the nascent stages of development, are rapidly evolving. Researchers are actively devising novel methodologies to distil essential information from corporate publications, aiming to standardize the process and ensure the reliability of the results (Humphreys & Wang, 2018; Khadjeh Nassirtoussi et al., 2014). However, inherent limitations persist, primarily stemming from subjectivity—these include concerns regarding coding stability, reproducibility, reliability, and accuracy.

This study employs the dictionary-based text analysis approach, fully cognizant of its limitations, to discern and distil strategic factors cited by preeminent organisations—those commanding an 80% market share in the UK—as delineated in their 2019 10-K annual reports (refer to Figure 1.2 in Chapter 1). As depicted in Figure 4.1, these factors, pertinent to the five identified payment system stakeholders (Banks or Issuers, Acquirers, Payment networks, Retailers, and Regulators), are categorized and clustered. This display facilitates a visual comparison of both shared and stakeholder-specific strategic factors among banks.

To synthesise these findings into a coherent strategic overview, the research integrates a soft systems methodology tool, the Systemigram, with a decision-based process model, the "Playing to Win" framework. This fusion not only illustrates the dynamic interplay of the factors but also their cumulative impact on strategic objectives (Blair et al., 2007a; Boardman & Sauser, 2008; Lafley & Martin, 2013). Complementing this analysis, two resilience frameworks, RALF and CERT, are employed to elucidate how these strategic factors enhance specific operational resilience attributes (Caralli et al., 2010; Purvis et al., 2016)

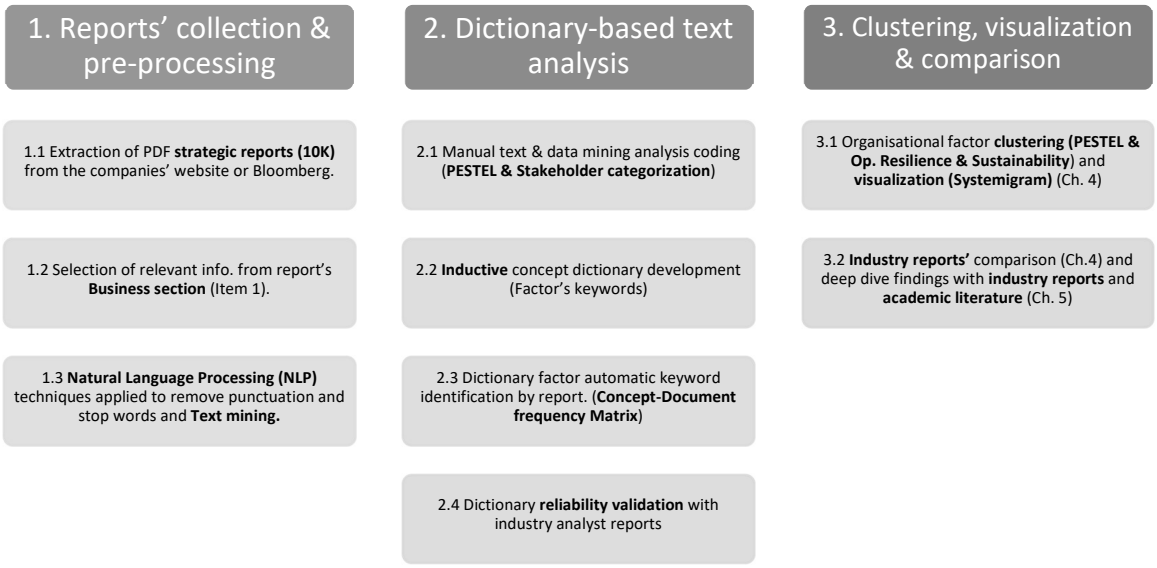


FIGURE 4.1 RESEARCH METHOD ACTIVITY OVERVIEW (SYSTEMS APPROACH)

To the author's knowledge, the innovative integration of RBV (Resource-Based View), PESTEL (Political, Economic, Social, Technological, Environmental, and Legal analysis), Systemigram, and Organisational Resilience (OR) approaches for analysing banking 10-K reports represents a novel methodological contribution. Prior studies have indeed applied content analysis to various sectors, focusing on singular disciplines or industries, like marketing excellence (Morgan et al., 2019), customer value propositions (Mishra et al., 2020), servitisation in manufacturing operations (Lee & Hong, 2016), and resilience in banking operations (Leo, 2020). Notably, these studies typically concentrated on organisations' strategic reports.

The dictionary-based text analysis technique addressed herein enriches the realm of content analysis, particularly in evaluating and mitigating the subjective nature, which often leads to limitations in reproducibility, stability, reliability, and accuracy (Balakrishnan et al., 2010). The analysis pinpoints organisational capabilities by linking strategic factors to specific keywords and phrases. The PESTEL framework facilitates categorising these factors into different strategic priority groups, broadening the original PESTEL categories to encapsulate a more extensive range of factors. Subsequently, Systemigrams are employed to cluster and succinctly represent both the common and distinct strategic

factors across the organisations under study. This method elucidates industry-wide initiatives and each organisation's distinctive strategic approach to OR and sustainability.

The findings are juxtaposed with reports from industry analysts and regulators—who aim to decipher market trends and ensure compliance with standards and laws, respectively—to delineate the variances in the identified factors (sources include Accenture, BIS, Cox et al., IMF, McIntyre, PwC, Steemis, UK Finance, World Bank, Oliver Wyman, and Vives, spanning from 2019 to 2020). While the phraseology may differ, there is a notable overlap in the strategic factors identified. This research constructs a descriptive model that facilitates comprehension of the alignment of these factors within a defined system, thereby contributing to a deeper understanding of the industry (Gosling et al., 2020).

The UK retail payment system research analysis deliverables are:

1) the identification and clustering of the PESTEL common and specific factors that affect the operation of payment technologies according to the environmental characteristics that feedback into the system, along with a Systemigram, and

2) a dictionary of stakeholders' capabilities that could influence the overall system resilience and sustainability.

3) A factors analysis that has been assessed in terms of industry experts 'opinions based on industry analyst reports.

These results help better understand the components that can reinforce or balance the resilience and sustainability of payment technologies and possibly generate a basic evaluation framework, which could investigate the historical factor's presence and possible future scenarios (Strohhecker 2005).

The proposed model complies with certain criteria to reduce problems in downstream phases. The criteria used are size, simplicity for understanding, clear relationships, and agreement with the industry's language. As recognised, if a model is too complex, the level of detail is too broad, and the possibility to break it down to analyse it are reduced (Ratha 1997; Repenning 2002).

This chapter is organised according to Figure 4.1 sub-processes and activities. Section 4.1 Reports' collection & pre-processing describes the process of obtaining the strategic reports and preparing the adequate sections for text analysis. Section 4.2 shows the applied dictionary-based text analysis to extract organisational factors from the text in the strategic reports. Section 4.3 Clustering, visualisation, & comparison describes the different categories proposed to cluster the identified organisational factors, using the PESTEL classification and the Systemigrams – "Playing to win" framework to visualise and compare the identified factors to industry analysts' reports. The general results can be found in Chapter 5.

The deliverables of this UK retail payment system research comprise:

1) The identification and clustering of PESTEL factors—both common and specific—that influence the functioning of payment technologies within the defined environment, including a Systemigram depicting the relationships within the system.

2) A compilation of stakeholders' capabilities likely to impact the system's resilience and sustainability.

3) An analysis of factors evaluated against the perspectives of industry experts, drawing on insights from industry analyst reports.

These deliverables are instrumental in enhancing our comprehension of the elements that bolster or moderate the resilience and sustainability of payment technologies. They set the stage for a rudimentary evaluative framework that could be expanded to examine these factors' historical significance and explore potential future scenarios (Strohhecker, 2005).

The proposed model has been crafted to align with criteria designed to alleviate potential issues in subsequent phases. These criteria emphasise manageability in size, ease of understanding, relationship clarity, and industry terminology conformity. An overly intricate or broadly detailed model diminishes our ability to deconstruct and scrutinise it effectively (Ratha, 1997; Repenning, 2002).

This chapter is structured to align with the subprocesses and activities depicted in Figure 4.1. Section 4.1 delineates the methodology for acquiring and pre-processing strategic reports for text analysis. Section 4.2 details the dictionary-based text analysis that distils organisational factors from these strategic reports. Section 4.3 discusses the categorisation, visualisation, and comparison of organisational factors, employing the PESTEL framework and Systemigrams in conjunction with the "Playing to Win" framework to visualise and juxtapose these factors with those found in industry analysts' reports. Comprehensive results will be presented in Chapter 5.

4.1 Reports' collection & pre-processing

The study conducted a meticulous extraction and analysis of strategic factors from key stakeholders in the UK retail payments system. This was achieved using dictionary-based text analysis in Section 1 of their 10-K strategic reports. Stakeholders were chosen for their substantial market share and influence. The UK is home to more than 300 banks and 44 building societies, in addition to other categorised organisational stakeholders in the retail and acquirer sectors, where a Pareto effect is observed: a handful of these entities command nearly 80% of the market (Norrestad, 2019). The comprehensive process of the research method is delineated in Figure 4.1, which refines the automated text analysis procedures suggested by Humphreys and Wang (2018).

The collection and pre-processing of reports entailed a tripartite approach. Initially, strategic report PDFs were obtained from the respective company websites. Supplemental sources included the SEC's EDGAR database and financial information platforms such as Bloomberg, Capital IQ, and Refinitiv, potentially aiding in automating the report extraction process (Balakrishnan et al., 2010; Li, 2010; Karapandza, 2016; Hájek, 2018). Subsequently, pertinent sections of text from each bank's strategic business report were meticulously extracted and isolated into separate text files to prevent any contamination; all images were excluded to maintain textual purity. The final step involved text pre-processing, utilising Natural Language Processing (NLP) techniques within the 'R' software. This process removed punctuation marks (e.g., periods, commas, exclamation marks) and stop words (e.g., articles, common verbs,

pronouns), leaving only significant words and phrases—or 'tokens'—for analysis (Humphreys & Wang, 2018; Lee, 2022). This cleansing of punctuation and stop words from the documents mitigates potential 'noise' in subsequent keyword searches within the strategic reports, resulting in documents primed for the next phase of the research methodology.

4.2 Dictionary-based text analysis

The dictionary-based text analysis is a cornerstone of the research methodology, employed to distil strategic factors from organisational stakeholders' reports (Kim & Kim, 2017; Hájek, 2018; Humphreys & Wang, 2018; Homburg et al., 2020; Chris Bail, 2021). The construction of this dictionary commenced with a manual text analysis using NVivo software, focusing on the banks' stakeholder organisations—an illustrative coding process is provided in Appendix A. Strategic factors were pinpointed based on references to organisational resources, current capabilities, or future developmental plans. The grouping of some factors was facilitated by the PESTEL framework, which aided in recognising commonly used terms across similar factors or factor clusters within each PESTEL category.

Text mining techniques were integral to the dictionary's creation. Techniques included identifying frequently occurring words, applying a tf-idf algorithm (term frequency – inverse document frequency) to pinpoint words prevalent in one document but rare across others, and employing n-grams to uncover recurring phrases within a document. N-grams ranged from bi-grams (two-word phrases) to tri-grams (three-word phrases), as documented by Welbers et al. (2017) and Chris Bail (2021). Following a comprehensive tri-grams analysis, which produced a saturated list of terms, the study opted not to extend the analysis to phrases exceeding three words. This decision was informed by the observation that most factor names were typically expressed in one to three words. The outcomes of this text analysis are detailed in Appendix A.

For an expanded analysis across a broader sample, the dictionary of strategic factors was crafted by cataloguing common and complete keywords or key phrases inherent to each factor's code. Utilising full words preserved the nuances of different factors, as

stemmed words could conflate distinct factors. A dictionary based on stemmed words was also compiled to discern any disparities. In addition, a frequency analysis of two-word and three-word sequences—n-grams—assisted in pinpointing key terms (Jun & Cai, 2001). An excerpt of this dictionary and keyword examples are available in Appendix B.

Subsequently, this dictionary was applied to the corpus comprising various stakeholders' strategic reports. The deployment of NLP techniques and dictionary application was automated using the open-source software 'R', following the precedent set by earlier research conducted with 'R' and Python (Welbers et al., 2017). This process yielded a matrix detailing the presence and frequency of each strategic factor within the stakeholders' reports.

Validating the reliability of strategic factor identification was crucial. It required ensuring that the frequencies matched the intended meanings of words or phrases. For instance, the term “cash” should correspond to physical currency rather than financial cash flow within a company's context. A robust reliability check mandates that the identified frequencies should align with at least 70% of the total words and phrases and their associated strategic factors (Smith & Taffler, 2000). In this study, a single coder conducted the reliability assessment, and a subsequent validation check was performed after a 3-month interval by the same individual due to the limited number of researchers available for the task.

4.3 Clustering, visualisation, & comparison

In Section 2, strategic factors—resources and capabilities pertaining to operational resilience and sustainability—were derived from stakeholder engagement using specific factors. This identification process utilised the Resource-Based View (RBV) theoretical framework (Barney, 1991), enriched by complementary theories such as the Relational View (RV), as applied by Gold and Seuring (2010), and the dynamic capabilities extension of the RBV, known as the Dynamic Capabilities View (DCV) (Teece et al., 1997).

The strategic factors unearthed in this study were systematically classified into two categories: stakeholder categorisation, which was inductively refined during the coding of

the strategic reports, and a PESTEL categorisation, sourced from preceding research (Kolios & Read, 2013).

To assess the macro-environmental or external alignment of these factors, a grounded-theory classification was employed, centring on the stakeholders identified within the business section of the reports:

- Customers are defined as individuals or groups with purchasing needs.
- Colleagues or Employees are those engaged in work for the company and compensated with salary and benefits.
- Suppliers and Partners are external entities or individuals supplying services to the company.
- Merchants are categorised as commercial enterprises, encompassing SMEs and large retailers, that offer products for sale.
- Regulators are bifurcated into:
    - Government bodies, primarily focused on economic development policies.
    - Policymakers, responsible for establishing governance principles and business rules.

The PESTEL framework, as established by Kolios & Read (2013), provided the basis for categorising the strategic factors concerning their function within the macro-environment:

- Political and Organisational (e.g. organisations' interests)
- Economic and Financial (e.g. GDP/ income)
- Socio-Cultural and Demographic (e.g. Cultural beliefs)
- Technological and Methodological (e.g. R&D, Technological readiness)
- Environmental and Societal (e.g. Sustainability and impact on the community)

- Legal and Ethical (e.g. Privacy issues)

Key organisations within each stakeholder category included:

- *Banks:* Barclays, the Hongkong and Shanghai Banking Corporation Limited, also known as HSBC, Lloyds, the Royal Bank of Scotland (RBS), now part of NatWest group (Norrestad 2019).
- *Retailers*: Amazon, Morrisons, Sainsbury's, Tesco, and Walmart-ASDA
- *Payment Networks*: American Express, Discover, Mastercard, and Visa.
- *Acquirers*: FIS, Fiserv, GPN, and US Bancorp.
- *Regulators*: Bank of England (BOE), Financial Conduct Authority (FCA), HM Treasury, Prudential Regulatory Authority (PRA), and UK Finance.

The factors unearthed in this research were classified and clustered, primarily along PESTEL categories, while also considering the specific stakeholders they influence (Kolios & Read, 2013). Initially, manual PESTEL categorisation derived from the banking organisations was used to classify factors across the remaining stakeholders. Through this extended application, some categories were refined; for instance, technological factors specific to banking were broadened to more generic terms to encompass all stakeholders—mobile banking became mobile services.

For the clustering phase, the factors were grouped according to their occurrence across the various organisations' reports (Barthélemy & Brucker, 2008). This route led to a comparative analysis of stakeholder alignment or coordination of the factors (Cachon, 2003; Disney et al., 2008; Mello et al., 2017; Winkler & Etter, 2018). Factors were identified as specific (mentioned by a single organisation), shared (cited by more than one but not all organisations), or common (acknowledged by all organisations). Alignment was assessed first at the individual stakeholder level, then within the broader retail payment system context, with detailed findings presented in the subsequent chapter. The common, shared, and specific factors were depicted graphically, and segregated by

PESTEL factors for clarity. For example, various initiatives related to mobile app development were grouped accordingly.

Beyond the visual grouping of PESTEL factors, additional methodologies were employed. Systemigrams were introduced as a tool for representing strategic factors (Blair et al., 2007a), drawing from the Viable System Model (Mugurusi & de Boer, 2019) and Complex Adaptive Systems (Kazakov et al., 2020). The initial coding of relevant factors and subsequent dictionary creation within the payments system were informed by literature on technology adoption and utilisation in the financial sector (Yousafzai & Yani-de-Soriano, 2012; Schuh & Stavins, 2013; Koulayev et al., 2016; Rysman & Schuh, 2017). Systemigrams articulated the common factors within the payment system, differentiating objectives, strategies, capabilities, and target markets, adhering to research-adapted guidelines (Clegg & Boardman, 1996; Blair et al., 2007b; Lafley & Martin, 2013). Appendix D houses a comparative table showcasing various guidelines from different sources and the research-adapted guidelines developed for this study. The construction of the Systemigrams was iterative, beginning with a general model to visualise dynamics and group factors following the aforementioned guidelines.

In this phase of the research, the "Playing to Win" decision-based framework was utilised to further categorise the myriad of identified strategic factors, with the aim of constructing a cascading strategy decision process guided by enterprise architecture principles (Rhodes & Ross, 2010; Lafley & Martin, 2013; McDermott et al., 2015). A matrix was devised to facilitate the visualisation of Systemigram factors, classifying them in accordance with definitions previously outlined in Figure 3.6. This classification process sought to generate tables akin to Table 3.1 for each stakeholder and, subsequently, for the system as a whole. Concurrently, a narrative was crafted to elucidate the logic and interrelationships among the factors, enhancing the Systemigrams' coherence.

Formatting the Systemigrams necessitated attention to colour coding and the arrangement of elements to ensure all factors were clearly displayed within a single graphic. The final graphic was then integrated into a storyboard, structured to mirror the

progression of the narrative prose. This technique was adopted to aid readers in comprehending the intricate Systemigrams.

In the discussion section, the analysis of strategic factors was delineated into categories of common, shared, and specific factors. This classification was performed in line with the corresponding area of the CERT® Enterprise Resilience framework (Caralli et al., 2010) and the RALF model (Purvis et al., 2016), to which they contributed, addressing operational resilience at both the stakeholder and system levels (Folke et al., 2010; Walker & Cooper, 2011; Alexander, 2013; Coetzee et al., 2016; Kazakov et al., 2020; Soroka et al., 2020). Factors were assigned to different resilience attributes based on the RALF framework and corroborated by literature from industry analysts (Appendix E) and academic sources, as presented in Table 3.2. For instance, a factor such as an Enterprise Risk Management System noted for its risk mitigation utility, was primarily associated with the robustness attribute of resilience. If evidence supported the association of a factor with other resilience attributes, such correlations were also established, referencing not just RALF's definitions but also expanding through insights from broader literature. The culmination of this analysis is succinctly presented in the concluding section of the research.

5 Results

The presentation of results adheres to the sequence outlined in Figure 4.1, commencing with an analysis of stakeholders' strategic reports. The initial focus is on banks, as delineated in this section and in Appendix C, proceeds with retailers or merchants, payment networks, and acquirers, culminating with regulators. An integrated analysis of the retail payment systems concludes this chapter, juxtaposing stakeholders to unearth distinctive and shared competitive capacities, as delineated by the Resource-Based View (RBV) and systems theory. This comparative synthesis, drawing on seminal works by Warren (2005) and Forrester (2012), stratifies stakeholders based on their competitive interactions within the market ecosystem, as conceptualised by Senge (1991).

5.1 Reports' collection & pre-processing

Business sections can be further segmented into subsections, each reflecting key organisational facets such as purpose, business model, market presence, competitive risks, and various initiatives. These initiatives encompass engagements with customers, employees, society, the environment, investors, the board, regulatory bodies, governments, policymakers, suppliers, and strategic partners.

Table 5.1 exhibits the word count for each analysed organisation's strategic plan, specifically within the business section.

Stakeholder Type	Organisation	Number of words
Banks	Barclays	12,178
	HSBC	8,997
	Lloyds	14,948
	RBS	9,317
Retailers	Amazon	13,838
	Morrisons	20,702
	Sainsburys	21,395
	Tesco	21,458
	Walmart-ASDA	14,694
Payment Networks	American Express	25,298
	Discover	30,174
	Mastercard	17,912
	Visa	17,951
Acquirers	FIS	25,283
	Fiserv	15,209
	GPN	15,645
	US Bancorp	19,769
Regulators	Bank of England (BOE)	22,066
	Financial Conduct Authority (FCA)	29,932
	HM Treasury	7,009
	Prudential Regulatory Authority (PRA)	13,432
	UK Finance	6,211

TABLE 5.1 WORD COUNT OF BUSINESS SECTION BY STAKEHOLDERS' ORGANISATIONS

The subsections within the analysed strategic reports exhibit a high degree of uniformity across stakeholders, with a notable exception for regulators who, distinctively, incorporate segments dedicated to their regulatory duties, such as supervision and fostering market competition. Typically, organisations begin their reports by spotlighting Key Performance Indicators (KPIs), encompassing sustainability metrics, accompanied by introductory letters from the Chairman and CEO. These letters provide insights into historical

accomplishments and forthcoming endeavours. Subsequently, a synopsis of influential factors on organisational performance and prospective forecasts is presented. After that, a delineation of generic strategic initiatives and core values precedes an in-depth exploration of the diverse operational divisions, such as retail banking, commercial banking, wealth management, and insurance.

A consistent pattern emerges as each entity delineates strategic elements that impact its stakeholders—customers, employees, suppliers, and regulators. Most organisations culminate their reports with an outline of sustainability-driven initiatives, integrating these into their strategic aims or dedicating a specific section to such endeavours. In contrast, regulators commence by articulating their strategic aims, aligning them with the priorities of the UK government and their statutory roles. They then proceed to enumerate various initiatives undertaken to advance these strategic aims.

5.2 Dictionary-based text analysis

Following the manual text coding analysis, creating a theoretical dictionary led to the identification of 505 factors, with select examples of these manual codings detailed in Appendix B. Throughout the development of this dictionary, the factors were meticulously reorganised and consolidated. The comprehensive list of all 505 dictionary factors, complete with corresponding keywords and frequency data, can also be found in Appendix B.

Upon establishing the matrix of factor frequencies via the dictionary, a rigorous evaluation of accuracy and reliability was conducted using NVivo software. This ensured the congruence of each factor's implied meaning with the context of the strategic report narratives. The subsequent section will categorise and group the factors discerned in the dictionary-based text analysis, providing a structured overview of the findings.

5.3 Clustering, visualisation, & comparison

Diverse PESTEL subgroups have been delineated by drawing upon strategic factors extracted from organisational strategic reports, as illustrated in Figures 5.1 to 5.6 (Kolios and Read, 2013).

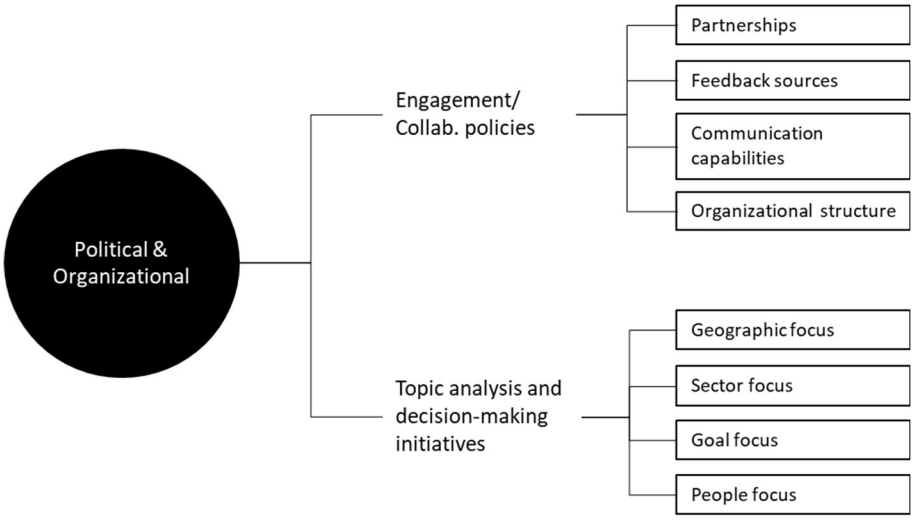


FIGURE 5.1 PESTEL CLASSIFICATION AND SUB CLASSIFICATION AREAS (POLITICAL)

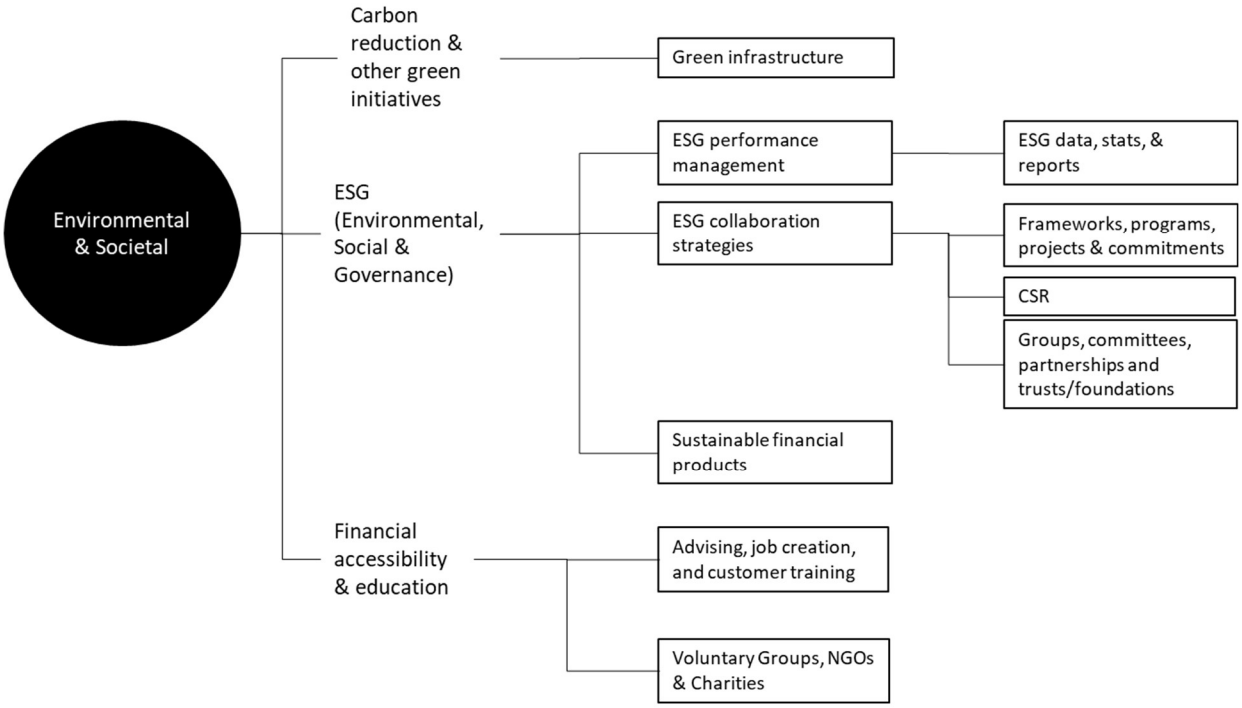


FIGURE 5.2 PESTEL CLASSIFICATION AND SUB CLASSIFICATION AREAS (ENVIRONMENTAL)

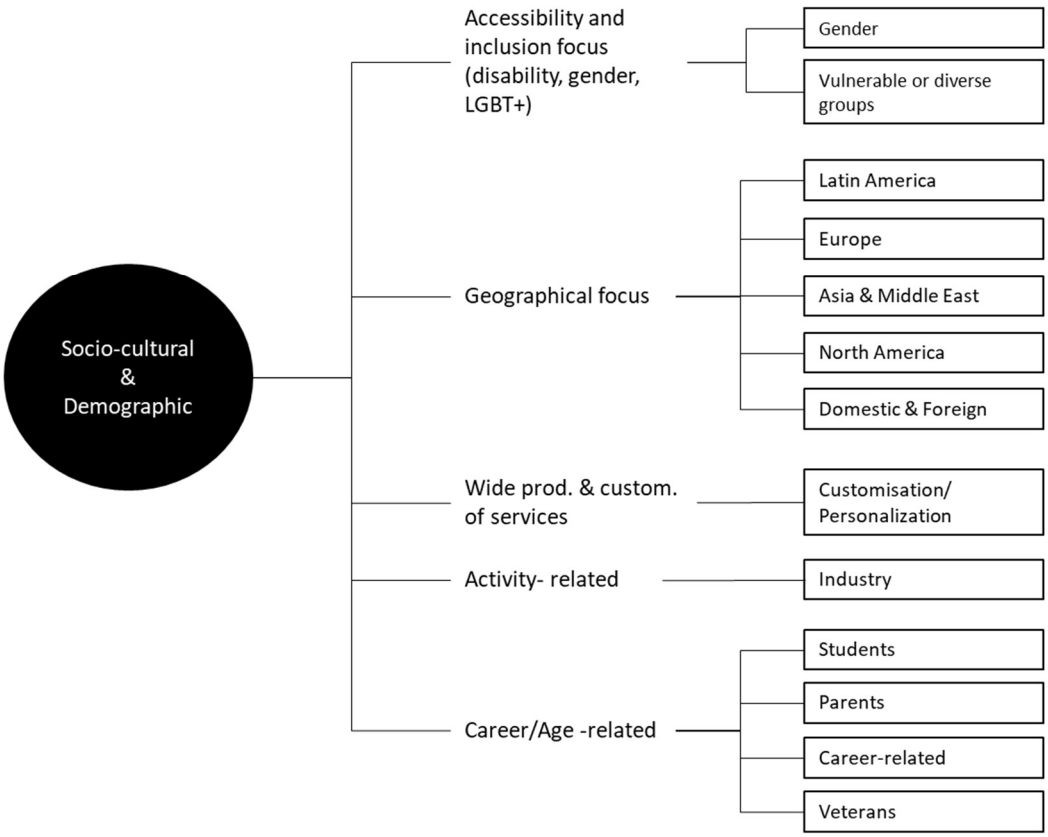


FIGURE 5.3 PESTEL CLASSIFICATION AND SUB CLASSIFICATION AREAS (S)

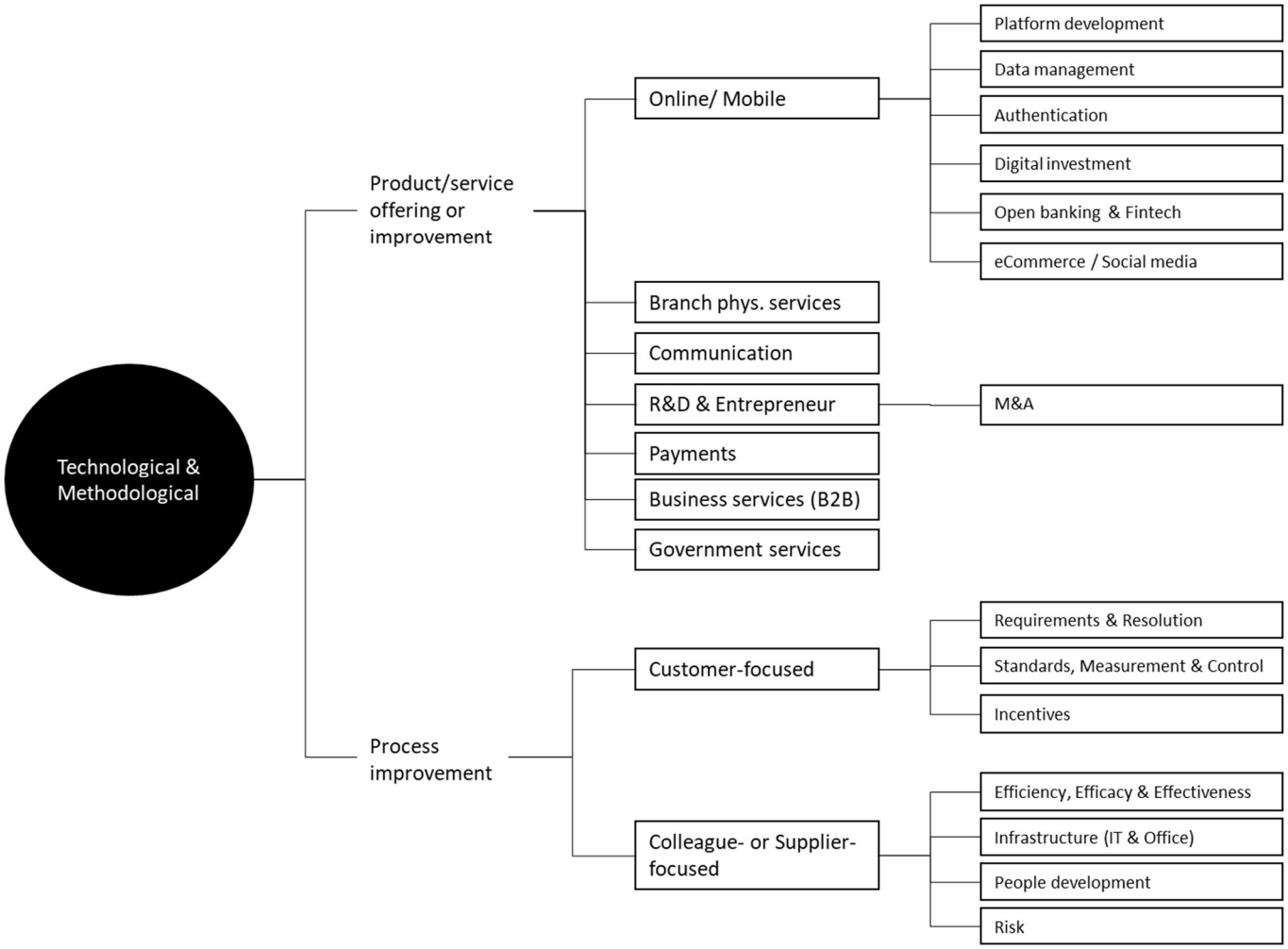


FIGURE 5.4 PESTEL CLASSIFICATION AND SUB CLASSIFICATION AREAS (T)

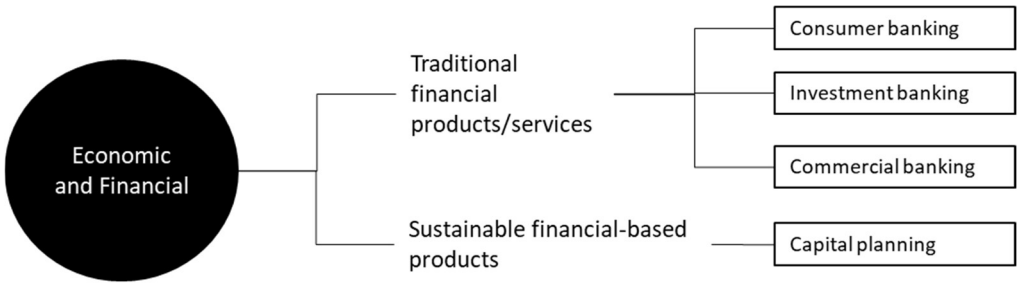


FIGURE 5.5 PESTEL CLASSIFICATION AND SUB CLASSIFICATION AREAS (E)

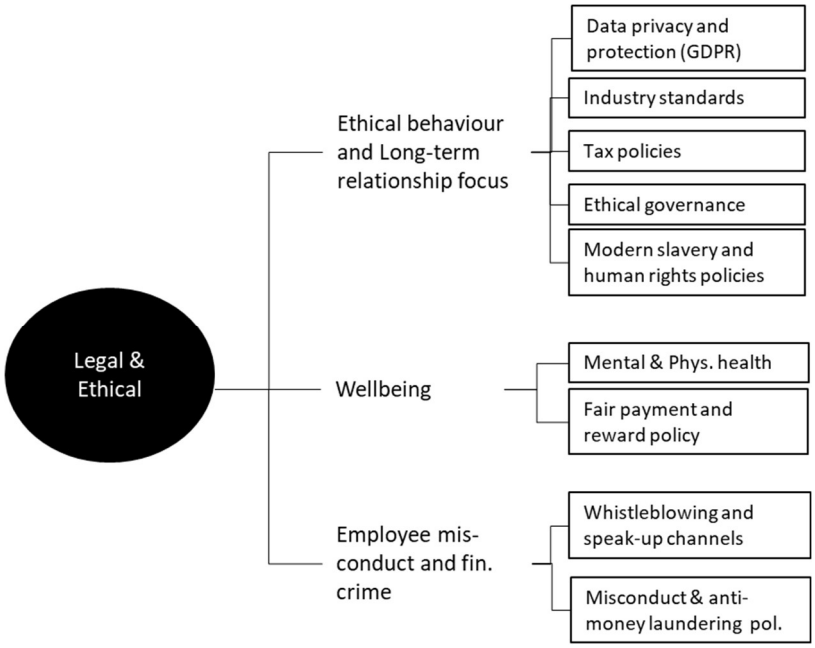


FIGURE 5.6 PESTEL CLASSIFICATION AND SUB CLASSIFICATION AREAS (L)

The following subsections present the results in terms of factor categorisation and clustering, organised by stakeholders. In these subsections, we use formatting to distinguish elements visually: PESTEL categories are presented in **bold**, subcategories are in *italics*, and specific factors are CAPITALISED. Additionally, Systemigrams, both in prose and graphical form, illustrate the common factors at each stakeholder level and depict an integrated retail payment system. Furthermore, the strategic factors are categorised according to the CERT operational resilience framework and represented in radar plots. These plots position common or aligned factors in the middle, with non-aligned factors closer to the border.

In the subsequent two subsections, we initially demonstrate the application of the systems approach at the stakeholder level, using Banks as an example. The analysis for other stakeholders can be found in **Appendix C**. Subsequently, we extend the systems approach to the system level, focusing on the UK retail payment system.

5.3.1 Banks

In this section, the descriptive statistics from applying the method to the Bank's stakeholders are presented.

5.3.1.1 Bank's dictionary-based factor clustering results.

This section encompasses factors categorised according to various PESTEL categories. The quantity of factors within each category corresponds to the number of coding factors identified, with a higher count potentially indicating the strategic emphasis of a company or a group of companies. In the context of banks, there was a notable emphasis on technological development bolstered by strategic initiatives from several other categories.

Note: These tables can be found in the Excel file.

Banks level analysis

PESTEL categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Political_Organisational	119	88	17.4%
Economic_Financial	57	34	6.7%
Socio-Cultural_Demographic	60	41	8.1%
Technological_Methodological	168	129	25.5%
Environmental_Societal	65	61	12.1%
Legal_Ethical	46	25	5.0%
Banks' identified factors		378	74.9%
Grand Total	515	505	98%

TABLE 5.2 NUMBER OF FACTORS PER PESTEL CATEGORY AT A BANKS' LEVEL ANALYSIS

Note: Percentages are related to the Total Factors Identified (505)

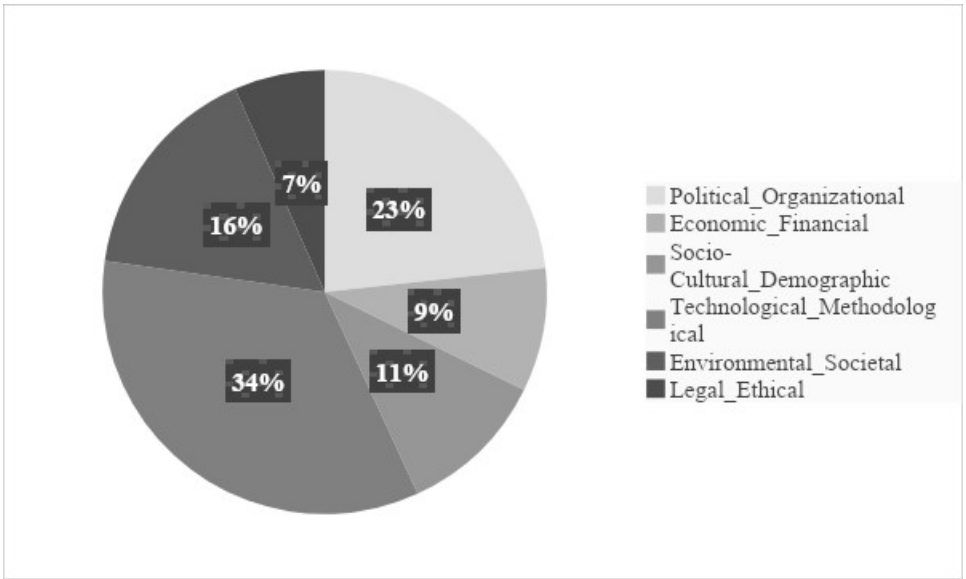


FIGURE 5.7 PERCENTAGE OF FACTORS PER PESTEL CATEGORY

PESTEL categories	Barclays (B)	HSBC (H)	Lloyds (L)	RBS (R)	Santander (S)
Political_Organisational	60	55	55	53	51
Economic_Financial	24	19	14	23	16
Socio-Cultural_Demographic	26	21	21	22	24
Technological_Methodological	**84**	**63**	**86**	**78**	**61**
Environmental_Societal	35	37	43	40	32
Legal_Ethical	13	16	14	13	18
Grand Total	242	211	233	229	202

TABLES 5.3 NUMBER OF FACTORS PER PESTEL CATEGORY PER BANK

PESTEL categories	Barclays (B)	HSBC (H)	Lloyds (L)	RBS (R)	Santander (S)
Political_Organisational	24.79%	26.07%	23.61%	23.14%	25.25%
Economic_Financial	9.92%	9.00%	6.01%	10.04%	7.92%
Socio-Cultural_Demographic	10.74%	9.95%	9.01%	9.61%	11.88%
Technological_Methodological	34.71%	29.86%	36.91%	34.06%	30.20%
Environmental_Societal	14.46%	17.54%	18.45%	17.47%	15.84%
Legal_Ethical	5.37%	7.58%	6.01%	5.68%	8.91%
Grand Total	47.92%	41.78%	46.14%	45.35%	40.00%

TABLES 5.4 Percentage **OF FACTORS PER PESTEL CATEGORY PER BANK**

Additionally, the subsequent table presents the strategic factors that stakeholders focus on. As expected, most initiatives target Customers, with Investors and Colleagues ranking second and third in the number of initiatives. Please note that the compilation of strategic factors in the dictionary is derived from analysing all stakeholders. Consequently, not all factors may be explicitly mentioned by a single stakeholder. In the case of Banks, 98% of the factors were identified.

Stakeholders' categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Colleagues	66	60	11.88%
Customers	**176**	**127**	**25.15%**
Investors and Board	103	72	14.26%
Regulators, Governments, and Policy Makers	104	55	10.89%
Society/Communities/Environment	48	47	9.31%
Suppliers and Strategic partners	18	17	3.37%
Banks' identified factors		378	74.85%
Grand Total	515	505	98.06%

TABLE 5.5 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY AT A BANKS' LEVEL ANALYSIS

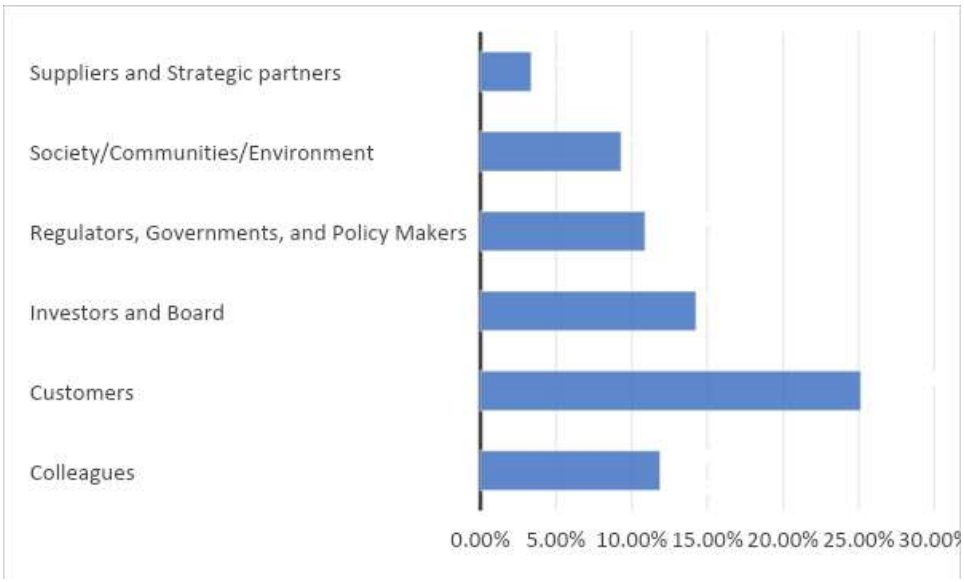


FIGURE 5.8 PERCENTAGE OF FACTORS PER STAKEHOLDERS' CATEGORIES

Stakeholders' categories	Barclays (B)	HSBC (H)	Lloyds (L)	RBS (R)	Santander (S)
Colleagues	19.83%	16.59%	16.31%	18.78%	17.82%
Customers	**34.71%**	**33.18%**	**33.48%**	**34.50%**	**29.21%**
Investors and Board	16.53%	17.54%	18.03%	18.78%	18.81%
Regulators, Governments, and Policy Makers	10.74%	15.17%	12.02%	9.17%	17.33%
Society/Communities/Environment	12.81%	14.22%	16.31%	13.97%	13.37%
Suppliers and Strategic partners	5.37%	3.32%	3.86%	4.80%	3.47%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%

TABLE 5.6 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY AT A BANKS' ORGANISATIONAL LEVEL OF ANALYSIS

Stakeholders' categories	Barclays (B)	HSBC (H)	Lloyds (L)	RBS (R)	Santander (S)
Colleagues	19.83%	16.59%	16.31%	18.78%	17.82%
Customers	**34.71%**	**33.18%**	**33.48%**	**34.50%**	**29.21%**
Investors and Board	16.53%	17.54%	18.03%	18.78%	18.81%
Regulators, Governments, and Policy Makers	10.74%	15.17%	12.02%	9.17%	17.33%
Society/Communities/Environment	12.81%	14.22%	16.31%	13.97%	13.37%
Suppliers and Strategic partners	5.37%	3.32%	3.86%	4.80%	3.47%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%

TABLE 5.7 PERCENTAGE OF FACTORS PER STAKEHOLDERS' CATEGORY AT A BANKS' ORGANISATIONAL LEVEL ANALYSIS

The statistics for organisational clustering of strategic factors reveal that approximately one-fifth of these factors are shared by all banks, with over a third shared among various combinations, and an additional 20% specific to individual banks. In the category of factors shared by four, three, or two banks, the most substantial clusters include Barclays-Lloyds-HSBC-RBS (BHLR) at 4.16%, followed by Barclays-Lloyds-RBS-Santander (BLRS) at 3%. All other clusters represent equal or lesser percentages, typically below 2%.

Combining these factors with the common ones demonstrates that at least 25% of the strategic initiatives are shared among all peers within a specific sector. It is important to note that the sum does not reach 100% because not all factors within the dictionary, compiled from various stakeholders, may be applicable in every case.

Number of sharing organisations	Sharing factors count	Percentage	Organisational cluster	Sharing factors count	Percentage
5	93	18.42%	BHLRS	93	18.42%
4	59	11.68%	BHLR	21	4.16%
			BHLS	6	1.19%
			BHRS	8	1.58%
			BLRS	17	3.37%
			HLRS	7	1.39%
3	61	12.08%	BHL	12	2.38%
			BHR	3	0.59%
			BHS	2	0.40%
			BLR	11	2.18%
			BLS	2	0.40%
			BRS	8	1.58%
			HLR	6	1.19%
			HLS	2	0.40%
			HRS	7	1.39%
			LRS	8	1.58%
2	68	13.47%	BH	11	2.18%
			BL	7	1.39%
			BR	5	0.99%
			BS	8	1.58%
			HL	6	1.19%
			HR	4	0.79%
			HS	4	0.79%
			LR	5	0.99%
			LS	11	2.18%
			RS	7	1.39%
1	97	19.21%	B	28	5.54%
			H	19	3.76%
			L	19	3.76%
			R	19	3.76%
			S	12	2.38%
Total	378	74.85%		378	74.85%

TABLE 5.8 SHARED FACTORS BY NUMBER OF BANKS CLUSTERED AND ORGANISATIONAL CLUSTERS

	B	H	L	R	S
B		156	169	166	144
H			153	149	129
L				168	146
R					155
S					

	B	H	L	R	S
B		30.9%	33.5%	32.9%	28.5%
H			30.3%	29.5%	25.5%
L				33.3%	28.9%
R					30.7%
S					

TABLES 5.9 & 5.10 SHARED FACTORS BETWEEN ANY TWO BANKS (ABSOLUTE AND RELATIVE VALUES)

The most similar organisations are RBS and Lloyds. At the same time, HSBC and Santander exhibit the slightest similarity. Nevertheless, it is worth noting that the statistical difference is relatively small, as all these organisations possess comparable capabilities and offer similar services. In the following section, we delve into an integrated analysis of the relevant factors, examining them from quantitative and qualitative perspectives.

5.3.1.2 Banks' strategic reports' categorisation and clustering

This subsection summarises relevant categorisation and clustering statistics. Subsequently, it presents a concise overview of findings related to pertinent factors. Figures 5.9, 5.10, and 5.11 visually depict the results of strategic factors' categorisation and clustering, with organisation clusters referred to by their initial letters: Barclays (B), HSBC (H), Lloyds (L), RBS (R), and Santander (S).

Out of 515 factors, 505 (98%) were identified across all stakeholders, forming the basis for comparison. In the Banks' analysis, 378 factors were identified, accounting for 75% of the total.

Regarding PESTEL categorisation, the most frequent category is Technological and Methodological, comprising 25.54% of the factors, followed by Political and organisational at 17.43%, and Environmental and Societal at 12.08%. In terms of stakeholder categorisation, 25.15% of the factors focus on Customers, 14.26% on Investors and Board, and 11.88% on Colleagues. Additionally, 10.89% pertain to Regulators, Governments, and Policy Makers. This distribution remains consistent across most

banks, with Lloyds allocating as many initiatives to Society/Communities/Environment as to the Colleagues category.

Concerning the organisational clustering of strategic factors, 18.42% are shared by all banks, 11.68% by four banks, 12.08% by three banks, 13.47% by two banks, and 19.21% are specific to individual banks. Among clusters shared by four, three, or two banks, the largest are Barclays-Lloyds-HSBC-RBS (BHLR) at 4.16%, followed by Barclays-Lloyds-RBS-Santander (BLRS) at 3%. All other clusters represent equal or lesser percentages, typically below 2%.

When considering all shared factors without tiering, Barclays and Lloyds emerge as the two most similar organisations, sharing 33.5% of the identified factors. At the same time, HSBC and Santander exhibit the slightest similarity, with 25.5%. The majority of these shared factors fall within the Technological and Methodological category, followed by Political and organisational, and then Environmental and Societal.

The subsequent paragraphs provide detailed insights into the PESTEL categorisation and clustering analysis of all shared initiatives, while Figures 5.1 to 5.6, presented earlier, group different categories for ease of understanding in the PESTEL tiering analysis.

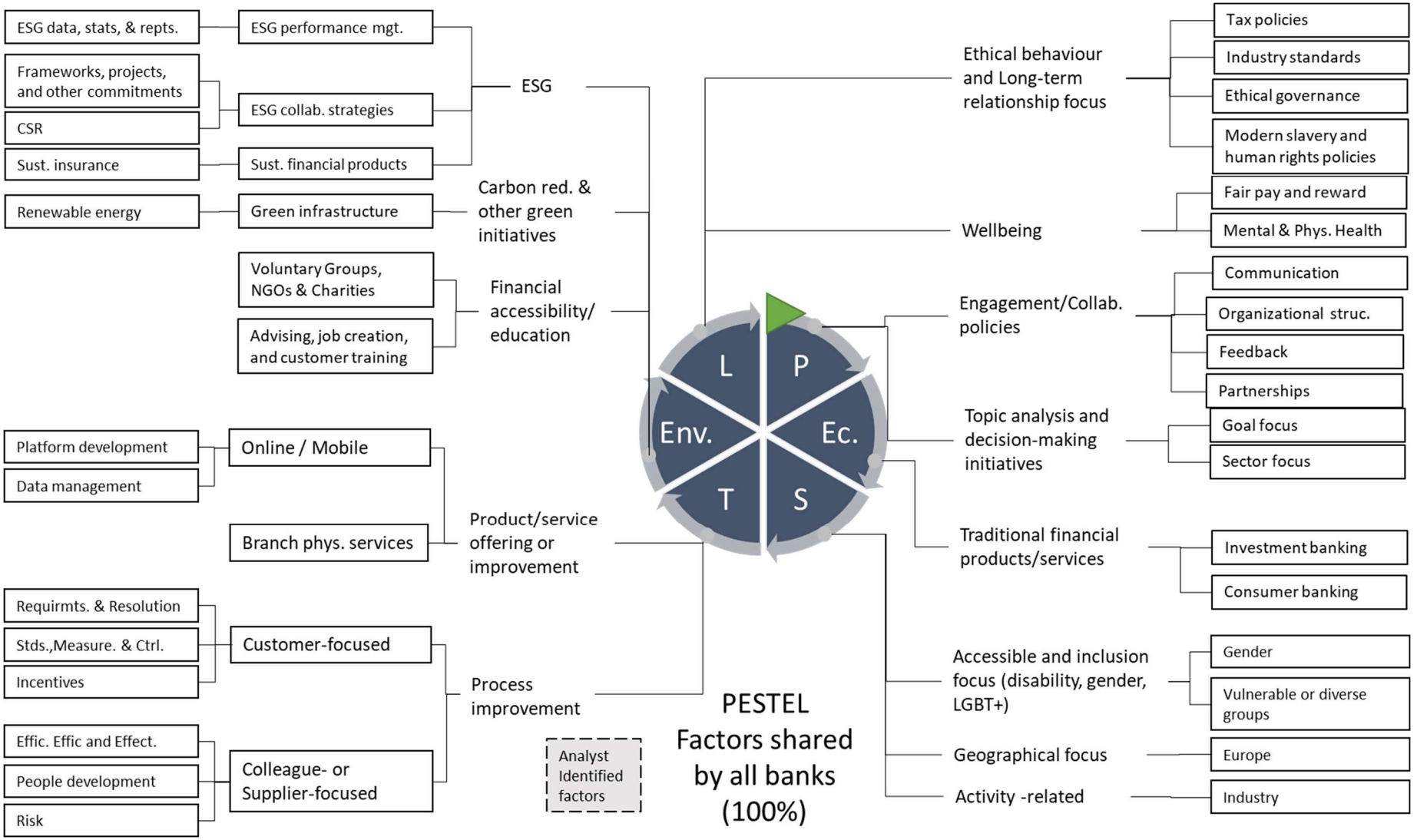


FIGURE 5.9 STRATEGIC FACTORS SHARED BY ALL BANKS

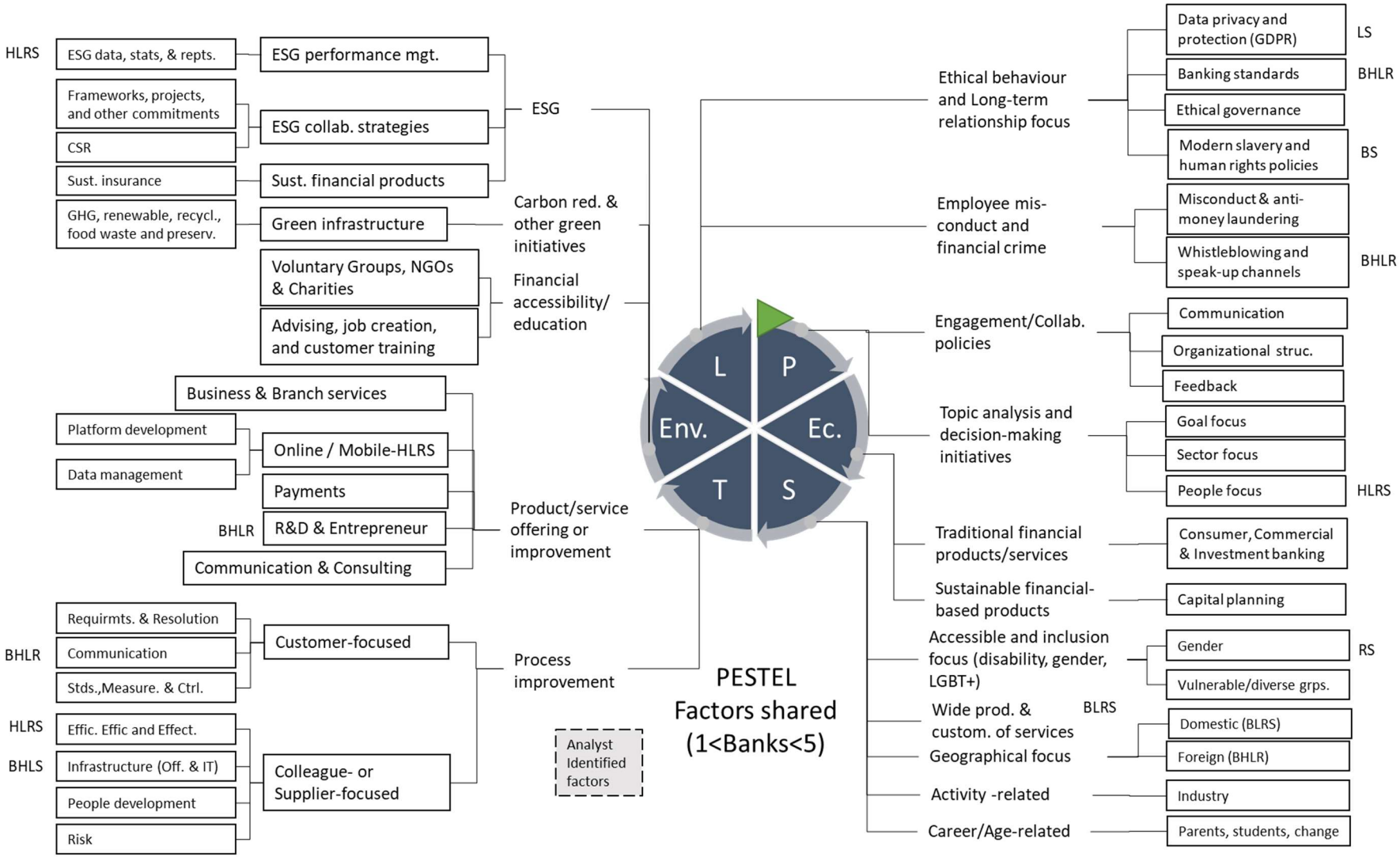


FIGURE 5.10 STRATEGIC FACTORS SHARED BY BANKS (INCLUDING SHARED BY 4, 3, AND 2 BANKS)

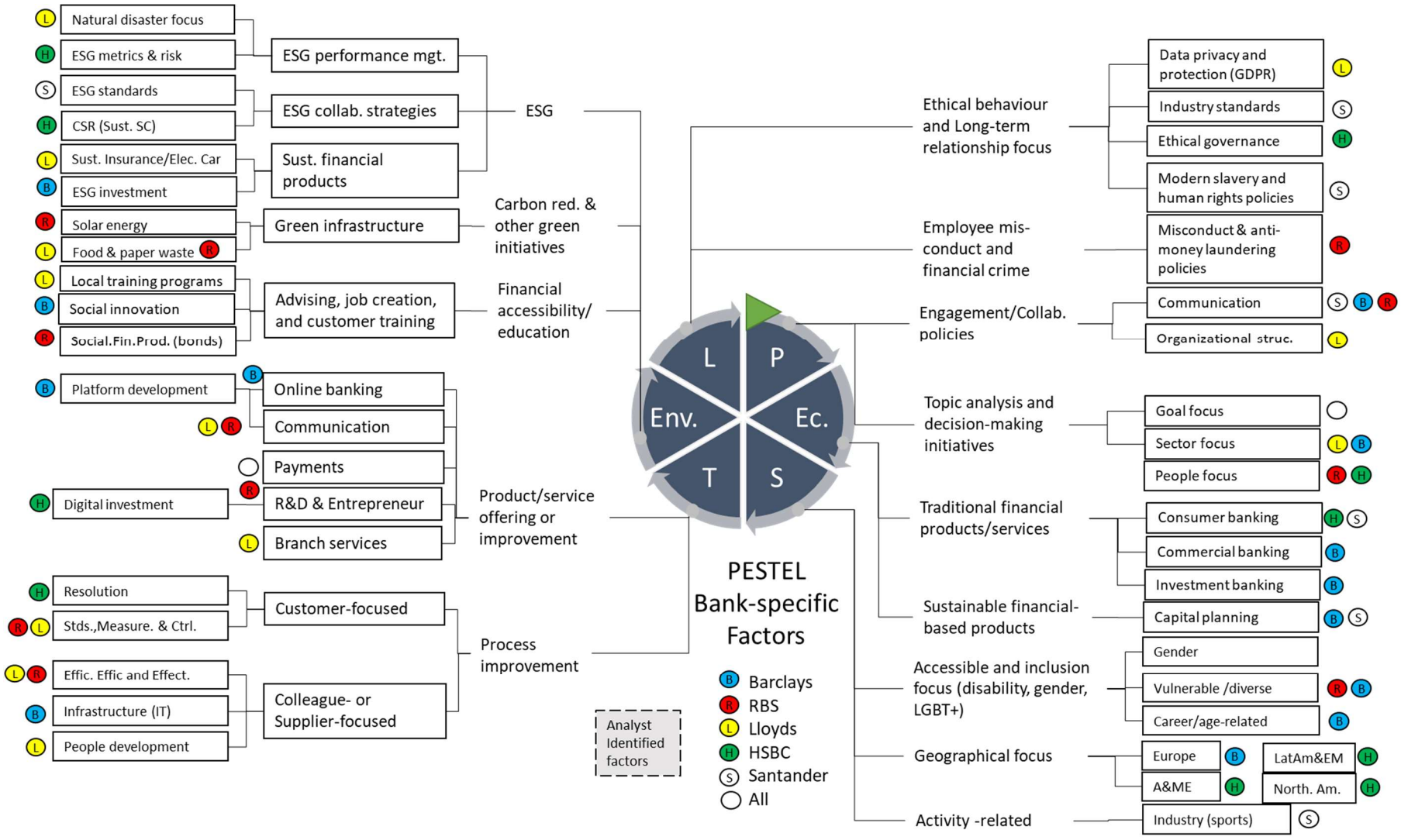


FIGURE 5.11 STRATEGIC FACTORS SPECIFIC BY BANK

Technological and Methodological

For the **Technological and Methodological (T&M)** factors, the analysis is divided in two sections: *Product or service offering or improvement* and *Process improvement*.

Product or service offering or improvement

Common Factors

Concerning *Product or service offering or improvement*, all banks prioritise *Digital, Online and Mobile* capabilities, encompassing *Data management, Product personalization*, and *Platform development*. Simultaneously, they maintain an interest in developing their *Physical branches* to cater to a broader customer base.

Shared initiatives involving two, three, or four banks

In the realm of shared initiatives involving two, three, or four banks, a comprehensive approach is adopted to enhance *Branch services*. This includes the provision of face-to-face services and post office cash services, as well as the delivery of Business services to address the needs of B2B and Travel sectors.

Banks prioritize staying connected with their customers through diverse channels within the Communication category. They employ digital marketing strategies, engage in Multi-channel communication encompassing print, video banking, virtual reality (VR), voice banking, and web chat. Furthermore, they offer Consulting services to provide valuable guidance and support.

An emphasis on fostering *Entrepreneurship* is evident across the banking sector, with various banks implementing innovation programs. Additionally, they actively consider opportunities for *mergers and acquisitions (M&As)* and venture capital investments to support entrepreneurial endeavours.

In the *Mobile and Online* category, banks are committed to advancing their *digital* capabilities. They focus on the digitalization of integrated banking services and fintech solutions, offering features such as Mobile app personalization and Biometric

authentication. These initiatives are often powered by open banking initiatives, enhancing the overall customer experience. Banks also leverage Social media and web chat platforms to keep customers informed and engaged.

Furthermore, within the *Payments* domain, banks continue to invest in cash services, particularly related to ATMs. Concurrently, they seek to provide integrated services with digital options, facilitating electronic payments and offering credit card services to cater to a wide range of customer preferences and needs. This multi-faceted approach demonstrates banks' commitment to evolving with the digital age while maintaining accessibility and convenience for their customers.

Bank-specific initiatives

In their bank-specific initiatives, each institution adopts a unique strategic focus to cater to their specific organisational objectives.

Lloyds places a strong emphasis on expanding its physical presence by developing an extensive *branch network* within the Branch Services category.

RBS stands out in the *Communication* category by creating a Customer networking platform and fostering Entrepreneurship capabilities through initiatives like accelerators, incubators, and crowdfunding, aiming to empower entrepreneurs within its ecosystem.

Lloyds takes the lead in enhancing communication through digital channels by prioritising Digital notification services, ensuring timely and efficient communication with its customers.

In the realm of *Online & Mobile* capabilities, Barclays directs its efforts towards App development and the establishment of Trade or eCommerce portals to cater to the needs of both customers and colleagues. Meanwhile, HSBC focuses on offering Digital investment capabilities to its clientele. In contrast, Santander shines a spotlight on various digital player financial capabilities, enhancing its digital banking offerings.

In the *Payments* arena, Barclays adopts a comprehensive approach by emphasising checks, smart cards, contactless payments, and cross-border payment solutions.

Notably, they maintain a closed-loop architecture to enhance the efficiency and security of payment processes. Lloyds diversifies its initiatives by including banking collections services while also harnessing digital capabilities such as Smart cards, Digital checkout, Invoice processing, Contactless payment solutions, and Merchant acquiring technologies, including Point-of-sale (POS) systems. They also continue to offer traditional check services and maintain a closed-loop architecture. Lastly, Santander strongly emphasises Contactless payments, aligning with the growing trend of digital and contactless payment methods.

Process Improvement

Common factors

In terms of *Process Improvement*, banks prioritize initiatives aimed at enhancing efficiency and effectiveness within their operations. They share a common commitment to streamlining processes, fostering collaboration, and simplifying workflows to achieve these objectives.

In the *Incentives* category, they collectively implement a range of strategies to incentivise and reward various stakeholders. These include Customer reward programs designed to enhance the customer experience and meet their evolving needs. Additionally, banks address Customer requirements and focus on People development, encompassing Training, skilling, coaching, mentoring, and the development of digital capabilities. They are equally dedicated to supporting their colleagues through initiatives such as Surveys and Expert leadership development programs.

Within the *Risk* category, banks are united in their dedication to risk management. They employ robust Enterprise Risk Management Frameworks to identify, assess, and mitigate risks effectively. Furthermore, they develop strategies to mitigate the impact of risks and possess capabilities to combat fraud effectively.

Standards, measurement, and control are integral aspects of their Operational excellence initiatives. Banks adopt a comprehensive approach to Performance management, relying on surveys and assessments to gauge their performance continually. They implement a

Project and program management approach to ensure that initiatives are executed efficiently. Additionally, they focus on measuring performance goals, which are essential for monitoring progress. A strong emphasis is placed on developing a robust system for monitoring and reviewing activities to make data-driven decisions. Regular assessments and reports contribute to a culture of continuous improvement and transparency across the organisation.

Shared initiatives involving two, three, or four banks

In the realm of shared initiatives, where two, three, or four banks collaborate to enhance their operational capabilities, several key areas of focus emerge:

- *Efficiency and Effectiveness*: Banks prioritise the optimisation of their operations through initiatives such as Customer feedback mechanisms (BHLR) to understand better and respond to customer needs. They emphasise a Fast resolution process (BHL) to address issues promptly and enhance customer satisfaction. Additionally, they conduct Interviews and focus groups (LRS) to gain valuable insights and stakeholder feedback.

- *Operational Improvement*: Banks are committed to improving their operations in various dimensions. They concentrate on Cost reduction (HLRS) to streamline processes and enhance financial Efficiency and time optimisation (BHLR). They also focus on improving Agility (BLRS) to adapt quickly to changing market dynamics and implement General process improvement initiatives (LS) to enhance overall operational efficiency.

- *Digital Transformation*: Collaboratively, they invest in developing their IT infrastructure, with a specific focus on Cloud-based digital environments (BL), strengthening Cybersecurity and data protection (BHLS), and enhancing IT and communications capabilities (BHL) to support their digital transformation efforts.

- *Flexible Office Infrastructure*: Banks acknowledge the importance of adaptable workspace solutions and incorporate Co-working capabilities (BS) within their office infrastructure to foster collaboration and agility.

- *People Development:* They strongly emphasise the development and growth of their workforce. Initiatives include Apprenticeship programs (BLRS), Career development initiatives (BLR), Colleagues' benefits (HLRS), Employee leadership development programs (BLRS), Recruitment programs (BHLR), and Colleagues' workshops and boot camps (RS) to nurture talent and enhance skills.

- *Research and Development (R&D):* Banks are committed to innovation and invest in Research science capabilities (BL) to drive technological advancements and stay competitive in the market.

- *Risk Management:* They prioritise risk management by focusing on areas such as Financial risk (HLRS), Accountability initiatives (BHL), Risk mitigation strategies (BS), Recovery and contingency plans (BHL), Resilience (BHLS), and Stress testing (BHRS) to ensure stability and security.

- *Standards, Measurement, and Control:* Banks adhere to rigorous standards and measurement practices. This includes maintaining Banking standards (LRS), leveraging Analytics insight (BHL) for data-driven decision-making, tracking Customer satisfaction and trust scores (BHLR), utilising Scorecard capabilities (BHLR) for performance measurement, harnessing Machine learning and artificial intelligence (BHLS) for advanced analytics, establishing robust Measuring capabilities (BHLR), conducting Auditing (HS) for compliance, and focusing on Consumer behaviour analysis (BLR) to understand customer preferences better.

These shared initiatives underscore the banks' commitment to enhancing their operational efficiency, customer satisfaction, innovation, and risk management while fostering a culture of continuous improvement and accountability.

Bank-specific initiatives

For bank-specific initiatives related to *Efficient, effective, efficacious* capabilities, *Lloyds focuses on Effective communication and Cash Performance measurements.* In *IT infrastructure*, Barclays mentions ML & IA to develop Algorithm capabilities and invests in Technological infrastructure renovation and support programs. Related to *People*

development, RBS mentions Colleague entrepreneurial capabilities, and Lloyds promotes Supplier support. In *Resolution* initiatives, HSBC focuses on Resolving or resolution capabilities. Finally, in relation to *Standards, measurement, and control*, Lloyds talks about a Customer performance platform, while RBS includes Dashboard capability development and Customer surveys.

Environmental and Societal

Common factors

In the **Environmental and Societal** factors category, all banks concentrate their efforts on initiatives related to *Carbon reduction and other green endeavours*, including climate-oriented and green infrastructure projects. Concerning *ESG collaboration strategies*, encompassing *Frameworks, projects, and other commitments*, their focus lies on *Sustainable Initiatives*, *ESG groups, and committees*, as well as adherence to *ESG Principles*.

Within the scope of *ESG collaboration strategies*, including Corporate Social Responsibility (CSR) and a focus on the development of supply chain suppliers, banks are committed to advancing Community financial accessibility programs, Community financial education, and making Strategic commitments. Furthermore, in the realm of *ESG performance management*, all banks provide ESG data, statistics, and reports related to Climate change risk management.

In terms of *Financial accessibility and education*, under the Advising, job creation, and customer training subcategory, the emphasis is placed on establishing Community financial accessibility programs, Community financial education, and making Strategic commitments. Additionally, within the *Voluntary Groups, NGOs (Non-Governmental organisations), and Charities* subcategory, they actively support Charities, Foundation and fundraising programs, as part of their societal and environmental responsibility initiatives.

Shared initiatives involving two, three, or four banks

In terms of shared initiatives by two, three, or four banks, related to *Carbon reduction and other green initiatives*, they prioritize addressing GHG (Greenhouse Gas) emissions (HLS), engaging in initiatives related to Forestry and agriculture (BHL), Palm oil sustainability (BH), Preservation and safeguarding of the environment (BLR), Waste reduction initiatives (RS), Wind energy projects (HLR), and Recycling efforts (BS).

Regarding *ESG collaboration strategies*, specifically within *the Frameworks, projects, and other commitments* subcategory, they focus on forming ESG partnerships and trusts (BHLR), contributing to Local development initiatives (BLRS), and aligning with international agreements like the Paris climate agreement (BHLR). Additionally, in the context of Corporate Social Responsibility (CSR), banks highlight their commitment to Supplier accountability (BLR) and actively support Volunteering programs (BHRS).

In the realm of *ESG performance management*, banks provide ESG-related data, statistics, and reports that encompass ESG recognition (LRS), issuing ESG reports and statements (HRS), participating in ESG surveys (HL), and addressing the impact of significant events like the Coronavirus pandemic (LS).

Under *Sustainable financial products*, they offer ESG-focused business financing products and services (BLR), ESG personal financing products (BHLR), ESG financing services and support tailored for SMEs (BHLR), Green lending options (HL), Sustainable housing financing (BLRS), and opportunities for Sustainable investment (BLR).

In the *Financial accessibility and education* subcategory, particularly in *Advising, job creation, and customer trainin*g, banks invest in the development of Academies, schools, workshops, and financial education programs (LRS), offer Business advising services (BHLS), and provide Financial educational tools (HLRS).

Within the *Voluntary Groups, NGOs, and Charities* subcategory, banks engage in various forms of philanthropic support, which include making Donations (LRS), advancing Financial inclusion efforts (HLRS), collaborating with Non-Governmental organisations (NGOs) (BHR), and actively participating in Volunteering initiatives (BRS).

This comprehensive approach by banks demonstrates their commitment to addressing environmental and societal concerns through collaborative and individual efforts across various initiatives and categories.

Bank-specific initiatives

Regarding bank-specific initiatives, each bank is actively involved in initiatives related to *Carbon reduction and other green endeavours*. For instance, Lloyds emphasizes initiatives related to Food surplus and waste reduction. On the other hand, RBS has implemented Paperless initiatives and invested in Solar energy projects.

In terms of *ESG collaboration strategies*, within the Frameworks, projects, and other commitments subcategory, Santander commits to adhering to specific ESG standards. In the realm of Corporate Social Responsibility (CSR), HSBC focuses on Sustainable supply chain finance, Sustainable supply chain initiatives, and compliance with Anti-corruption laws.

With respect to *ESG performance management*, under the *ESG data, stats, and reports* subcategory, Barclays takes steps to manage ESG-related risks and metrics. Lloyds, in addition to ESG reporting, pays particular attention to addressing challenges posed by Natural disasters.

Regarding *Sustainable financial products*, Lloyds is actively involved in the development of Electric cars and Sustainable insurance products, aiming to contribute to environmental sustainability. Barclays focuses on offering ESG investment options, providing opportunities for sustainable financial growth.

In the context of *Financial accessibility and education*, particularly in the *Advising, job creation, and customer training* subcategory, Lloyds undertakes the development of Local clinic training programs, contributing to skills development and financial literacy. Barclays engages in Social innovation initiatives, fostering innovative approaches to societal challenges, while RBS focuses on Social financing products to promote financial accessibility and inclusion.

Socio-cultural and Demographic

Common factors

In the **Socio-cultural and Demographic** classification, all banks prioritise an *Accessibility and inclusion focus*. This includes addressing Disability, gender diversity, and LGBT+ inclusion through initiatives such as Accessible services, Gender diversity initiatives, Inclusion focus, Gender balance initiatives, and Multicultural diversity initiatives. In terms of industry-related activities, they all highlight a Trade focus. On the Geographical front, their primary focus is on Europe, with additional attention given to other international initiatives and a specific UK focus.

Shared initiatives involving two, three, or four banks

In shared initiatives by four, three, or two banks, within the *Accessibility and inclusion focus (disability, gender, LGBT+)* category, they expand their efforts to include support for Vulnerable or diverse groups, encompassing Abuse-related (LS), Autistic-related (LS), and Disability-related initiatives (BHLR). They also address the Gender pay gap through initiatives (RS) and delve into areas such as Gambling-related (HLRS) and Impaired hearing-related initiatives (BL).

In terms of *Activity-related or Industry* initiatives, they mention involvement in Sports sponsorships (HRS), a focus on Wholesale operations (BRS), a commitment to Trading activities (BLRS), and a dedication to maintaining high-quality standards (BLRS). In the Career or Age-related initiatives, they highlight Career break or change initiatives (BH), initiatives targeting Students through Graduate programs (BS), a broader Student focus (RS), and a program catering to Parents (BS).

Regarding *Geographical focus*, they venture into Foreign markets (BHL) and specific regions such as Asia (BHLR), while also emphasising Domestic market targeting (BLRS). Additionally, they highlight Wide product customisation (BLRS) and a comprehensive strategy encompassing a Wide range of products and services (BL).

Bank-specific initiatives

Turning to bank-specific initiatives, RBS expands its focus within the *Accessibility and inclusion* category by including initiatives for Vulnerable or diverse groups and addressing the Ethnicity pay gap. Barclays extends its involvement to encompass Religious groups-related initiatives within the same category. Santander shows commitment to the Activity-related category with Football sponsorships. In the *Career or Age-related* initiatives, Barclays introduces Age group diversity initiatives and initiatives aimed at Veterans. Regarding Geographical focus, HSBC extends its reach to Asia and the Middle East, Emerging markets, Latin America, Africa, and North America. Barclays maintains its focus on Europe.

Political and organisation

Common factors

In the **Political and organisation** category, all banks share a common focus on several key aspects:

- *Engagement and collaboration policies:* This encompasses Communication capabilities, Cultural focus, Events, and Reports and statements, reflecting their commitment to effective engagement and collaboration within their organisations.

- *Feedback sources:* Banks prioritise adopting a Regulatory approach and fostering collaboration with regulators as crucial sources of feedback and guidance.

- *Organisational structure:* They emphasise Membership capability, Teams building, Groups or forums centres, and Meetings as essential components of their organisational structure to facilitate effective communication and collaboration.

- *Partnerships*: All banks highlight the importance of forming Partnerships and Alliances as part of their collaborative efforts.

- *Topic analysis and decision-making:* They focus on specific areas such as Credit, Customers or consumers, Employees' learning and training strategies, Lending,

Office locations, Strategic business planning, Positive views, and Competition as central to their decision-making processes. Additionally, they identify specific sectors of importance, including Retailing, Technology and Innovation, and a Third-party or supplier focus, which informs their strategic decisions and approaches.

Shared initiatives involving two, three, or four banks

In shared initiatives by four, three, or two banks, they further expand their focus within the **Political and Organisation** category.

In relation to *Engagement and collaboration policies*, they emphasise Corporate governance (BH) and Sponsorships (HRS) as integral components of their collaborative strategies.

Within the *Communication* capabilities category, they implement various practices such as Annual General Meetings (BL), Board tours (BS), Councils (BHLR), Feedback mechanisms (BHLR), Executives' remuneration reports (BLR), and Letters and briefs (BHL) to facilitate effective communication within their organisations.

For *Feedback* sources, they underscore the significance of Board engagement (BHLR), Benchmarking (LRS), and Accounting policies (LS) in gathering valuable insights and information.

In the *Organisational structure* category, they actively engage in Change management programs (BH), seek to simplify their Organisational models (BH), develop Expert panels (LR), and maintain Partnerships, Communication channels, and Negotiations with unions (BHS) to streamline their operations.

In terms of *Topic analysis and decision-making*, they diversify their goals' focus to include areas such as Complaint management (BHLS), Entrepreneurial initiatives (BHR), Onboarding processes (BH), Profitability (BHRS), Financial indicators (BRS), Long-term strategic focus (BHRS), Segmenting (BLRS), and Productivity enhancement (BLR).

In the context of *Risk*, they address a broad spectrum of risk factors, including Financial risk (BRS), Ringfencing (BHLS), Risk management (BH), Operational risk (BS), Libor transition (LS), Transition risk (HL), Credit Risk (BHL), Brexit-related risks (BRS), Market risk (LS), Financial crisis (HL), Geopolitical risk (HRS), Operational resilience (HL), Political issues (LR), and Emerging risks (HS), indicating a comprehensive approach to risk management and mitigation.

In the *People's focus*, they consider the CFO's role and focus (HLR) and Senior managers (HRS) in their decision-making and organisational strategies.

When it comes to *Sector focus*, they target specific sectors, including Merchant (BHR), Shareholder (BLRS), and Government (BLRS), to tailor their policies and initiatives accordingly.

Bank-specific initiatives

In terms of *bank-specific initiatives*, RBS and Santander tailor their approaches within the *Engagement and collaboration policies* category. RBS introduces Culture planning and measurement to foster effective engagement and collaboration within the organisation, while Santander places a focus on Financial statements to enhance communication capabilities.

Lloyds, on the other hand, emphasises the importance of Roundtables within the organisational structure subcategory to facilitate effective organisational coordination and communication.

Within the *Topic analysis and decision-making domain*, RBS refines its goals' focus by highlighting a Debit card focus and Short-term focus. HSBC addresses Non-financial risk as a key consideration in decision-making. Santander introduces Economic sanctions and Reputational risk as critical factors influencing their strategic decisions. Lloyds showcases its commitment to Joint ventures and prioritises a Cancer customer focus. Barclays expands its focus to include a Payments focus and considerations regarding Negative views within their decision-making processes.

In terms of *People's focus*, RBS emphasises the *CEO's role and focus*, while HSBC places attention on Executive directors' *focus* as they navigate organisational challenges and decision-making.

In the context of *Sector focus*, Barclays extends its initiatives to include a Consultative employee capacity, a specific focus on the Farming industry, and recognition of the significance of Major banks. Lloyds, on the other hand, highlights a Manufacturing focus as a crucial aspect of their strategic approach within specific sectors.

Ethical and Legal

Common factors

Across the board, banks prioritize ethical and legal considerations in their operations, emphasizing the following key areas:

- *Ethical Behaviour and Governance:* Banks are dedicated to upholding ethical standards and values. They focus on initiatives related to Ethical values governance to ensure that ethical principles guide their decision-making processes. Additionally, they adopt a Long-term relationship approach with suppliers to foster ethical relationships throughout their supply chain.

- *Modern Slavery and Human Rights:* Banks are committed to combating Modern slavery and safeguarding human rights. They develop policies and measures to address issues related to Modern slavery and human rights, demonstrating their commitment to ethical and responsible business practices.

- *Tax Policies and Codes:* Banks adhere to stringent tax policies and codes, ensuring transparency and compliance with tax regulations. This commitment is instrumental in maintaining ethical and legal integrity in their financial operations.

- *Industry Standards and Policymaking*: Banks actively engage in policymaking activities, contributing to the development of industry standards. This involvement

demonstrates their commitment to shaping ethical and legal frameworks within the financial sector.

- *Wellbeing Initiatives*: Banks recognize the importance of employee wellbeing. They prioritize initiatives related to Mental and Physical Health, promoting a healthy and supportive work environment. Additionally, they implement Fair payment and reward policies to ensure that employees are compensated fairly for their contributions.

These ethical and legal initiatives underscore the banks' dedication to responsible and sustainable business practices. They demonstrate a commitment to fostering ethical governance, protecting human rights, adhering to tax regulations, shaping industry standards, and promoting the wellbeing of their employees.

Shared initiatives involving two, three, or four banks

In the realm of shared initiatives among banks, several key areas underscore their collective commitment to ethical governance, data protection, human rights, industry standards, and combatting employee misconduct and financial crime.

In the *Ethical Governance* category, they jointly develop a robust Code of conduct (BHRS), setting clear ethical guidelines for their operations. Moreover, they prioritize maintaining ethical supplier relationships through Supplier prompt payment commitments (BHL), fostering financial transparency, and upholding Financial disclosures (HLRS) to ensure transparency in financial reporting.

In terms of *Data Privacy and Protection*, compliance with the General Data Protection Regulation (GDPR) (LS) is a shared objective, reflecting their dedication to safeguarding individuals' data.

The commitment to *Modern Slavery and Human Rights* is evident in policies like the Employees' human rights and rights to work policy (BS), underscoring their ethical employment practices. In their dedication to adhering to Industry Standards, they emphasize Prudential standards (HL) and ensure integrity in Financial reporting (BR).

Additionally, they collaboratively address concerns related to *Employee Misconduct and Financial Crime Prevention*, including Anti-bribery and Anti-corruption policies (HLS) to prevent unethical practices. Measures against money laundering activities are evident in their focus on *Anti-money laundering* (RS) efforts, while their commitment to countering corruption is reflected in *Anti-corruption policies* (BHS). Moreover, they establish secure *Whistleblowing and speak-up channels* (BHLR) to provide employees with a platform to report misconduct and unethical behaviour confidently. These collective initiatives underscore the banks' unwavering dedication to ethical governance, data protection, human rights, industry standards, and maintaining the highest ethical standards in their operations.

Bank-specific initiatives

In their unique initiatives, each bank demonstrates its individual approach to *Ethical behaviour, Long-term relationship focus*, *Modern slavery and human rights policies*, *Ethical governance*, and adherence to *Industry standards*.

Santander stands out with a focus on Counter-terrorism in their approach to Modern slavery and human rights policies, indicating their dedication to preventing terrorism-related activities.

Lloyds prioritizes compliance with Data privacy and protection regulations, specifically the General Data Protection Regulation (GDPR), reflecting their commitment to safeguarding data privacy in their operations.

HSBC places an emphasis on fostering Ethical behaviour, underscoring their dedication to ethical conduct in all aspects of their operations.

Santander maintains a strong commitment to adhering to industry standards by referencing Strategic reports and compliance with the Companies Act, showcasing their dedication to transparent reporting and adherence to regulatory standards.

Barclays highlights their focus on policy development in the realm of Treasury policy development, indicating their commitment to crafting sound financial policies.

These bank-specific initiatives demonstrate each institution's unique priorities and approaches in ensuring ethical behaviour, human rights, governance, and adherence to industry standards within their respective operations.

Economic and Financial

Common factors

In the domain of **Economic and Financial** considerations, all banks share a common emphasis on traditional financial products and services. Within the realm of *Consumer Banking*, they collectively concentrate on streamlining processes, particularly in areas such as Mortgage process improvement and automation, aiming to enhance efficiency and customer experience. Moreover, there's a shared focus on managing Debt, reflecting their commitment to helping customers effectively handle their financial obligations. In the sphere of Investment Banking, they extend their offerings to include Asset finance and a range of Investment products and services, catering to the diverse financial needs of their clients. This common focus underscores their commitment to providing comprehensive financial solutions and services in both consumer and investment banking sectors.

On the ***Economic and Financial*** category, all banks focus on *Traditional financial products/services*, in terms of *Consumer banking*, such as Mortgage process improvement and automation and a Debt focus. In relation to *Investment banking*, they include Asset finance and Investment products and services.

Shared initiatives involving two, three, or four banks

In the context of shared initiatives across the Traditional financial products/services category and various sectors, banks demonstrate their collective commitment to a range of financial aspects:

- In the *Commercial Banking* sector, they emphasize a Commercial banking focus (HLR), reflecting their dedication to catering to the financial needs of commercial clients. Additionally, they address Dividend-related initiatives (HS), Transaction fees (BHRS), Transaction banking (BH), and Balance sheet analysis (BRS),

highlighting their comprehensive approach to financial services for commercial clients.

- In the *Consumer Banking* sector, their shared initiatives encompass offerings such as Pension products (BLRS), Leasing (BHLR), Pricing practices (LR), and management of Interest rates (BHRS), underscoring their commitment to delivering a wide array of consumer financial products and services.

- Within the *Investment Banking* sector, banks collectively address important financial metrics like the Common Equity Tier 1 ratio (CET1) (BRS) and focus on Financial strategies (BH) and Risk Weighted Assets (BHR). They also emphasize Wealth investment (BHLR), Private banking (BR), and an Investment banking focus (BHLR), signifying their commitment to offering comprehensive investment banking solutions. Additionally, they mention engagement in the Stock market (BR) and dealings with Bonds (BHLR). Further financial aspects include attention to Libor (LRS) and Gross Domestic Product (GDP) (HR), underlining their dedication to diverse investment opportunities and financial strategies.

- In the context of *Sustainable financial-based products*, their focus extends to *Capital planning*, encompassing considerations related to Financial health or planning (LRS) and Capital planning (BHRS). This indicates their dedication to promoting sustainable financial practices and responsible capital allocation.

These shared initiatives underscore their commitment to providing a comprehensive suite of financial products and services while also focusing on sustainability and responsible financial management across various sectors and financial domains.

Bank-specific initiatives

Within the realm of bank-specific initiatives, each institution tailors its approach to address specific aspects related to traditional financial products and services:

In the *Commercial Banking* sector, HSBC places an emphasis on a Zero fee focus, reflecting its commitment to providing fee-free financial services. On the other hand,

Santander highlights its Reimbursement capabilities, signifying its dedication to offering efficient reimbursement services for commercial clients.

In the *Consumer Banking* sector, Barclays focuses on Consumer lending, underlining its dedication to providing lending solutions tailored to consumers' financial needs.

Within the *Investment Banking* sector, Barclays extends its offerings to include Cross asset capabilities, showcasing its ability to manage diverse assets effectively. Additionally, it addresses aspects related to Goodwill and Intangible assets, emphasizing its comprehensive approach to investment banking services.

In the context of *Sustainable financial-based products,* particularly in relation to Capital planning, Barclays mentions engagement with Building societies, indicating its commitment to Sustainable financial practices within this specific financial domain.

These bank-specific initiatives reflect each institution's unique approach and specialization within *Traditional financial products and services*, highlighting their commitment to addressing specific financial needs and objectives.

5.3.1.3 Banks' strategic reports' systemigram

The development of the Systemigram involved an initial step of categorizing various factors using the "Playing to Win" framework, as depicted in Table 5.11.

	Systems (Infrastructure)	Capabilities (Process)	How we will win?	Where we will play?	Winning aspirations
Definition	Support systems structures, and measures	Set of reinforcing activities and specific configuration	Value proposition and competitive advantage	Geographies, product categories, costumer segments, channels, vertical stages of production	Purpose or guiding aspirations
Factors	*Technological and Methodological* -Branch development (ATM) & F2F serv. (retail/post cash) -Business consulting, entrepreneurship & fintech -Process improvement (collaboration, simplification, standardization, & efficiency) -Risk management (i.e. fraud) -Goal performance (dashboards, assessments and reports) -Surveys & business analytics *Legal & Ethical* -Prudential information disclosure & reporting standards (i.e. statements) -Employee & supplier conduct codes, policies, practices & ceritications (mental & physical health, long-term contracts, fair payment & reward, modern slavery and human rights, money laundering & corruption, & whistleblowing & speak-up channels) *Political & Organizational* -Communication & working cap.(meetings, councils, &events, surveys, Internal culture, groups, teams, & committees) - People management & training *Environmental & Societal* -ESG, CSR & SC accountability	*Financial and Economical* -Debt & mortgage services -B2B services related with cash flow & transactions -Financial health or capital planning -Trade (stocks & bonds) & wealth investment *P&O* *Environmental & Societal* -Sustainable insurance, ethical trading, green lending & mortgages -Educational community programs, charities, foundations, fundraising programs	*Political & Organizational* - Better and faster services (payments) -Customer rewards & digital platforms -Digital skills & leadership training for employees (coaching/ mentoring) -Bank statements, personal data management & service customization - LT goals strategic planning - Board engagement, benchmarking, internal policies, & change management programs - External sponsorships *Environmental & Societal* - Food waste, renewable energy, forestry, agriculture, preservation, and recycling *Socio-cultural & Demo.* -Wide product & customization in branded prod. & merch.	*Social & Demographic* *Political & Organizational* -Retail, technology & 3rd party sector focus -Trade, wholesale & sports focus - Middle mgt. focus *Environmental & Societal* -ESG focus (climate change, pandemics, & natural disasters, sustainable & ethical product offering) -Income-based focus *Socio-cultural & Demographic* -Vulnerable groups (i.e. abuse-related, autistic, gambling, & impaired hearing) -Geographic focus (UK & Europe mainly, some Asia & ME focus) -Student & parents programs	*P&O* Customer-led approach *Socio-Cultural & Demographic* -Gender & cultural balance and diversity (i.e. pay gap) *Environmental & Societal* Environmentally conscious & resilient *Legal & Ethical* -Employee & supplier wellbeing

TABLE 5.11 BANKS' "PLAYING TO WIN" DECISION-BASED FRAMEWORK CATEGORIZATION

The Systemigram prose was subsequently crafted, and this can be observed in the following paragraphs. Simultaneously, the Systemigram graphic and comprehensive storyboard were presented in Figures 5.12.A to F, progressively displayed.

Banks offer a *Wide and Customizable set of branded products, services, and merchandise*, with a strong emphasis on providing Better and faster services, particularly in the realm of *Payment services*. They utilize Marketing services to attract customers, highlighting external sponsorships, such as sports partnerships, along with customer Reward programs and Membership programmes. Communication with customers is facilitated through various Communication channels, enabling them to access *Traditional financial services* aimed at Trade, retail, technology, and third-party business sectors. Additionally, banks extend their offerings to encompass *Environmental, Social, and Governance (ESG)* financial services, with an Income-based focus and targeting segments including Vulnerable, student, parental, and environmental projects. Geographically, their primary focus is on the UK and Europe, with some banks expanding their presence in Asia and the Middle East.

In the realm of *ESG financial services*, banks have developed Educational community programs, charities, foundations, and fundraising initiatives, as well as Financial health and capital planning services. These services are underpinned by a support infrastructure aligned with various policies related to *ESG,* Corporate Social Responsibility (CSR), and Supply Chain (SC) accountability, all in accordance with Prudential information disclosure and reporting standards, including ESG and CSR statements.

Regarding *Communication channels*, banks employ a Digital platform strategy that emphasizes easy Access to bank statements and Customer data management, all while prioritizing Data privacy. From a *Physical service* perspective, banks focus on Branch development and automation, enhancing ATM access with increased services and maintaining Face-to-face (F2F) services, primarily for Retail and Post office branch cash withdrawals.

In terms of *Traditional financial services*, within the Business-to-Business (B2B) channel, banks are dedicated to providing Cash flow, transactions, and payment services, as well

as offering Business consulting, entrepreneurship, and fintech capabilities. In *Consumer and Commercial* banking, banks continue to provide Debt, mortgages, and insurance services, and further extend their portfolio to include Stock and bond trading, along with various Wealth investment services.

In respect of internal strategies**,** banks have seen a common improvement in *Long-term goals planning* using Board engagement, benchmarking, internal policies, and change management programs strategies, as well as from the Colleagues' side, Digital skills & leadership training for employees, such as coaching and mentoring, with a focus on Middle management.

Turning to internal strategies, banks share a common commitment to *Long-term goal planning*, leveraging Board engagement, benchmarking, internal policies, and change management programs. Additionally, they invest in enhancing the Digital skills and leadership training of their employees, particularly focusing on Middle management.

Supporting these strategies is a robust *Support infrastructure* that encompasses organisational governance and structure, along with Performance management capabilities. Organisational governance and structure are geared toward fostering Colleague development, emphasizing People management and training resources. Communication and working capabilities, such as Meetings, councils, events, groups, teams, and committees, play a pivotal role in Internal culture development. Moreover, banks adhere to Employee and supplier conduct codes, policies, practices, and certifications, covering aspects related to Mental and physical health, Long-term contracts, Fair payment and rewards, Modern slavery and human rights, Anti-money laundering, Corruption, and Whistleblower and speak-up channels. *Performance management* is facilitated through *Process improvement capabilities* that target Collaboration, Simplification, Standardization, and Efficiency. Goal performance is tracked using Dashboards, Assessments, Reports, Surveys, and advanced Business analytics. Banks also prioritize *Risk management* capabilities, particularly related to Fraud mitigation.

Overall, banks share common goals that reflect a *Customer-centric approach* and *Collaboration with regulators* to achieve Social and environmental sustainability. These goals encompass achieving *Gender and cultural balance and diversity*, fostering *Environmental consciousness*, and enhancing *Employee and supplier well-being*. Economic profitability remains a central focus, with an emphasis on *Economic and financial performance*, alongside a commitment to maintaining the Operational resilience of all services and infrastructure.

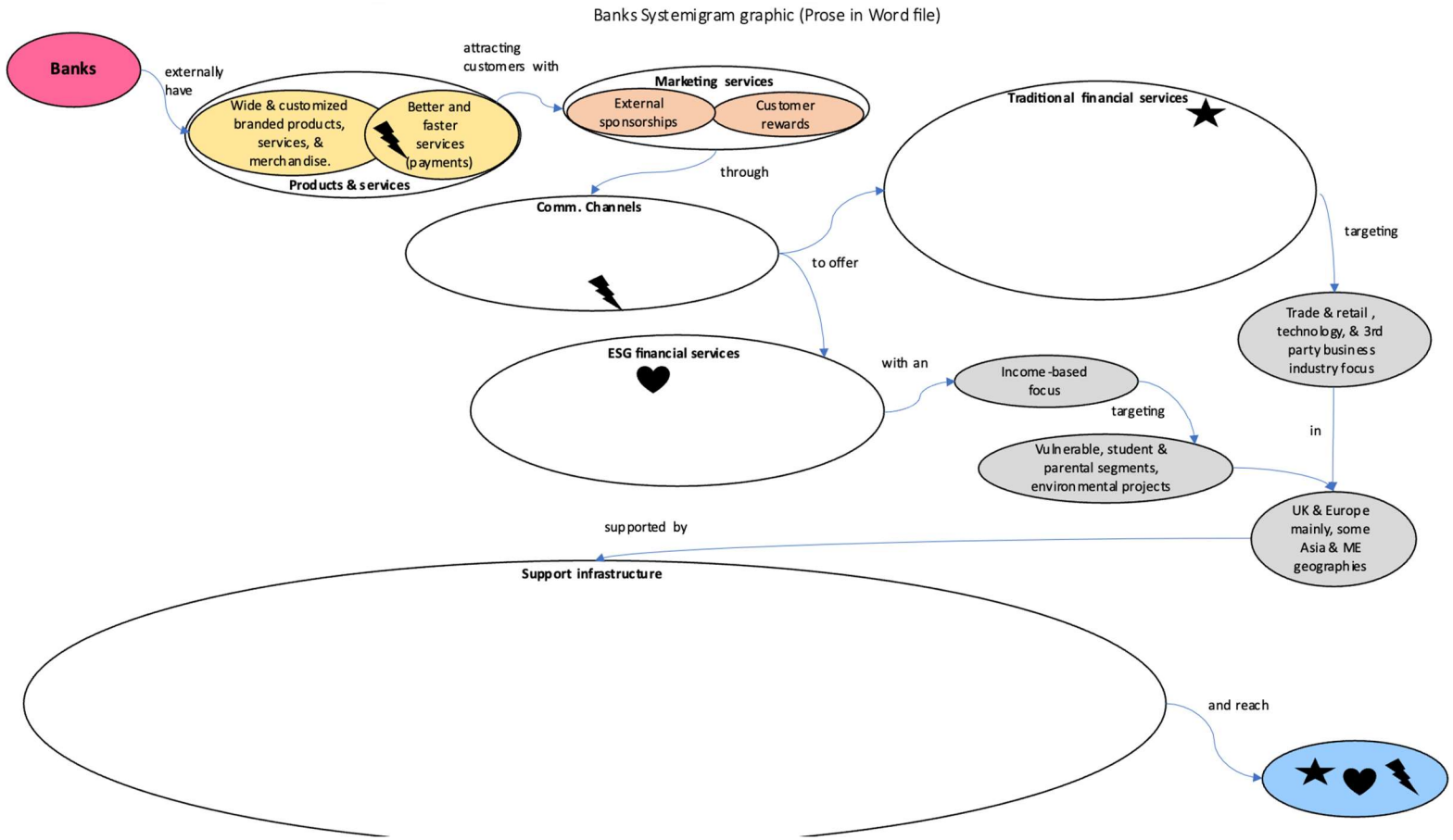


FIGURE 5.12.A BANKS SYSTEMIGRAM STORYBOARD

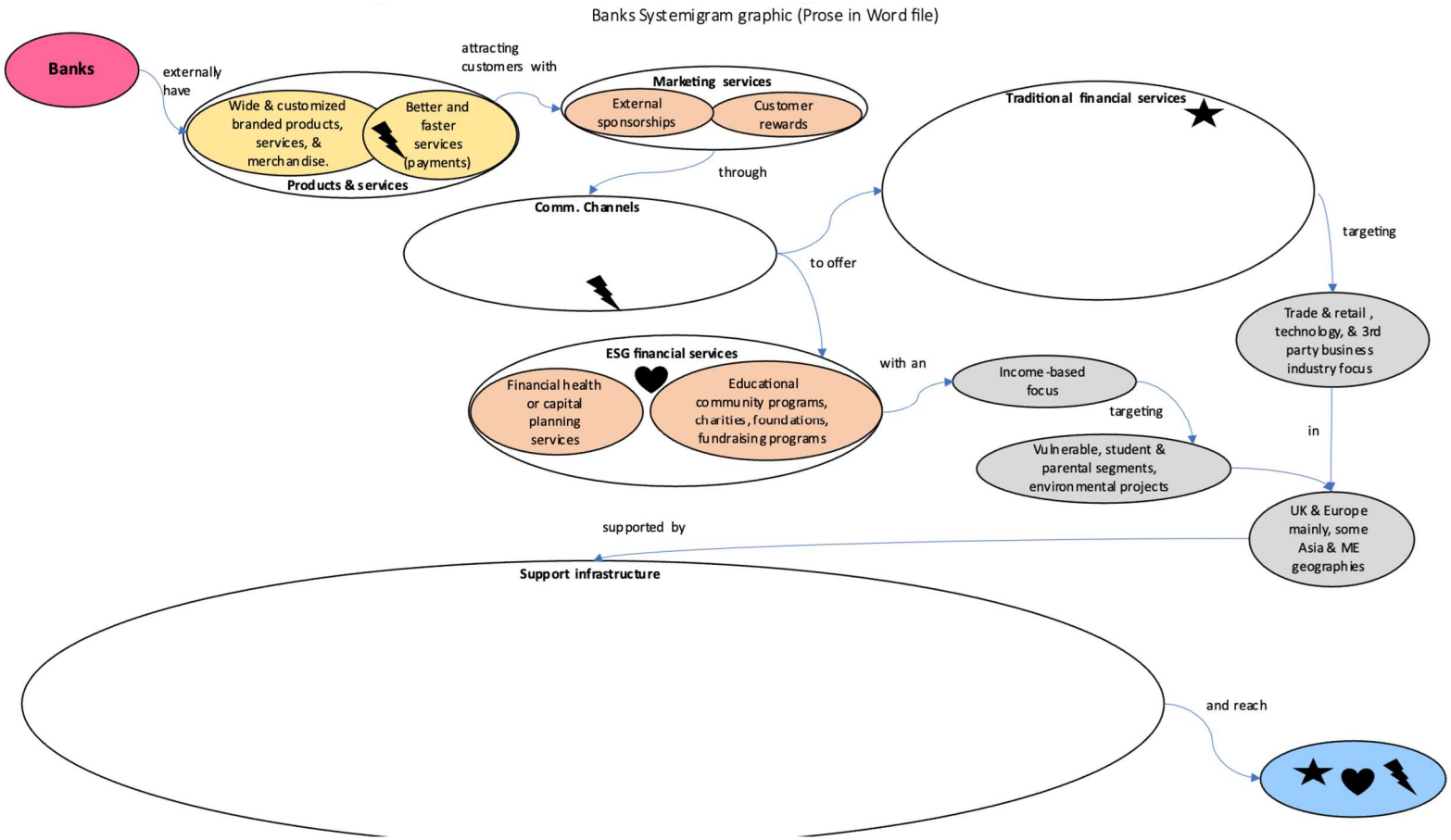


FIGURE 5.12.B BANKS SYSTEMIGRAM STORYBOARD

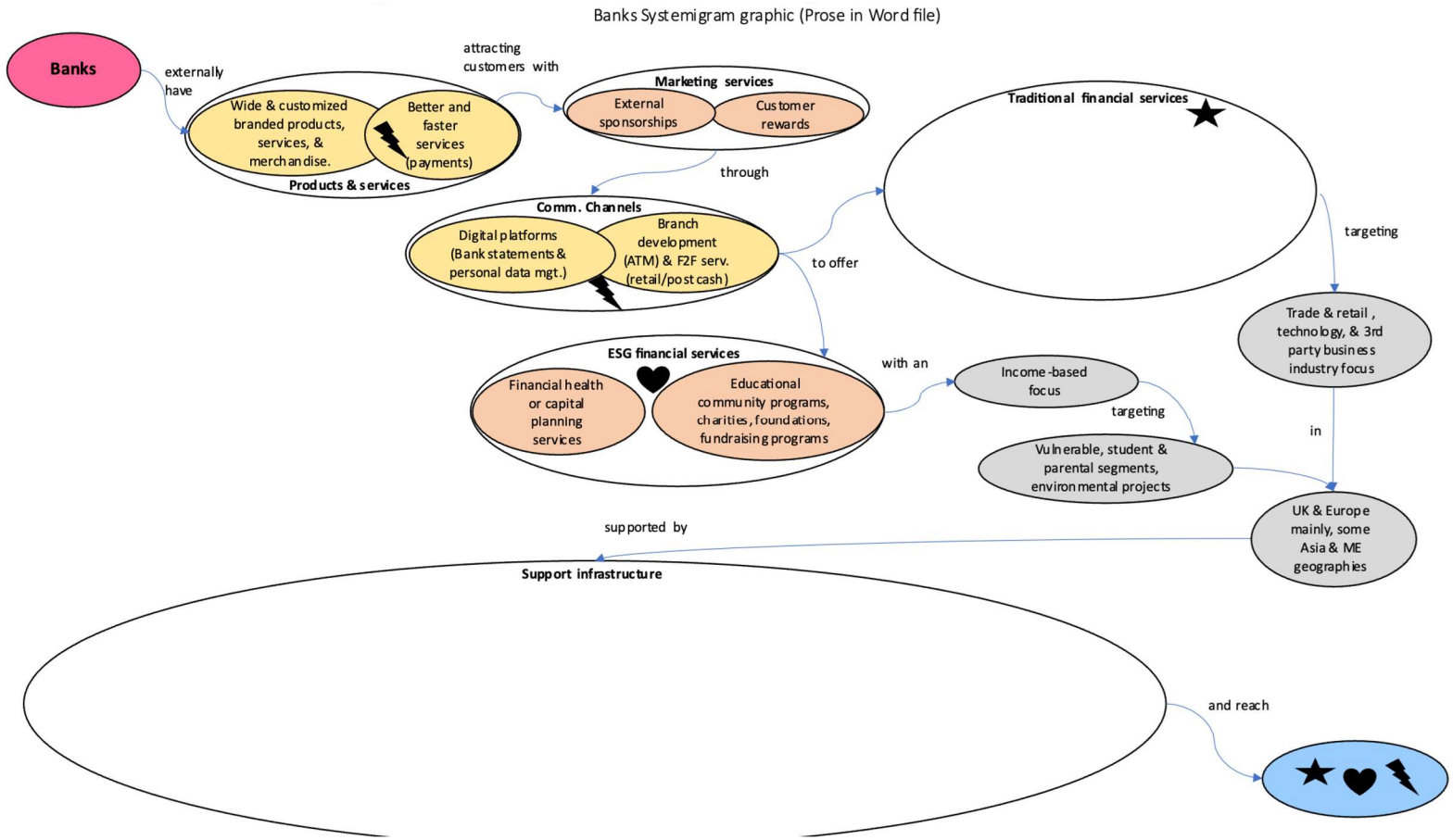


FIGURE 5.12.C BANKS SYSTEMIGRAM STORYBOARD

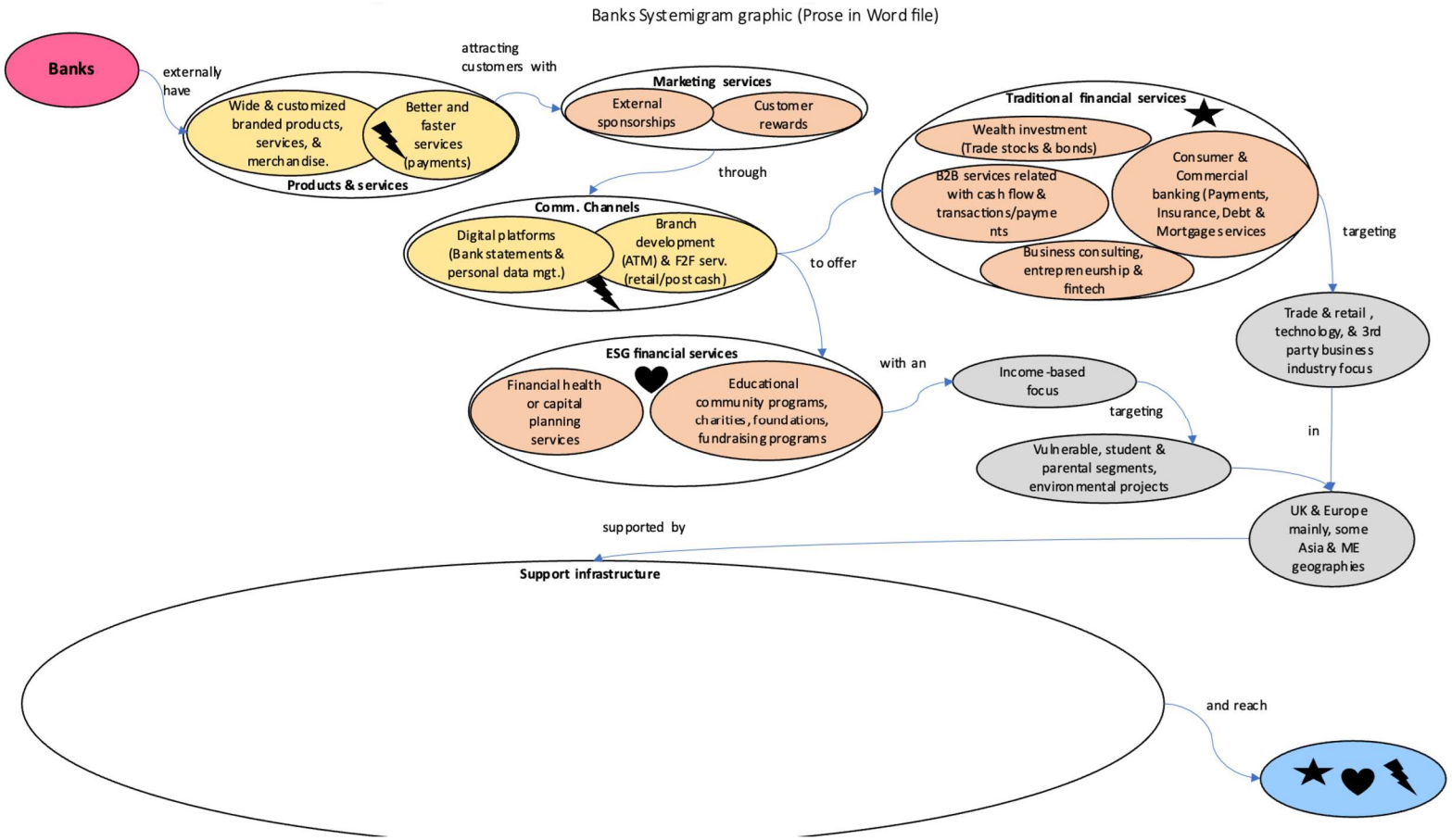


FIGURE 5.12.D BANKS SYSTEMIGRAM STORYBOARD

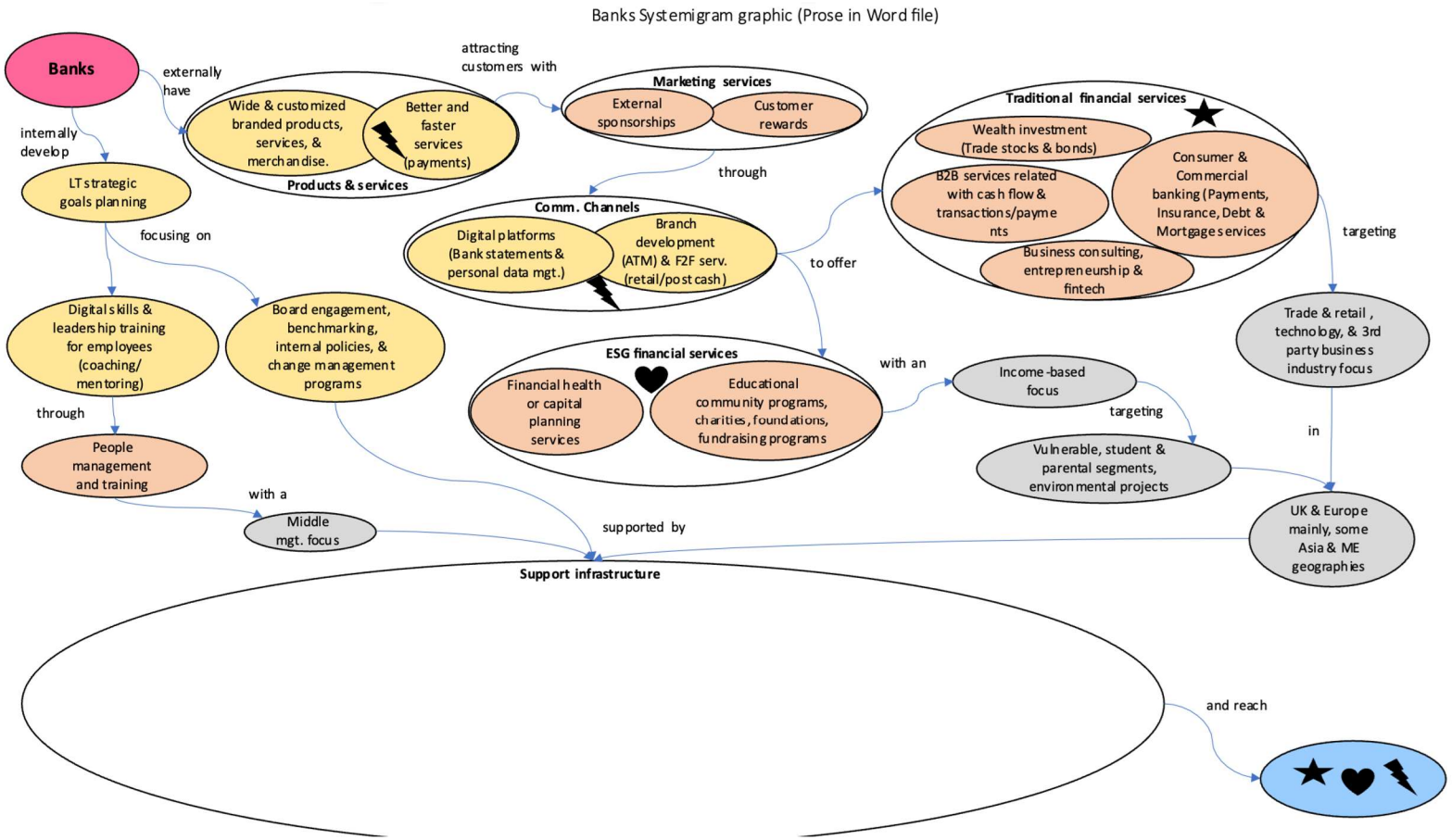


FIGURE 5.12.E BANKS SYSTEMIGRAM STORYBOARD

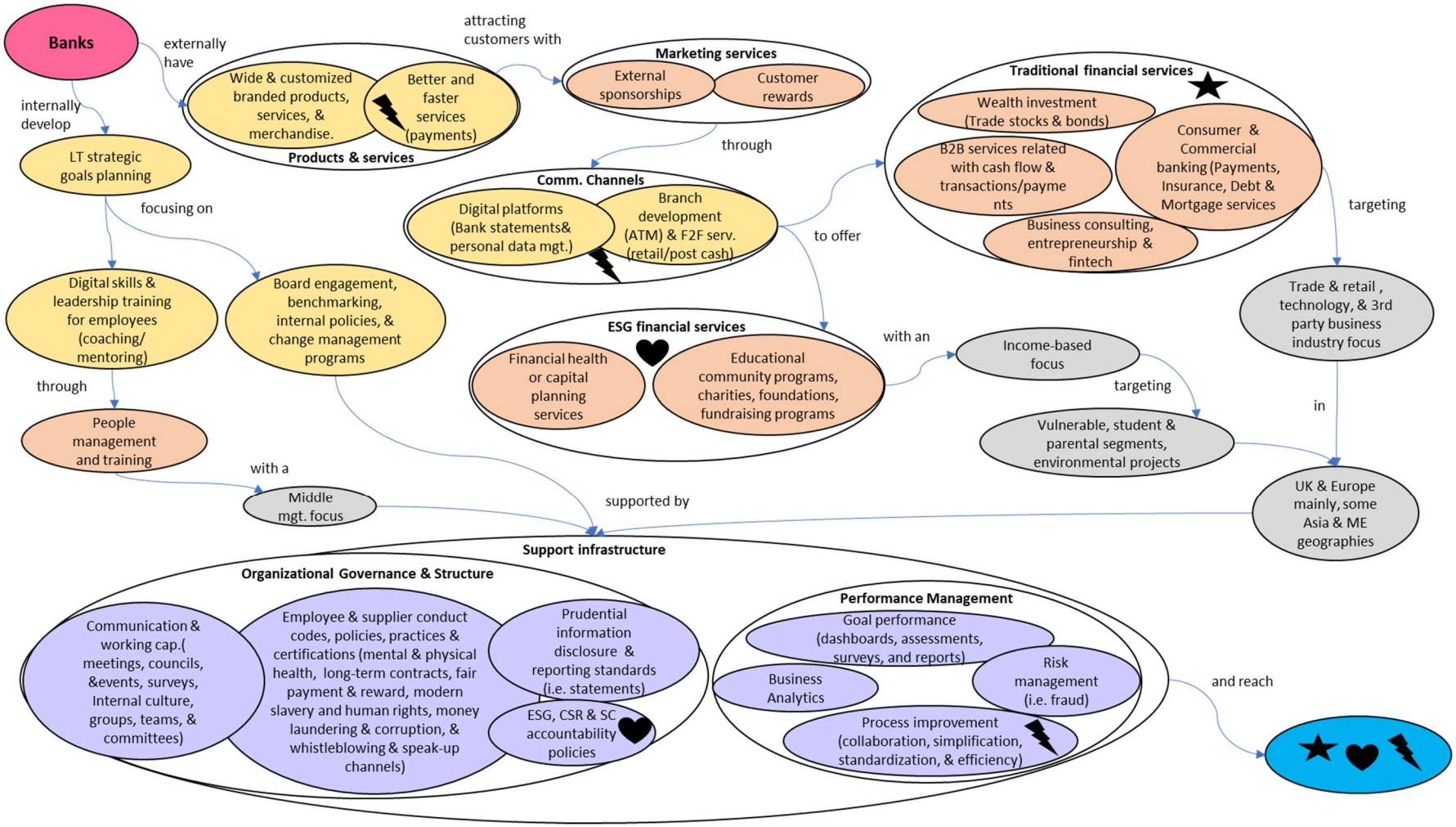


FIGURE 5.12.F BANKS SYSTEMIGRAM STORYBOARD

5.3.1.4 Banks' degree of operational resilience alignment

In Figures 5.13–5.16, the strategic factors identified in the banks' strategic reports and analyst reports are classified using the CERT® operational resilience framework areas and sub-areas. This classification takes into account their common, shared, and specific clustering. For a more detailed analysis, please refer to Section 5.4, where the factors are discussed based on their contribution to the RALF resilience attributes. Supporting evidence from both academic articles and industry analyst reports is presented as well. To visualize the integrated analysis of these strategic factors and resilience attributes, please consult **Appendices E** and **F**.

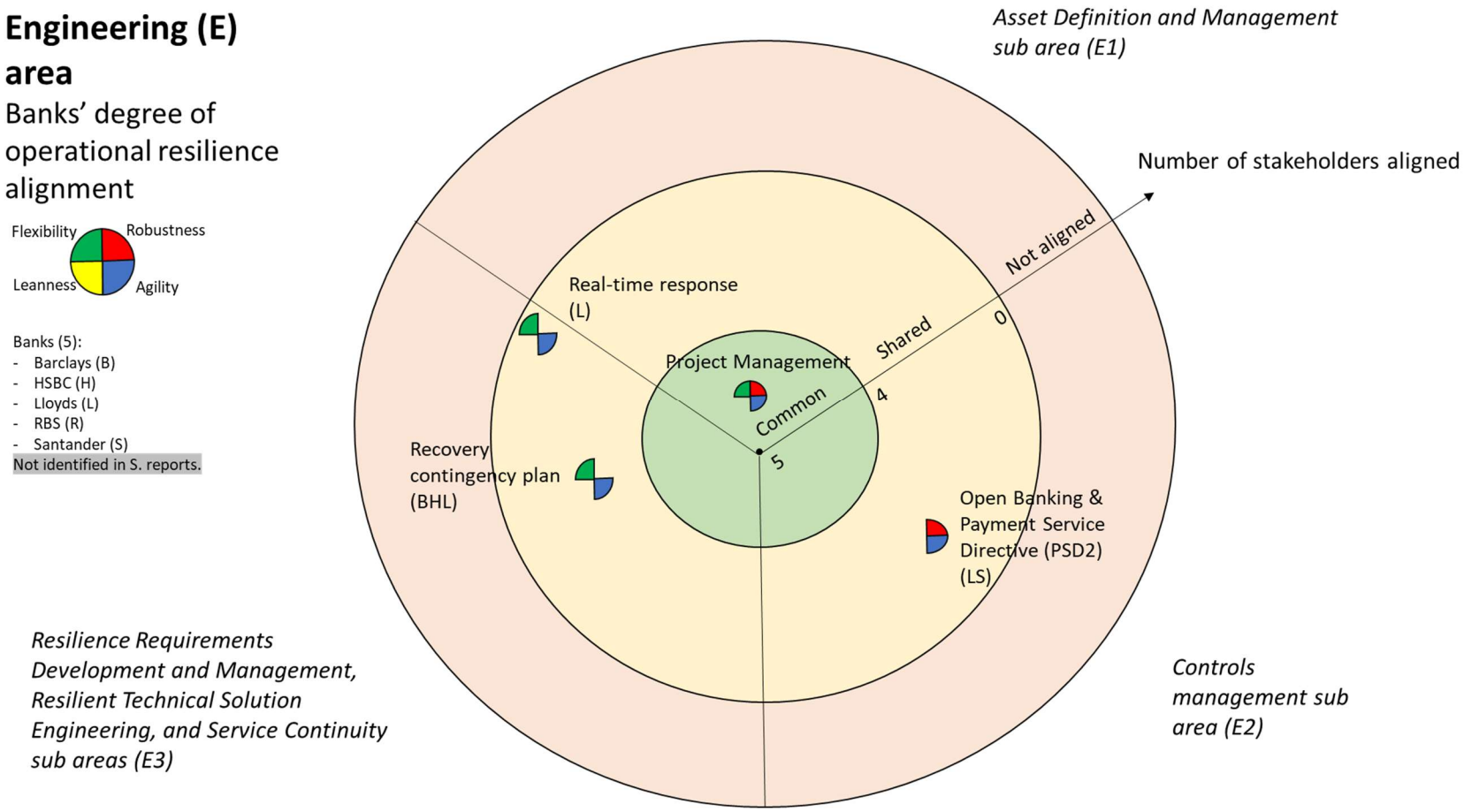


FIGURE 5.13 ENGINEERING AREA BANKS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

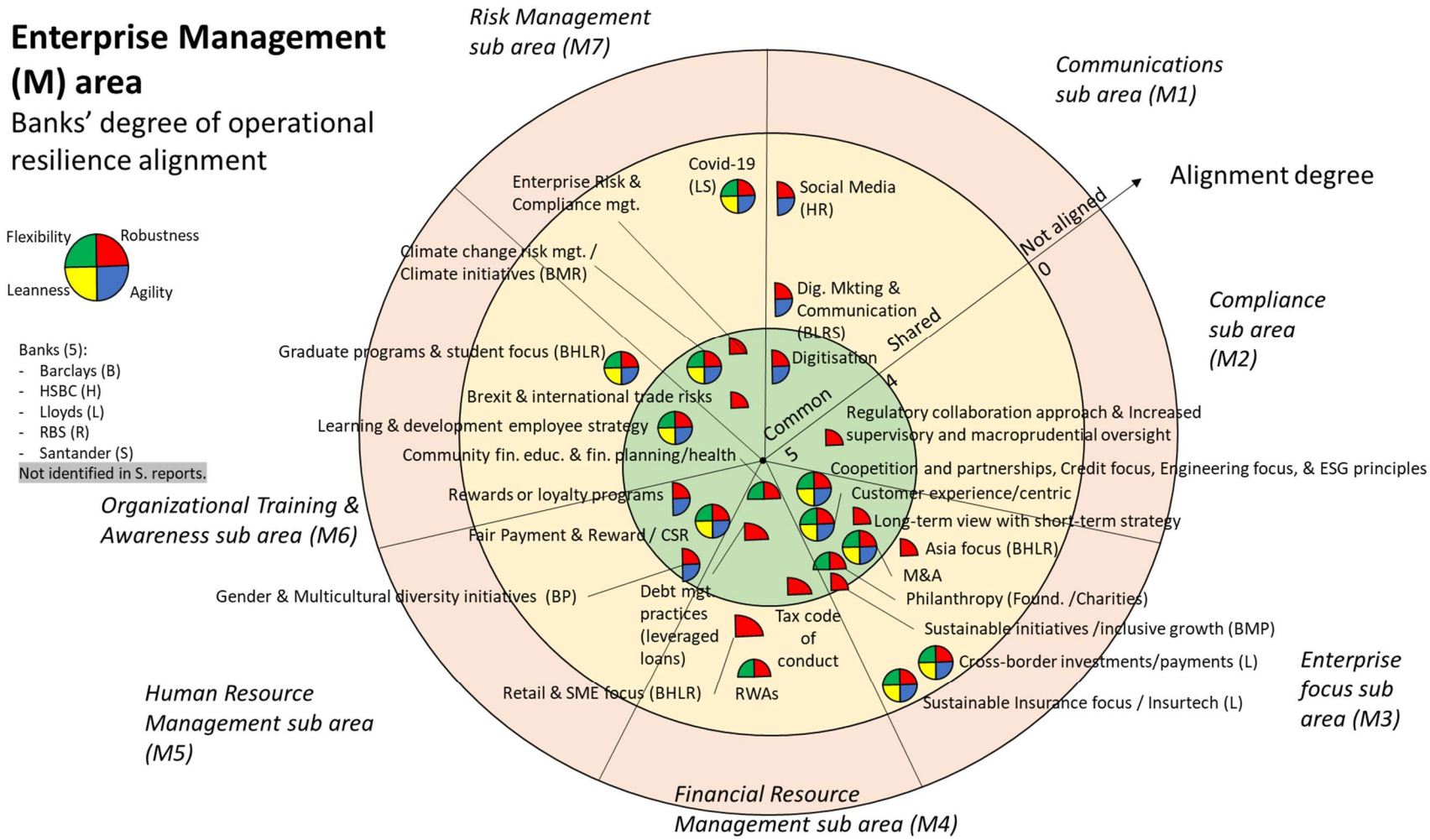


FIGURE 5.14 ENTERPRISE MGT. AREA BANKS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

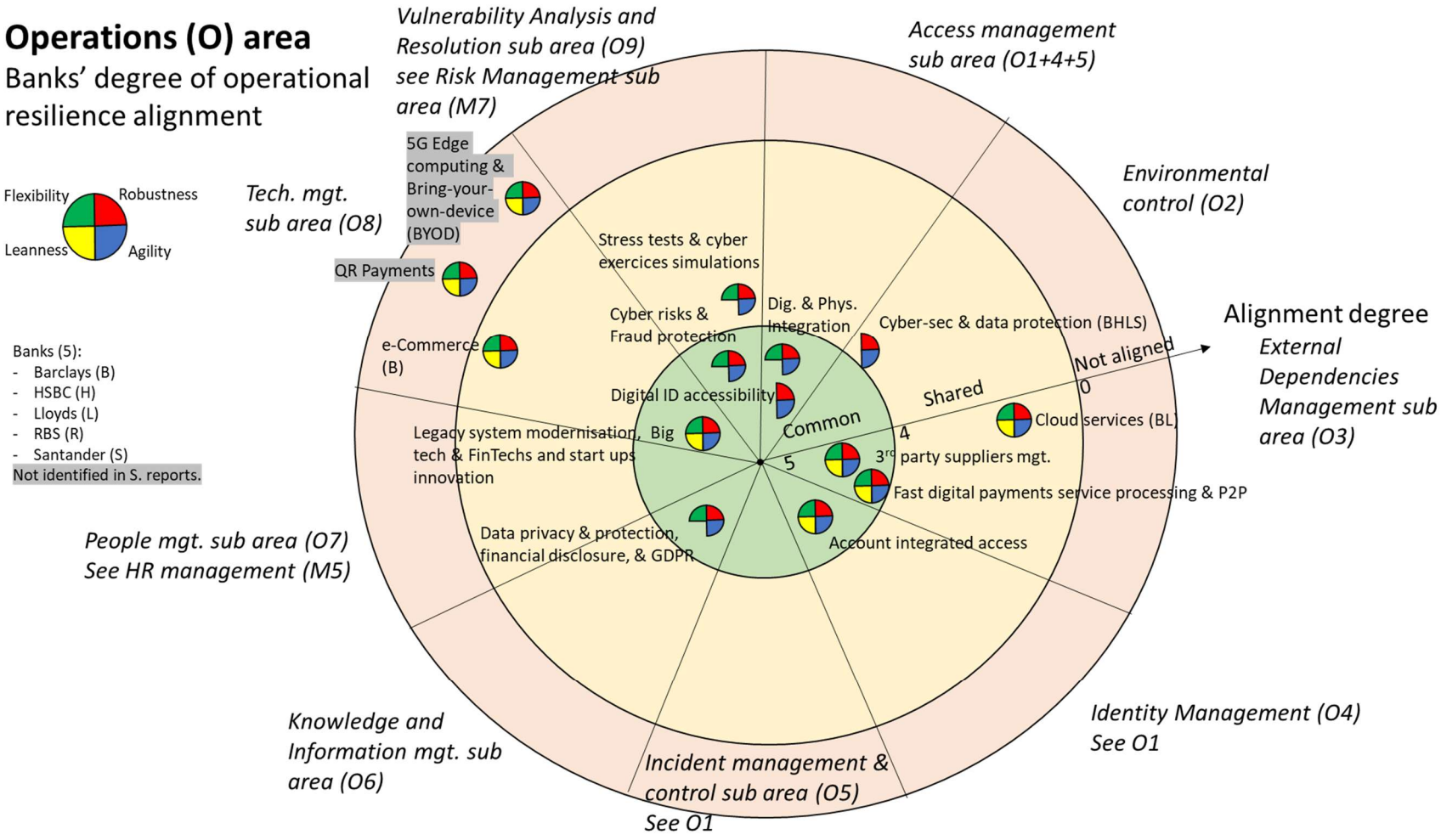


FIGURE 5.15 OPERATIONS AREA BANKS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

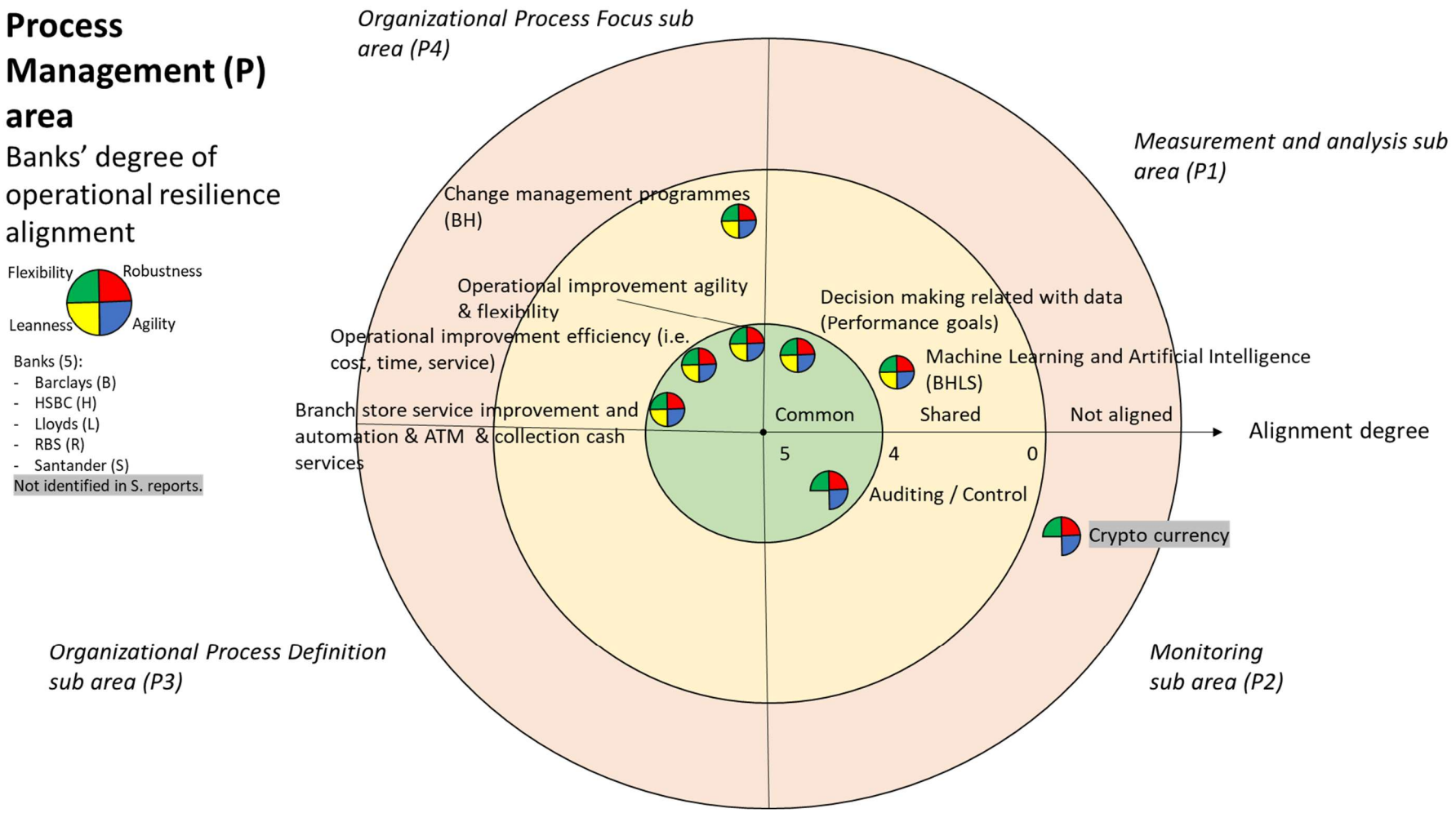


FIGURE 5.16 PROCESS MGT. AREA BANKS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

The rest of the stakeholder's analysis (Retailers, Payment networks, Acquirers, Regulators) can be found in **Appendix C**.

5.3.2 Retail payment system integrated strategic reports' analysis

This section presents the results from the application of the method to the stakeholders in the UK retail payment system.

5.3.2.1 Integrated payment system's dictionary-based factor clustering results

To begin, the following section presents descriptive statistics, categorizing factors based on various PESTEL categories. The number of factors within each category may vary and can provide insights into the strategic priorities of the stakeholders. In the context of the system, there was a notable emphasis on technological development, bolstered by appropriate political and organisational initiatives.

Note: These tables can be found in the Excel file as well.

Retail payment system level

PESTEL categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Political_Organisational	119	51	26.84%
Economic_Financial	57	15	7.89%
Socio-Cultural_Demographic	60	17	8.95%
Technological_Methodological	168	66	34.74%
Environmental_Societal	65	22	11.58%
Legal_Ethical	46	19	10.00%
Grand Total	515	190	36.89%

TABLE 5.12 NUMBER OF FACTORS PER PESTEL CATEGORY

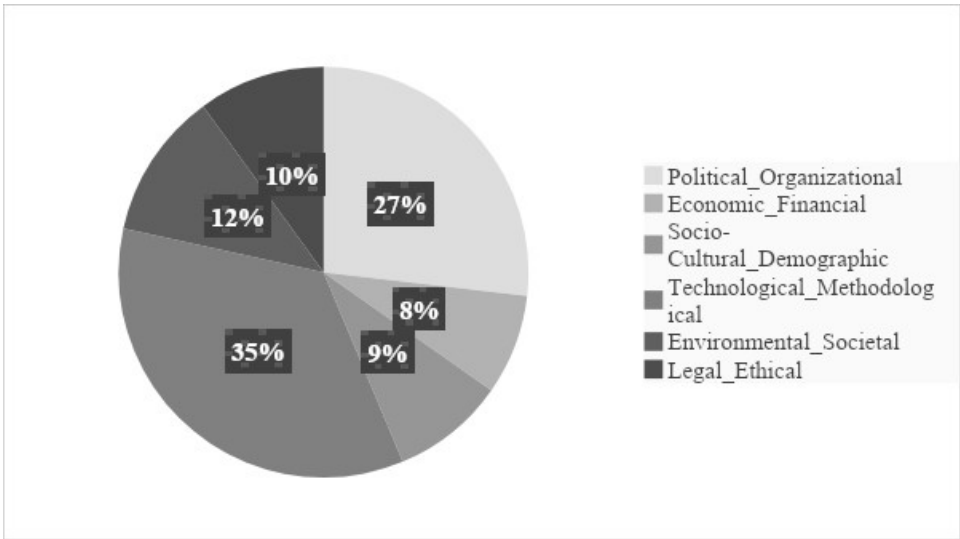


FIGURE 5.17 PERCENTAGE OF FACTORS PER PESTEL CATEGORY

PESTEL categories	Acquirers (A)	Banks (B)	Merchants/ Retailers (M)	PayNet (P)	Regulators (R)
Political_Organisational	31	25	29	37	21
Economic_Financial	11	6	4	7	4
Socio-Cultural_Demographic	11	10	10	11	5
Technological_Methodological	38	29	26	45	18
Environmental_Societal	8	16	13	9	11
Legal_Ethical	11	7	6	10	3
Grand Total	110	93	88	119	62

TABLE 5.13 NUMBER OF FACTORS PER PESTEL CATEGORY & STAKEHOLDERS

PESTEL categories	Acquirers (A)	Banks (B)	Merchants/ Retailers (M)	PayNet (P)	Regulators (R)
Political_Organisational	28.18%	26.88%	32.95%	31.09%	33.87%
Economic_Financial	10.00%	6.45%	4.55%	5.88%	6.45%
Socio-Cultural_Demographic	10.00%	10.75%	11.36%	9.24%	8.06%
Technological_Methodological	34.55%	31.18%	29.55%	37.82%	29.03%
Environmental_Societal	7.27%	17.20%	14.77%	7.56%	17.74%
Legal_Ethical	10.00%	7.53%	6.82%	8.40%	4.84%
Grand Total	57.89%	48.95%	46.32%	62.63%	32.63%

TABLE 5.14 PERCENTAGE OF FACTORS PER PESTEL CATEGORY & STAKEHOLDERS

Similarly, this section provides insights into the various stakeholders that the strategic factors focus on. As anticipated, the majority of initiatives are directed towards customers. However, investors and regulators occupy the second and third positions, respectively, with a significant number of strategic factors. Notably, stakeholders other than banks have a higher proportion of strategic factors targeting investors. Colleagues and regulators exhibit a relatively small percentage difference, suggesting potential compliance-related considerations for certain stakeholders (e.g., Acquirers). In a system-wide analysis, the percentage differences between the categories are relatively smaller compared to the specific stakeholder-level analysis.

Stakeholders' categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Colleagues	66	29	15.26%
Customers	176	58	30.53%
Investors and Board	103	40	21.05%
Regulators, Governments, and Policy Makers	104	33	17.37%
Society/Communities/Environment	48	20	10.53%
Suppliers and Strategic partners	18	10	5.26%
Grand Total	515	190	36.89%

TABLE 5.15 NUMBER & PERCENTAGE OF FACTORS PER STAKEHOLDERS

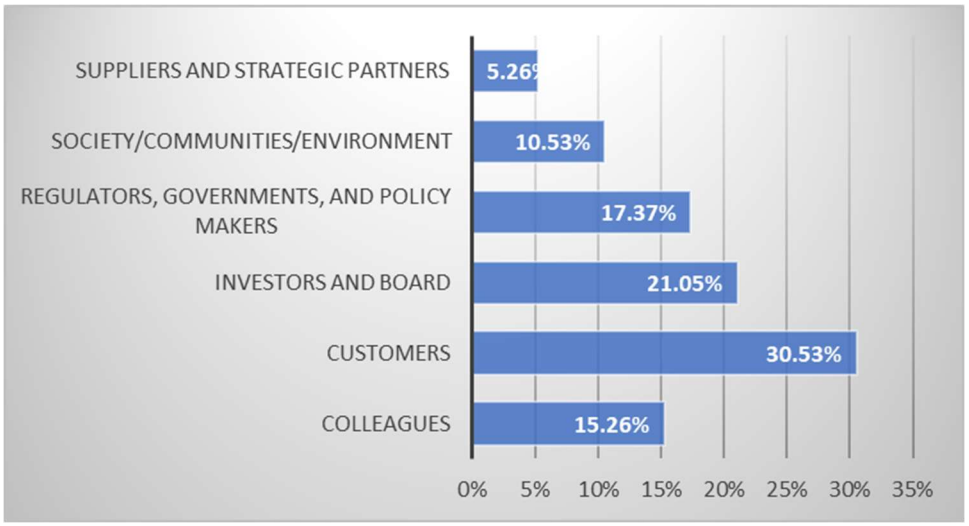


FIGURE 5.18 PERCENTAGE OF FACTORS PER STAKEHOLDERS' CATEGORIES

Stakeholders' categories	Acquirers (A)	Banks (B)	Merchants /Retailers (M)	PayNet (P)	Regulators (R)
Colleagues	11	22	14	16	10
Customers	37	28	26	39	17
Investors and Board	27	16	24	26	14
Regulators, Governments, and Policy Makers	22	9	10	20	11
Society/Communities/Environment	7	15	10	9	8
Suppliers and Strategic partners	6	3	4	9	2
Grand Total	110	93	88	119	62

TABLE 5.16 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY & STAKEHOLDERS

Stakeholders' categories	Acquirers (A)	Banks (B)	Merchants/ Retailers (M)	PayNet (P)	Regulators (R)
Colleagues	10.00%	23.66%	15.91%	13.45%	16.13%
Customers	33.64%	30.11%	29.55%	32.77%	27.42%
Investors and Board	24.55%	17.20%	27.27%	21.85%	22.58%
Regulators, Governments, and Policy Makers	20.00%	9.68%	11.36%	16.81%	17.74%
Society/Communities/Environment	6.36%	16.13%	11.36%	7.56%	12.90%
Suppliers and Strategic partners	5.45%	3.23%	4.55%	7.56%	3.23%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%

TABLE 5.17 PERCENTAGE OF FACTORS PER STAKEHOLDERS' CATEGORY & STAKEHOLDERS

Number of sharing organisations	Sharing factors Count	Percentage	Organisational cluster	Sharing factors Count	Percentage
5	27	36.04%	ABMPR	27	36.04%
4	23	15.64%	ABMP	10	4.16%
			ABPR	3	0.59%
			AMPR	5	2.38%
			BMPR	5	3.37%
3	31	16.04%	ABM	2	1.58%
			ABP	3	0.40%
			ABR	3	1.78%
			AMP	10	1.19%
			AMR	3	1.78%
			BMP	5	0.79%
			BMR	4	1.19%
			BPR	1	5.94%
2	43	14.26%	AB	1	0.59%
			AM	1	1.19%
			AP	24	3.96%
			AR	1	3.76%
			BM	5	1.19%
			BP	3	2.18%
			BR	7	0.40%
			MR	1	0.40%
1	66	18.02%	A	17	2.57%
			B	14	7.13%
			M	10	3.37%
			P	23	3.37%
			R	2	1.58%
Total	190			190	100.00%

TABLE 5.18 SHARED FACTORS BY NUMBER OF STAKEHOLDERS CLUSTERED AND STAKEHOLDERS' CLUSTERS

Among the various stakeholders, the selected strategic factors were those mentioned by at least one other stakeholder. Consequently, at a system level, the list of strategic factors was reduced to 190. Within this pool of factors, roughly one-third were common to all stakeholders, while less than 20% were specific to particular stakeholders. Shared factors accounted for approximately 50% of the analysed factors. These shared factors hold significance when examining stakeholders from a specific perspective or interest. For

instance, Acquirers might be interested in identifying areas of overlap with other stakeholders. While this type of analysis could be expanded further, it is not explored in detail within this thesis.

	A	B	M	P	R
A		49	58	82	42
B			58	57	50
M				62	45
P					41
R					

	A	B	M	P	R
A		26%	31%	43%	22%
B			31%	30%	26%
M				33%	24%
P					22%
R					

TABLE 5.19 SHARED FACTORS BETWEEN ANY TWO STAKEHOLDERS

The stakeholders with the highest degree of similarity are Acquirers and Payment Networks. These stakeholders exhibit similar capabilities as they both provide the technological infrastructure necessary for the payment network to function. In the following section, the analysis will delve into the various pertinent factors, considering both quantitative and qualitative perspectives.

5.3.2.2 Integrated strategic reports' categorization and clustering

In this section, we will begin by summarizing key categorization and clustering statistics, which are presented in detail in Tables and Figures found in Appendix C. Subsequently, a concise overview of the notable findings related to strategic factors will be provided. You can visually explore the results of strategic factors categorization and clustering in Figures 5.19 to 5.21. The organisation clusters will be referred to by their respective initial letters: Acquirers (A), Banks (B), Merchants/Retailers (M), Payment Networks (P), and Regulators (R). Out of the total 505 identified factors, 190 (equivalent to 37.62%) represent those that are common among all stakeholder organisations.

In the *PESTEL categorization*, the most frequent category is **Technological and Methodological**, accounting for 13.07% of the factors, followed by **Political and organisational** at 10.10%, and **Environmental and Societal** at 4.36%. it is worth noting that Merchants and Regulators mention more factors related to **Political and**

organisational aspects than **Technological and Methodological** factors. Acquirers emphasize **Economic and Financial** as well as **Socio-Cultural and Demographic** factors more than **Environmental and Societal factors**. Payment Networks, on the other hand, mention a higher number of **Socio-Cultural and Demographic** factors compared to **Environmental and Societal** factors.

In terms of *stakeholder categorization*, the majority of factors (30.53%) focus on Customers, followed by 21.05% on Investors and Board, and 17.37% on Regulators, Governments, and Policy Makers. it is interesting to observe that Banks and Merchants/Retailers both mention more factors related to Colleagues compared to Investors and Board (in the case of Banks) and Regulators, Governments, and Policy Makers (in the case of Merchants).

The *organisational clustering* of strategic factors reveals that 36.04% of these factors are shared by all stakeholders, indicating a high level of commonality. Additionally, 15.64% of the factors are shared by four stakeholders, 16.04% by three stakeholders, 14.26% by two stakeholders, and 18.02% are specific to individual stakeholders.

Among the clusters shared by four, three, and two stakeholders, the largest clusters include BPR with 5.94% of the factors, ABMP with 4%, AP with 3.96%, AR with 3.76%, BMPR with 3.37%, and AMPR with 2.38%. These clusters are primarily composed of factors related to the **Technological and Methodological** category, highlighting the significance of technological aspects in the stakeholders' strategies.

When comparing all the shared factors without tiering them, the stakeholders that are most similar are Acquirers and Payment Networks, with 43% of the identified factors in common. On the other hand, Regulators have the least similarity with Acquirers and Payment Networks, sharing only 22% of the factors. The majority of these shared factors are found in the **Technological and Methodological** category, followed by the **Political and organisational category**, and then the **Environmental and Societal** category. This indicates a strong alignment between Acquirers and Payment Networks in their strategic focus, while Regulators have a distinct set of factors in their strategies.

The following paragraphs provide a detailed analysis of the PESTEL categorization and clustering for all shared initiatives, as illustrated in Figures 5.19 to 5.21. For a more in-depth PESTEL tiering analysis, please refer to Figures 5.1 to 5.6.

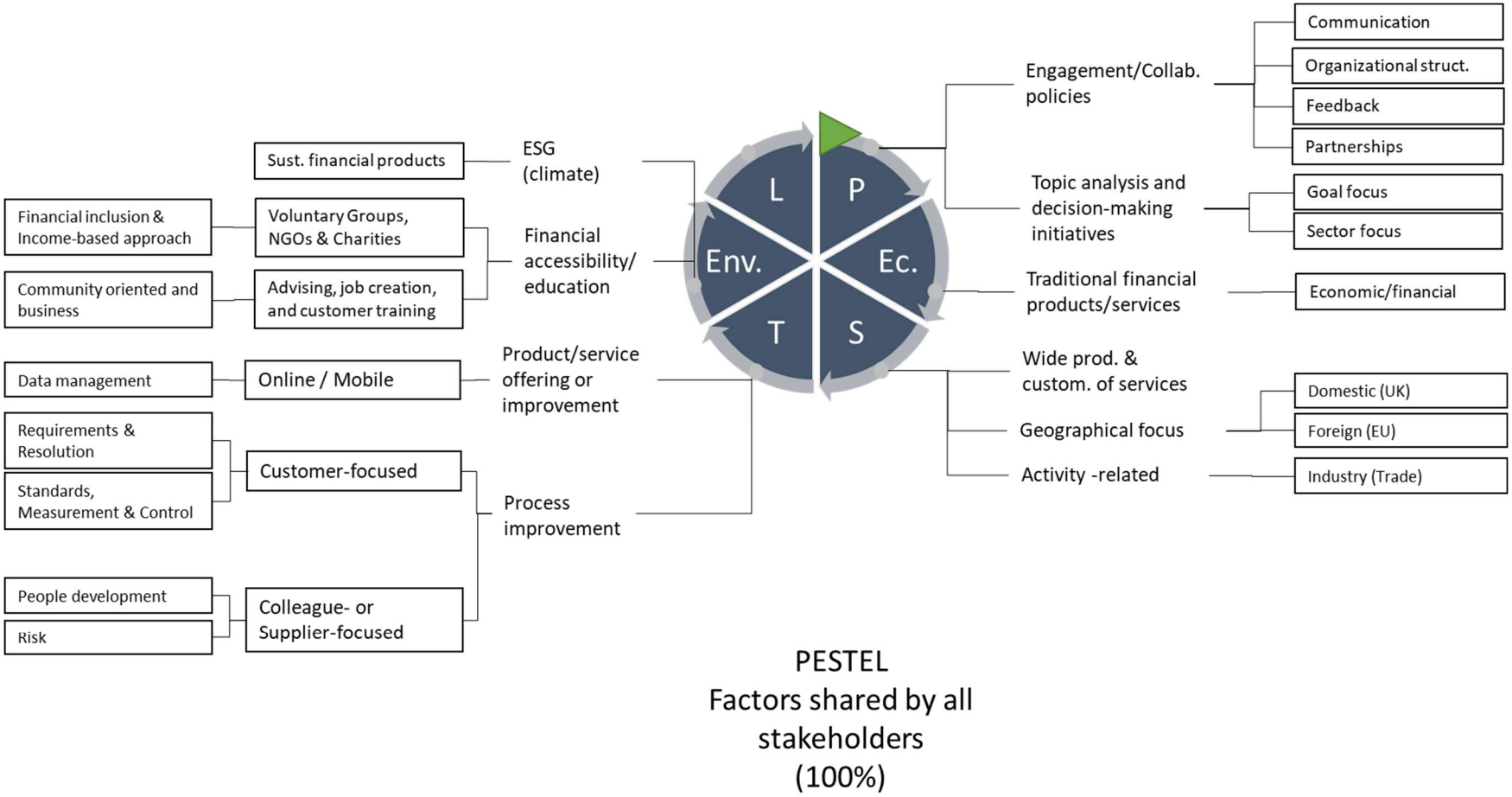


FIGURE 5.19 STRATEGIC FACTORS SHARED BY ALL STAKEHOLDERS

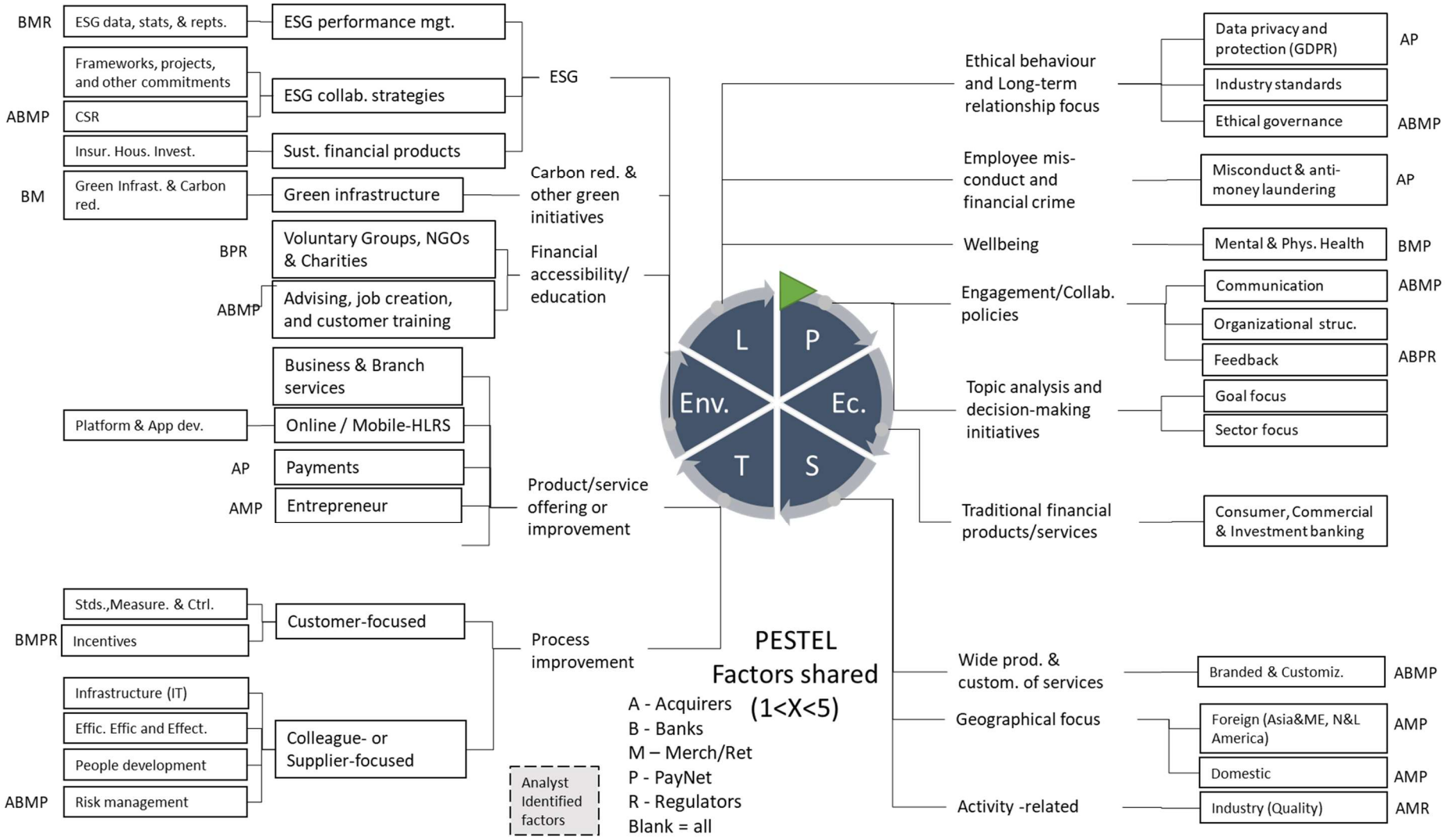


FIGURE 5.20 STRATEGIC FACTORS SHARED BY 4,3, AND 2 STAKEHOLDERS

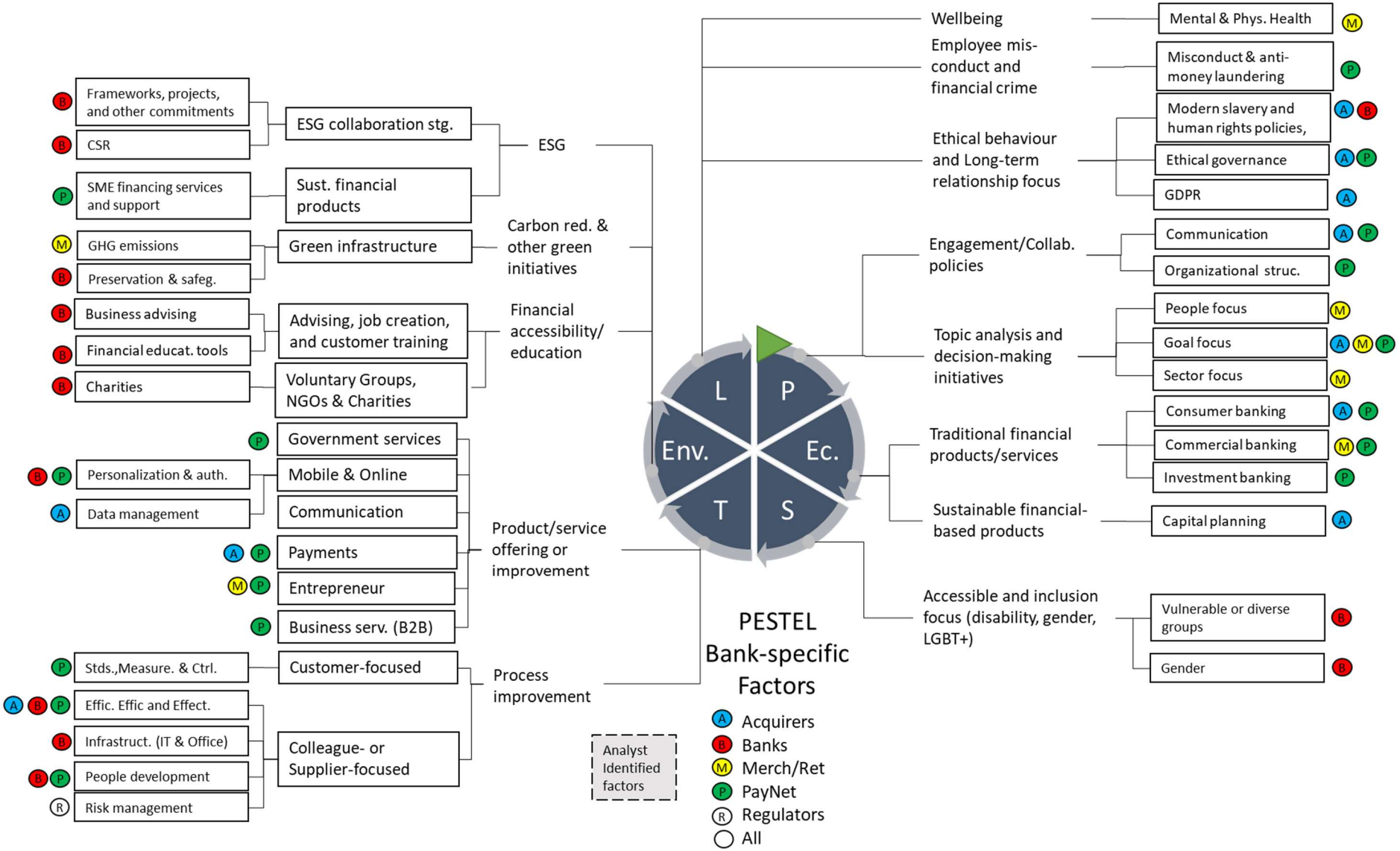


FIGURE 5.21 STRATEGIC FACTORS STAKEHOLDER SPECIFIC

Technological and Methodological (T&M)

Common Factors

In the **Technological and Methodological (T&M)** category, the shared factors among all stakeholders include the following:

- *Process Improvement:* Within the People Development subcategory, they highlight Training and skilling, along with a focus on Requirements.
- *Risk*: Common mention of an Enterprise Risk Management Framework capability.
- *Standards, Measurement, and Control:* References to Assessments and reports, as well as a Review capability.
- *Product and Service Offering/Improvement:* Emphasis on Data management.

These factors collectively demonstrate a shared focus on enhancing processes, managing risks, adhering to standards, and improving products and services across all stakeholders.

Shared initiatives involving two, three, or four stakeholders

For shared factors among two, three, and four stakeholders within the *Process improvement* category, there is a consensus on prioritising Efficiency, effectiveness, and efficacy. This is exemplified by initiatives like Fast convenience services (AMP) and operational improvement through Simplification (BMP), as well as process streamlining (ABP) and Customer feedback (AMR).

In the realm of *People development*, the focus includes Colleague engagement policies (BM), Expert leadership development (BMP), and Recruitment programs (AMP). Vendor management (AP) and Career development (AP) are also noted, alongside Colleague support (BMR).

Risk management highlights the need for robust Fraud capabilities (ABP), a solid Mitigation approach (AP), and an assessment of Risk impact (ABMP).

Under *Standards, measurement, and control*, stakeholders document an Audit capability (MR), adherence to Industry standards (AP), and a Monitoring capability (ABPR). Surveys (BR) and Analytics insights (AP) contribute to Performance goals' measurement (BMPR), along with a Project or programme approach (BR).

Incentives are represented through Customer reward programs (BMPR), signifying a commitment to customer engagement and retention.

Physical service improvements, particularly within *IT infrastructure*, are addressed through Cybersecurity and data protection (AMPR), IT and communications improvements (AP), and Branch store service improvement and automation (ABM), reflecting a drive towards enhancing digital and physical customer interfaces.

In *Product and service offering or improvement*, under *Entrepreneurial capabilities*, they include Mergers and acquisitions (AMP). In the *Mobile/Online* domain, they highlight Platform portal development (ABMP), Mobile banking (ABMP), Digital bank (ABMP), Fintech (AP), and Online banking (AMPR) capabilities.

In *Payments* category, they include Credit card (AP), Electronic payments (AP), Merchant acquiring solutions (AP), and Transaction processing (AP) initiatives.

Stakeholder-specific initiatives

For stakeholder-specific initiatives, particularly those aimed at *Process improvement*, the focus is on enhancing *Efficiency, effectiveness, and efficacy*. These initiatives prioritise Collaboration Improvement (B) to strengthen teamwork and cooperation by Banks; Operational Improvement with a Cost Focus from Acquirers (A), allowing to streamline operations to minimise expenses; Banks' Operational Improvement with an Efficiency Focus (B) to maximise operational efficiency; Operational Improvement with a Service Focus (P) from Payment Networks, enhancing Service quality; and a general Process Improvement (A) from Acquirers, optimising processes for greater effectiveness.

In the area of *People Development*, the Payment Networks' emphasis is on nurturing talent and leadership, with a spotlight on Employee Leadership Development Program

(P). While Banks' foster leadership skills among employees, with Coaching and Mentoring (B) programmes that provide guidance and promote growth. As well, they use Colleague Surveys (B) to gather valuable feedback from colleagues, and People Digital Capabilities Development (B) to enhance employees' digital skills.

Within the domain of *Risk Management*, the central focus of Retailers is on Resilience (R), ensuring the ability to adapt and withstand challenges.

In the sphere of *Standards, Measurement, and Control*, the Payment Networks' emphasis is on harnessing advanced technology. Using Machine Learning and Artificial Intelligence (P) to leverage cutting-edge technology for improved decision-making. When it comes to enhancing their *Product and service offerings*, they focus on nurturing Entrepreneurial capabilities. This includes fostering a culture of innovation through Innovation Programs (P). While Merchants explore new business opportunities through Ventures (M).

In the digital *Online/Mobile* landscape, Banks tailor experiences for individual users with Personalization (B) capabilities, ensuring secure access through Authentication (B), and supported by enhanced security through their supply chain with Biometric Authentication from Payment Networks (P). Efficient *Data management* is crucial, and Acquirers highlight Data Processing (A) to manage and process data effectively.

In the realm of *Payments*, they offer a comprehensive range of services to meet diverse needs. Acquirers (A) provide easy access to Cash Services (A) through ATMs and Banking Collection Services (A) to streamline collection processes.

Payment networks provide Card Issuance Services (P) to provide and oversee payment cards through Payment Integration Capabilities (P) to integrate various payment systems seamlessly. Enhancing point-of-sale experiences with a POS Focus (P). They also facilitate international transactions with Cross-Border Payment Solutions (P). For managing and processing checks, they offer Check Services (P). In the sphere of *Business services*, they offer Business Solutions (B2B) (P) to cater the specific needs of business clients.

Environmental and Societal

Common factors

In the classification of **Environmental and societal factors**, stakeholders unanimously prioritise an ESG (Environmental, Social, and Governance) approach.

Pertaining to *Financial accessibility and education*, areas such as Advising, Job creation, and Customer training are highlighted. These components are seen as essential in fostering financial empowerment and literacy. Notable initiatives within this context include Community Financial Education programs and the Strategic commitments made to further these goals.

Moreover, *Voluntary groups, NGOs, and charities* demonstrate a pronounced focus on Income-based initiatives, addressing societal needs with a specific lens on the economic circumstances and income levels of the communities they serve.

Shared initiatives involving two, three, or four stakeholders

When examining shared factors among two to four stakeholders, there is a clear consensus on the importance of initiatives aimed at *Carbon reduction and other green initiatives*. Notably, Green Infrastructure (BM) and Carbon reduction (BM) plans are recognised by multiple stakeholders, with specific emphasis on developing innovative business models.

Under the *ESG* umbrella, there is a concerted effort towards *Collaboration strategies*, seeking to harness the power of partnerships to effect meaningful change. While *Corporate Social Responsibility (CSR)* is characterised by a distinct focus on Supply chains or suppliers (ABMP), reflecting the commitment to responsible practices throughout the entire value chain.

Further, in the realm of *Frameworks, projects, and other commitments*, stakeholders acknowledge the role of ESG partnerships and trusts (AMPR), with a subset highlighting ESG Principles (BR) and Sustainable Initiatives (BMR). *ESG performance management*, along with the analysis of *ESG data, statistics, and reports*, is exemplified by capabilities

in Climate change risk management (BMR). These initiatives emphasise the importance of ethical and sustainable business practices and addressing climate-related challenges.

In the area of *Financial accessibility and education,* which encompasses *Advising, job creation, and customer training*, there are mentions of Community financial accessibility programmes (ABP) and Financial educational tools (M). These efforts are aimed at promoting financial literacy and empowering individuals and communities.

Lastly, the contribution of *Voluntary Groups, NGOs, and Charities* includes establishing Foundations and fundraising programs (BPR). These social enablers reflect their ethical missions, enabling them to positively impact and support their initiatives effectively.

Stakeholder-specific initiatives

Stakeholder-specific factors within the domain of *Carbon Reduction and other green initiatives*, particularly in the subcategory of *Green Infrastructure*, include Preservation and safeguarding (A) by Acquirers, and GHG emissions management (M) by Merchants.

Within the broader scope of ESG, and specifically in CSR, the development of a Corporate Responsible culture (B) is highlighted by Banks.

Moreover, the discussion on *Frameworks, projects, and other commitments* brings to the fore ESG groups and committees (B) by Banks, signifying a structured approach to governance. The sector of *Sustainable financial products* is enriched by ESG SME-oriented financing services and support (P) of Payment Networks, indicating a tailored financial strategy for small and medium-sized enterprises (SME).

Focusing on *Financial accessibility & education*, particularly within *Advising, job creation, and customer training*, Retailers contribute Business advising (R), and Merchants reiterate the importance of Financial educational tools (M). Within the activities of *Voluntary Groups, NGOs, & Charities*, there is a distinct emphasis on Charities (B) by Banks, reflecting a philanthropic commitment.

Within the domain of *Carbon Reduction and other green initiatives*, stakeholders exhibit distinct factors, especially in the subcategory of *Green Infrastructure*. Notably, Acquirers

emphasise Preservation and Safeguarding (A), demonstrating a strong commitment to preserving natural resources and safeguarding the environment. Additionally, Merchants focus on GHG Emissions Management (M), indicating a concerted effort to manage and reduce emissions effectively.

Expanding into the broader landscape of *ESG* particularly within *Corporate Social Responsibility (CSR),* Banks underscore the importance of fostering a Corporate Responsible Culture (B).

Furthermore, when exploring *Frameworks, Projects, and other Commitments,* Banks prioritise the establishment of ESG Groups and Committees (B), showcasing their commitment to structured governance and accountability.

In the sector of *Sustainable Financial Products*, Payment Networks enrich the landscape with offerings such as ESG SME-Oriented Financing Services and Support (P). This signifies a tailored financial strategy designed to empower and support small and medium-sized enterprises (SMEs) in their sustainability initiatives.

Shifting focus to *Financial Accessibility and Education*, particularly within *Advising, Job Creation, and Customer Training*, Retailers actively contribute to Business Advising (R), providing valuable guidance and support to businesses. While Merchants also emphasize the importance of Financial Educational Tools (M) to promote financial literacy and empower individuals and communities.

Lastly, within the activities of *Voluntary Groups, NGOs, and Charities*, Banks emphasize on Charities (B), reflecting a philanthropic commitment to supporting various social and humanitarian causes.

Socio-cultural and Demographic

Within the **Socio-cultural and Demographic** classification, all stakeholders unanimously concentrate on initiatives that are *Activity-related* or *Industry-specific*, with a notable emphasis on Trade. This collective emphasis highlights the importance of addressing societal and demographic considerations that intersect with various business activities.

Geographically, stakeholders adopt a multifaceted approach. Their attention spans across different regions, with a significant focus on Europe as a whole. Additionally, there is a particular emphasis on the United Kingdom, indicating a keen interest in the specifics of this geographical area. Furthermore, their scope extends beyond domestic boundaries to encompass Foreign and International spheres.

Shared initiatives involving two, three, or four stakeholders

Stakeholders converge on the importance of *Accessibility and Inclusion, specifically addressing the needs of disability, gender, and LGBT+* communities, related with *Vulnerable or diverse groups*, with a particular emphasis on the overarching goal of Inclusion (BP). It underscores their collective effort to create an inclusive and diverse environment that values all individuals.

When discussing *Activity-related* or *Industry* factors, there is a consensus on maintaining a Quality focus (AMR), ensuring that quality standards are upheld.

When it comes to *geographical* considerations, stakeholders recognize the significance of catering to the Domestic market (AMP), acknowledging the importance of addressing local needs and preferences. Simultaneously, their vision extends internationally, with a particular focus on regions such as Asia and the Middle East (AMP), Latin America (AP), and North America, notably the United States (AP). This global perspective underscores their commitment to serving diverse markets and regions.

Furthermore, in the context of offering a *Wide product and customization of services*, stakeholders articulate a strategy centred on a Wide Product Service Range (AM), highlighting their intent to provide a comprehensive array of offerings. Within this strategy, there is a notable emphasis on Branded Products (BMP), signifying their commitment to delivering products and services with a strong brand identity.

Stakeholder-specific initiatives

Stakeholder-specific factors within the focus of *Accessibility and Inclusion*, particularly concerning disability, gender, and LGBT+ considerations, are addressed by Banks

through initiatives aimed at achieving Gender balance (B) and promoting Gender diversity (B). These initiatives underscore their dedication to creating an inclusive environment that values and supports individuals of all genders and identities.

Moreover, when addressing the unique needs of *Vulnerable or Diverse Groups*, Banks prioritize two essential aspects. First, they are committed to providing Accessible Services (B), ensuring that their offerings are easily accessible to everyone. Second, they actively work to foster Multicultural Diversity (B), recognizing the importance of embracing and celebrating diverse cultures within their initiatives. These efforts exemplify their commitment to inclusivity and support for a wide range of individuals and communities.

Political and organisation

Common factors

Within the **Political and organisational** category, stakeholders collectively emphasise *Engagement and Collaboration policies*. This is particularly evident in their *Communication capabilities*, which are manifested through Events, Reports, and Statements.

When it comes to *Feedback Sources*, especially in the context of *Regulator Collaboration*, stakeholders adopt a structured approach guided by a Regulatory framework. In the domain of *organisational Structure*, with a specific focus on *Group Membership*, stakeholders highlight their *Membership capabilities*. This encompasses aspects like the frequency and productivity of Meetings, as well as the establishment of valuable Partnerships and Alliances.

Venturing further into *Topic Analysis and Decision-Making*, with a particular emphasis on *Goals*, stakeholders explicitly mention a Credit focus, demonstrating their commitment to financial stability, alongside a focus on Regulation and Compliance, highlighting their dedication to adhering to regulatory standards.

Furthermore, under the purview of *Sector* focus, stakeholders underscore their unwavering commitment to the ever-evolving realms of Technology and Innovation, recognizing their significance in shaping the future landscape.

Shared initiatives involving two, three, or four stakeholders

Stakeholders have come together to identify shared initiatives in the realm of *Engagement and Collaboration policies*, particularly within *Communication* capabilities. In the *Performance* subcategory, they unanimously prioritize a Cultural focus (BP) to foster a shared organisational culture. Additionally, they place significant emphasis on Financial Statements (AMP) as a crucial aspect of their reporting efforts.

When it comes to *organisational Structure* factors, there is a consensus on the importance of Committees (BR), Groups, Forums, and Centres (BMPR), and Teams (BMPR) as mechanisms for collaboration and decision-making. Stakeholders also underscore the significance of effective Union Partnership Communication and Negotiations (AMPR). Licensing (AP) is noted as a valuable component of their partnership strategies.

In the domain of *Topic Analysis and Decision-Making*, stakeholders address a range of *Goals* with a specific focus on *Risk Management*. They collectively recognise the importance of considering Economic Sanctions (AMP), Geopolitical Risk (AP), Market Risk (AR), and Material Adverse Effects (AP) when making strategic decisions.

Additionally, their general goals encompass a wide array of strategies, including Collaborative (ABR), Competitive (ABMP), Consumer (BMP), Employment and job creation (BM), Learning and training for employees (BR), Lending (ABPR), as well as tackling Negative views (AP), Office location (ABMP), Political issues (AMP), and Positive views (BM). This diverse set of goals reflects their comprehensive approach to decision-making and strategic planning.

In the Sector focus, shared initiatives highlight a wide range of sectors, including Government (AMPR), Merchant (AP), Retailing (ABMP), and Third-Party Suppliers (ABPR). These sector-specific focuses demonstrate the stakeholders' diverse interests and strategies as they navigate various industries and segments.

Stakeholder-specific initiatives

In the context of specific initiatives tied to *Engagement and Collaboration policies*, and more precisely within *Communication* capabilities, the inclusion of Councils (A) by Acquirers is noted. These Councils play a pivotal role in the communication strategy, fostering engagement and collaboration across various levels of the organisation.

Within *organisational Structure* factors, under the *Partnerships* subcategory, Sponsorships (P) are specifically mentioned by Payment Networks. These serve as a cornerstone of different collaborative efforts, allowing to forge strategic partnerships that drive their mission forward.

As part of *Topic Analysis and Decision-Making*, with respect to a Goals' focus in the Risk subcategory, Payment Networks discussions touch upon the Corrupt Practices Act (P), Liquidity Risk (P), Reputational Risk (P), and overarching Risk Management (P). While Acquirers highlight Internal Control (A) capabilities. These measures are integral to risk mitigation efforts.

General goals include Corporate Governance (M) and Joint Ventures (M) by Merchants, and a focus on Payments (P) from Payment Networks. These goals reflect a commitment to maintaining strong corporate governance standards and exploring collaborative ventures, all while enhancing payment capabilities.

Within the *People's* focus, Merchants' attention is drawn to a CFO focus (M) and a Shareholder focus (M). These are pivotal roles in every organisation's success, and their needs and expectations need to be prioritised. Lastly, their *Sector* focus sheds light on the Food Industry (M).

Ethical and Legal

Shared initiatives involving two, three, or four stakeholders

Within the **Ethical and Legal** category, stakeholders, in groups of two, three, and four, have identified shared initiatives related to *Employee Misconduct and Financial Crime*, specifically focusing on *Misconduct and Anti-Money Laundering policies*, where they

collectively emphasize Anti Money Laundering (AP) as a critical component of their compliance efforts.

In the *Ethical Behaviour and Long-Term Relationship* focus, particularly related to *Data Privacy and Protection* under *GDPR*, stakeholders prioritize both Data Privacy and Protection (AP) and Intellectual Property (AP) to ensure the ethical handling and safeguarding of sensitive information.

In *Ethical Governance*, stakeholders highlight the importance of Ethical Values Governance (BP) and a Long-Term Approach (ABMP) to guide their decision-making and corporate governance practices, emphasizing ethics and sustainability.

Within *Industry Standards*, they emphasize Policymaking (BR) and Treasury Policy (AMR) to ensure compliance with industry norms and regulations. Additionally, in *Tax Policies*, they include factors such as a Tax Code of Conduct (ABMP) to uphold ethical taxation practices.

When it comes to *Wellbeing*, particularly related to *Fair Payment and Reward Policies*, stakeholders place significant emphasis on the Fair Payment and Reward (BMPR) to ensure fair and equitable compensation practices.

Finally, in the domain of *Mental and Physical Health*, they underscore Employee Mental and Physical Health and Safety (BMP) to prioritize the well-being and safety of their workforce.

These shared initiatives underscore the stakeholders' commitment to ethical, legal, and responsible business practices across various facets of their operations.

Stakeholder-specific initiatives

In term of specific initiatives, stakeholders address *Employee Misconduct and Financial Crime*, particularly within *Misconduct & Anti-Money Laundering* policies, Payment Networks specifically mention the need to combat Corruption (P). This highlights their commitment to ethical conduct and anti-corruption efforts.

Within the *Ethical Behaviour and Long-Term Relationship* focus, especially related to *Data Privacy and Protection under GDPR*, Acquirers emphasize a General Data Protection Regulation focus (A). This underscores their dedication to compliance with data privacy regulations and protecting the privacy of individuals.

In *Ethical Governance*, Payment Networks and Acquirers extend their efforts to uphold ethical standards by addressing various areas, including Antitrust Law (P), Credit Reporting (A), Deposit Insurance (A), and Fair Debt Collection (A). These initiatives reflect their commitment to legal and ethical governance practices.

In *Modern Slavery and Human Rights* policies, Acquirers and Banks take a comprehensive approach by including Counterterrorism (A) and Modern Slavery (B) policies. This multifaceted approach underscores their dedication to addressing and combatting various forms of human rights violations.

Within the domain of *Wellbeing*, specifically within *Mental & Physical Health*, Merchants prioritize Health-focused products (M), demonstrating their commitment to promoting the well-being and health of their employees and customers.

These specific initiatives showcase the stakeholders' dedication to ethical, legal, and responsible business practices across a wide range of areas, reflecting their commitment to ethical governance, compliance, and the well-being of individuals and communities.

Economic and Financial

Common factors

On the ***Economic and Financial*** category, all stakeholders mention an Economic and Financial focus.

Shared initiatives involving two, three, or four stakeholders

In terms of shared initiatives by two, three, and four stakeholders, they converge on shared initiatives in the following areas:

- *Commercial Banking (Traditional Financial Products and Services):* They emphasize Transaction Fees (AP) as a key consideration in their financial products and services offerings.

- *Consumer Banking:* Their shared initiatives revolve around improving and automating the Mortgage Process (ABR) and focusing on Debt Management (BM) to better serve their consumer banking customers.

- *Investment Banking:* In the realm of investment banking, they highlight Asset Finance (ABR), Investment Products and Services (AB), and Stock Market Initiatives (AP), demonstrating their commitment to offering a wide array of investment options and services.

Stakeholder-specific initiatives

In respect of stakeholder-specific initiatives, related to *Sustainable Financial-Based Products*, Acquirers emphasise Capital Planning (A) and Financial Planning Health (A) to ensure sustainable financial products and services.

In the domain of *Traditional Financial Products/Services*, within Commercial Banking, a specific focus on Cash Flow (M) from Merchants is noted, as well as a mention of Interchange Fee Rates (P) by Payment Networks to address financial considerations.

Acquirers address *Consumer Banking* with a focus on Debt Reduction Collection Capabilities (A), while Payment Networks use Pricing Practices (P) to serve their consumer banking customers better.

In the context of *Investment Banking,* Payment Networks highlight an Investment Banking Focus (P), indicating their commitment to serving the needs of clients in the investment banking sector.

5.3.2.3 Integrated strategic reports' systemigram

For the Systemigram development, first, a categorisation of the different factors was used with the "Playing to win" framework, as seen in Table 5.20.

	Systems (Infrastructure)	Capabilities (Process)	How we will win?	Where we will play?	Winning aspirations
Definition	Support systems structures, and measures	Set of reinforcing activities and specific configuration	Value proposition and competitive advantage	Geographies, product categories, costumer segments, channels, vertical stages of production	Purpose or guiding aspirations
Factors	- Training & skilling -Enterprise Risk Management Framework - Performance management (Assessment, reports, review, &statements) - Data management - Events & Meetings - Partnerships Alliances	Costumer Membership & Rewards programs Community financial education	Regulator collaboration & compliance Strategic commitments Credit focus	Trade focus UK, Europe & International Technology & innovation focus Income based focus	ESG approach Economic & Financial focus

TABLE 5.20 PAYMENT SYSTEM'S INTEGRATED "PLAYING TO WIN" DECISION-BASED FRAMEWORK CATEGORIZATION

Then, the Systemigram prose was developed, as seen in the next paragraphs, alongside, the Systemigram graphic and complete storyboard, as seen in Figures 5.22.A to F.

Stakeholders within the UK Retail Payment System have observed an uptick in *Regulator collaboration and compliance*, particularly with respect to Information Disclosure & Industry Standards, coupled with the integration of Customer Feedback. Two principal areas have been identified. Firstly, *ESG initiatives*, with a particular focus on *Sustainable Products and Services*. Their commitment extends to Climate and Health-focused initiatives, underscoring their dedication to sustainability and societal well-being. Furthermore, they prioritise Community Financial Education programs with a particular emphasis on addressing Income-based demographics, aiming to enhance financial literacy and inclusivity. Secondly, they recognise the pivotal role of Credit, Debt, or Lending Services, especially within the capital-intensive Trade sector. Their particular attention is directed towards the Retail segment, with a strong focus on Small and Medium-sized Enterprises (SMEs). This underscores their commitment to supporting the financial needs of SMEs, contributing to economic growth and resilience.

Strategic Business Plans have been formulated with a spotlight on Technology and Innovation as well as Colleague Development, in harmony with the increasing trend towards Partnerships and Alliances that align with Coopetition practices.

The *Technology and Innovation strategy* strongly emphasises IT Infrastructure Development, which includes robust measures for Data Management and Privacy. Stakeholders prioritize enhancing Cyber Security measures to protect sensitive information. Furthermore, they are dedicated to advancing Online and Mobile Platforms, which also encompasses investments in Social Media and Fintech. Of particular note, they are keen on leveraging emerging technologies such as Machine Learning, Artificial Intelligence, and Cloud capabilities to stay at the forefront of innovation.

In tandem with their technology efforts, stakeholders place considerable importance on *Colleague Development*. This strategy centres on providing Mentoring and coaching support to nurture leadership skills. There is also a focus on Digital Learning, Training, and Skilling to empower colleagues with the necessary expertise and capabilities.

These strategic initiatives are carefully crafted to enhance decision-making processes by implementing robust *Performance Management Systems*. These systems play a pivotal role in overseeing various aspects, including:

- *Definition, Measurement, and Monitoring of Goals*: Performance Management Systems are instrumental in defining clear and measurable goals. They actively monitor progress towards achieving these goals, ensuring stakeholders stay on course.

- *Review and Assessment*: These systems facilitate the regular review and assessment of performance. This ongoing evaluation is vital for identifying areas of improvement and making necessary adjustments.

- *Data and Statistics*: Performance Management Systems rely on a wealth of data and statistics to inform decision-making. Tools such as Surveys and Reports provide valuable insights into key performance indicators and trends.

- *Auditing Capabilities*: Auditing capabilities are integrated into these systems to ensure compliance, accuracy, and transparency in all processes.

A crucial and integrated component within these systems is the Enterprise Risk Management Framework. This framework is specifically designed to address Climate Change Risks and prioritise the reduction of Risk Weighted Assets. It ensures that risk management strategies are aligned with the evolving landscape, including environmental and regulatory factors.

Support organisational infrastructure capabilities are also critical in two main areas: *Communication* and *Group Work*. In terms of *Communication*, the following capabilities are identified:

- Events: Stakeholders use events to foster engagement, share information, and collaborate with various stakeholders, including regulators, customers, and partners. These events serve as platforms for networking and knowledge sharing.

- Statements: Clear and informative statements are essential for conveying key messages, updates, and organisational positions. Statements help maintain transparency and accountability.

- Union Partnership Communications and Negotiations: Effective communication with union partners is vital for addressing labour-related matters, negotiating agreements, and maintaining productive labour relations.

- Meetings: Meetings facilitate direct discussions and decision-making processes among stakeholders. They provide opportunities to exchange ideas, align strategies, and address emerging issues promptly.

From *Group Work*, these are relevant capabilities:

- Committees: Committees are established to delve into specific topics or initiatives. They bring together experts and stakeholders with relevant expertise to collaborate on particular projects or challenges.

- Membership: Membership in industry-related associations or groups provides stakeholders with opportunities to contribute to industry standards, share best practices, and advocate for common interests.

- Teams: Teams are formed to work collectively on projects, often with a defined goal or objective. Cross-functional teams can bring diverse perspectives and skills to problem-solving and decision-making.

- Groups: Groups may focus on broader objectives within the organisation or industry, working together to achieve common goals or address industry-wide challenges.

- Forums: Forums serve as platforms for open discussions and knowledge sharing among stakeholders. They can be instrumental in addressing industry-wide issues and fostering collaboration.

- Centres: Centres may be dedicated to specific research, development, or innovation efforts. They play a central role in driving progress in critical areas.

Many of these *group work* capabilities align with specific goal development, such as adhering to the Task Force on Climate-related Financial Disclosures (TCFD).

Geographically, stakeholders in the UK Retail Payment System primarily focus on the domestic UK market, considering it as their core target. However, they also recognise the importance of extending their reach to Europe and other International regions. To achieve their goals and objectives, they employ effective Engagement strategies, using Rewards Programs to incentivise and engage customers, and leveraging the power of Social media, stakeholders engage with their audience through marketing campaigns and interactive content.

These capabilities facilitate effective collaboration and collective action among stakeholders, contributing to the achievement of shared objectives and the advancement of the UK Retail Payment System, not only geared towards achieving Economic Profitability but also focusing on broader objectives, including Social and Environmental Sustainability. Additionally, these strategies contribute to Operational Resilience, ensuring that the organisation can adapt and thrive in a dynamic and competitive environment.

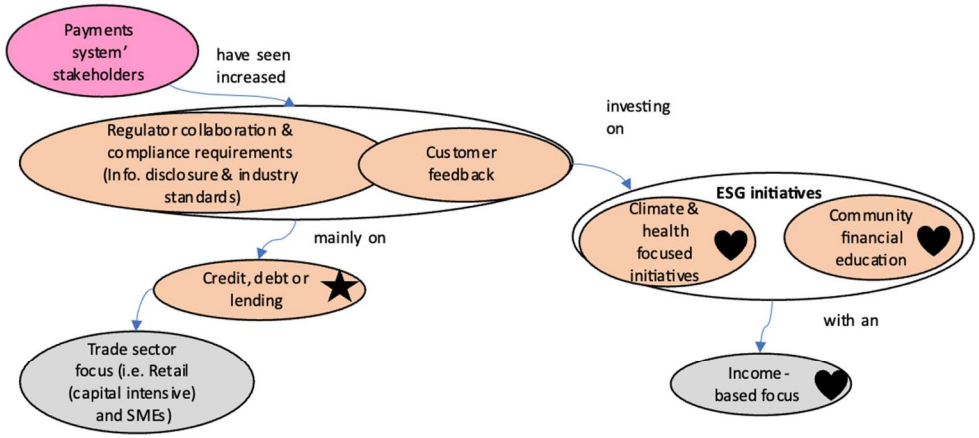


FIGURE 5.22.A. INTEGRATED PAYMENT SYSTEM SYSTEMIGRAM STORYBOARD

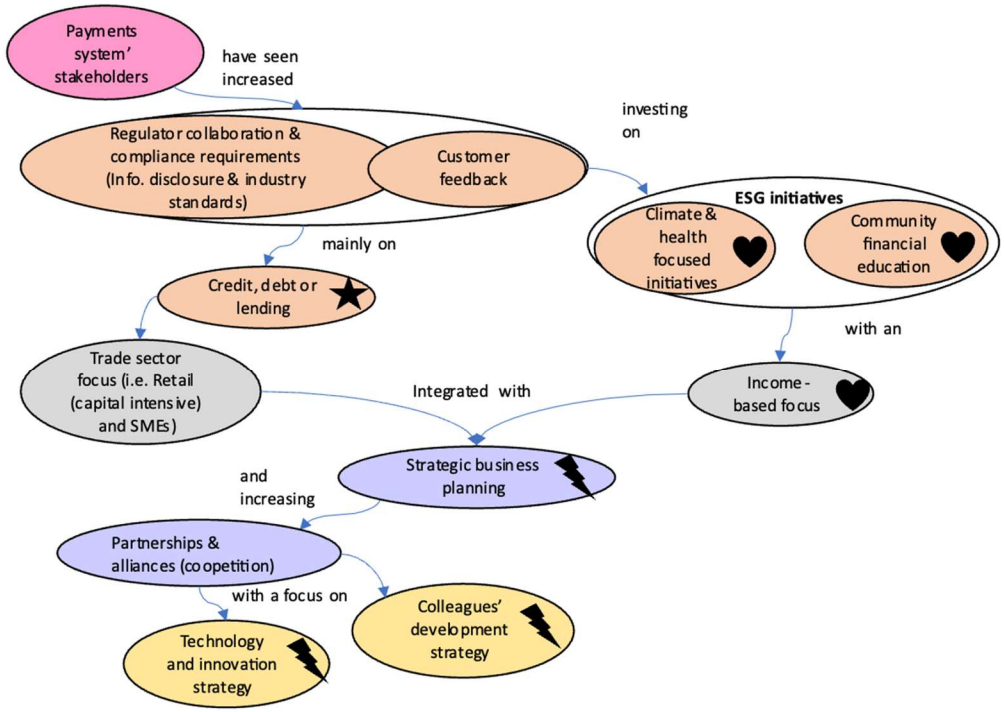


FIGURE 5.22.B INTEGRATED PAYMENT SYSTEM SYSTEMIGRAM STORYBOARD

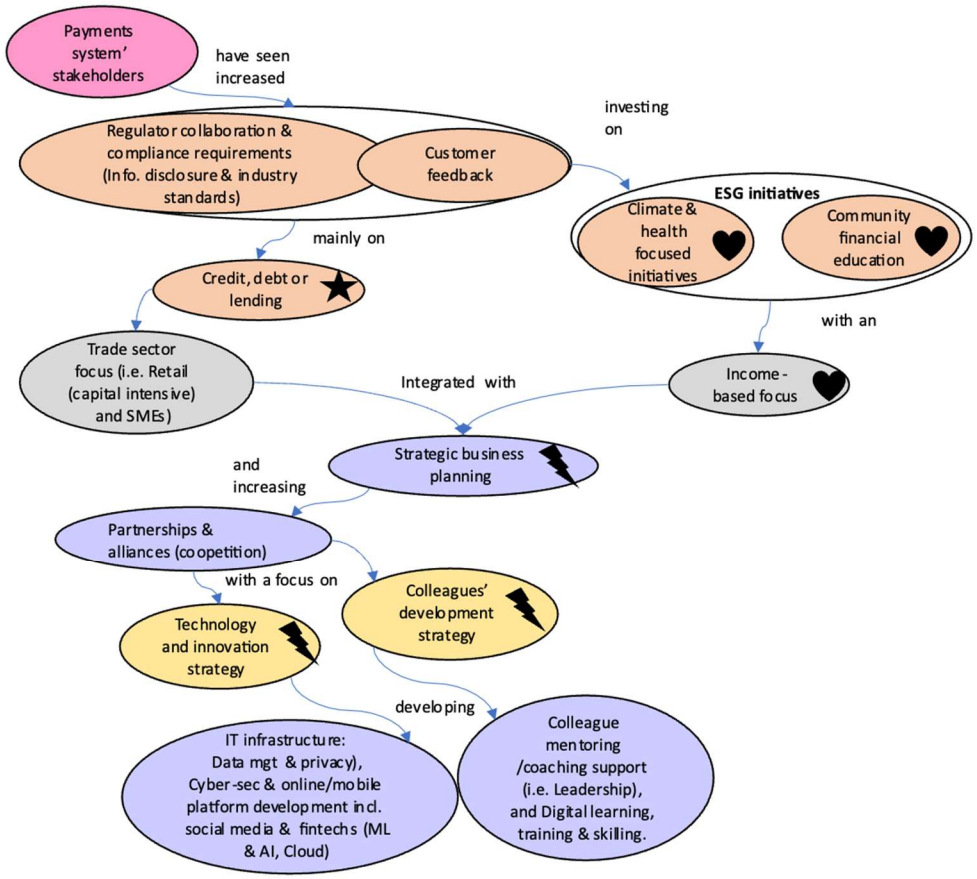


FIGURE 5.22.C INTEGRATED PAYMENT SYSTEM SYSTEMIGRAM STORYBOARD

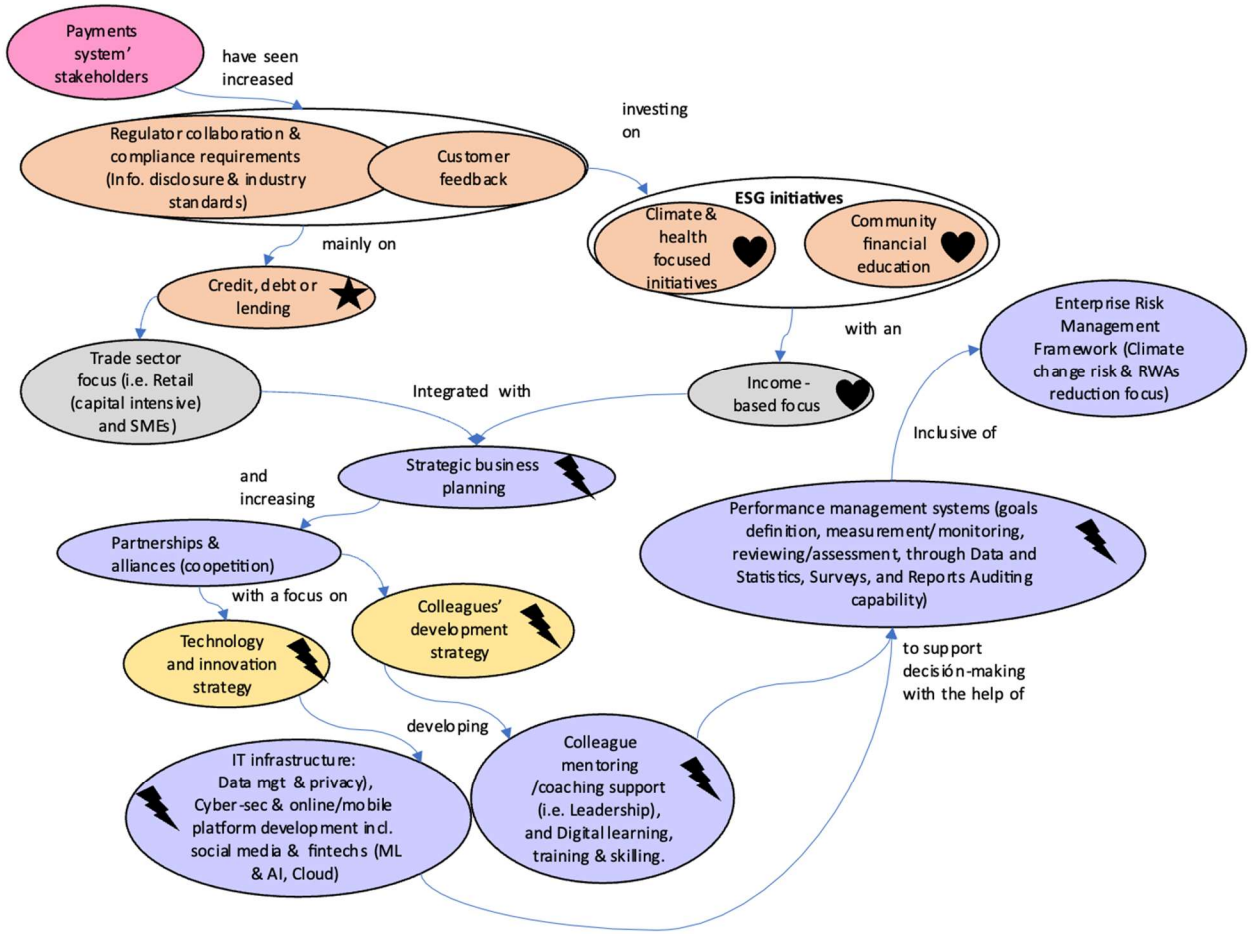


FIGURE 5.22.D INTEGRATED PAYMENT SYSTEM SYSTEMIGRAM STORYBOARD

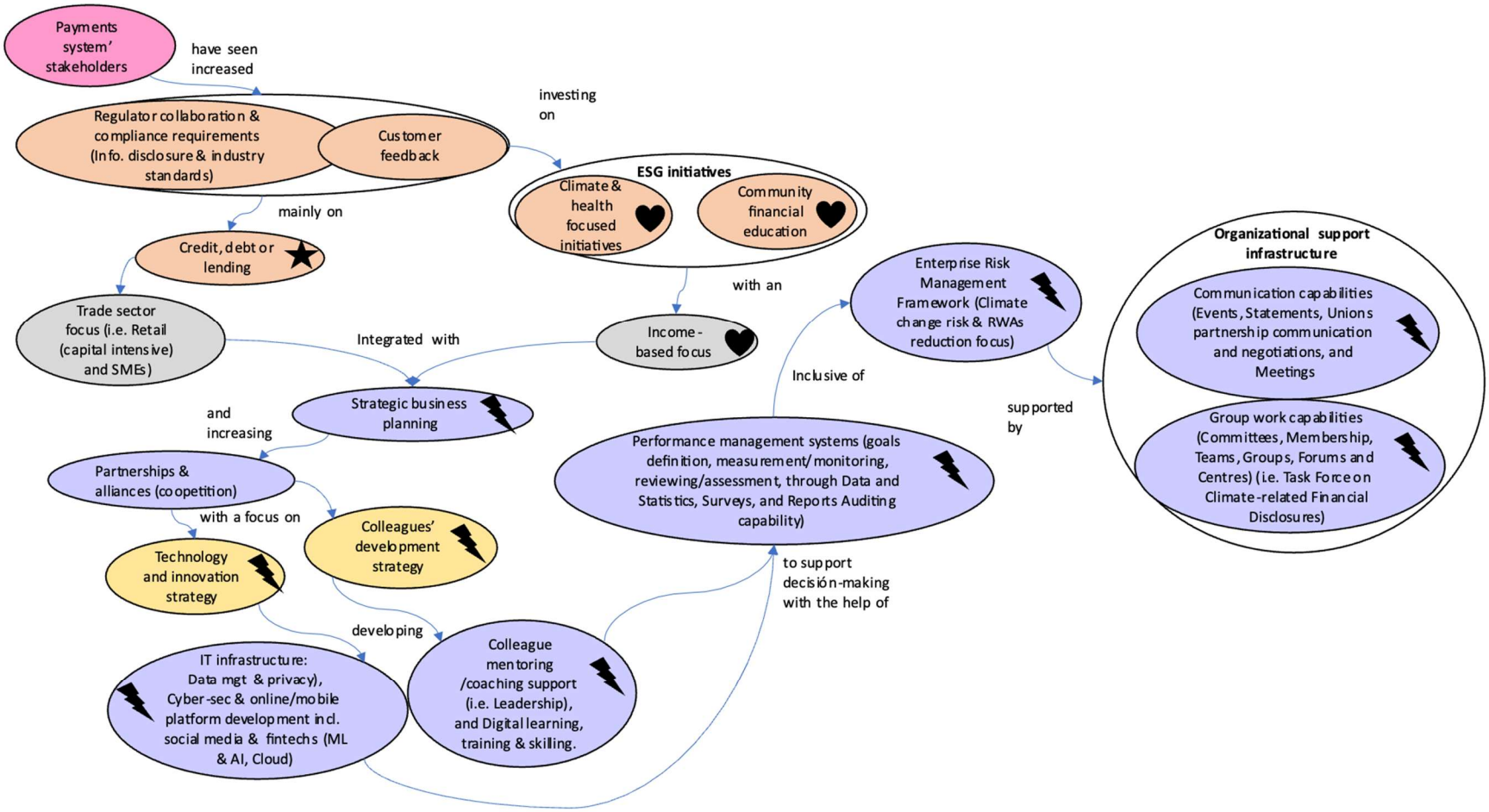


FIGURE 5.22.E INTEGRATED PAYMENT SYSTEM SYSTEMIGRAM STORYBOARD

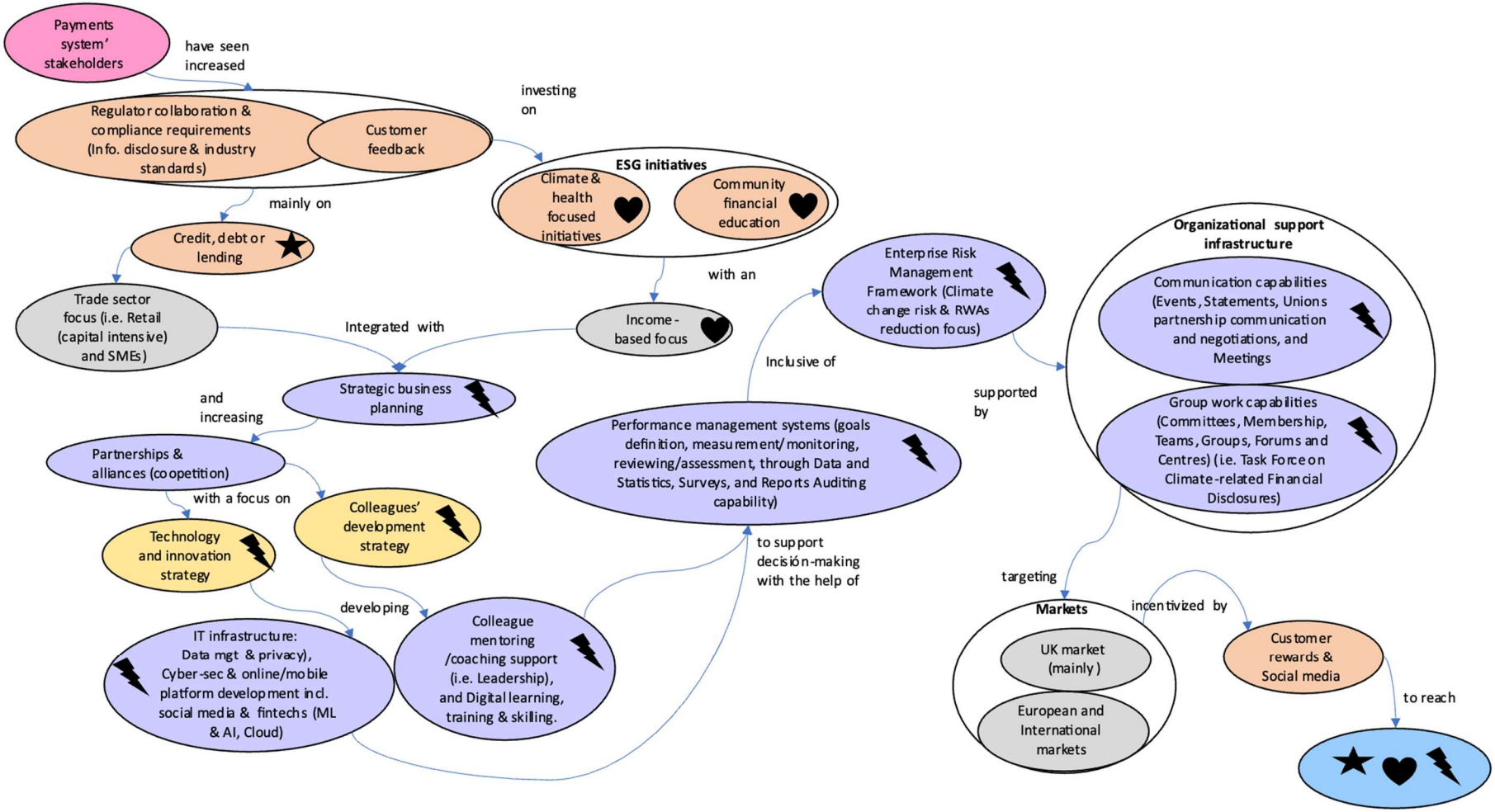


FIGURE 5.22.F INTEGRATED PAYMENT SYSTEM SYSTEMIGRAM STORYBOARD

5.3.2.4 Payment system's degree of operational resilience alignment and deep-dive findings

The following Figures 5.23 to 5.26 categorise the strategic factors extracted from strategic reports and analyst briefs of integrated payment systems. This categorisation is framed within the CERT® Operational Resilience Framework's areas and sub-areas, employing a taxonomy that distinguishes between common, shared, and specific clusters. A comprehensive discussion on these factors, examining their impact on RALF resilience attributes, is delineated in Section 5.4. This discussion synthesises insights drawn from academic literature and industry analyst reports. For a consolidated view of the strategic factors' interplay with resilience attributes and the corresponding references, please consult **Appendices E** and **F.**

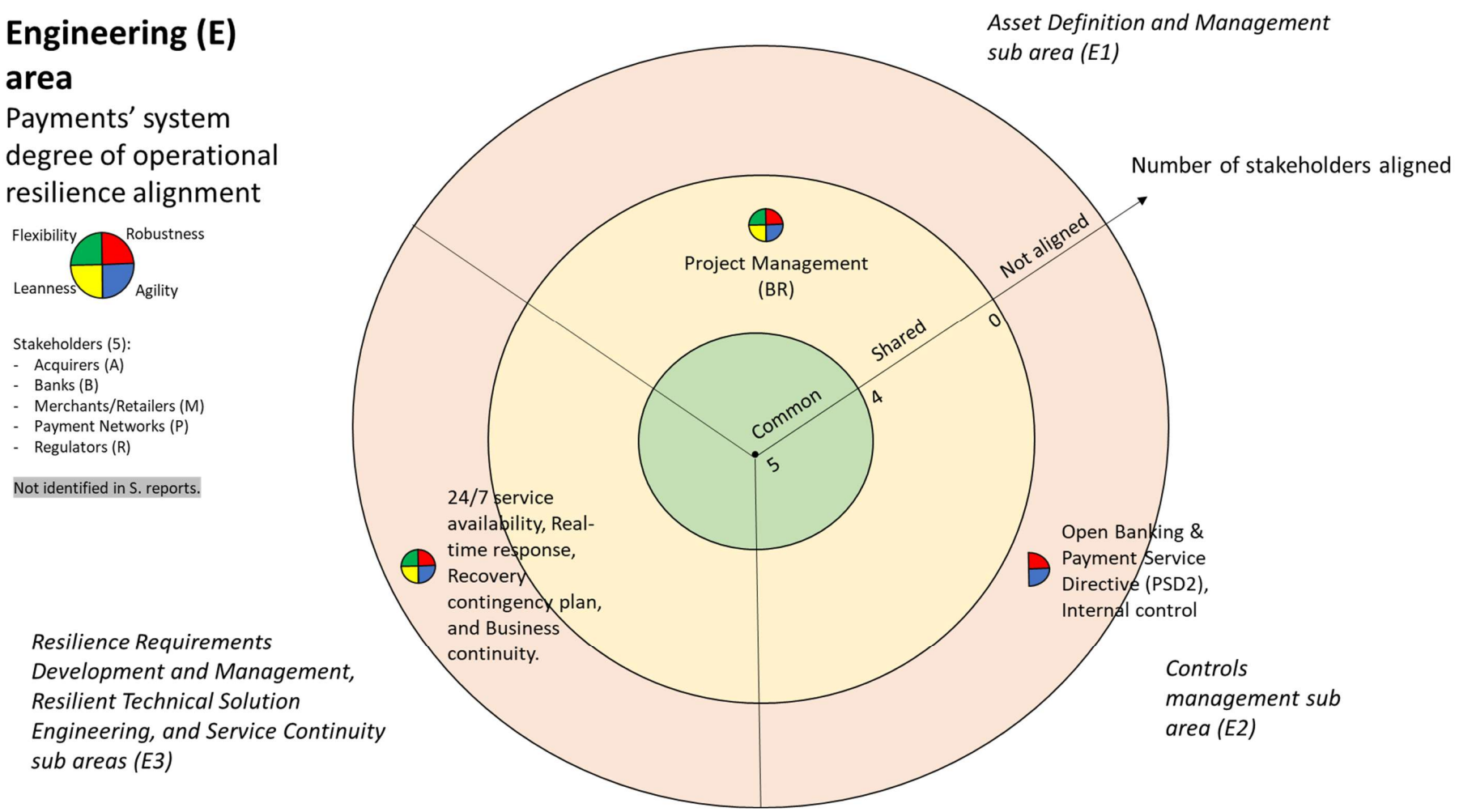


FIGURE 5.23 ENGIN. AREA PAYMENT SYSTEM'S STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

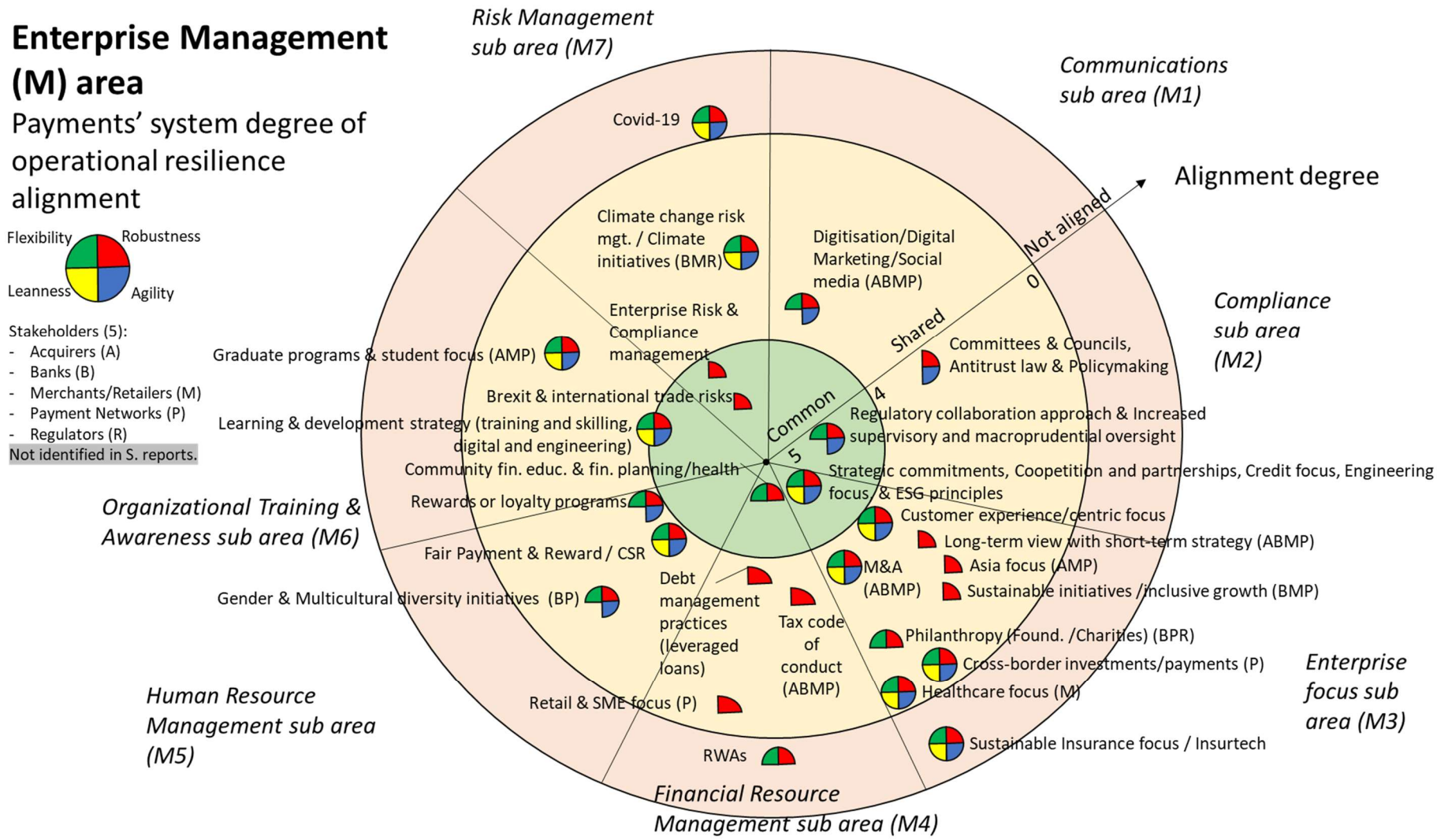


FIGURE 5.24 ENTERPRISE MGT. AREA PAYMENT SYSTEM'S STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

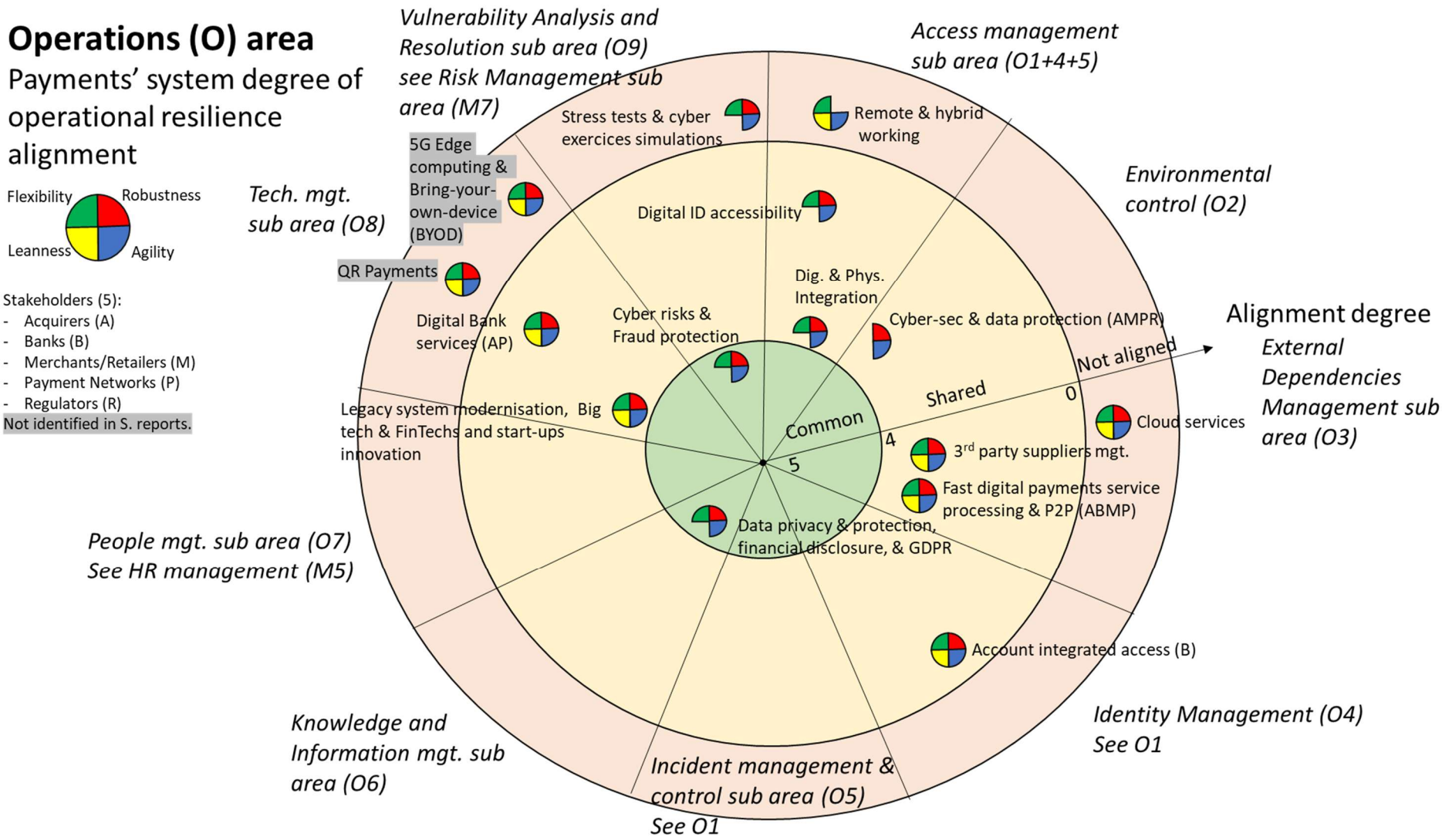


FIGURE 5.25 OPERATIONS AREA PAYMENT SYSTEM'S STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

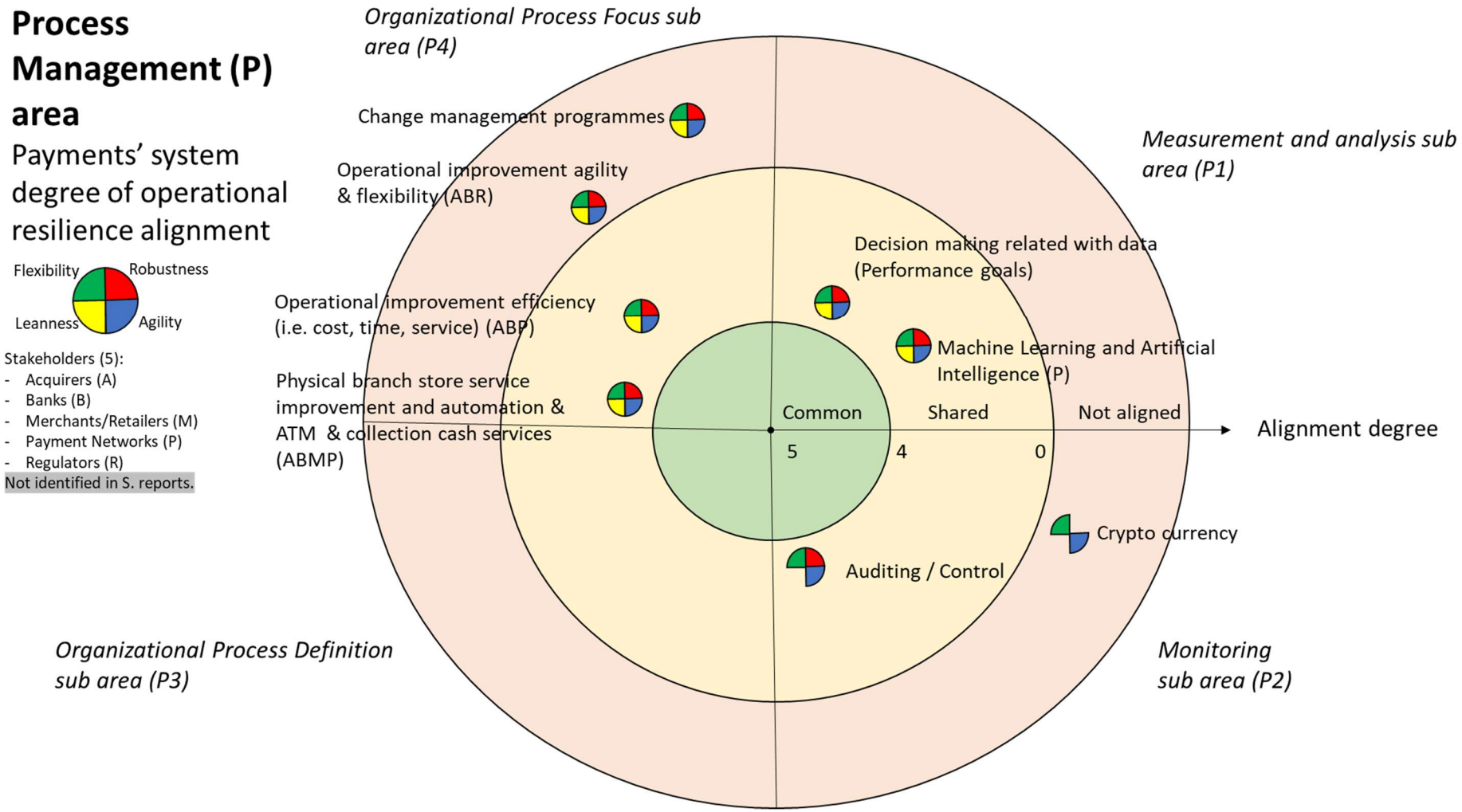


FIGURE 5.26 PROCESS MGT. AREA PAYMENT SYSTEM'S STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

5.4 Deep dive CERT-based resilience areas' system-level findings

This section delineates the resilience findings of the retail payment system's integrated strategic factors, juxtaposing them with industry analyst reports and the academic groundwork laid out in Chapter 2. It is structured into subsections corresponding to the CERT resilience framework, with a tripartite analysis within each area—encompassing common, shared and organisation-specific, and non-aligned factors within the retail payment system. The ensuing discussion evaluates the factors pinpointed in analyst reports and academic discourse, correlating them with resilience attributes they support. The contribution of these factors to the operational resilience and sustainability of the retail payment system is a focal point of the findings, underscoring the system's capacity to withstand and adapt to short and long-term disruptions, as described by Alexander (2013).

For clarity, this chapter operates under specific conventions. Factors identified by industry analysts are *italicized* and correlated with those from the retail payment system stakeholders' strategic reports, also in *italics*, with a bold PESTEL classification. The type of stakeholder (Acquirers, Banks, Merchants/Retailers, Payment Networks, and Regulators) and the count of aligned organisations (1 to 5) accompany these factors. Common factors are universally acknowledged by stakeholders and thus are not parenthesized.

The section proceeds to validate the recognised contributions to the RALF resilience attributes—Robustness, Agility, Leanness, and Flexibility, highlighted in **bold**—through academic and industry literature arguments. These are compared with organisational stakeholder narratives from their strategic reports related to PESTEL factors. Supplementary factors are also noted for context but not exhaustively analysed due to their peripheral impact. While most resilience subareas may align with specific resilience attributes, some may reflect a singular attribute or capability based on the industry's and stakeholder reports' pertinence.

Refer to **Appendix E** for a detailed list of strategic factors from the reports and their corresponding analyst factors, operational resilience areas, PESTEL categories, and

supporting analyst reports. **Appendix F** presents a tabulated overview of strategic factors and their contributions to operational resilience, substantiated by arguments from selected sources. This table exclusively cites industry analyst reports and academic articles.

It is essential to remember that common factors imply consensus among stakeholders' organisations, shared and organisation-specific factors indicate areas of partial alignment, and non-aligned factors reveal gaps in capabilities within the system being studied. The subsequent chapter, 'Discussion', will encapsulate the insights derived from the UK retail payment system's common, shared, and specific factors.

5.4.1 Engineering area

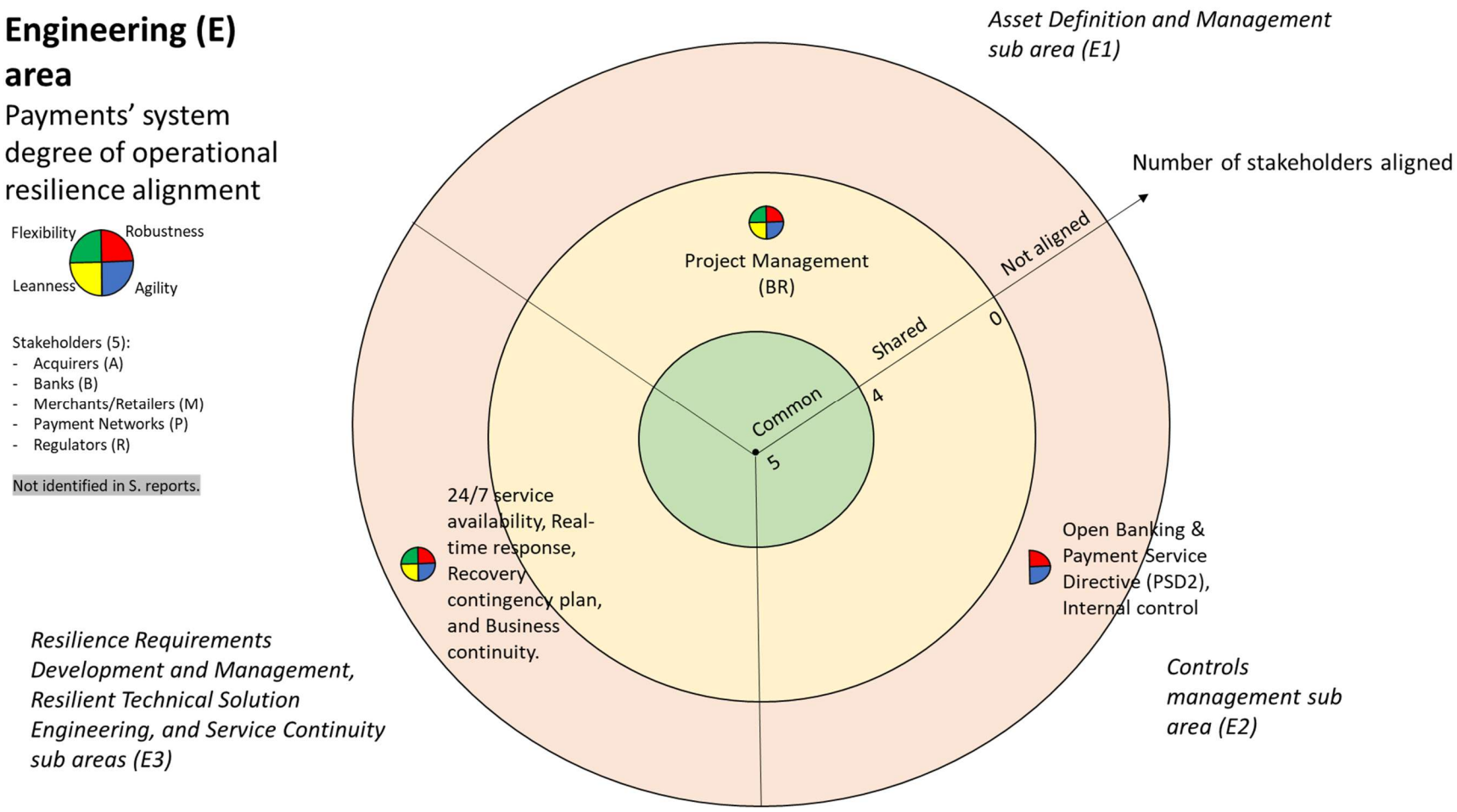


FIGURE 5.23 ENGIN. AREA PAYMENT SYSTEM'S STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

Shared and organisation-specific factors (alignment gaps)

ASSET DEFINITION AND MANAGEMENT SUB AREA

Within the sub-area of Asset Definition and Management process, *Project Management* has been pinpointed by industry analysts as a key component. This element corresponds with the **Technological and Methodological** factor derived from strategic reports of both Banks and Regulators, encapsulated as a *Project or Programme Management approach*. This approach garnered alignment across all five Banks and all five Retailers, with partial alignment from Payment Networks (Visa) and Acquirers (FIS, US Bancorp) and substantial alignment from Retailers (Amazon, Morrisons, Sainsburys, and Tesco).

Such a factor is pivotal in enhancing a company's **robustness, agility, leanness, and flexibility**, a sentiment echoed by both industry analysts and corporate strategists. Project planning and development are deemed essential to strategic planning, enabling the establishment or refinement of capabilities to fulfil specific objectives. For instance, adept project management can facilitate market position advancements, customer base expansion, or tailored risk response strategies. Consequently, projects are instrumental for organisations to amplify efficiency, efficacy, and effectiveness in realising distinct organisational goals.

Companies harness dynamic capabilities to respond adeptly to market shifts, as evidenced by Salunke et al. (2011) and Coetzee et al. (2016). Notably, banks including Barclays, RBS, Lloyds, Santander, and HSBC, have undertaken green and energy-efficient initiatives (Barclays 2019; HSBC 2019; Lloyds 2019; RBS 2019; Santander 2019; Innovate Finance 2020; Barclays 2021). However, banks like Triodos that engage in ethical or green banking find these projects to be labour-intensive and potentially risky, impacting profitability (Urban and Wójcik 2019). Adopting a sustainable finance taxonomy and industry-specific de-regulation, such as easing capital requirements, may bolster investment in sustainable projects. An increase in financial offerings that include green and social assets is becoming standard practice in financial activities like private equity (PwC 2019; Pyka and Nocoń 2021).

PwC (2019) asserts that organisations typically progress through internal projects through various stages, from pilot to implementation, relying on comprehensive data from existing systems, including finance, risk management, and resource utilisation. Investments in project management or digital skills apprenticeships are also on the rise to provide targeted training (Lloyds 2019; Steemis 2019). organisational project management, often characterised by a matrix structure, requires clear procedures to maintain agility given its complex accountability and multiple reporting lines (HM Treasury 2016; KPMG 2020).

In the financial sector, projects are pivotal for renewing and optimising infrastructure. Each new bank branch or retail store is approached as a distinct project (Morrison 2019). Investments extend to infrastructure domains such as cloud services, A.I., carbon reduction, and renewable energy projects, encompassing wider government initiatives aimed at societal benefits (Amazon 2019; HSBC 2019; Lloyds 2019; Morrison 2019; RBS 2019; Santander 2019; Kalifa 2021). Payment system resilience projects, like the Bank of England's RTGS system upgrade and advancements in Retailers' and Merchants' technological platforms, are underway. These include enhancing strong customer authentication, developing wholesale cash supply chain programmes, and implementing open banking solutions (BoE 2019; FIS 2019). Retailers in the food sector are initiating projects focused on agricultural productivity, sustainable diets, animal welfare, and conservation (Sainsbury 2019).

Non-aligned factors (capability gaps)

CONTROLS MANAGEMENT SUB AREA

In the sub-area of Controls management process, *Open Banking and the Payment Service Directive (PSD2)* have been acknowledged by industry analysts. These regulatory frameworks, although not uniformly adopted due to the global operations of some stakeholders, intersect with the **Technological and Methodological** dimension of *Open Banking* (Non-aligned stakeholders include Banks: Lloyds and Santander; Payment Networks: Amex; Regulators: FCA and UK Finance), and *Internal Control* (Aligned stakeholders: Acquirers (4); Non-aligned stakeholders: Retailers: Morrison and Walmart/ASDA; Regulators: Bank of England, FCA, PRA, and UK Finance). These

frameworks are integral to enhancing organisational **agility** and **robustness** by fostering superior risk management and security, stimulating innovation, and facilitating the assimilation of new technologies, which in turn cultivates a more competitive market landscape (Senge 1991; Porter 1996; Coetzee et al. 2016).

For instance, Lloyds (2019) and Santander (2019) cite open banking as instrumental in adapting to market changes, encouraging innovation by allowing new entrants to challenge conventional service delivery models. Conversely, Amex (2019) views such regulations as a potential threat to their business model. Ernest and Young (2020) recognise the competitive pressures from BigTech and FinTech entities reshaping the payments sector. Regulation and organic market demand are prompting companies to integrate with third-party providers, intensifying competition and digital transformation. While disruption is an inherent aspect of technological progression, it also represents a cost of market competition that can significantly impact existing firms (Shukla et al. 2011).

Internal Control, while not highlighted in analyst reports, is frequently referenced by industry stakeholders in association with standards like PSD2 and ISO20022, which serve to normalise operations and regulate financial market transactions. These controls play a pivotal role in mitigating payment fraud through robust security protocols, such as the Strong Customer Authentication (SCA), which mandates multiple verification methods for transactions within the UK (PWC 2016; Bancorp 2019; FIS 2019; Fiserv 2019; Global Payments 2019; Visa 2019a; UK Finance 2021).

Resilience Requirements Development, Resilience Requirements Management, Resilient Technical Solution Engineering, and Service Continuity sub areas

Industry analysts underscore the importance of 24/7 service availability for resilience in payment systems. While not a universally adopted capability, it aligns with several technological and methodological factors identified in strategic reports. *Real-time response* (Non-all aligned stakeholders: Banks (1): Lloyds; Payment Networks (3): Amex, Mastercard, and Visa; Acquirers (3): FIS, Fiserv, and GPN, Retailers (1): Sainsburys; and Regulators (2): BoE and HM Treasury)*, Recovery contingency plan* (Non-all aligned stakeholders: Banks (3): Barclays, HSBC, and Lloyds, Payment Networks (1): Visa;

Acquirers (2): Fiserv and US Bancorp, Retailers (4): Amazon, Morrisons, Sainsburys, and Tesco , Regulators (4): BOE, FCA, HM Treasury, and PRA), and *Business continuity* (Non-all aligned stakeholders: Payment Networks (3): Discover, Mastercard, and Visa; Acquirers (2): Fiserv and US Bancorp; Retailers (3): Morrisons, Sainsburys, and Tesco; and Regulators (4): BoE, FCA, PRA, and UK Finance). These factors are critical for resilience, enabling organisations to respond rapidly and flexibly to risks through well-developed business capabilities (Nutt 2000; Durach et al. 2015).

Payment Networks like Mastercard (2019), Visa (2019b), and Discover (2019) recognize the need for business continuity and recovery plans to mitigate security and operational risks, now a regulatory prerequisite in financial markets. KPMG (2020) advocates regularly updating these plans, especially for banks and associated third parties. The benefits—resistance to shocks, swift recovery, reorientation of operations, and renewal of growth trajectories—are attainable through such planning (Soroka et al. 2020). Furthermore, scenario planning, a risk management approach that integrates complex systems theory, has been adopted by entities like the Bank of England, providing a non-predictive, counter-systemic perspective to crisis management, exemplified by the response to the Covid-19 pandemic (Walker and Cooper 2011; Bank of England 2019a). These contemporary methods complement traditional standards like ISO9001:2015 and COSO 2004, which typically assess the impact and likelihood of risks (Pettit et al. 2010; Purvis et al. 2016).

As mentioned in the literature review, key challenges in payment systems include multi-currency funding costs, competitive barriers across jurisdictions, inconsistent payment processing data formats, and the need for automated reconciliation, among others. These challenges could drive the adoption of Central Bank Digital Currencies (CBDCs) as alternatives to the existing SWIFT infrastructure, potentially creating a more distributed and competitive landscape. Such a shift could enhance the system's flexibility and agility by enabling parallel infrastructures and reducing organisational redundancy costs (Giannetti and Ransing 2016; Bank for International Settlements 2020).

5.4.2 Enterprise Management area

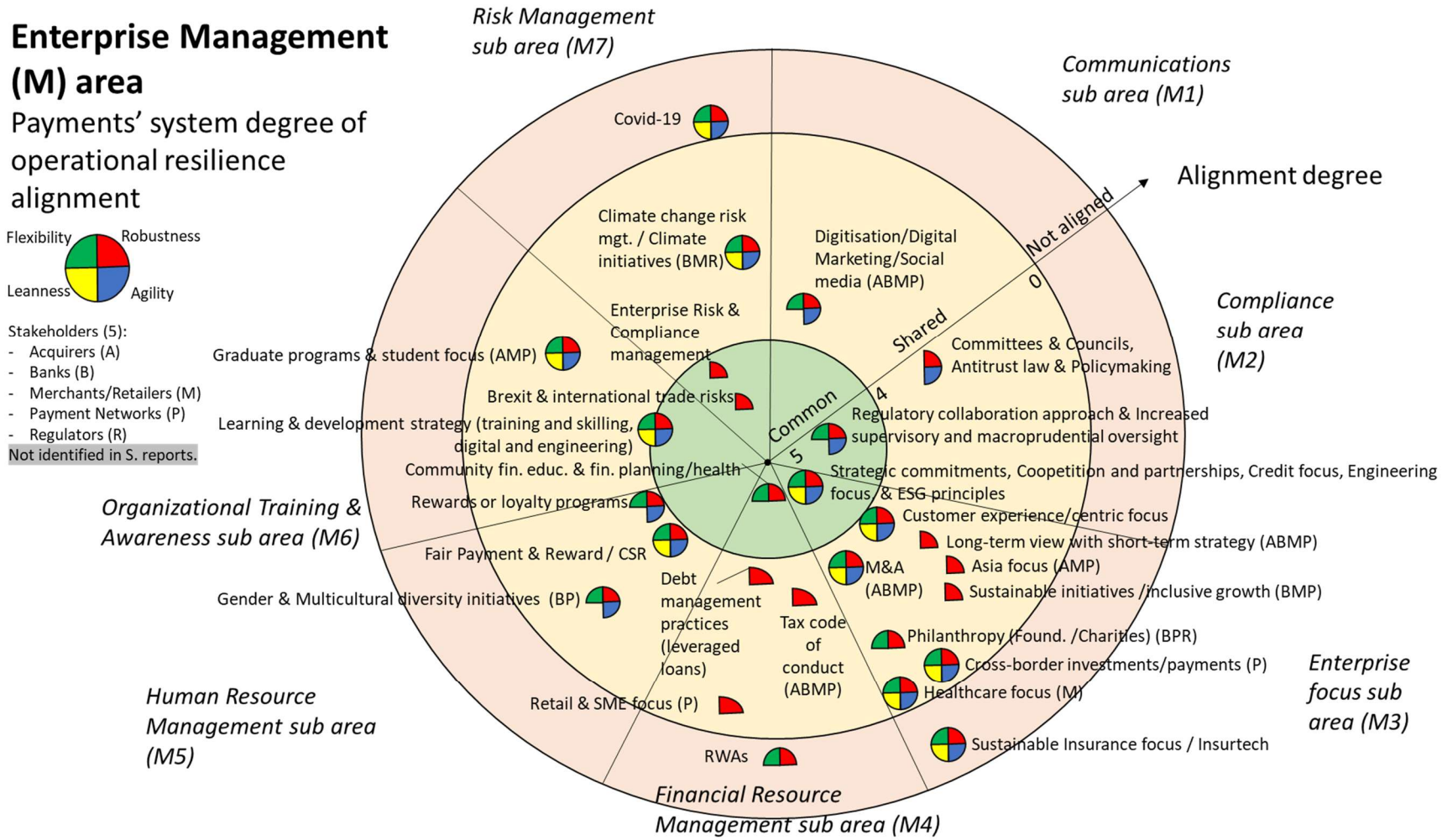


FIGURE 5.24 ENTERPRISE MGT. AREA PAYMENT SYSTEM'S STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

Common factors

COMPLIANCE SUB AREA

Increased supervisory and macroprudential oversight, alongside a *focused regulatory collaboration* and *intervention framework*, have been emphasized by industry analysts. These elements correspond with the **Political and organisational** factors coded from strategic reports: *Regulatory Approach, Regulator Collaboration*, and *Regulation and Compliance Focus*. These factors primarily influence **robustness**, as collaboration with regulators and adherence to regulatory practices are necessary for enhancing transparency and avoiding penalties. However, due to associated costs and risks, regulatory requirements may also impinge upon a company's **flexibility** and **agility**.

Visa (2019b) notes that new market offerings, including those from internal development or through acquisitions, are subject to rigorous regulatory reviews across strategic areas and policies. Key regulatory domains in the UK encompass innovation, customer financial education, and competition promotion (Innovate Finance 2019; Santander 2019). Regulators such as the PRA and FCA prioritise equipping organisations with appropriate tools to manage risks, including systemic, cybersecurity, data management, and climate-related financial exposures (Giocoli 2014). Nonetheless, stakeholders may perceive these as compliance burdens or additional risks, especially in the context of an exacting regulatory schedule and the need for expertise in the field. The expansive regulatory agenda can constrain industry flexibility, potentially leading to significant costs from contractual commitments or penalties (Zhou et al. 2007; Japp and Kusche 2009; Morrison 2019; PwC 2019; Santander 2019; Ernst & Young 2020).

Regulations vary depending on the activities of each stakeholder. However, a holistic product and service lifecycle assessment is crucial to understanding the global impact on the economy, society, and environment (Puschmann 2017). Consequently, there is an imperative for international alignment of regulatory standards to ensure best practices within operational resilience frameworks (FIS 2019; IMF 2019a; KPMG 2020). Puschmann (2017) suggests that Fintech could facilitate a more cost-effective regulatory adaptation via Regulatory Technology (RegTech) and Open Banking initiatives.

Industry analysts have pinpointed several strategic factors, such as a *Long-term View* juxtaposed with *Short-term Strategy*, *Coopetition and Partnerships*, *Credit Focus*, *Engineering Focus*, and the significance of *Environmental, Social, and Governance (ESG) principles* for both borrowers and investors. These align with the common factors identified across all stakeholders, encompassing *Strategic Commitments, Partnerships and Alliances*, and a *Credit Focus* within the **Political and organisational** spectrum, as well as an *ESG approach* under the **Environmental and Societal** category. These factors collectively enhance organisational **robustness, flexibility, leanness**, and **agility**.

Coopetition, Partnerships, and Alliances represent strategies where industry analysts and companies concur that collaboration with new partners, including other companies and government entities, is crucial for delivering diverse services effectively (Quelin et al. 2019). PwC (2019) notes the emergence of complex networks of cooperative competition between financial service groups and Fintech start-ups. However, this can lead to competitive clashes due to the influx of new market entrants.

Regarding *Credit Focus*, credit facilities enable customer investments beyond current assets, considering future prospects. Despite credit being a historically profitable service, environmental risks have introduced higher costs. To capitalise on this, financial institutions must devise robust risk modelling methods (Maier 1998; The UK Cards Association 2017; UK Finance 2019b, Vives 2020). The Basel Committee is working towards a standardised approach for credit risk assessment, involving the recalibration of risk weights assets (RWAs) through the evaluation of stress scenarios to demonstrate operational robustness amid transitional uncertainties and, for example, implementing new or additional capital requirements according to Common Equity Tier 1 ratio (CET1)[1] (American Express 2019; HSBC 2019; PRA 2019).

[1] It is a measure of the loss absorbing capacity of the banking system and is an indicator of the resilience of the financial system.

In respect of an *ESG focus*, and several related principles, which have been quite relevant since the 1990s from a regulatory perspective, but also now as part of the increasing demands from ESG-aware customers. organisations are being held accountable for all their operations' impact from an economic, social, and environmental view, or as commonly known, a triple bottom line (3BL) (IMF 2019a). This focus requires companies to develop new flexible services and related projects, to evaluate an integrative impact considering all different perspectives, and to affect all different resilience attributes from a societal long-term perspective (Kleindorfer et al. 2005; Machado et al. 2017; Hayes et al. 2019; Ernst & Young 2020)

In addressing the focus on ESG and related principles, which have been increasingly significant since the 1990s and are now further amplified by the rising demands of ESG-aware customers, organisations are being scrutinised for the impact of their operations on the economic, social, and environmental fronts, encapsulated by the concept of the triple bottom line (3BL) (IMF 2019a). The integration of ESG considerations necessitates the development of new, flexible services and projects that assess comprehensive impacts, thereby influencing all aspects of resilience from a societal, long-term viewpoint (Kleindorfer et al. 2005; Machado et al. 2017; Hayes et al. 2019; Ernst & Young 2020).

Various entities are now disclosing their energy usage, climate change impact, and sustainable sourcing efforts in specialised reports, which encompass their green initiatives (Schoenmaker 2018; Hayes et al. 2019). For example, Banks are offering loans to buy environmentally friendly cars or houses (i.e., green mortgages), creating accessible services for vulnerable population, and quantifying climate risks (Barclays 2019; Lloyds 2019). Other stakeholders are focusing in developing a greener infrastructure. Retail companies mention using electric vehicles and more renewable energy sources (American Express 2019; HSBC 2019; Morrison 2019). From a social perspective, retailers are looking into sourcing and serving both local and global communities (Sainsbury 2019; Ernst & Young 2020).

Financial analysts and institutions like the IMF and HM Treasury recognise this shift towards sustainable finance, which integrates ESG principles into broader business,

economic, and investment decisions (IMF 2019; HM Treasury 2021). Academic research further supports that a focus on material ESG issues is often associated with enhanced financial performance (Schoenmaker 2018).

Financial Resource Management sub area

In the realm of financial health and education, industry analysts have highlighted a salient factor that corresponds with several key elements in various stakeholders' strategic reports. This factor encompasses **Environmental and Societal** factor *Community Financial Education,* and aligns with **Economic and Financial** factors; such as *Financial Planning (Health)* and *Capital Planning.* While Acquirers (4) are aligned with these initiatives, certain Banks (Lloyds, RBS, Santander), Payment Networks (American Express, Discover, Mastercard), Retailers (Amazon, Sainsbury, Tesco, Wal-Mart/ASDA), and Regulators (BoE, FCA, HM Treasury, US Bancorp) are not fully aligned, indicating the scope for enhanced collaboration. Further, **Environmental and Societal** factors' *Financial Educational Tools* and *Community Financial Accessibility Programs* feature prominently across the strategic reports of Banks, Payment Networks, Acquirers, with partial alignment from Retailers and Regulators. These factors notably contribute to the operational resilience attributes of robustness, agility, and flexibility.

Stakeholders underscore the significance of robust educational offerings that target specific markets, such as the health sector, as vital for sustainable performance. Agility and flexibility are also enhanced as customers adopt and utilise new products and services, and as financial technologies evolve, leading to greater market efficiency (Klee 2006; Teoh et al. 2013; Bank for International Settlements 2019).

Strategic reports indicate that banks see community education as part of their charitable activities, necessitating integration with marketing activities and regular services (Gray 2006; Bloxham 2011). Such initiatives aim to support long-term community well-being and mitigate health risks, particularly for those from low-income or disadvantaged backgrounds. Retailers, for instance, have community champions who offer guidance on healthy eating and provide nutritional education to suppliers and third parties (Morrison 2019; Sainsbury 2019).

Regarding the digital education capability, it is critical that there's a coherent communication strategy in place, similar to those developed by HSBC (2019) and Barclays (2019), which educate clients about cybersecurity and data privacy. This knowledge empowers customers to better protect their digital assets by mitigating associated risks. RBS (2019) has launched workshops conducted by their staff to provide financial education and address financial crime, which is prevalent among vulnerable groups (UK Finance 2019b). However, the effectiveness of these programs can vary, as customer engagement can be inconsistent. Therefore, a comprehensive strategy that leverages various service and communication channels is essential (Accenture 2019).

Regulators are pivotal in encouraging financial organisations to adopt proactive and reactive measures against market abuse and related risks. They also play a critical role in reducing barriers and collaborating with these institutions to educate customers on the optimal use of financial products, such as facilitating the ease of changing and exiting financial services (FCA 2019a; IMF 2019a; Santander 2019). Community financial services are being extended to local councils as part of development initiatives, ensuring that programs offer secure and appropriate access to cash and credit, emphasising supporting lower-income areas (HM Treasury 2016; American Express 2019; UK Finance 2019a).

In addition to these services, regional ambassadors have been appointed to foster connections with local leaders, institutions, and councils across the UK regions, enhancing community engagement. Moreover, employees from financial organisations are volunteering as digital champions, conducting workshops to bolster the digital proficiency of local communities, thereby supporting the growth of SMEs and micro-businesses. These educational efforts span various topics, including fraud prevention, digital marketing, transitioning from traditional payment systems, and broad financial skills and regulations (Lloyds 2019; Visa 2019c). Business networking platforms and trade events are also being developed to provide resources and insights, focusing on inclusivity for women, LGBT+, and other marginalised groups (Santander 2019).

Retailers contribute to these community-oriented initiatives by offering space for local charities and establishing branches that double as community centres, featuring advanced technology and providing convenient financial service access (Sainsbury 2019).

Technological innovation is another avenue for promoting financial education. Banks are collaborating on a "Single Customer View" feature within mobile apps and online portals, allowing customers to manage all their financial products across various providers from a unified platform (Lloyds 2019). Other online and mobile functionalities highlighted include:

- Opening savings accounts with minimal requirements to facilitate banking for transient individuals and help establish savings goals.
- Download financial statements and monitor account activities for more effortless financial management.
- Managing credit requests, tracking repayments, and receiving instant updates on credit card purchases.
- Offering free home condition reports and reduced mortgage overpayments, catering specifically to first-time buyers to help navigate unexpected costs.
- Enabling card locking and unlocking features, as well as blocking unrecognised transactions associated with unethical activities, like gambling (RBS 2019).

These initiatives aim to enhance customer engagement, provide valuable financial knowledge, and foster a more inclusive financial environment.

ORGANISATIONAL TRAINING AND AWARENESS SUB AREA

Industry analysts have identified *Long-term View with Short-term Strategy* and an *Engineering Focus* as vital factors, which correlate with the **Technological and Methodological** category's common factors across all stakeholders, such as *Training and Skilling, Digital Skills,* and *Engineering Focus*. These elements contribute to

enhancing organisational **robustness, agility, leanness,** and **flexibility**, addressing both internal and external skill development needs. To foster resilience, it is crucial for both colleagues and customers to possess the appropriate technological and digital competencies, which can require significant time to develop.

Several organisations detail in their strategic reports the creation of internal schools, academies, or frameworks designed to educate their workforce in areas like risk management, engineering, data science, and cybersecurity, contributing to robustness (Carabine and Wilkinson 2016; Amazon 2019; American Express 2019; Lloyds 2019; PRA 2019). Additionally, educational programs for customers are being developed to promote the benefits of new digital services. For instance, Santander introduced a "Vulnerable Customer Strategy" encompassing colleague training featuring real customer experiences. ASDA/Walmart offers fast-track leadership programs and even opportunities for colleagues to finance their college education. Amazon has implemented an engineering program to provide computer science education to low-income, disadvantaged youth (Amazon 2019; Santander 2019; Walmart 2019).

Analysts emphasise the importance of fostering a risk-conscious culture within organisations to sustain operational resilience, highlighting the need to sensitise and train employees and customers, particularly regarding cybersecurity (PwC 2019; KPMG 2020). EY (2020) notes "talent risk" as a critical issue due to the skills gap in deploying new technologies within organisations. The World Bank (2019) suggests that such training initiatives should be coordinated with government and market regulatory bodies to effectively guide the workforce into suitable roles.

RISK MANAGEMENT SUB AREA

The factor of *Brexit and international trade tariffs*, identified by industry analysts, aligns with **Political and organisational** factors such as *Brexit, Trade focus, United Kingdom focus, Europe focus, and International focus*, which have been recognised in all strategic reports. These factors are pivotal for operational **robustness** as industry analysts and companies acknowledge a shift towards more local business operations, propelled by

local regulations, policies, and the global environmental crisis (Deloitte 2021; IIF and EY 2021).

Stakeholders are cognizant of the transitional challenges, uncertainties, and potential disruptions Brexit poses to international trade, with many preparing for its impact on trade agreements and foreign investments (Santander 2019; UK Finance 2019a). UK financial institutions are actively supporting SMEs during Brexit, offering advice to navigate the changes and support local business continuity to mitigate supply chain disruptions (Wang et al. 2018; FCA 2019a).

Additionally, other shared and non-aligned factors related to market focus contribute to operational **robustness** and **flexibility**. A *Domestic market focus* is noted among Acquirers, Merchants, Payment Networks, with some Banks and Regulators not fully aligned. Likewise, *a Foreign focus* and specific focuses on the *United States* and *Latin America* show similar patterns of alignment and non-alignment among stakeholders. *Economic sanctions* and *Geopolitical risk* factors highlight the need for awareness of international dynamics (BoE 2019; FCA 2019a; Global Payments 2019; Morrison 2019; Sainsbury 2019; Tesco 2019).

These factors underscore a strategic intent to achieve market leadership within the UK and other competitive landscapes. organisations mention the importance of collaborating with national and international associations to develop services, with retailers focusing on building physical distribution networks to meet global logistical challenges and digital service providers leveraging existing infrastructure and investing in data centres. Compliance with regulations and alignment with national, regional, and local plans, including National Security, Living Wage, and decarbonisation efforts, as well as adherence to standards such as ESEF, PSD2, GDPR, is imperative. Non-compliance could result in significant fines or penalties, a risk acknowledged by all companies (BoE 2019; FCA 2019a; Global Payments 2019; Morrison 2019; Sainsbury 2019; Tesco 2019).

In the payments industry, Europe stands out as a market leader in integrated omnichannel technologies, yet stringent regulations, particularly in trade, also characterise it. Companies within the EU must harmonise regulations across member states to maintain

fair competition. Exchange rate risks also contribute to the volatility of payment flows. Strategic alliances with strong regional players are essential to secure market coverage, such as having an extensive network of merchants with POS systems dominating physical and e-commerce trades. Investments in bespoke technological solutions help retain customers on proprietary platforms tailored to their needs (Bancorp 2019; FIS 2019; Fiserv 2019; Global Payments 2019).

While focusing on a specific country can strengthen market position, diversification across markets mitigates systemic and network risks. Some organisations, identified as systemically important, have the potential to impact national and international economies if they were to fail (Morrison 2019). Companies like RBS and Morrisons pursue a local-centric approach, seeking competitive advantage and community development. However, relying solely on local capabilities is challenging in a global market. Many firms adopt a hybrid investment strategy, combining local operations with global outreach to facilitate transactions across geographies while adhering to network regulations that prevent market concentration. Access to international platforms is also part of the strategy, enabling connection to innovation hubs worldwide (Morrison 2019; RBS 2019).

Investment focus areas companies cite include the U.S., Latin America, Asia, and the Middle East. Each region poses unique geopolitical risks that must be managed through scenario planning. Additional international risks encompass supply chain vulnerabilities, natural disasters, extreme weather, geopolitical events, security concerns, public confidence, unemployment rates, business investment levels, geopolitical instability, election outcomes, and government fiscal policies (Rysman 2007; Amazon 2019; Sainsbury 2019; Tesco 2019).

Risk and Compliance Management, as identified by industry analysts, aligns with the **Technological and Methodological** factor of *Enterprise Risk Management Frameworks*. These frameworks, together with general risk evaluation and management of specific risks outlined in strategic reports, underpin operational **robustness**. Such high-priority processes are the initial steps towards resilience, preparing organisations to anticipate potential scenarios and establish mechanisms for dynamic **flexibility, agility,** and

leanness, ultimately enhancing business performance (Scholz et al. 2012; Durach et al. 2015; Purvis et al. 2016; Deloitte 2021; IIF and EY 2021).

organisations like Barclays (2019) have cultivated expertise in managing financial risk services and have shared their knowledge with peers and clients. Despite the existence of industry-specific standards like Basel III for finance and COSO for IT, a universal framework for risk management remains elusive due to the complexity and uncertainty of risks. Common among all organisations is the integration of environmental and social risks, with some companies having dedicated teams to address these issues. Compliance with and disclosure of emerging or principal risks are required, with oversight often provided by risk management committees closely monitored by the Board of Directors. These committees are responsible for setting frameworks, assessing their efficacy, and maintaining controls for risk oversight, sometimes linking risk management to recovery and resolution strategies through stress-testing exercises (BoE 2019; HSBC 2019; Lloyds 2019; Santander 2019; UK Finance 2019a; KPMG 2020).

Each organisation faces a common set of operational risks. Retailers, for instance, grapple with risks associated with consumer eating habits, sustainability, environmental and climate change, and technological innovation (Morrison 2019; RBS 2019; Sainsbury 2019). Financial companies confront financial risks like credit, market, liquidity, and fraud risks, and by virtue of their financing activities, they are exposed to sector-specific risks, including those related to third-party suppliers and geographical locations of operations (Santander 2019).

Financial technologies like AI and Machine Learning are enhancing risk management frameworks (Fiserv 2019). In the payment's domain, governance, reporting, licensing, cybersecurity, processing infrastructure, and capital or credit risk management are key requirements (American Express 2019; Visa 2019c). Retail payment system organisations acknowledge the limitations of their risk management capabilities, recognising that their methods might not effectively manage common risks such as credit, market, asset liability, liquidity, operational, compliance, model, strategic and business,

and reputational risks. Other significant risk management areas include cybersecurity controls, business continuity plans, crisis management, and fraud risk management.

Shared and organisation-specific factors (alignment gaps)

COMMUNICATIONS SUB AREA

The digitisation of the financial sector, including the rise of *digital marketing and social media*, is a prominent trend identified by industry analysts. These trends align with the **Technological and Methodological** factors such as *Digital Banking*, which enjoys broad stakeholder alignment, and *Digital Marketing*, where some banks, payment networks, acquirers, and retailers are not fully aligned. *Social Media Customer Communication* and *Digital Communication* factors show a similar pattern of partial alignment. Companies and analysts agree that these factors enhance operational **robustness**, **agility**, and **flexibility**.

Visa (2019b), FIS (2019), and Santander (2019) highlight that delivering a consistent digital banking experience across mobile and online platforms—and processing large transaction volumes from digital entities—demands security, reliability, and convenience. Partnering with other companies enhances coordination and collaboration in this regard. Industry analysts like the OECD note that customer expectations are being shaped by the digitisation of commerce and the ability to transact in real-time (Raconteur 2018; Vives 2020). Services such as Buy-Now Pay-Later (BNPL) and Peer-to-Peer (P2P) lending are considered by some to be more socially responsible and of greater social value than traditional banking, which often incurs higher costs due to project due diligence (Urban and Wójcik 2019). Customers' emotional connection with technology brands also drives market expectations and can build trust in financial services (Deloitte 2019).

However, new market entrants face compliance costs, such as banking licenses and protocols, which can be burdensome for smaller firms. To navigate these challenges, digital players often partner with established financial entities that can absorb these costs, thereby improving market competitiveness and sustainability. This can lead to enhanced organisational activities and process development, including risk sharing and operating

technology optimisation, or even deregulation efforts from both parties (Quelin et al. 2019; Bui et al. 2020).

Despite the advantages, digital banking presents challenges, such as increasing control for financial institutions without clear regulation, and the need for customer education on complex financial services, which can be costly. Adoption factors derived from Technology Adoption Models (TAM) and diffusion of innovation theories need to be considered to ensure services are user-friendly, fast, and secure, particularly for older and lower-income demographics (Yousafzai and Yani-de-Soriano 2012; Arvidsson 2014; Oliveira et al. 2016a; Hedman et al. 2017; Alderman 2018; Nelms et al. 2018; Bank of England 2020). Coordination among financial service providers, overseen by market regulators, is crucial to facilitate market development (Worthington and Edwards 2000).

In the dynamic sphere of *Social Media Marketing* and *Digital Communication*, companies are leveraging the unique opportunities provided by these platforms. Morrisons (2019), for example, has innovated with a 'love index' to gauge customer affection for their brand and uses blogs and surveys to communicate strategic topics and engage with employees. The OECD (2020) has observed that BigTech companies, especially those specialising in social media, can harness search histories and direct personal connections to analyse customer habits, thereby optimising service distribution, pricing, and credit assessment.

Academic research highlights the potential of social media and digital technologies to enhance business analytics and dynamic capabilities within operations research. These tools enable businesses to access vast volumes of data, prioritise target customers, evaluate marketing campaign efficacy, customise customer experiences, and develop personalised risk scores for credit assessments, among other uses (Conboy et al. 2020). They also facilitate the flow of information across supplier networks (Johnson et al. 2007).

Conversely, companies like American Express (2019) approach social media cautiously, acknowledging the potential for rapid and widespread reputational damage to a brand—a risk also noted in PwC's global fintech survey (PwC 2019). However, not all digital technology threats are identified by companies in a timely manner, indicating a need for better coordination among stakeholders to mitigate these risks (Taylor 2016).

COMPLIANCE SUB AREA

The industry analysis highlights a robust focus on *Regulatory aspects, with collaboration, intervention, supervision, and frameworks* being key shared **Political and organisational** factors. *Committees* form a crucial part of this focus, allowing for a response to compliance requirements and fostering robustness and agility. For instance, Morrisons (2019) has established various committees such as Corporate Compliance and Responsibility (CCR), Audit, Executive, and Treasury, each addressing specific internal or external issues. The Bank of England (2019) orchestrates coordination among regulators with its Financial Policy, Prudential Regulation, Monetary Policy, Audit, and Risk committees. Bancorp (2019) emphasises its Risk Management and Basel committees, while Santander (2019) operates Responsible Banking and Asset and Liability committees. Sainsbury (2019) discusses a Sustainability Committee and others focused on Operational Resilience, Data Governance, Corporate Responsibility and Sustainability, and Group Safety. RBS (2019) mentions involvement in the Climate Group's EV100, EP100, and RE100 initiatives, while Barclays (2019) operates an Environmental and Social Impact (ESI) Committee and Reputation Committee. Lloyds (2019) highlights the Group Customer First Committee, Discover discusses its Leadership Development Committee, and UK Finance (2019a) lists the Nominations and Remuneration, Membership, and Management Committees. The FCA notes participation in IOSCO's committees and its own Independent Governance Committees (IGCs), Governance Advisory Committees (GAAs), and Staff Consultative Committee (SCC), with the latter attending Board meetings to discuss staff-related issues.

Additionally, various companies refer to *Councils* that address compliance issues. Amazon (2019) includes local and work councils, statutory employee representation obligations, and union agreements. Other organisations mention supervisory councils such as Bancorp's (2019) Financial Stability Oversight Council, the Federal Financial Institutions Examination Council (FFIEC), RBS's (2019) Financial Reporting Council in accordance with the UK Stewardship Code, and the Payment Card Industry Security Standards Council as noted by Visa (2019c) and Discover (2019). HSBC (2019)

discusses Climate Business Councils, and Sainsbury (2019) points to the Marine Stewardship Council (MSC), promoting sustainable fishing practices.

Regarding *Antitrust law oversight* within the payment system, Payment Networks and some Acquirers and Retailers focus on controlling practices through antitrust actions, laws, and regulations, particularly concerning pricing strategies. American Express (2019) and Visa (2019c) are among those who acknowledge this as a critical area of ongoing scrutiny.

The **Legal and Ethical** *Policymaking* factor is integral to compliance practices within the payment system, involving stakeholders such as Banks and Regulators, and others like Payment Networks, Acquirers, and Retailers, albeit with varying degrees of alignment. These practices encompass a range of operational aspects, from data privacy and security to credit risk management, which necessitates collateral and transaction monitoring. The rapidly evolving payment landscape brings risks like the potential loss of key employees to competitors offering more attractive benefits and disruptions to current business models that may affect the system's long-term sustainability (American Express 2019; Global Payments 2019; Morrison 2019; Walmart 2019).

Policymaking in this context also addresses corruption practices, including anti-money laundering and anti-corruption compliance measures. Ethical policies are enforced in areas like responsible lending, ensuring that housing and general financial practices meet regulatory standards (Amazon 2019; Santander 2019). Sustainability practices and targets are increasingly focused on climate change, ethical sourcing, supplier responsibility, and human resources management, including issues such as modern slavery, living wages, and inclusive practices (Álvarez Jaramillo et al. 2019; Barclays 2019; HSBC 2019; Lloyds 2019; RBS 2019; Sainsbury 2019).

Economic policies span a broad spectrum, including financial stability, conduct policies, trade, monetary policy, accounting and tax issues, restructuring planning, governance, communication, budgeting, wages, mortgages, and pensions. These policies are critical for maintaining the integrity and stability of financial operations (HM Treasury 2016; BoE 2019). For merchants, specific capital requirements and safeguards are required, along

with the authorisation and supervision of personnel, systems, processes, and documentation to ensure compliance and operational effectiveness (FIS 2019).

ENTERPRISE FOCUS SUB AREA

The burgeoning *investment interest in Asia* is recognised by industry analysts, aligning with the **Socio-cultural and Demographic** *Asia focus* factor, evident across Acquirers, Merchants, and Payment Networks. Banks and Regulators, however, show varied levels of engagement. organisations like Barclays (2019) and Global Payments (2019) note Asia's growth market status, hosting some of the largest organisations by assets. However, they acknowledge the need for stringent regulation in offshore investments due to varying practices and risks in developing markets, including potential fines (HSBC 2019; PRA 2019). Local government policies may also impact operations differently across Asian countries (IMF 2019a; Visa 2019c).

Industry analysts also identify the importance of balancing *a Long-term view with a short-term strategy*, which corresponds with the **Political and organisational** *Long-term approach* factor. This approach is crucial for resilience, particularly robustness, as it necessitates a sustainable investment strategy that accounts for economic, social, and environmental risks (Karapandza 2016; Accenture 2019; HSBC 2019; Oliver Wyman 2020; IIF and EY 2021).

Further, *Corporate governance* and *Corporate responsible* culture are additional **Political and organisational** factors that promote responsible business operations. Companies like Barclays and HSBC prioritise high ethical standards and KPIs to guide decisions (FCA 2019a; FIS 2019; HSBC 2019; UK Finance 2019a). Non-adherence to these practices can affect supervisory ratings and limit competitive activities like Mergers & Acquisitions (Porter 2008; Bancorp 2019). These governance practices are often detailed in ESG reports, business conduct and ethics codes, and committee charters (Schoenmaker 2018; Amazon 2019; Discover 2019; Global Payments 2019; Morrison 2019). Companies engage in CSR activities to further promote responsible practices and align with the UN Principles for Responsible Banking (American Express 2019; HSBC 2019; Morrison 2019; Sainsbury 2019; UK Finance 2021).

Digital initiatives in the payment sector focus on data protection and the responsible use of emerging technologies like machine learning and AI. Retailers emphasise resilience in supply chain relations, with activities such as sustainable farming to improve productivity and reduce environmental impact (Sainsbury 2019). Banks increasingly restrict investments in certain industries to mitigate climate change, pollution, and uphold human rights, acknowledging the reputational risks associated with such investments (Santander 2019). These efforts aim to bridge the knowledge gap among companies and stakeholders, fostering accountability for their environmental and social impacts (Bloxham 2011).

The **Political and organisational** *Shareholder focus* is a critical support factor for merchants, while alignment varies among banks, payment networks, acquirers, and regulators. organisations typically engage with shareholders via *Annual General Meetings (AGMs), external events,* and various *reports and surveys* (HSBC 2019). A primary risk highlighted in the 'Forward-looking statements' of shareholder reports concerns sustaining long-term value and earnings, particularly the implications for future acquisitions approved by shareholders. These considerations may constrain competitive capabilities and operational **flexibility** but are seen as necessary to ensure market stability. There is also the factor of how profit distribution may limit reinvestment opportunities for enhancing customer products and services (Porter 2008; HM Treasury 2016; Amazon 2019; Bancorp 2019; Global Payments 2019; RBS 2019; Santander 2019).

Some companies foster long-term partnerships to enhance accountability and process improvement (Mastercard 2019; Morrison 2019; Walmart 2019). From a customer perspective, there is a focus on developing products and offers that attract short-term interest while fostering long-term loyalty through service quality, competitive pricing, ethical standards aligned with the UN Sustainable Development Goals (SDGs), and safety (Subramanian et al. 2017; American Express 2019; Bancorp 2019; Santander 2019). Community societal aspects are also addressed through local investment initiatives and volunteering programs (BoE 2019).

Regarding environmental sustainability, companies are shifting focus to long-term climate impacts, setting goals in line with the UN SDGs (Hayes et al. 2019; Nedopil Wang et al. 2020; Popescu et al. 2021). Regarding human resources, there is an acknowledged need for long-term investment in talent and material resources to sustain organisational growth and development (Amanatidou et al. 2012).

Mergers and acquisitions (M&As) have been identified by industry analysts as a significant factor in the financial sector, aligning with the **Political and organisational** *Mergers and acquisitions* factor in strategic reports. Most stakeholders in the sector, including Acquirers, Banks, Merchants, and Payment Networks, recognise the role of M&As in developing new capabilities and adapting to the ever-changing market conditions related to **all resilience** attributes (Johnson et al. 2007; Sluyts et al. 2011; Morgan et al. 2019; PwC 2019). M&As can also be driven by market consolidation efforts to eliminate competitors, especially when companies are profitable and capable of purchasing others (Porter 2008; Katsafados et al. 2021).

For instance, in response to the growing demands of sustainable and digital finance, some companies have merged with or acquired renewable energy and fintech firms (HSBC 2019; Visa 2019c). Attempts to expand market share can be seen in the failed merger attempt between ASDA and Sainsbury due to regulatory concerns over market competitiveness (Sainsbury 2019; Walmart 2019). Geographic expansion is another motive for M&As, as illustrated by RBS's merger with a Middle Eastern bank (RBS 2019).

However, the risks associated with M&A activities are also acknowledged. These can include the need for additional capital, incurring debt, liabilities, and amortisation expenses that may impact profitability, customer loss, and the need for significant reorganisation or integration of control systems, processes, and information systems (Nutt 2001; Amazon 2019; Global Payments 2019; Visa 2019c; Ernst & Young 2020). Regulatory oversight is crucial in these activities to prevent unfair market advantages and protect consumer welfare (FCA 2019a; World Bank 2019b). Furthermore, organisations involved in cross-border mergers must navigate international and national regulations,

ensuring their operational resilience is not compromised and that they remain within established impact tolerances (Bank for International Settlements 2019; Deloitte 2021).

Industry analysts identify another factor is *Philanthropy* and *Not for profit,* which relates with the **Environmental and Societal** factor *Foundation and fundraising programs,* the *Charities* factor (Aligned stakeholders: Banks (5), Payment Networks (4), Regulators (5), Non-aligned stakeholders: Acquirers (3): FIS, GPN, and US Bancorp, and Retailers (4) Amazon, Morrisons, Sainsburys, and Tesco) and *Donations* (Non-aligned stakeholders: Banks (3): Lloyds, RBS, and Santander, Payment Networks (2): Amex and Discover, Merchants (4): Amazon, Morrison, Sainsburys, and Tesco, and Regulators (3) – Bank of England, FCA and UK Finance). Other **Environmental and Societal** factors identified are *ESG groups and committees* (Aligned stakeholders: Banks (5), Non-aligned stakeholders: Merchants (4): Amazon, Morrison, Sainsbury, and Tesco, Payment Networks (1): American Express, and Regulators (2): BoE and FCA), *ESG partnerships and trusts* (Aligned stakeholders: Acquirers(4), Banks (5), Merchants(5), Payment Networks (4), and Regulators (5), and Non-aligned stakeholders: Banks (4): Barclays, HSBC, Lloyds, and RBS), and *Preservation and safeguarding* (Aligned stakeholders: Acquirers (4), Non-aligned stakeholders: Banks (3): Barclays, Lloyds, and RBS, Payment Networks (2): American Express and Mastercard, Retailers (2): Morrison and Tesco), and Regulators (4): BoE, FCA, HM Treasury and UK finance). These are relevant in terms of **robustness** and **flexibility** because both industry analysts and companies mention that companies use them as means to give back to society and tackle some of the societal challenges recognised, identified as a market efficiency mechanism through policymaking to encourage redistribution of capital to the most vulnerable groups (Amanatidou et al. 2012; Government and Division 2015; Nelms et al. 2018).

Some companies studied have developed volunteering, fundraising, donations, or related not-for-profit programs to help organisations trying to tackle social and environmental problems. For example, Discover supports organisations that focus on children's development, Sainsbury supports organisations that verify responsibly fishing sourcing, and the Bank of England supports disease research (BoE 2019; Discover 2019; Sainsbury 2019; Visa 2019c). Others have developed fundraising programs that help

collect NGO funds through internal company networks. Donations from their earnings are another way that companies contribute to these causes, encouraged by governments and payment regulators through tax reliefs. Customer donations are received through ATMs and digital platforms (BACS 2016). Donations are focused on community investment to support leadership development, historic preservation, children safeguarding and community services through campaigns (i.e., fundraising) or charities, and not only focusing on money but also material donations (i.e., food) and volunteering (Lloyds 2019; Sainsbury 2019). Mechanisms such as matched donations or even promoting cashback bonuses, are commonly used and awards to encourage donations (American Express 2019; BoE 2019; Santander 2019). During difficult periods, donations have increased, such as the Covid response (Amazon 2019).

The different organisations focus on different initiatives according to their industry needs; while Banks focus on greening financing products, retailers focus on responsible sourcing. Nonetheless, there is a lack of alignment regarding focused efforts throughout the retail payment system. As a result, some retail companies have started to develop their own financial organisations (Ernst & Young 2020).

Philanthropy and non-profit activities are highlighted by industry analysts as key factors, aligning with the **Environmental and Societal** efforts, particularly in the realms of *foundation and fundraising programs, charities,* and *donations*. These efforts are noted across the financial sector, with banks, payment networks, and regulators actively participating, though there is varied involvement from acquirers and retailers. Such initiatives are seen as instrumental in demonstrating corporate responsibility and addressing societal challenges, enhancing **robustness** and **flexibility** within organisations by facilitating societal contributions and capital redistribution to vulnerable groups (Amanatidou et al. 2012; Government and Division 2015; Nelms et al. 2018).

The companies under study engage in a variety of philanthropic activities. Discover, for instance, supports child development organisations, Sainsbury advocates for responsibly sourced fishing, and the Bank of England backs medical research (BoE 2019; Discover 2019; Sainsbury 2019; Visa 2019c). Fundraising efforts within companies often benefit

NGOs, while direct donations from profits—encouraged by government and regulatory tax incentives—contribute to various causes. Customer donations facilitated through ATMs and digital platforms also play a role in these philanthropic efforts (BACS 2016).

Donations are not limited to monetary contributions; they extend to material donations like food and involve employee volunteering. Campaigns may include mechanisms like matched donations or incentives such as cashback bonuses to stimulate giving (American Express 2019; BoE 2019; Santander 2019). Notably, donation levels have increased during crises like the Covid-19 pandemic (Amazon 2019).

organisations tailor their philanthropic initiatives to align with their industry. Banks often prioritise green financing products, while retailers focus on responsible sourcing. Despite this, there is a noted lack of unified focus across the retail payment system, prompting some retail companies to establish their financial institutions to direct their charitable efforts better (Ernst & Young 2020).

Sustainable initiatives are tightly interwoven with the broader **Political and organisational** theme of *Sustainable, responsible, and inclusive growth*, in line with the United Nations Sustainable Development Goals and other sustainability metrics. This resonates across the banking and merchant sectors and with regulators, though there is slightly less alignment among payment networks like American Express, Mastercard, and Visa. These initiatives are fundamental for operational **robustness**, emphasising the necessity for businesses to incorporate a spectrum of risks and comprehensive business strategies to foster sustainable growth beyond mere economic expansion, often debt-driven, to address pivotal societal issues (Bank for International Settlements 2019; Sani et al. 2021).

Banks have highlighted the importance of maintaining access to cash for those who do not prefer digital payments, leading to new systems for wholesale cash distribution that contribute to an efficient, resilient, and sustainable payment system despite decreasing cash transactions (Barclays 2019; BoE 2019).

UK Finance (2021) underscores the regulator's role in conducting research to shape public debate and foster business models that are environmentally resilient and socially conscious, mitigating associated risks (HM Treasury 2016; Ernst & Young 2020; Deloitte 2021). Merchants are incorporating sustainability into their supply chains, ensuring compliance with regulations, and promoting healthier consumer choices (Amazon 2019; Morrison 2019; Sainsbury 2019; Walmart 2019). For instance, Barclays has established a Sustainable and Impact banking team, attending to the ethical concerns of clients and investors (Barclays 2019; RBS 2019; Santander 2019).

Despite the progress, some market participants encounter hurdles in economically viable sustainable investments due to systemic design misalignments (Gartner 2019; Lagoarde-Segot 2019). Others advocate for an enterprise-wide approach to operational resilience, emphasising flexibility, measurable performance indicators, risk assessments, and top-down governance (KPMG 2020).

The development of a taxonomy for products and services aligned with sustainability goals, supported by appropriate technologies, is crucial (Innovate Finance 2019; Nedopil Wang et al. 2020). Vigneau et al. (2015) point out that there is a disconnect between lofty sustainability objectives and their practical application, which should be translated into industry standards, mindful of potential unintended compliance consequences.

In relation to Enterprise focus, *Customer experience, Personalized services,* and *Brand focus* have been spotlighted by industry analysts, resonating with the industry's *Customer-centric orientation*. This encompasses **Political and organisational** factors such as *Customer Focus*, where banks, merchants, and payment networks have shown strong alignment. Acquirers and some regulators have somewhat different perspectives. Additionally, facets like *Customer Feedback* and *Personalization* see banks and other financial entities aligning to varying extents with the goal of offering a wide range of products and services. These factors crucially underpin **all resilience** attributes, with industry commentators and corporations alike asserting that customer experience is a strategic imperative that delivers a competitive edge through the deployment of novel,

tailored capabilities, thereby capturing market share through simplicity, personalisation, and service excellence (Accenture 2019; Gartner 2019).

Companies are adopting various strategies to enhance resilience in the face of shifting customer behaviour. Open Banking, for instance, is highlighted by regulators as a means to deliver more differentiated and innovative consumer services (FCA 2019a; Lloyds 2019; Morrison 2019). Moreover, investments in technological infrastructure overseen by boards contribute to a frictionless customer experience, enhancing service efficiency, particularly in the digital realm. Businesses are modernising processes and delivering dedicated platforms across integrated channels, leveraging mobile applications powered by AI and robotics to meet specific customer needs, emphasising secure access to information and financial management (Barclays 2019; HSBC 2019; Lloyds 2019; Sainsbury 2019; Vives 2020).

However, customer service remains a highly subjective measure of service quality in physical outlets and online through e-commerce or financial services. Other metrics considered by organisations include price transparency, product assortment, convenience, and the speed and cost of services, which are believed to influence customer loyalty and confidence (Yousafzai and Yani-de-Soriano 2012; Schuh and Stavins 2013; Koulayev et al. 2016; Rysman and Schuh 2017; Santander 2019; Walmart 2019). Key areas of product development within the retail payment system include cross-border payments and B2B banking services (Bank For International Settlements 2020; Deloitte 2021).

Some organisations are consolidating different business lines to broaden their offerings (HSBC 2019), addressing challenges such as regulatory proposals that require coordination, like commitments to maintaining free access to cash as part of community service (UK Finance 2021). In terms of personalising customer offerings, there are innovations like smart tools for financial planning, faster account opening and credit applications, branch refurbishments focusing on service and community engagement, and retailers' order and collect services (Hasan et al. 2013b; Holmes et al. 2019; Lloyds 2019; Sainsbury 2019; Santander 2019; Walmart 2019).

Moreover, in the Enterprise Focus sub-area, industry analysts have highlighted the significance of *Cross-border investments and payments*—a sentiment echoed in the strategic reports of all Payment Networks, which underscore the Political and Organisational dimensions of this issue. This was corroborated through the perspectives of various stakeholders: Lloyds Bank, acquirers such as FIS and Fiserv, retailers including Amazon, Morrisons, and Sainsbury's, and regulators like the Bank of England (BOE), Financial Conduct Authority (FCA), Prudential Regulation Authority (PRA), and UK Finance. These parties collectively recognise that access to rapid, secure, transparent, and cost-effective financial services across the globe is paramount for **all resilience** attributes. However, these services' current state is marred by inefficiencies and exorbitant costs, leading to an inability to authenticate end-to-end transactions (Bank for International Settlements 2020).

Globalisation has spurred economic growth worldwide and increased reliance on cross-border payment methods like international credit cards. Revenue streams for payment networks arising from the processing and settlement of such transactions are influenced by the regulatory frameworks and agreements established within each country (Weiner and Wright, 2009; Bolt and Schmiedel 2013; Discover 2019). With individuals and businesses engaging in more international transactions, the daily use of international payment services has become commonplace. However, the absence of transparency is often linked to the lack of international standards and practices, including transformational frameworks such as tax schemes, which permit low traceability operations (Deloitte 2019; The World Bank 2019).

To ensure a robust and resilient financial services system, mechanisms like free trade agreements and universal regulations are essential to facilitate the monitoring of monetary exchanges in near-real-time (Batiz-Lazo and Del Angel 2018b; Deloitte 2019; Bank for International Settlements 2020).

Technological advancements aim to enhance *Cross-border payment systems*. For instance, BigTech companies are developing real-time transfer services that, while reliant on traditional banking networks, necessitate bank collaboration. Facebook, notably, is

aspiring to provide its customers with payment services on a global scale, unrestricted by local or regional barriers, by introducing digital currencies or e-money (Discover 2019; Bank for International Settlements 2020; Vives, 2020; UK Finance 2021). However, these innovative services are susceptible to various operational risks attributed to their novelty. The pandemic, for example, with its travel and foreign exchange restrictions, has significantly impacted the financial sector (Visa 2019c). Moreover, challenges such as internal cross-border organisational structures in businesses, which report profits differently across regions—seemingly independent of the actual value generated by each unit—and regulatory discrepancies in data protection have introduced systemic risks (The World Bank 2019; Leo 2020; Vives 2020).

Nevertheless, it is proposed that progressive regulations, like the International Financial Reporting Standards (IFRS), could herald a range of benefits. These include enhanced comparability between companies, simplified cross-border transactions, and heightened transparency. Such regulations could also lead to robust asset prices and more informative financial statements, thereby facilitating contract conclusions and financial operations in Europe and the UK with greater efficiency and clarity (Acheampong and Elshandidy 2021; IFRS Technical Readiness Working Group 2021).

Similarly, in the Enterprise Focus Process sub-area, industry analysts have highlighted a *Healthcare Propositions focus*, aligning with the **Legal and Ethical** factors. This pertains to *Health-focused products* and involves various stakeholders, including Merchants, Payment Networks such as Visa, Acquirers like FIS and Fiserv, and Regulators including the FCA. Additionally, a **Political and organisational** *Food Industry focus* has been recognised, with Merchants actively aligned, alongside a Merchant or Retail focus encompassing Acquirers, Banks, Merchants, Payment Networks, and Non-aligned Regulators such as the FCA, PRA, and UK Finance. These elements are pivotal across **all resilience** attributes, as it has been acknowledged that financial health is crucial for mitigating future risks, necessitating sustainable and timely investments that are responsive to customer needs (Schoenmaker 2018).

Present digital offerings in this sector include health savings accounts and tools to manage credit health, like credit score accessibility, card freezing options, and service provider alerts (Discover, 2019; HSBC, 2019; Mastercard, 2019). Beyond these, the UK economy faces health challenges that extend beyond the scope of financial data management, such as domestic abuse and mental health issues (Lloyds 2019), indicating the need for community-oriented coordination.

Payment Networks and Acquirers are introducing technology solutions in the payment sector. For instance, customers engaged with health and fitness markets are incentivised with financial rewards tied to their health achievements, subject to verification by health professionals (Global Payments 2019; Visa 2019c). On the retail front, efforts are being made to supply nutritious foods that meet dietary needs and promote active lifestyles, supported by company policies and collaborations with health and fitness experts (Morrison, 2019; Sainsbury, 2019). Moreover, the health and safety of employees, as well as health insurance provisions, are key considerations for all Merchants (Walmart 2019).

FINANCIAL RESOURCE MANAGEMENT SUB AREA

Industry analysts have brought attention to *Debt Management practices*, encompassing leveraged loans and non-performing loans, with a particular emphasis on *Retail and SME sector* lending. This issue aligns with the **Financial and Economic** factors and *a Lending focus*, engaging a broad array of stakeholders: Acquirers, Banks, Payment Networks, Regulators, and Retailers such as Amazon, Sainsburys, and Tesco. Further engagement is seen with *ESG SME financing services and support*. Additionally, areas such as *Debt focus* and *Debt Reduction and Collection* are acknowledged, with participation from entities including American Express and Sainsbury. A notable *Profitability focus* intersects with the activities of Acquirers, Merchants, Payment Networks, and Banks like Barclays and HSBC, alongside Regulators including the FCA and UK Finance. These facets are integral to the system's **robustness**, with the recognition from both industry analysts and companies that high levels of debt are present among market participants, often supported by hazardous sources (IMF 2019a).

Despite rigorous oversight by governance institutions, some financial practices are considered unsustainable, particularly when risks are not accurately assessed (UK Finance 2019a). As a result, there is a concerted effort to improve these preventive measures. A consensus to reduce unsecured lending, which typically requires warranty holding, has been reported among the scrutinised organisations. The mortgage sector is shifting towards loans that are reflective of risk profiles, enabling safer investments attuned to customer profiles (Sainsbury 2019). Correspondingly, governments have instituted guarantee schemes to support households unable to meet payment obligations or large upfront deposits, particularly in the aftermath of financial crises (Calomiris et al. 2004; HM Treasury 2016). These initiatives are developed in tandem with regulations designed to protect clients (BoE 2019).

In tackling the challenges of unsecured lending, banks are turning to new technological methods, especially within electronic payments, to furnish better options for those who cannot provide traditional guarantees. These options include Buy-Now-Pay-Later (BNPL) schemes, online lending platforms such as P2P, and social bonds tailored for SMEs struggling to refinance their debts (Hasan et al. 2012; Accenture 2019; Barclays 2019; Deloitte 2019; PwC 2019; UK Finance 2019a; Vives 2020; Deloitte 2021). Moreover, there is an emphasis on issuing loans in adherence to responsible practices, encompassing human rights and climate change considerations, and implementing new loan controls throughout the entire repayment process (HSBC 2019; Ernst & Young 2020).

Taxation has been flagged by industry analysts as a factor intimately connected with *Tax Avoidance and various tax policies*, aligning with the **Political and organisational** factor *Tax Code of Conduct.* Stakeholders encompass Acquirers, Banks, Merchants, and Payment Networks, with HM Treasury and the PRA noted as non-aligned Regulators. Taxation's influence on a company's robustness is acknowledged in reports, not only as a government tool to finance public policies and programmes but also as a means to incentivise desired market behaviours and mitigate unwarranted risks (IMF 2019a).

Tax Avoidance is prosecutable, prompting companies to settle any due fines to preclude adverse repercussions. However, organisations have pointed out taxation as a risk area,

with future UK laws and regulations remaining ambiguous (Amazon 2019; FIS 2019; PRA 2019). The complexity is compounded internationally as companies grapple with international operations and cross-border transactions (Barclays 2019; HSBC 2019; Lloyds 2019; Morrison 2019; Sainsbury 2019; Santander 2019; Tesco 2019; Walmart 2019). To address this, some organisations have launched tax initiatives to bolster operational transparency, facilitating easier access to their information by authorities (HSBC 2019). While these strategies are prevalent in the finance sector due to stringent regulation and the traceability of digital transactions, they represent a greater challenge for physical transactions and other industries, where improved transparency could benefit the non-banking sector (Deloitte 2019; World Bank 2019b; Vives 2020).

Governance regulations continually evolve to address the myriad practices companies adopt to minimise tax liabilities and enhance profitability, which can represent both opportunity and risk (Deloitte 2021). With companies now mandated to report on Corporate Social Responsibility (CSR) activities, tax avoidance schemes are increasingly viewed as socially irresponsible (Naher and Aya 2013). In some instances, regulations may inadvertently favour debt over equity, engendering risk through excessive borrowing. Such imbalances warrant closer regulation to forestall additional risks (Bank for International Settlements 2019; IMF 2019b).

HUMAN RESOURCE MANAGEMENT SUB AREA

Industry analysts have identified *Rewards or Loyalty Programs* as a key factor, which aligns with the **Political and organisational** factor of *Customer Reward Programs focus*. Key stakeholders in this domain include Banks, Merchants, Payment Networks, and Regulators, with Acquirers such as FIS, Fiserv, and GPN being non-aligned. These programs are seen as instrumental in enhancing organisational **robustness, flexibility,** and **agility,** with the consensus being that loyalty programs positively influence customer behaviours, managing risks effectively and efficiently. However, academics have posited that other critical attributes drive the adoption of a specific payment method, such as service quality, ease of use, cost, and accessibility (Rysman 2007; Koulayev et al. 2016; Ernst & Young 2020).

Banks and Payment Networks also recognise customer rewards as pivotal in establishing a competitive edge, viewing them as a marketing investment to foster long-term customer loyalty (American Express 2019; Barclays 2019; Lloyds 2019; Mastercard 2019; Morrison 2019; RBS 2019; Sainsbury 2019; Santander 2019; Tesco 2019; Visa 2019c). Moreover, economic rewards and membership programs are acknowledged for their ability to promote behaviours with positive environmental and social repercussions (Dahlstrom et al. 2014). However, the extent to which economic competition or financial leverage can be used to offer rewards is bounded, considering that current payment models are dependent on interchange fees, which are subject to regulation and cannot be significantly increased (Gilmore 2018; Deloitte 2019).

One of the most valued rewards, air travel miles, now faces restrictions by financial organisations due to environmental regulations (Discover 2019). Cashback rewards are another popular incentive aimed at boosting digital payment usage by leveraging interest rates. For example, Sainsbury (2019) enhances customer engagement by allowing rewards management and personalisation through mobile technology. The capacity for companies to offer a diverse rewards portfolio is increasingly dependent on strategic partnerships and their adeptness at utilising customer data to tailor rewards to individual needs (Barclays 2019; UK Finance 2019a).

Industry analysis has brought to light *Social Protection and Assistance*, including payroll-based insurance models, as factors intersecting **Environmental and Societal** aspects such as *Fair Payment and Reward Policy*, and *Corporate Responsible Culture*. Engaged stakeholders include Banks, Merchants, Payment Networks, and Regulators, with Acquirers like GPN and US Bancorp, and Merchants such as Morrison, Sainsbury, and Tesco noted as non-aligned. Also relevant are the **Legal and Ethical** factors focusing on *Employee Mental and Physical Health and Safety*, as well as *Modern Slavery Policy*, with American Express and UK Finance among the stakeholders. Additionally, the **Political and organisational** factor emphasises *Unions' Partnership Communication and Negotiations*, involving entities like Barclays, HSBC, and Santander.

These factors contribute to resilience, with evidence suggesting that companies with satisfied or motivated employees generally outperform in all tasks. The technology sector is often cited for rewarding short-term job prospects due to high profitability. However, there is a call for companies to also invest in long-term employee benefits like insurance services and other allowances, which bear relevance from a risk management perspective (Ponomarov and Holcomb 2009; Sluyts et al. 2011; World Bank 2019b; Ernst & Young 2020). A prudent reward system correlates with retaining human capital, which is vital in a competitive job market and impacts the financial performance of companies both short and long-term (Calomiris et al. 2004). Consequently, research into benefits and rewards performance quantification is expanding to encompass broader social and environmental factors (Gray 2006; Lagoarde-Segot 2019).

Corporate responsibility culture has led organisations to create workplaces that attract, retain, and fairly reward top talent while maintaining work-life balance and safeguarding their business models (FCA 2019a; Santander 2019). Economic initiatives, such as raising the average hourly wage for frontline workers, are being adopted (Morrison 2019). However, there is a need to address pay disparities, for instance, between CEOs and their lowest-paid employees, which can influence employee motivation, sense of purpose, and leadership. Innovative measures like reducing working hours without pay cuts, allocating time for social causes, offering company share buy plans, and developing fair pay reports that target diversity and gender vulnerabilities are being explored (HM Treasury 2016; Barclays 2019; BoE 2019; Lloyds 2019; RBS 2019). These initiatives are recognised as needing to align with effective performance tracking to ensure they contribute positively to organisational productivity (Sainsbury 2019; Walmart 2019; Oliver Wyman 2020).

Companies actively engage in health and safety (H&S) initiatives to ensure optimal working conditions for their employees. Retailers, for instance, adhere to standards set by regulatory bodies like the Ministry of Health, Labour, and Welfare and monitor employee performance via dedicated H&S committees (Amazon 2019; Morrison 2019; Sainsbury 2019; Tesco 2019; Walmart 2019). For office environments, the focus is on

maintaining day-to-day working standards that uphold employee H&S (Bancorp 2019; FIS 2019; Global Payments 2019; Mastercard 2019; PRA 2019; Visa 2019c).

Financially-oriented companies place a greater emphasis on mental health and professional development. They provide training, conduct surveys, establish peer support groups, and subscribe to standards and associations to ensure best practices and reward performance, including initiatives like the Mental Health Network and the Thriving at Work mental health standard. Additionally, they organise events like Mental Health Awareness week and offer medical treatment through private services at no additional cost (BoE 2019; FCA 2019a; Lloyds 2019; Mastercard 2019; RBS 2019; UK Finance 2019a; Visa 2019c). In light of public health risks such as COVID-19, organisations have heightened their focus on the potential impacts on employee work (Fiserv 2019; Tesco 2019).

From a supply chain standpoint, stakeholders are committed to human rights and ethical trading to prevent modern slavery, forced labour, human trafficking, and exploitation. They ensure compliance by having suppliers adhere to these standards through rigorous risk assessments (Morrison 2019; Sainsbury 2019; Tesco 2019). Additionally, many stakeholders provide statements, policies, and/or codes of conduct related to these critical issues (American Express 2019; HSBC 2019; Lloyds 2019; RBS 2019; Santander 2019; UK Finance 2019a).

Regarding Unions, companies ensure agreements with workers and suppliers, particularly in the retail sector (e.g., Amazon, Sainsbury's). Financial service companies often collaborate with credit unions (e.g., National Credit Union Administration or Enterprise the Business Credit Union) and engage in negotiations concerning payments (e.g., Unite national assembly negotiations) (HM Treasury 2016; Amazon 2019; BoE 2019; FIS 2019; PRA 2019; Sainsbury 2019). UK Finance (2019a) emphasises its objective to unify the financial services industry with a collective voice.

In the Human Resource Management process sub area, a *Focus on women* and *Underrepresented unbanked communities or financial inclusion,* and *Diversity and Equality, gender, ethnicity or demographic shifts* were identified by industry analysts, which match with the **Socio-cultural and Demographic** factors, *Gender diversity*

initiatives (i.e., women and lgbt+) (Aligned stakeholders: Banks (5), and Non-aligned stakeholders: Merchants (3): Amazon, Morrison, Sainsbury, Tesco, Payment Networks (1): Visa, and Regulators (3): BoE, FCA, UK Finance), *Multicultural diversity initiatives (i.e., BAME)* (Aligned stakeholders: Banks (5), and Non-aligned stakeholders: Acquirers (4): FIS, Fiserv, US Bancorp, Merchants (5): Amazon, Morrison, Sainsbury, Tesco, Payment Networks (4): American Express, Discover, and Visa, and Regulators (5): BoE, FCA, HM Treasury, and PRA), a *Cultural focus* and *Inclusion focus,* both (Aligned stakeholders: Banks (5), and Payment Networks (4), and Non-aligned stakeholders: Acquirers (1): US Bancorp, Merchants (3): Morrison, , Tesco, and Wal-Mart/ASDA, and Regulators (5): BoE, FCA, HM Treasury, and UK Finance). These factors are relevant to an organisation's **agility**, **flexibility,** and **robustness**, as they help to have a diverse employee base, considering a disability, gender, LGBT+, multicultural, and multigenerational perspective. This diversity focus can enrich the range of views or skills, building different capacities that can complement each other and provide everyone with equal opportunities, based on their capacities, to improve motivation (BoE 2019). As well, it has a community impact, providing more opportunities for society's integration into different companies, based on the community diversity composition percentages. Organisations promote a balanced and diverse workforce to create fairer and more inclusive working environments, boosting creativity and productivity, which are good for business (Carabine and Wilkinson 2016; Schoenmaker 2018; UK Finance 2019a; Visa 2019c).

Different opportunity gaps have been targeted to improve gender, racial (i.e., BAME) and cultural diversities; for example, pay gaps and leadership or entrepreneurship roles. In terms of gender, most companies try to create an even split and provide reports about the progress with these initiatives, including creating associations and diversity awards (American Express 2019; BoE 2019; HSBC 2019; RBS 2019; Sainsbury 2019; Santander 2019; UK Finance 2019a; Visa 2019c). Networks are being established to support these groups, championed by senior leaders, who celebrate diversity through different mechanisms, like campaigns, event celebrations, peer support networks, identity passes, prizes, etc. (Barclays 2019; FCA 2019a; Morrison 2019). Companies are funding educational programs to allow underrepresented groups to get full-time jobs, especially

in digital skills (Visa 2019c). Prohibition of selection standards based on personal characteristics is developed and implemented into the recruitment/selection process to reduce diversity bias, support equal rights in their communities and help the unbanked (HSBC 2019; Payments.com 2019b). Diversity has also been targeted from the AI personnel selection and customer data algorithms in digital processes, trying to identify and understand the bias towards the appeal of certain types of employees and customers and avoid diversity-related risks (Hamish et al. 2018; Accenture 2019).

In the Human Resource Management process sub-area, industry analysts have highlighted a focus on women, underrepresented unbanked communities, financial inclusion, and broad *Diversity and Equality across gender, ethnicity, and demographic shifts*. These align with **Socio-cultural and Demographic** factors, such *as Gender Diversity* initiatives encompassing women and *LGBT+ communities*, and *Multicultural Diversity* initiatives addressing *BAME r*epresentation. Stakeholders involved are Banks, Merchants like Amazon, Morrison, Sainsbury, Tesco, Payment Networks such as Visa, and Regulators including the BoE, FCA, and UK Finance. Moreover, a Cultural and Inclusion focus is promoted by Banks and Payment Networks, with additional stakeholders like US Bancorp and Wal-Mart/ASDA.

These factors are intrinsic to an organisation's **agility, flexibility,** and **robustness**, facilitating a diverse workforce considering disability, gender, LGBT+, multicultural, and multigenerational aspects. Such diversity enhances the range of perspectives and skills, fostering capacities that complement one another while offering equal opportunities. This approach is motivational and has a positive community impact, aiding societal integration into various businesses reflective of community diversity compositions. organisations that nurture a balanced and diverse workforce contribute to fairer and more inclusive working environments, sparking creativity and productivity that benefits the business sphere (Carabine and Wilkinson 2016; Schoenmaker 2018; UK Finance 2019a; Visa 2019c).

Efforts to address opportunity gaps in gender, racial (BAME), and cultural diversity include tackling pay gaps and promoting leadership and entrepreneurship roles. Companies report on progress, create associations, and offer diversity awards (American Express

2019; BoE 2019; HSBC 2019; RBS 2019; Sainsbury 2019; Santander 2019; UK Finance 2019a; Visa 2019c). Support networks led by senior figures celebrate diversity through campaigns, events, and recognition programs (Barclays 2019; FCA 2019a; Morrison 2019).

Additionally, companies invest in educational programs to equip underrepresented groups with vital digital skills, paving the way for full-time employment (Visa 2019c). Recruitment processes are being refined to eliminate biases based on personal characteristics, supporting community equal rights, and aiding the unbanked (HSBC 2019; Payments.com 2019b). AI in personnel selection and customer data algorithms is scrutinised to understand and mitigate biases, thereby avoiding diversity-related risks (Hamish et al. 2018; Accenture 2019).

ORGANISATIONAL TRAINING AND AWARENESS SUB AREA

Industry analysts have pinpointed a *Human Capital or work structure focus*, emphasising high-quality education that fosters advanced cognitive skills, like complex problem-solving and socio-behavioural skills predictive of adaptability. This aligns with **Political and organisational** factors such as *Learning and Training Employee Strategy*, *Employment Job Creation Focus*, and **Technological and Methodological** factors, including *Coaching and Mentoring*, *Career Development, Employee Leadership Development Programs*, *Expert Leadership Development*, *Colleague Engagement Policies*, and *Colleague Support*. Stakeholders range across Banks, Acquirers like FIS, Fiserv, and GPN, Merchants including Morrison, Sainsbury, Tesco, Wal-Mart/ASDA, Payment Networks such as Discover and Mastercard, and Regulators including the BoE, FCA, and UK Finance.

These factors are crucial for **all resilience** attributes, as having well-trained employees, including third-party suppliers, is key to implementing new strategies, particularly those associated with digital technologies (PwC 2019; Walmart 2019). Risks associated with the recruitment, training, retention, and management of qualified personnel are recognised, with the potential loss of 'key personnel' being detrimental to company performance (Amazon 2019; Fiserv 2019). Challenges include ensuring appropriate

resource investment, which can be difficult to quantify due to qualitative or subjective variables affecting overall value (Discover 2019).

Companies invest in training and professional development across various qualifications, such as lean management and agile methodologies (Amazon 2019; Mastercard 2019). Learning platforms have been established for continuous education, with employee engagement and feedback gauged through surveys, fostering an open and inclusive culture (Barclays 2019; HSBC 2019; Sainsbury 2019; Santander 2019; Walmart 2019). Insights from disruptive events are captured and shared through conferences and best practice sessions (Amazon 2019; Morrison 2019; PRA 2019; KPMG 2020), and industry or government insights are disseminated via expert panels and webinars (FCA 2019a; Tesco 2019).

In addition to industry skills, leadership abilities and mental well-being are focus areas for training (BoE 2019; Lloyds 2019), with career development centres and apprenticeship programs targeting specific demographics and sectors (Santander 2019; Tesco 2019). Policies to improve working conditions, such as raising pay to a living wage, are also being developed (Amazon 2019), with employee satisfaction measured through indices and surveys (Morrison 2019). Companies strive for employees to reach their full potential, correlating individual achievement with overall company productivity and market leadership.

Mentoring schemes and professional development networks, led by senior leaders, aim to impart knowledge, especially in technology, social diversity, inclusion, and environmental initiatives (BoE 2019; Morrison 2019; RBS 2019; Tesco 2019). These schemes support external programs focused on innovation, financial management, and digital skills, addressing the needs of SMEs, charities, young professionals, students, and the public. A special emphasis is placed on financial education programs to combat financial fraud (FCA 2019a; Lloyds 2019; Santander 2019). Committees oversee talent development processes to ensure adherence to various criteria and standards.

In the organisational training and awareness process sub area, *Graduates recruitment or a general focus on recruitment, talent acquisition* was identified by industry analysts,

which matches with the **Political and organisational** factors, *Recruitment programs* (Aligned stakeholders: Acquirers (4), Merchants (5), Payment Networks (4), and Non-aligned stakeholders: Banks (5): Barclays, HSBC, Lloyds, RBS, and Regulators (5): BoE, FCA, HM Treasury) and non-aligned factor, *Student focus*, and **Socio-cultural and Demographic** factor**,** *Graduate programs,* (Non-aligned: Acquirers (1) US Bancorp, Banks (3): Barclays, RBS, Santander, Payment Networks (2): Discover and Visa, Merchants (4): Amazon, Morrisons, Sainsburys, and Wal-Mart-ASDA, and Regulators (1): BoE). These factors are relevant in terms of **all resilience attributes**, given that the market, community, and organisational needs are changing, and people with different and emerging skills might contribute to the relevant technical fields of expertise. With these changing market circumstances, companies tend to focus on technological skills (Santander 2019; World Bank 2019b; Ernst & Young 2020). As well they focus on continuing programs with the help of universities to further skill current employees and encourage employee retainment as they identify the risk of not finding the right professionals or motivating them to remain (i.e., failure to hire and retain highly skilled employees) (Mastercard 2019; World Bank 2019b).

Some organisations provide student-specific loans or sponsorships to attend schools and universities or obtain certain qualifications, like degree apprenticeships (Barclays 2019; BoE 2019; Discover 2019; Lloyds 2019). As well, they develop early-career programmes to build skills and leadership capabilities in partnership with universities or research centres (i.e., Warwick, UCL, Cambridge, among others) (BoE 2019). In sustainable finance, these graduate courses are relevant as they establish principles related to respecting and investing in local communities and compliance with anti-corruption and anti-competitive behaviour while enhancing transparency through tracking and reporting (Schoenmaker 2018). Others have investigated improving the hiring process by changing the traditional process and looking for professionals in unconventional ways, for example, through computer programming competitions, being as diverse and inclusive as possible (Barclays 2019).

In the organisational Training and Awareness process sub-area, industry analysts have underscored the importance of *Graduate Recruitment* and a broader focus on

Recruitment and Talent Acquisition, aligning with **Political and organisational** factors like *Recruitment Programs*. This involves Acquirers, Merchants, Payment Networks, with Banks such as Barclays, HSBC, Lloyds, and RBS, and Regulators including the BoE, FCA, and HM Treasury. Additionally, there is a *Student Focus* and **Socio-cultural and Demographic** factor in *Graduate Programs*, involving a range of stakeholders from across the sector.

The relevance of these factors to **all resilience** attributes is highlighted by the evolving market, community, and organisational needs, particularly as different and emerging skills become increasingly important in technical fields. In response to these changing market dynamics, companies are increasingly emphasising technological skills (Santander 2019; World Bank 2019b; Ernst & Young 2020). There is also a focus on continuing education programs in collaboration with universities to enhance the skills of current employees and support employee retention, acknowledging the risk associated with the challenge of finding and keeping highly skilled professionals (Mastercard 2019; World Bank 2019b).

Organisations offer specific loans or sponsorships for students to attend schools and universities or to achieve qualifications like degree apprenticeships (Barclays 2019; BoE 2019; Discover 2019; Lloyds 2019). Early-career programs are developed in partnership with universities or research centres to build skills and leadership capabilities (BoE 2019), with sustainable finance courses emphasising principles of community respect and investment, anti-corruption, anti-competitive behaviour avoidance, and enhancing transparency through tracking and reporting (Schoenmaker 2018).

Some entities are innovating the hiring process, moving away from traditional methods, and searching for talent through unconventional avenues, such as computer programming competitions, emphasising diversity and inclusivity (Barclays 2019).

RISK MANAGEMENT SUB AREA

Industry analysts have identified *Climate Change and the transition to a low-carbon economy*, guided by frameworks such as the *Task Force on Climate-related Financial Disclosures* (TCFD), as a significant factor. This encompasses **Environmental and Societal** factors such as *Climate Change Risk Management, Climate Initiatives, Carbon*

Reduction Initiatives, and GHG Emissions. Involved stakeholders include Banks, Merchants, and Regulators, with Payment Networks like American Express and Visa, and Regulators such as the BoE, FCA, and UK Finance also playing a role.

These factors are integral to **all resilience** attributes, as industry and payment system organisations recognise the imperative of adhering to new ESG and climate regulations, which demand a reduction in emissions impacting all operations and presenting various financial risks and opportunities, including green finance. Investments are being directed towards technologies and skills supporting decarbonisation efforts and financing greener initiatives, steering clear of high carbon sectors (FCA 2019a; IMF 2019a; Lloyds 2019; Morrison 2019; Santander 2019; IIF and EY 2021).

Regulatory requirements around environmental accountability have expanded to include ESG reporting frameworks like the TCFD, involving new performance management, accounting principles, and sustainable activity taxonomies, particularly for multinational corporations. These frameworks, which incorporate Corporate Social Responsibility (CSR) and Ecological Performance Standards (EPS), aim to close the gap between consumer perceptions and reality, prompting a redesign in the lifecycle measurement of products and services to aid the shift towards lower or zero-carbon solutions (Bloxham 2011; Callahan et al. 2011; Vigneau et al. 2015; Álvarez Jaramillo et al. 2019; Lagoarde-Segot 2019; Azahara and González 2021; Popescu et al. 2021).

Companies have set forth plans to achieve net-zero or carbon-neutral status within the coming decades, targeting years like 2040 or 2050 (Amazon 2019; BoE 2019). These initiatives consider various GHG emissions scopes (scopes 1, 2, and 3) and require comprehensive strategies to reduce carbon intensity and improve energy efficiency in operations and infrastructure, supported by investment in green technologies. Collaborative efforts such as those established by the Carbon Trust are defining industry projects, standards, and targets (Callahan et al. 2011).

Non-aligned factors (capability gaps)

ENTERPRISE FOCUS SUB AREA

In the Enterprise Focus Process sub-area, Insurtech and a focus on *Insurance* have been noted by industry analysts. This area corresponds with the **Technological and Methodological** factor, specifically *Sustainable Insurance*, which is not consistently aligned among stakeholders, including Banks like Lloyds, Retailers such as Sainsbury's, and Regulators like the BoE.

The emphasis on insurance in this context primarily supports **robustness**, as well as other resilience attributes, in light of the financial sector's trend towards sustainable practices and the investment in technology that facilitates access to data. This data access enables the provision of more tailored information to customers, helping them to mitigate specific risks they may face (Steemis 2019; Conboy et al. 2020). Initiatives like the BoE's Sustainable Insurance forum have been established for stakeholders to delve into these topics (BoE 2019).

Further underlining this priority, the United Nations Environment Programme Finance Initiative (UNEP FI) has introduced the Principles for Responsible Banking and Principles for Sustainable Insurance. These principles serve as a preliminary framework to standardise sustainable practices in the financial sector and offer guidance (Lloyds 2019).

Companies are also channelling investments into Insurtech innovations to enhance financial services for unbanked populations who may not meet the criteria of conventional insurance analysis and approval models (PwC 2019).

FINANCIAL RESOURCE MANAGEMENT SUB AREA

Within the Financial Resource Management process sub-area, industry analysts have highlighted the focus on *Risk Weighted Assets (RWA) investment* as a prudent alternative to riskier or less liquid assets. This focus aligns with the **Economic and Financial** factor, *Risk Weighted Assets. However,* it is not uniformly prioritised among stakeholders, including Banks like Barclays, HSBC, and RBS, Payment Networks such as American Express and Discover, and Acquirers like US Bancorp.

The attention given to RWA is critical for an organisation's **flexibility** and **robustness**. The Basel Committee, which sets international banking standards, is instrumental in this area. They have been refining the standardised approach for credit risk assessment, which includes recalibrating risk weights and improving the RWA framework. Additionally, the Committee is introducing new or enhanced capital requirements concerning Common Equity Tier 1 (CET1) ratios. These measures could potentially constrain operational capacities of companies. Furthermore, the Committee emphasises evaluating various stress scenarios to mitigate systemic risks (HM Treasury 2016; Barclays 2019; BoE 2019; HSBC 2019). This ongoing refinement of regulatory requirements underlines the importance of maintaining a robust balance sheet and a strong capital base to withstand potential financial disturbances.

RISK MANAGEMENT SUB AREA

In the Risk Management process sub-area, the *Covid-19 pandemic* has been flagged by industry analysts as a significant factor, corresponding with the same **Socio-cultural and Demographic** factor identified in industry reports. Stakeholders not necessarily aligned on this issue include Banks such as Lloyds and Santander, Merchants like Amazon, Payment Networks such as American Express, and Regulators including the BoE, FCA, and HM Treasury.

The pandemic has impacted the entire payment system across **all resilience** attributes. Governments and organisations have recognised the need to prepare for such crises, implementing relevant recovery mechanisms. These include pandemic emergency purchasing programs, long-term financing operations, and interest rate management mechanisms aimed at supporting the economy and preventing the inflation of essential assets such as housing and energy (Fair 2005; HM Treasury 2016; Bancorp 2019; BoE 2019; FCA 2019a; Morrison 2019).

These recovery mechanisms have accelerated digital transformation initiatives, such as enhancing digital payment systems, reducing the use of cash, and fostering e-commerce, in response to changing customer preferences and restrictions (Visa 2019c; Deloitte 2021). Furthermore, new collaborative systemic models and rapid adaptations to

operational capabilities have been developed with a view to cost reduction. Running stress test scenarios has been key to reducing system vulnerabilities (Pettit et al. 2010; Araz et al. 2020; KPMG 2020; IIF and EY 2021).

The pandemic has also presented opportunities to adapt to more efficient systems and reduce environmental costs. However, seizing these opportunities requires redesigning current business models to ensure sustainability and resilience in a post-pandemic world (Ojo/Roedl 2021).

5.4.3 Operations area

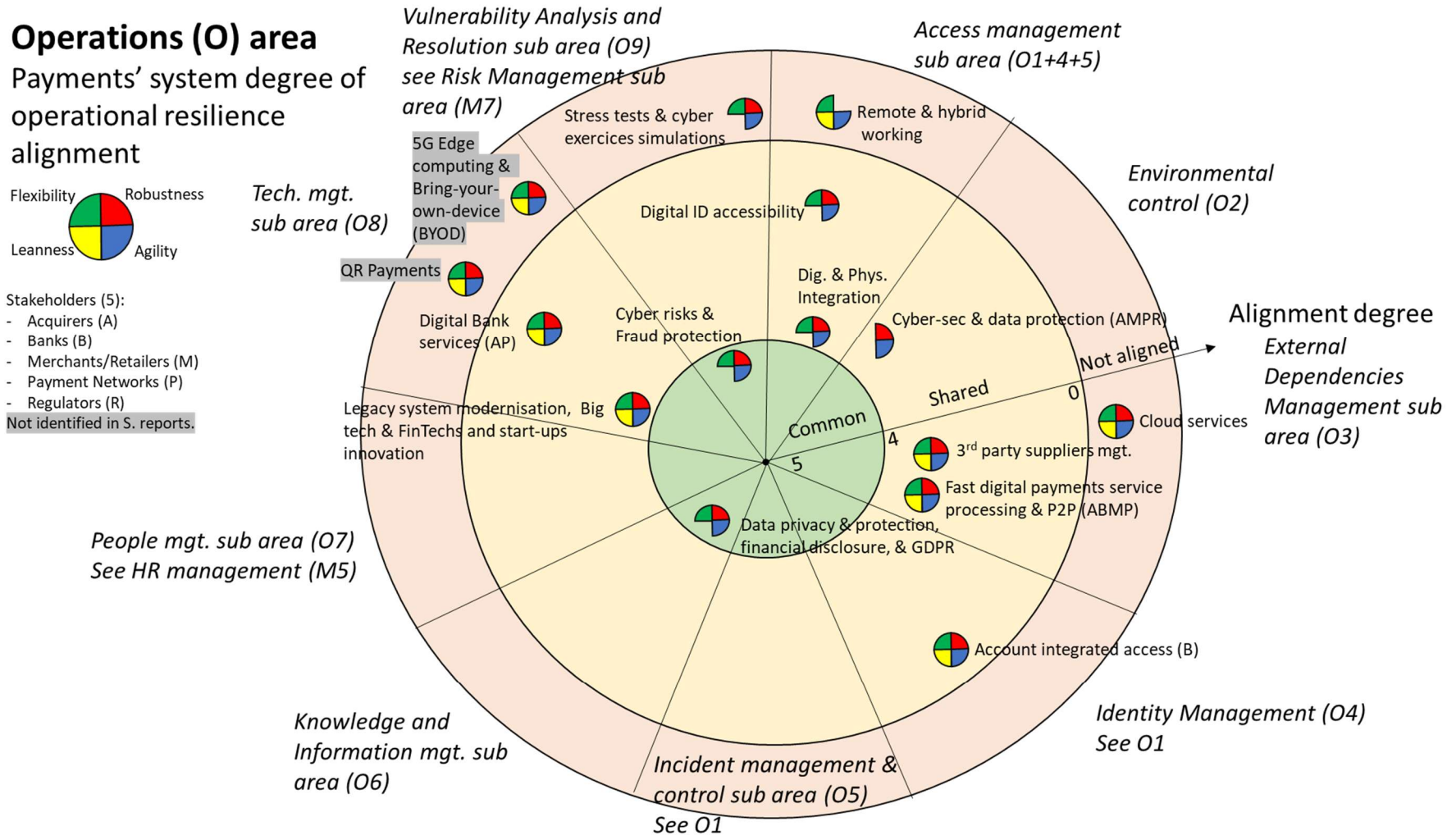


FIGURE 5.25 OPERATIONS AREA PAYMENT SYSTEM'S STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

Common factors (alignment)

KNOWLEDGE AND INFORMATION MANAGEMENT SUB AREA

In the sub-area concerning knowledge and information sharing, industry analysts have pinpointed *Datacentres or data-centric approaches, Personal Information management* (encompassing data privacy and sharing, GDPR, trust, and consumer protection), and *Information Disclosure* as critical factors. These align with the **Technological and Methodological** factor of *Data Management* and the **Political and organisational** factor of *Reports and Statements*. Additional non-aligned factors include *Data Privacy and Protection, Financial Disclosure, General Data Protection Regulation (GDPR),* and *Intellectual Property*. Stakeholders in these areas include Acquirers, Payment Networks, Merchants like Amazon and Wal-Mart/ASDA, and Regulators such as HM Treasury.

These factors are deemed crucial for **robustness, agility**, and **flexibility**. Organisations must manage customer data effectively to be responsive and tailor services to user needs while ensuring data protection and compliance with reporting standards to safeguard this information (Accenture 2019; KPMG 2020; Oliver Wyman 2020; Deloitte 2021; IIF and EY 2021).

Investment in data storage, cloud services, and analytics is being driven by a data-centred strategy across organisations to garner business intelligence for various purposes. Regulatory frameworks like Open Banking (PSD2) require timely information availability in compliance with supervisory mandates to mitigate risks such as money laundering and corruption and to adhere to data privacy standards (Amazon 2019; American Express 2019; Bancorp 2019; FCA 2019a; Global Payments 2019; Lloyds 2019; Morrison 2019; PRA 2019; Tesco 2019; Visa 2019c).

In line with these efforts, climate-related disclosures, such as those mandated by the TCFD, are being integrated to encompass extensive supply chain and third-party impacts. These disclosures assist organisations in reporting on resources and processes, aiding regulatory oversight across various industries (Amazon 2019; American Express 2019; Bancorp 2019; FCA 2019a; Global Payments 2019; Lloyds 2019; Morrison 2019; PRA 2019; Tesco 2019; Visa 2019c).

Financial statements, vital for tracking financial transactions, operations, and risks, are standardised by regulators and reviewed by auditors. This standardisation supports transparency in financial dealings, including credit risk disclosures in line with legislation such as the UK's Fair Credit Reporting Act (Hasan et al. 2013b; Barclays 2019; Holmes et al. 2019; HSBC 2019; Lloyds 2019; Santander 2019).

Technological advancements, such as the Legal Entity Identifier system, facilitate the tracking of financial operations along supply chains, integrating pertinent data. Education and training for all parties in the process are fundamental to ensure effective data management and protection (RBS 2019).

Intellectual property protection remains a priority for most companies, ensuring the security of trademarks, service marks, copyrights, patents, domain names, trade dress, trade secrets, and proprietary technologies like algorithms. There is also a risk associated with potential intellectual property rights infringement charges or other violations (Open Banking Ltd. 2019).

VULNERABILITY ANALYSIS AND RESOLUTION SUB AREA

The sub-area in question intersects with the **Technological and Methodological** *Enterprise Risk Management Framework* factor within *Risk Management*. It considers the broad spectrum of risks that financial institutions face, including but not limited to Liquidity Risk, Market Risk, Reputational Risk, Material Adverse Effects, and issues concerning Deposit Insurance.

Stakeholders such as Acquirers, Banks, Merchants, Payment Networks, and Regulators (including the BoE, FCA, PRA, and UK Finance) are aligned in acknowledging the importance of Risk Impact, Mitigation Approaches, and a Resilience Focus. While **robustness** is the primary concern, the discussion encompasses all resilience attributes, emphasising the overall resilience of the financial system against various risks. Specific areas underlined include Operational Resilience, Cyber Resilience, a culture fostering resilience, and Market Resilience.

Strategies for Operational Resilience may include the formation of evaluation committees and colleague training programs, reflecting the comprehensive approach organisations are taking to mitigate risks (Barclays 2019; HSBC 2019; Lloyds 2019; RBS 2019; Santander 2019).

organisations are proactive in managing the impact of diverse risks on operations, as detailed in their strategic reports. An illustrative Risk Matrix can be found in Appendix G of these reports, providing a full list of risks identified by payment system companies. Some of the most commonly identified risks are:

- Liquidity Risk: The potential difficulty of converting assets into cash without loss.
- Market Risk: The possibility of financial loss due to movements in market prices.
- Reputational Risk: Negative public opinion can impact the company's operations or profitability.
- Material Adverse Effect: Refers to any significant negative change in business conditions that could affect a borrower's ability to repay loans, the performance of contractual obligations, or the enforceability of loan agreements.
- Deposit Insurance: A safeguard measure implemented by banks to protect depositors from losses due to a bank's failure to meet its debt obligations.

These risks are standard considerations in the financial industry. They are mitigated through various strategies and regulatory compliance measures, such as adherence to the General Data Protection Regulation (GDPR) for data privacy and the application of frameworks like the TCFD for climate-related financial disclosures. The assessment and management of these risks are essential to maintain the integrity and stability of the financial system.

Moreover, in the same process sub-area, analysts have highlighted concerns around *Hackers, cybercriminals, and the dark web, as well as cyberattacks and cybersecurity risks*. This aligns with the **Technological and Methodological** factors *of Cyber Security*

and Data Protection, and *Fraud Capabilities.* Additionally, *Anti-money Laundering, Corruption, Counterterrorism*, and adherence to the *Corrupt Practices Act* are significant considerations involving a range of aligned and non-aligned stakeholders from Acquirers, Payment Networks, Banks, Merchants, and Regulators.

These factors are pivotal to an organisation's **flexibility, agility**, and **robustness**. A key priority is collaboration between companies, governments, and regulators to establish stringent regulations and controls in digital innovation, including data protection, data ethics, and cybersecurity to address fraud issues and maintain customer trust (American Express 2019; BoE 2019; Global Payments 2019; Lloyds 2019; UK Finance 2019a; IIF and EY 2021).

Fraudulent activities can lead to reputational damage, brand harm, and significant legal, regulatory, and financial exposure. Sophisticated cyberattacks such as viruses, ransomware, social engineering, corporate espionage, and denial-of-service attacks pose security threats. Often, the detection and full impact of cybersecurity incidents may not be immediately known (American Express 2019). Businesses must have robust continuity plans, with dedicated engineering teams and task-focused groups to mitigate these risks (Amazon 2019; Lloyds 2019; Santander 2019), with oversight from government organisations ensuring operational integrity (BoE 2019).

Decision-making regarding resource allocation for cybersecurity is complex and is being optimised through various quantitative and qualitative models, including stochastic modelling and scenario stress testing (Paul and Zhang 2020).

Regarding corrupt practices, anti-money laundering, and counterterrorism efforts, companies emphasise adherence to existing laws and acts, fulfilling all necessary compliance requirements, and proactive measures such as strategy development, committee programs, designated officers, and cooperation with professional bodies or task forces. Such actions are standard for addressing various financial frauds. When regulations trigger investigations, organisations are obliged to acknowledge and report these as per regulatory requirements (BoE 2019).

Shared and organisation-specific factors (alignment gaps)

ACCESS MANAGEMENT SUB AREA

In the Access Management sub-area, *Digital Identification* has been highlighted by industry analysts as a crucial factor, encompassing Know Your Customer (KYC) protocols and the Legal Entity Identifier (LEI) system. This is aligned with the broader **Technological and Methodological** factor of *Cyber Security and Data Protection*. Stakeholders across Acquirers, Merchants, Payment Networks, and Regulators are invested in these processes, with Banks like Barclays, HSBC, Lloyds, and Santander also involved.

Implementing Biometric Authentication and Accessible Services is pivotal for ensuring **robustness, agility,** and **flexibility** within organisations. There is an acknowledgement that accurate data and secure, efficient access methods are essential for increasing customer trust and enhancing the overall experience. From a Knowledge and Information Management standpoint, these capabilities are integrated with other automation technologies like Machine Learning, AI, IoT, Natural Language Processing, 5G, and blockchain to create a more dynamic environment (PwC 2019). Mobile technologies, in particular, are bridging financial gaps for the unbanked, with systems like Kenya's M-Pesa allowing individuals to access financial services via mobile devices (Olaleye et al. 2017; Bech et al. 2018; Raconteur 2018).

Biometric identification methods, such as facial recognition and fingerprint scanning, are increasingly adopted by Payment Networks and Banks for secure and improved service access. Additionally, one-time use identifiers or tokenisation and two-factor authentication techniques, which leverage something the customer knows, has and is (via biometrics), enhance security and user adoption (Barkhordari et al. 2017; American Express 2019; Visa 2019a).

The Bank of England advocates using the LEI as a unique identifier for businesses within the UK, particularly in payment messaging, to deter fraudulent activity. This is complemented by the thorough utilisation of transactional data like card identification numbers and transaction specifics (Discover 2019; Global Payments 2019).

Moreover, data must be accessible to customers, investors, suppliers, and third parties to foster a more collaborative market in line with PSD2 and Open Banking standards (PWC 2016; American Express 2019; BoE 2019; Open Banking Ltd. 2019). Financial services must be user-friendly, safe, reliable, resilient, and cost-effective. In the UK, challenger banks, FinTechs, and retailer-owned banking offer competitive alternatives. These entities' Data-driven services enable more personalised product offerings tailored to customer needs (HM Treasury 2016; FCA 2019a; Morrison 2019).

Another factor identified by industry analysts is the *Integration of physical and digital channels, remote or hybrid working, and Mobility and mobile applications, apps, smartphones, mobile banking, digital wallets, and digital platforms.* This factor matches with the **Technological and Methodological** factors, *Branch store service improvement and automation* (Aligned stakeholders: Acquirers (4), Banks (5), Merchants (5), *Digital bank company, Mobile banking,* and *Platform or portal development* (Aligned stakeholders: Acquirers (4), Banks (5), Merchants (5), Payment Networks (4) and Non-aligned stakeholders: Regulators (4): BoE, FCA, HM Treasury, and UK Finance)*, Online banking capabilities* (Aligned stakeholders: Acquirers (4), Merchants (5), Payment Networks (4), and Regulators (5), and Non-aligned stakeholders: Banks (5): HSBC, Lloyds, RBS), *ATM cash services* (Aligned stakeholders: Acquirers (4), and Non-aligned stakeholders: Banks (2): RBS, Santander, Merchants (1): Sainsbury, Payment Networks (3): Discover, Mastercard, and Visa, and Regulators (1): FCA), *Cash services* (Aligned stakeholders: Acquirers (4), and Non-aligned stakeholders: Banks (3): Barclays, HSBC, Lloyds, Payment Networks (3): Discover, Mastercard, Visa, and Regulators (2): FCA and UK Finance), and *Check services* (Aligned stakeholders: Payment Networks (4), and Non-aligned stakeholders: Acquirers (3): FIS, Fiserv, GPN, Banks (1): RBS, Merchants (4): Amazon, Morrison, Tesco, Wal-Mart/ASDA, and Regulators (5): FCA). Companies and analysts mention that offering different access methods to your services improves the customer experience, especially for those customers who are not as acquainted with digital and mobile technologies, which can contribute in terms of terms of **robustness, agility,** and **flexibility**, as explained in the next paragraphs (Gartner 2019; Vives 2020).

Online capabilities have been increasing and integrating across different channels or even services. Specifically, payment capabilities are being added to retailers' platforms, given the increase in online sales, based on card payments (Borzekowski et al. 2008; Bansal et al. 2018; Amazon 2019; Payments.com 2019a; Sainsbury 2019). Financial personal account websites have also improved reliability and integrated many services, especially from a fraud perspective, incorporating security services (FCA 2019a). Online channels have also remained the main means of communication for the different organisations about all their operations and any other company-related issues.

Lately, companies find it more costly to maintain a branch. However, there needs to be an assessment of different use cases and commercial decisions, for example, considering local communities' last-in-town branch initiatives and their social and environmental impact. There needs to be an overall assessment that ensures customer access. Branches can diversify their use, working as places where the community gets education. Other options that substitute branches are integrating financial services with post-offices or developing pop-up branches (Barclays 2019; HSBC 2019; Lloyds 2019). Branch offerings are important in the case of a merger or acquisition, as they are relevant to evaluating where organisations offer certain types of services and considering specific types of regulations (Bancorp 2019). This is also important in terms of international operations that might affect the risk profile of a certain organisation (PRA 2019). Nonetheless, in the case that companies find certain branches worth opening, they try to automate them to make them as efficient as possible, simplifying products, services, and underlying processes and use partnerships to build financial services at a scale (FIS 2019; Santander 2019; Ernst & Young 2020). Today, branches are seen as experience hubs, and the use of these channels depends on different factors such as age, geography, and culture. Concerning the retail payment system, offering access to certain payment methods, such as cash, in which some population still relies on, for example, older adults (Klee 2008; Yousafzai and Yani-de-Soriano 2012; Bech et al. 2018).

In terms of paper-based transactions, cash and check services access mainly, all the banks and acquirers continue providing these services but try to make them as resource-efficient as possible to provide the right payment mix to everyone. Using postal shops,

retail stores, pop-up branches, and ATMs to access them. Also, an area of focus is reducing the fraud related to checks and cash. Other associated costs or fees include late payments, returned checks, and balance transfers, among others (American Express 2019; Discover 2019; Mastercard 2019; Visa 2019c).

Industry analysts have identified the *integration of physical and digital channels, hybrid working models,* and *the advancement of mobile applications and digital platforms* as pivotal factors. These elements are part of the **Technological and Methodological** factors associated with improving *Branch store service improvement and automation, Mobile banking, Platform or portal development, Online banking, ATM, Cash, and Check services* capabilities. Aligned stakeholders in this area include Acquirers, Banks, Merchants, and Payment Networks, with Regulators such as the BoE, FCA, HM Treasury, and UK Finance also engaged.

These developments are crucial for enhancing customer experience, particularly for those less familiar with digital and mobile technologies. They contribute to operational **robustness, agility,** and **flexibility** (Gartner 2019; Vives 2020). Online capabilities are expanding, with payment functionalities increasingly integrated into retailers' platforms due to a surge in online sales (Borzekowski et al. 2008; Bansal et al. 2018; Amazon 2019; Payments.com 2019a; Sainsbury 2019). Financial websites have bolstered their reliability and service integration, particularly concerning fraud prevention and security (FCA 2019a).

While maintaining physical branches becomes more costly, evaluating their social and environmental impact is necessary, especially for 'last-in-town' branches and their significance to local communities. Branches are diversifying, serving as educational community hubs, or being supplemented by services integrated with post offices or temporary 'pop-up' branches (Barclays 2019; HSBC 2019; Lloyds 2019). In mergers or acquisitions, the role of branches in service provision is a key consideration, as well as the regulatory implications of such services (Bancorp 2019). The risk profile of international operations can also influence branch utility (PRA 2019). Automated branches are being designed for efficiency, simplifying processes, and leveraging

partnerships to scale financial services (FIS 2019; Santander 2019; Ernst & Young 2020). Branches are increasingly viewed as experience hubs, with their usage influenced by factors like age, geography, and culture.

As for the retail payment system, offering access to traditional payment methods such as cash is critical, especially for populations like older adults who rely on it (Klee 2008; Yousafzai and Yani-de-Soriano 2012; Bech et al. 2018).

Banks and Acquirers continue to offer paper-based transaction services like cash and check services while striving to make them resource-efficient and provide a balanced payment mix. These services are facilitated through postal shops, retail stores, pop-up branches, and ATMs. Reducing fraud associated with checks and cash is a focus area, along with managing costs related to late payments, returned checks, and balance transfers (American Express 2019; Discover 2019; Mastercard 2019; Visa 2019c).

ENVIRONMENTAL CONTROL SUB AREA

Digital Identification, commonly referred to as Know Your Customer (KYC) or Legal Entity Identifier (LEI), is a critical factor identified by industry analysts. It aligns with the **Technological and Methodological** *Cyber Security and Data Protection* factor. It involves a wide array of stakeholders, including Acquirers, Merchants, Payment Networks, and Regulators, with Banks such as Barclays, HSBC, Lloyds, and Santander also playing a key role.

This factor is integral to an organisation's **robustness** and **agility**. Industry analysts and companies recognise cyber security risk as a predominant threat to real-time operations. Effective digital identification of customers enhances the efficiency and security of payment transactions, thereby fostering customer trust and ensuring that there are no security gaps (Gheorghe et al. 2018; Barclays 2019; HSBC 2019; Lloyds 2019; PwC 2019; RBS 2019; KPMG 2020; Deloitte 2021).

Cyber security and data protection are crucial from both regulatory and operational service perspectives. organisations are required to implement controls to safeguard customer data, comply with data ethics, and adhere to GDPR requirements, which ensure

data confidentiality, availability, and integrity (American Express 2019; PRA 2019; Santander 2019). Additionally, they must be vigilant against data leaks from cyber-attacks such as DDoS (Distributed Denial of Service) (Bancorp 2019).

Retail payment system stakeholders are evolving their protocols to manage information securely under regulations like PSD2 (Visa 2019a) and are developing tools to detect data breaches or other cybercrimes (Barclays 2019). Companies routinely conduct stress tests and develop business continuity plans to test their systems' robustness. They collaborate with national and international entities like the Financial Services Cyber Collaboration Centre, the Government's National Cyber Crime Centre, and industry-specific groups such as the Cross-Market Operational Resilience Group and the Cyber Defence Alliance (CDA) to enhance collective cyber resilience (Lloyds 2019; PRA 2019).

External Dependencies Management sub area

Industry analysts have identified the *Gig and Sharing Economy, Freelancers, and the Network Effect* as factors significantly influencing the financial landscape. These factors relate to the **Political and organisational** factors of *Fair Payment and Reward Policy*, *Supply Chain Suppliers*, *Third Party Supplier* factor, and *Vendor Management*. Stakeholders in these realms include Banks, Merchants, Payment Networks, Regulators, and Acquirers, with involvement from entities like GPN, US Bancorp, and major retailers like Amazon and Wal-Mart/ASDA.

These factors are essential across **all resilience** attributes. A well-aligned supply chain, consistent in policies and practices, enables companies to deliver superior services and enhance customer experiences. One of the primary challenges in managing providers is the reliability of third-party systems. Dependence on these systems can introduce systemic risk, especially since replacing suppliers can be costly and complex (Purvis et al. 2016; Morozov 2018; Bancorp 2019; IIF and EY 2021).

With the increasing digitalization of services, companies' reliance on third-party services, such as cloud services and IT operational changes, has grown. This dependence raises concerns about aligning priorities, especially when third-party companies may be driven

solely by economic incentives and serve multiple clients with varied values (American Express 2019; Discover 2019).

Effective payment schemes and training programs that go beyond purely economic incentives are important for addressing company-specific needs. Some organisations opt for closed-loop operational environments, managing all operations internally, though this is increasingly challenging due to the specialisation of third-party providers. Establishing standards and policies for service delivery is key, ensuring both service-level agreements and adherence to ethical labour practices, as guided by principles like the UN Global Compact (Santander 2019; Ernst & Young 2020).

Third-party partnerships also play a crucial role in community development. Companies investing or offering services in specific regions should utilize local resources or develop local partnerships that bring additional value (BoE 2019; Oliver Wyman 2020). Fintech, in particular, has become a significant third-party provider in developing new services (Vives 2020).

The use of third parties extends to verifying an organisation's controls and improving operational services (FIS 2019). While retailers may provide promotional services for third parties in their stores and on their websites, they must also ensure compliance with regulations, applicable laws, and contractual agreements to mitigate risks that add operational complexity (Amazon 2019; American Express 2019).

Moreover, acquirers offering IT integration services for retailers face the challenge of managing disparate systems that must interoperate, creating critical integration points that require careful management (Fiserv 2019).

In the External Dependencies Management process sub-area, industry analysts have identified the integration of various payment services like Apple Pay and other money transfer and P2P lending platforms as significant. These fall under the **Technological and Methodological** factors, which include *Fast Digital Payment Services*, *Payment Integration Capabilities, Transaction Fees, Transaction Processing, Card Issuance, Interchange Fee Rates, Electronic Payments,* and an overall *Payments Focus*.

Stakeholders range from Acquirers, Merchants, Payment Networks, to Banks and Regulators like the BoE and FCA.

These factors contribute to **all resilience** attributes by enabling organisations and customers to develop more efficient, convenient, flexible, and faster payment capabilities, including expense management tools and electronic payment methods. Digital capabilities enhance service quality, speed, and reliability, which is crucial for simplifying service delivery, such as offering 24/7 digital access. However, these capabilities also introduce cyber risks, particularly fraud, that need to be addressed (Amazon 2019; American Express 2019; Morrison 2019).

Retailers are adapting to offer convenience services, with different store formats catering to varied customer needs, from corner shops to hypermarkets, ensuring customer and community service delivery expectations are met regardless of format (Tesco 2019). The integration of physical and digital channels is vital, complementing various services.

Infrastructure and knowledge for business models, such as RTGS, are being developed to provide these services while ensuring accessibility, integrity, and confidentiality in compliance with regulations (Fiserv 2019; Global Payments 2019). The current digital payment business model, which often relies on surcharging and interchange fees, lacks transparency, leaving customers unaware of the operational costs involved.

While there is recognition of the ongoing need for paper-based payment methods, these are considered more resource-intensive than electronic payments (Visa 2019c). Consequently, there is a push for digital services migration globally, expanding beyond card payments to include mobile payments (Klee 2006; Wang and Wolman 2016; Bank For International Settlements 2020; Vives 2020). Digital services include P2P transactions, corporate and government disbursements, bill payments, deposit check transactions, and initiatives involving cryptocurrencies or stablecoins. A key objective for various stakeholders is to increase payment method acceptance through integrated payment solutions like batch and real-time account-based payments (Visa 2019c; Bank of England 2020).

IDENTITY MANAGEMENT SUB AREA

In the Identity Management process sub-area, *industry analysts have highlighted Account Management* as a key factor. This element is associated with **Technological and Methodological** factors such as *Integrated Access Capabilities* and *Accessible Service*, with participation from various stakeholders like Acquirers, Banks, Payment Networks, Merchants, and Regulators.

These factors span **all resilience** attributes, acknowledging the growing provision of digital services and the necessity of identifying users and safeguarding their data with appropriate security measures. Efforts are underway to create digital identities that can be utilised across different platforms, enabling access to integrated financial products and services via various channels such as online and mobile (Barclays 2019; FIS 2019; Fiserv 2019; Mastercard 2019; RBS 2019; KPMG 2020; IIF and EY 2021). Organisations also have an internal strategic push to integrate systems for effective information exchange to seize opportunities and minimise risks.

In terms of payment processing, integrating payment flows and financial services across diverse marketplaces is crucial (Amazon 2019; Global Payments 2019; Lloyds 2019; Sainsbury 2019).

For a more comprehensive understanding, it is essential to consider overlapping factors from related sub-areas. Digital Identification, encompassing KYC and LEI, aligns with Cyber Security and Data Protection within the Access Management resilience sub-area. Additionally, the integration of physical and digital channels and the adaptation to remote or hybrid working models relate to the improvement and automation of branch services and digital banking factors, further underscoring the convergence of technological advancements and methodological approaches in enhancing resilience across the financial landscape.

INCIDENT MANAGEMENT AND CONTROL SUB AREA

For reference to the relevant factors that apply to this sub-area, please refer to *Digital identification (Know your Customer) KYC Legal Identity Identifier* matching with

Technological and Methodological *Cyber security and data protection* factor in the **Access Management** resilience area. See *Integration in physical and digital channels, remote or hybrid working.* This factor matches with the Technological and Methodological B*ranch store service improvement and automation* and *Digital bank company* factor in the **Access Management** resilience area.

People Management sub area

Please refer to the Human Resource Management sub-area in the Enterprise Management Area for the Common, Shared and Specific factors related to this People Management sub-area.

Technology Management sub area

In the Technology Management process sub-area, industry analysts have pinpointed the challenge of *Legacy Systems*, the push for *Legacy Modernisation*, and the rise of *Applications, Big Tech, Big Data, FinTechs, and Start-ups*. These elements align with **Technological and Methodological** factors such as *Operational Improvement Simplification and IT*, *Communications Improvement,* and general *Technology & Innovation focus*. Stakeholders ranging from Acquirers, Banks, and Payment Networks to Retailers and Regulators are involved in these areas.

The shift towards Process Streamlining, Business Solutions (B2B), a Focus on Technology and Innovation, Ventures, and Joint Ventures is evident across the sector. These factors underscore the importance of **all resilience** attributes, highlighting the need to address vulnerabilities in legacy systems and to refine processes for a more robust payment infrastructure (FCA 2019a).

A critical priority for companies is the transition from legacy systems to cloud-based integrated platforms, enabling the delivery of superior services (Amazon 2019; FIS 2019; Lloyds 2019). The adoption of agile and lean infrastructure methodologies facilitates this transition, whether through gradual operational improvements, technology replacements, or complete system re-engineering to simplify complex operating models (Naim et al.

2002; FIS 2019; Deloitte 2021). Such efforts aim to enhance data processing capabilities, potentially achieving real-time service delivery (PwC 2019; Deloitte 2021).

The encumbrance of legacy technology has often resulted in slow and unpredictable progress, with companies facing challenges in technological transitions (Oliver Wyman 2020). Setting new standards to integrate advanced technologies, such as FinTech innovations, is also part of this transformative journey (Vives 2020). These technological advances have facilitated remote working capabilities, though they also demand precise risk identification and regulation (PwC 2019; IIF and EY 2021).

Inadequate processes and outdated technology can restrict a company's ability to offer relevant products and services, a challenge acknowledged even by established players in the payment sector (Gartner 2019; Nelms et al. 2018). Specifically, in the B2B payment space, Acquirers and Payment Networks are prioritising opportunities to provide corporate cards and enhance FinTech services like cross-border payments, expense management, and data analytics. Efforts also encompass P2P and Government-to-Consumer (G2C) services.

Companies are streamlining their offerings and transforming their infrastructure, leveraging innovation and technology. Ventures and joint ventures are avenues pursued by some to foster innovation and build capabilities in unfamiliar domains (Bancorp 2019; FIS 2019; Fiserv 2019; Mastercard 2019; Sainsbury 2019; Tesco 2019; Visa 2019c). Banks and other institutions are encouraging innovation from within, supporting colleagues or community members to generate new ideas, particularly in the realm of ESG services (Barclays 2019; HSBC 2019; Lloyds 2019; RBS 2019; Santander 2019).

To understand overlapping areas, one may refer to *Digital Identification (KYC, LEI)* which is aligned with *Cyber Security and Data Protection* in the Access Management resilience area.

Non-aligned factors (capability gaps)

ACCESS MANAGEMENT SUB AREA

Remote and hybrid working models, while not highlighted in strategic reports, have been recognised by analysts as instrumental in fostering **leanness, agility,** and **flexibility** within organisations. These analysts predict a future where working from both home and office becomes the norm, potentially diminishing infrastructure expenses. However, they caution that this shift carries operational hazards, particularly concerning managing sensitive data and cyber risks. Furthermore, there are cultural obstacles to consider, including the challenge of cultivating rapport among colleagues (IIF and EY 2021). Nonetheless, hybrid working can offer distinct advantages, such as the capacity to assemble an international team, eliminate the need for physical office spaces, and adopt more adaptable time management practices (Deloitte 2021).

EXTERNAL DEPENDENCIES MANAGEMENT SUB AREA

Within the subset of External Dependencies Management, industry analysts have pinpointed several pivotal components: *Cloud services and standards, the Decentralisation* and *Network effect*—which fosters connections among customers, producers, and providers in a multisided model—alongside 3rd party outsourcing, and the intricacies of Interdependencies and systemic risk. These elements correspond with the **Technological and Methodological** factor derived from certain strategic reports, *Cloud-based digital environment*, yet stakeholders consistently lack consensus. The stakeholders exhibiting non-alignment include Acquirers such as FIS; Banks including Barclays and Lloyds; Payment Networks like American Express and Discover; Merchants namely Amazon, Morrisons, and Tesco; and Regulators such as the BOE, FCA, and PRA.

These identified factors are crucial across **all resilience** attributes since firms are transitioning their operations to external providers of digital and Software-as-a-Service (SaaS) solutions. This shift facilitates enhanced speed, cost-efficiency, scalability, flexibility, and superior quality service levels, marked by better insights and accelerated product innovation (Han et al. 2017; Han et al. 2020). However, these integrated services must be customised to meet customer needs, functioning as a cohesive network to

maintain and progressively refine their offerings. This network framework also bears the weight of third-party risks, predominantly cyber threats, which in turn, engender systemic risks (Haimes 2018; American Express 2019; Barclays 2019; Discover 2019; FIS 2019; Lloyds 2019; Homburg et al. 2020; IIF and EY 2021).

BigTech entities, which administer these services, can exploit extensive data repositories to discern various trends and enhance service delivery. Yet, bridging the educational divide remains a critical endeavour (Amazon 2019). Emerging customer omnichannel platforms and diverse mobile applications (APIs) require development or transition into these new settings, supported by an open architecture to facilitate flexible information sharing and process amalgamation (FIS 2019; Visa 2019c). Notable examples of such integrated technologies include cloud-based payment networks, retail applications, and assorted e-commerce solutions, both online and mobile (Fiserv 2019; Global Payments 2019). Furthermore, blockchain, cryptocurrency, and AI—underpinned by cloud computing—offer cutting-edge analytics and adaptive business learning, enabling business models to recalibrate in near real-time (Deloitte 2019; Deloitte 2021). Regulation, too, must evolve to mirror these advancements, ensuring appropriate governance and protection. However, regulatory directives may differ internationally, potentially escalating costs for certain entities and curtailing the advantages of scale (BoE 2019; PRA 2019; Visa 2019c).

Technology Management sub area

The advent of 5G edge computing, BYOD (Bring Your Own Device) banking, and QR payments for low-value transactions has been acknowledged by industry analysts but has yet to be captured in strategic reports. These innovations are pivotal in enhancing the sector's robustness, agility, leanness, and flexibility. Specifically, 5G technology is recognised for bolstering cloud computing capabilities by increasing data availability and accelerating the exchange of information, thereby cultivating a more robust and efficient digital milieu.

BYOD banking facilitates employees in utilising their preferred devices to deliver financial services, which, while improving service delivery, introduces challenges concerning

security and the personalisation of organisational IT services (PwC 2019). QR payments, on the other hand, offer a seamless interface for client transactions without the need for personal interaction, exemplified by restaurants taking orders directly from tables via QR codes, thus reducing the need for additional hardware such as POS systems. These payments are particularly conducive to creating a leaner and more adaptable framework, especially pertinent to low-value transactions (World Bank 2019b).

VULNERABILITY ANALYSIS AND RESOLUTION SUB AREA

In the process sub area of Vulnerability Analysis and Resolution, *Stress tests, cyber exercises, and simulations* have been spotlighted by industry analysts. These align with the **Political and organisational** factors extracted from selected strategic reports. However, disparities are evident in the application of *Stress tests* among stakeholders—ranging from Acquirers such as US Bancorp, to a range of Banks including Barclays, HSBC, RBS, and Santander, as well as Merchants like Morrison, Sainsbury, Tesco, and Wal-Mart/ASDA, in addition to Payment Networks American Express and Discover, and Regulators like the BoE, FCA, and PRA.

These mechanisms are integral to enhancing **flexibility, agility,** and **robustness** within organisational resilience frameworks. They enable firms to appraise various scenarios that could present diverse risks and vulnerabilities, particularly from financial and operational standpoints, such as IT systems. Through these evaluations, organisations can pinpoint potential mitigations—financial cushions—or develop contingency and crisis response strategies, with a focus on critical aspects like cybersecurity measures, identity access governance, and fraud risk management. Some of these systemic assessments are mandated by legislation and overseen by regulatory bodies, for instance, the Bank of England and CCAR (American Express 2019; Bancorp 2019; Bank for International Settlements 2019; Barclays 2019; BoE 2019; Discover 2019; Gandhi et al. 2019; Deloitte 2021).

Furthermore, there is emerging attention on identifying environmental and social hazards, exemplified by frameworks like TCFD or TNFD. However, the development of stress

testing for these areas remains in progress due to the qualitative character of the stress sources (HSBC 2019; RBS 2019; IIF and EY 2021).

5.4.4 Process management area

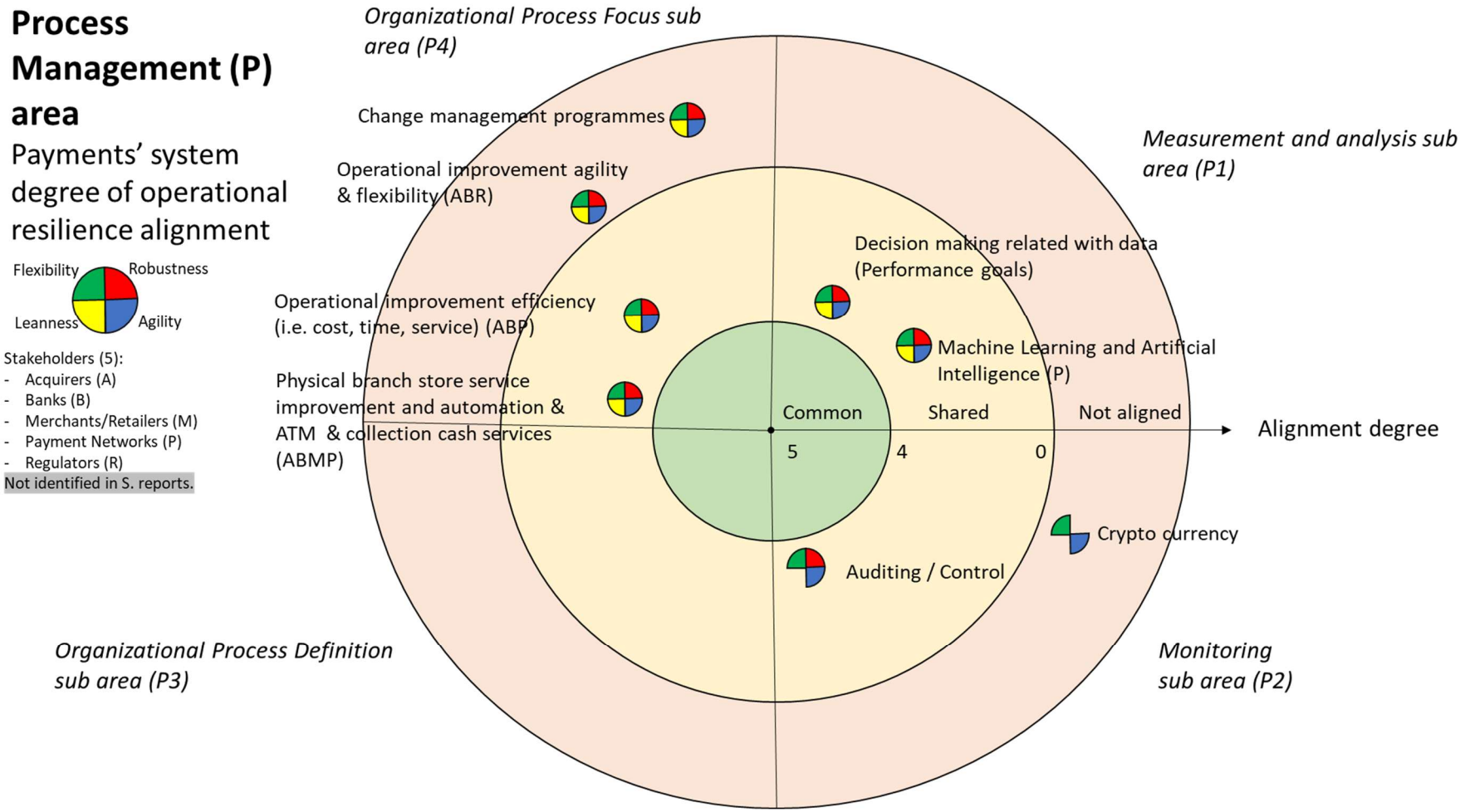


FIGURE 5.26 PROCESS MGT. AREA PAYMENT SYSTEM'S STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

Shared and organisation-specific factors (alignment gaps)

MEASUREMENT AND ANALYSIS SUB AREA

In the Measurement and analysis process sub-area, *Decision making related to data (i.e., personalised advice)* was identified by industry analysts, which matches with the **Political and organisational** factors, *Performance goals measurement* (Aligned stakeholders: Banks (5), Merchants (5), Payment Networks (4), and Regulators (5), and Non-aligned stakeholders: Acquirers (3): FIS, GPN, US Bancorp), and the factor coded from some strategic reports but not aligned, *Customer performance platform* (Non-aligned stakeholders: Banks (1): Lloyds). Other relevant related factors mentioned are: *Analytics insight* (Aligned stakeholders: Acquirers (4), Payment Networks (4), and Non-aligned stakeholders: Banks (3): Barclays, HSBC, Lloyds, Merchants (1): Sainsbury, Tesco, Wal-Mart/ASDA, and Regulators (5): BoE, FCA, PRA), *Survey* (Aligned stakeholders: Banks (5) and Regulators (5), and Non-aligned stakeholders: Merchants (5): Morrison, Sainsbury, Tesco, Payment Networks (4): American Express and Discover), *Colleague survey* (Aligned stakeholders: Banks (5), and Non-aligned stakeholders: Merchants (1): Tesco, and Regulators (3): BoE, FCA, HM Treasury), and *Business advising* (Aligned stakeholders: Regulators (5), and Non-aligned stakeholders: Acquirers (2): FIS, Fiserv, Banks (4): Barclays, HSBC, Lloyds, Santander, Merchants (2): Morrison and Tesco, Payment Networks (1): Discover). These factors contribute to **all resilience attributes**. As some companies acknowledge, performance management systems are the only way to track down results from strategic initiatives or decisions. As well as being able to measure and track down any kind of coordination and adaptation or responses to any business risks or hazards from a supply chain and both a Complex Adaptive Systems (CAS) and Complex Socio-Ecological Systems (SES) perspective (Folke et al. 2010; Coetzee et al. 2016; Li et al. 2017; Snowden and Boone 2017; Jain et al. 2018).

Different companies focus on their operations resource efficiency (i.e., management, personnel, operations, systems, technical performance, financial resources, and internal financial control and reporting functions) and the risks that the decisions they take involve when evaluating their performance. They also mention regulations, service standards, and benchmarks, as they must measure the delivery of the services (IIF and EY 2021).

Another area highlighted is employee performance measurement. Employees need to be incentivised and rewarded properly. Also, any kind of investment on new business units, suppliers, or other businesses are also included in the measurement systems. Measures make costs more transparent, make funding objectives clearer, and try to improve performance reporting from a short and long-term perspective.

As well, the improvements in the measurement capability comes not only from the financial and operational/technological side, but also from the environmental and social side (i.e., ESG and ethics, and financial inclusion, including the community impact), mentioned as Alternative Performance measures (IMF 2019b; World Bank 2019b). Most organisations have created KPIs dashboards aligned to their relevant objectives, as part of their strategic management process. The most common ones are ROI, ROTE, RWAs, CET1, Customer and Colleague (i.e., Culture) satisfaction and complaint resolution. In most cases, there is always a focus on increased performance, overseen by the board of directors or other committees, and reported to the investors and the general public (Amazon 2019; Barclays 2019; BoE 2019; FCA 2019a; FIS 2019; HSBC 2019; Lloyds 2019; Sainsbury 2019; Tesco 2019).

Several companies mention data analytics (i.e., advanced, leading, etc.) to obtain insights and predict behaviours from the data collected from customers and colleagues through different methods, including surveys and the data from their payment transactions. Some surveys gather information about their attitudes, customers' satisfaction and requirements, colleagues' working culture, qualifications, health, financial culture and practices, and sustainability practices. All this information is readily available and has to be protected by data privacy laws (Barclays 2019; BoE 2019; FCA 2019a; Sainsbury 2019; Tesco 2019; UK Finance 2019a). This is normally part of a technology or data strategy. Some focal strategic areas are risk (i.e., fraud), HR, and customer behaviour. Also, these internally developed analytics services are offered to their business clients (i.e., B2B services). The areas where they focus for the B2B services are risk management, financial local and global investments, technical advice (i.e., technology infrastructure and protocols), employee benefits related to wellbeing, pension, mortgage), and consumer trends (Barclays 2019; FIS 2019; Fiserv 2019; Visa 2019c).

In the Measurement and Analysis process sub-area, *Decision-making related to data* (i.e., personalised advice) has been recognised by industry analysts. This aligns with several **Political and organisational** factors, such as *Performance goals' measurement*, showing alignment among Banks, Merchants, Payment Networks, and Regulators, yet diverging with Acquirers such as FIS, GPN, and US Bancorp. Moreover, the *Customer Performance Platform* reveals misalignment, notably with Banks like Lloyds. Other critical factors include *Analytics insight*, achieving consensus with Acquirers and Payment Networks but not entirely with Banks, Merchants, or Regulators. *Surveys* are well-aligned among Banks and Regulators, yet variance is noted with Merchants and Payment Networks. The scenario is similar with *Colleague Surveys* and *Business Advising*, displaying both concurrence and divergence across different stakeholder categories.

These factors are pivotal to **all resilience** attributes; companies acknowledge that Performance Management Systems are essential in tracking the results of strategic initiatives or decisions. Additionally, these systems enable the measurement and tracking of coordination and adaptation or responses to business risks or hazards, from a supply chain perspective and through the frameworks of Complex Adaptive Systems (CAS) and Complex Socio-Ecological Systems (SES) (Folke et al. 2010; Coetzee et al. 2016; Li et al. 2017; Snowden and Boone 2017; Jain et al. 2018).

Organisations focus on the efficiency of their operations resources (i.e., management, personnel, operations, systems, technical performance, financial resources, and internal financial control and reporting functions) and the risks involved in decision-making when evaluating their performance. Regulations, service standards, and benchmarks are also considered vital for measuring service delivery (IIF and EY 2021). Employee Performance Measurement is highlighted, stressing the importance of proper incentivisation and reward structures. Investments in new business units, suppliers, or businesses are included in these measurement systems, which render costs more transparent and clarify funding objectives, thereby aiming to enhance Performance Reporting from both a short and long-term perspective.

Improvements in measurement capabilities arise not only from financial and operational/technological aspects but also from the environmental and social sides, such as ESG and ethics, financial inclusion, and community impact, referred to as Alternative Performance Measures (IMF 2019b; World Bank 2019b). Most organisations have created KPI Dashboards aligned with their strategic objectives. Common KPIs include ROI, ROTE, RWAs, CET1, and Customer and Colleague (i.e., Culture) satisfaction and complaint resolution. Typically, there is a focus on increased performance, overseen by the Board of Directors or other committees, and reported to investors and the general public (Amazon 2019; Barclays 2019; BoE 2019; FCA 2019a; FIS 2019; HSBC 2019; Lloyds 2019; Sainsbury 2019; Tesco 2019).

Many companies leverage Data Analytics to gain insights and predict behaviours from the data collected from customers and colleagues through various methods, including Surveys and transaction data. These Surveys collect information on attitudes, customer satisfaction and requirements, colleagues' work culture, qualifications, health, financial culture and practices, and sustainability practices. All collected data must comply with data privacy laws (Barclays 2019; BoE 2019; FCA 2019a; Sainsbury 2019; Tesco 2019; UK Finance 2019a). This is usually part of a Technology or Data Strategy. The strategic focus areas include Risk (i.e., fraud), HR, and Customer Behaviour.

Additionally, these internally developed analytics services are extended to business clients (i.e., B2B services), focusing on Risk Management, financial local and global investments, technical advice (i.e., technology infrastructure and protocols), Employee Benefits (related to wellbeing, pension, mortgage), and Consumer Trends (Barclays 2019; FIS 2019; Fiserv 2019; Visa 2019c).

Within the Measurement and Analysis process sub-area, the advent of *Artificial Intelligence and Technology*, specifically automated software solutions like *Verbal AI and Machine Learning*, has been recognised by industry analysts. These advancements correspond with the **Technological and Methodological** factor coded from strategic reports, *Machine learning and artificial intelligence*, which sees agreement from Payment Networks but less alignment among Acquirers such as FIS and GPN, Banks including

Barclays and HSBC, and Merchants like Amazon. These technologies are pivotal to enhancing resilience attributes, particularly **flexibility, agility,** and **leanness**. For instance, Ant Financial's innovative use of big data enables the disbursement of loans in under a second through their "3-1-0" lending model, significantly benefiting numerous small Chinese businesses since 2014 (Lloyds 2019; World Bank 2019b).

Billions of dollars have been invested in technology, with Artificial Intelligence being a critical area of focus to harness various data sources, such as *Social media*. Yet, this brings ethical considerations regarding consumer consent, data rights, and cybersecurity to the forefront, particularly in large-scale applications. Transparency and human oversight remain paramount (FCA 2019a; PRA 2019; PwC 2019; IIF and EY 2021). These technological strides have also enhanced *Customer service and performance metrics*, employing service bots across social media and messaging platforms for general customer service inquiries or providing "robo-advice."

Nevertheless, customer satisfaction with these services varies, and regulatory frameworks are still developing (Global Payments 2019; HSBC 2019; UK Finance 2019a). Applications such as risk scoring also bolster fraud prevention (Visa 2019c), with associated technologies including advanced authentication, predictive analytics, AI modelling, and the use of proprietary and shared databases (FIS 2019). Regulators are at the forefront, fostering a more competitive and innovative market while assessing policies from the customer's perspective (UK Finance 2019a).

Other overlapping factors include *Digital Identification, Know Your Customer (KYC), and Legal Identity Identifier*, which align with the **Technological and Methodological** *Cyber Security and Data Protection* factor, and *Integration in Physical and Digital Channels*, and *Remote or Hybrid Working*, which correspond with the **Technological and Methodological** *Branch Store Service Improvement and Automation and Digital Bank Company* factors within the Access Management resilience area. Refer to this section for a more detailed discussion.

MONITORING SUB AREA

In the Monitoring process sub-area, the integration of *Auditing and Control Rooms*, *encompassing deal management, conflict checking, wall crossing approvals, reporting, and detailed audit tracking*, has been identified by industry analysts. This aligns with the **Technological and Methodological** factor of *Cyber Security and Data Protection*, which has garnered support from Acquirers, Merchants, Payment Networks, and Regulators, albeit less so from Banks such as Barclays, HSBC, Lloyds, and Santander. The *Monitor* capability and *Internal Control* are other salient factors, with broad alignment from Acquirers, Banks, Payment Networks, and Regulators, but varying degrees of concurrence from Merchants.

These elements are instrumental in bolstering organisational **flexibility, agility,** and **robustness.** From a regulatory compliance standpoint, various resources and practices are scrutinised against established procedures and standards, such as ESG, CSR, and ethical considerations. Audits are typically conducted by internal and external auditors, oversight committees, and through reports or disclosures (FCA 2019a; FIS 2019; PRA 2019; UK Finance 2019a; Deloitte 2021). The auditing focus of cited organisations encompasses a wide range of issues, including speak-up and whistleblowing mechanisms, financial statements, treasury and taxation, risk management including fraud, procurement contracts, data management, HR practices, and operational procedures, increasingly linked with environmental practices (Amazon 2019; BIS 2019; BoE 2019; FIS 2019; Global Payments 2019; HSBC 2019; Morrison 2019; Sainsbury 2019; World Bank 2019b).

Monitoring capabilities extend to customer insights, cost control, tax compliance, adherence to policies and regulations, organisational culture, financial and operational risks (e.g., Key Risk Indicators (KRIs), climate change, health and safety, IT and cybersecurity, reputation), continuity plans, and real-time operations/transactions. These activities are facilitated by digital technologies, including software (e.g., AI) and hardware, utilising both quantitative and qualitative methods to forecast outcomes (Barclays 2019; BoE 2019; FCA 2019a; FIS 2019; Fiserv 2019; Lloyds 2019; Mastercard 2019; Morrison 2019; Santander 2019; Visa 2019c). Such priorities are mirrored in internal and external

control systems and processes, striving for maximal efficiency and effectiveness and reporting issues or vulnerabilities expeditiously, particularly those impinging on financial reporting (Bancorp 2019; BoE 2019; FCA 2019a; FIS 2019).

For overlapping factors, reference is made to *Digital Identification, KYC, and Legal Identity Identifier*, corresponding with the **Technological and Methodological** *Cyber Security and Data Protection* factor within the Access Management resilience sub-area, which also aids the Monitoring sub-area. Further, Integration in *Physical and Digital Channels, Remote or Hybrid Working* is associated with the **Technological and Methodological** *Branch Store Service Improvement and Automation* and the *Digital Bank Company* factor within the Access Management resilience area, further contributing to the Monitoring sub-area.

ORGANISATIONAL PROCESS DEFINITION SUB AREA

The relevant factors in these subareas overlap with *Digital identification (Know your Customer) KYC Legal Identity Identifier* matching with **Technological and Methodological** *Cyber security and data protection* factor and see *Integration in physical and digital channels, remote or hybrid working* matching with the **Technological and Methodological** B*ranch store service improvement and automation* and *Digital bank company* factors in the **Access Management** resilience subarea, please refer to these section to see the relevant discussion.

ORGANISATIONAL PROCESS FOCUS SUB AREA

In the organisational Process Focus process sub-area, initiatives such as *ATMs, banking apps, and stand-up branches (including edge processing), aimed at reducing costs associated with site maintenance* have been spotlighted by industry analysts. These align with the **Technological and Methodological** factor of *Branch Store Service Improvement and Automation*, which finds consensus among Acquirers and Banks, but less so with Payment Networks like Discover, Mastercard, and Visa. *ATM Cash Services* from all Acquirers also align with this factor. *Banking Collection Services* and *Office Location Focus* are additional relevant factors, with alignment from Acquirers and Banks, and varying degrees of agreement from Merchants, Payment Networks, and Regulators.

These factors significantly influence **all resilience** attributes. Industry analysts acknowledge a digital trend in the payment sector. However, there remains a substantial need for physical services and cash payments to ensure inclusivity and provide an excellent customer experience, particularly for specific demographics and vulnerable populations (Bech et al. 2018; FCA 2019a; Gartner 2019; Lloyds 2019; IIF and EY 2021). Despite this, due to the environmental impact of physical operations, many organisations are moving towards closing or reducing physical branches, replacing them with more efficient alternatives such as automated branches, ATMs, post office partnerships, or pop-up branches. This transition poses challenges in staffing as employees may need to be relocated (Barclays 2019; FIS 2019; HSBC 2019; RBS 2019).

Concurrently, investment continues in various office locations and sites, particularly noted by banks and retailers from the manufacturing distribution perspective. Companies also rely on linked Banking Collection Services, predominantly associated with physical transactions for debt, data, and payments, including product collection services such as "click and collect" (Amazon 2019; FCA 2019a; Morrison 2019; Sainsbury 2019).

In the organisational Process Focus process sub-area, the concentration on *Efficiency Focus, simplification, cost reduction, process improvement, and maturity assessments, coupled with Professional Standards and best practices sharing and standardised reporting,* were pinpointed by industry analysts. These initiatives resonate with the **Technological and Methodological** factor labelled *Operational Improvement Efficiency*, which finds consensus among Banks but varying degrees of alignment with Acquirers like FIS and US Bancorp, Merchants such as Amazon and Sainsbury, Payment Networks including Discover and Mastercard, and Regulators from the BoE to the PRA.

Other pertinent factors encompass *Operational Improvement (cost)* and *Operational Improvement (service)*, with varying alignments across stakeholders, as well as *Banking Standards* and *Industry Standards*, again showing different levels of agreement.

These factors underpin **all resilience** attributes, with organisations expressing a commitment to utilizing resources—material, financial, social, and environmental—in an efficient and effective manner. This not only aims to deliver low costs, superior service,

and optimal value to customers from all angles but also to enhance profit returns and growth. Initiatives highlighted by payment system stakeholders generally prioritize process and organisational simplification, risk and control management, and new technology adoption. Many aim to curtail operating costs or capital expenditures through technological advancements, operational mergers, and broad cost base reductions. In the realm of payments, operational costs have been mitigated through the adoption of digital payments.

These digital technologies have also facilitated a more secure and closed-loop supply chain, the development of green products and processes, and the expansion of remanufacturing practices. Moreover, they have improved service levels, bolstered service reliability, and minimized service disruptions, particularly those associated with transactional activities such as authorization, clearing and settlement services, and data security breaches (Kleindorfer et al. 2005; Walker et al. 2014; Amazon 2019; FIS 2019; Global Payments 2019; HSBC 2019; Lloyds 2019; Mastercard 2019; RBS 2019; Visa 2019c; Sani et al. 2021). The implementation of industry standards has been crucial in reducing costs, enhancing quality, and instituting controls and procedures, especially pertinent to financial services, cybersecurity, data management, IT, communication, and payment processing. For instance, banks such as RBS (2019) have expedited the process of opening personal savings accounts and credit requests by leveraging these new technologies.

Furthermore, some organisations underscore the importance of environmental or ethical standards and policies, mandated by regulators to ensure corporate accountability.

For overlapping factors in this sub-area, such as *Digital Identification (Know Your Customer) KYC* and *Legal Identity Identifier*, which align with the **Technological and Methodological** *Cyber Security and Data Protection* factor, and *Integration in physical and digital channels*, as well as *Remote or hybrid working*, which match with the **Technological and Methodological** *Branch Store Service Improvement and Automation* and *Digital Bank Company* factors in the Access Management resilience sub-area, please refer to the relevant sections for further discussion.

Non-aligned factors (capability gaps)

MONITORING SUB AREA

In the Monitoring process sub-domain, key digital financial instruments such as digital asset exchanges, digital tokens, blockchain-based tokens, and digital currencies have been pinpointed by industry specialists. These instruments correlate with the **Technological and Methodological** factor *Crypto digital currency,* extracted from strategic reports. However, there is a noticeable misalignment in perspectives, particularly noticeable. Non-aligned stakeholders include major acquirers such as US Bancorp and prominent payment networks like American Express, Mastercard, and Visa.

The integration of these factors can significantly enhance the **flexibility** and **agility** of payment systems. While digital payments predominantly depend on fiat currencies, incorporating cryptocurrencies could yield market efficiencies. Notably, these could manifest as expedited and more transparent international transactions, contingent on the robustness of the underlying technology. Crypto assets bear considerable risks, including fraud and financial instability, largely attributable to the challenges in regulating and supervising their activities. Despite these risks, a nascent community-based market is emerging, with some entities commencing the acceptance of cryptocurrency payments, often referred to as stablecoins, and initiating crypto asset exchange ventures (Dodd 2018; Nelms et al. 2018; Amazon 2019; Deloitte 2019; PwC 2019; Visa 2019c; Bank of England 2020).

ORGANISATIONAL PROCESS FOCUS SUB AREA

In the organisational Process Focus process sub area, *Agile, collaboration, and flexibility* were identified by industry analysts, which match with the **Technological and Methodological** factor coded from some strategic reports but not aligned. *Operational improvement related with agility* (Non-aligned stakeholders: Banks (4): Barclays, Lloyds, RBS, Santander, and Regulators (2): BoE and UK Finance). Other relevant factors are *Collaborative focus* (Aligned stakeholders: Acquirers (4), Banks (5), and Regulators (5), and Non-aligned stakeholders: Merchants (4): Amazon, Morrison, Sainsbury, Tesco, Payment Networks (1): Visa), *Collaboration improvement* (Aligned stakeholders: Banks

(5), and Non-aligned stakeholders: Acquirers (1): GPN, Banks (5): Barclays, HSBC, Lloyds, RBS, Santander, Merchants (2): Amazon, Sainsbury, Payment Networks (4): American Express, Discover, Mastercard, Visa, and Regulators (5): BoE, FCA, PRA), *Teams* (Aligned stakeholders: Banks (5), Merchants (5), Payment Networks (4), and Regulators (5), and Non-aligned stakeholders: Acquirers (3): FIS, Fiserv, US Bancorp), *Groups, forums, and centres* (Aligned stakeholders: Banks (5), Merchants (5), Payment Networks (4), and Regulators (5), and Non-aligned stakeholders: Acquirers (3): FIS, Fiserv, US Bancorp), and *Meetings* (Aligned stakeholders: Acquirers (4), Banks (5), Merchants (5), Payment Networks (4), and Regulators (5)).

These factors are important to **all resilience attributes,** mainly **flexibility** and **agility**. Their implementation allows them to provide fast, flexible, cost-effective, customer-oriented tailored services and operations according to changing market circumstances. Agile organisations need these technologies and related resources to be deployed relatively quickly, scalable, and reconfigured frequently and easily in response to changing customer demands (Han et al. 2017; Parreiras et al. 2019).

Some of the main initiatives aligned with these attributes involve a technology-led culture, which encourages dynamic working. It also improves employee learning skills and nurtures an organisational matrix collaboration instead of the traditional hierarchical one. These practices tend to have an iterative approach, meaning an incremental change, test-and-learn, and deal-with-failure culture perspective. From the technological perspective, retail payment system companies are investing in technologies that allow this kind of dynamics but maintain a safe working environment, especially from a cyber security perspective (American Express 2019; Barclays 2019; BoE 2019; Lloyds 2019; PwC 2019; RBS 2019; Santander 2019; Deloitte 2021; IIF and EY 2021). As recognised from the reports, organisations collaborate or coordinate with international or national organisations, peer companies, third parties, or with different internal departments using different internet-based technologies (Banks BHLRS, Payment Networks V, Acquirers FIGU, Retailers AMST, Regulators BFHPU).

Within the organisational Process Focus sub-area, *Agility, Collaboration, and Flexibility* are identified as critical by industry analysts, corresponding with the Operational improvement relating to agility **Technological and Methodological** factor obtained from strategic reports, albeit with misalignments noted from stakeholders such as Barclays, Lloyds, RBS, Santander, and regulatory bodies like the BoE and UK Finance.

As well, the importance of *Collaborative focus* is recognised, with alignment among Acquirers, Banks, and Regulators, and non-alignment with Merchants like Amazon, Morrison, Sainsbury, Tesco, and Payment Networks such as Visa. *Collaboration improvement* and the structuring of *Teams, Groups, forums,* and *centres* exhibit a similar pattern of stakeholder alignment and non-alignment.

These factors significantly contribute to resilience attributes, chiefly **flexibility** and **agility**. Implementing them enables the delivery of swift, adaptable, cost-efficient, and customer-centric services responsive to market shifts. Agile organisations require rapid deployment, scalability, and frequent, straightforward reconfiguration of these technologies and resources in response to evolving customer demands (Han et al. 2017; Parreiras et al. 2019).

Key initiatives that align with these resilience attributes promote a technology-driven culture, advocate dynamic work practices, enhance employee learning, and foster organisational matrix-style collaboration. This cultural shift favours an iterative approach: incremental, test-and-learn, and a resilient attitude towards failure. From a technological viewpoint, retail payment system companies are investing in technologies that support dynamic but secure work environments, especially considering cybersecurity. As per the strategic reports investigated, organisations collaborate or coordinate with various entities including international or national bodies, peer companies, third parties, or different internal departments using internet-based technologies (American Express 2019; Barclays 2019; BoE 2019; Lloyds 2019; PwC 2019; RBS 2019; Santander 2019; Deloitte 2021; IIF and EY 2021).

In the Organisational Process Focus sub-area, the concept of *Change management*, specifically evolving business models or model risk, has been highlighted by industry

analysts. This concept aligns with the 'Political and organisational' factor derived from several strategic reports, *Change Management programmes*, where non-aligned stakeholders include banks such as Barclays and HSBC, merchants like Tesco, and regulators including the FCA and HM Treasury.

This factor is integral to all aspects of organisational resilience as companies must orchestrate a harmonised response to the dynamic market environment, particularly emphasising the human-technology interface. Organisations recognise this as a source of risk that requires identification, comprehension, and regulation, particularly in complex systems involving multiple parties (FCA 2019a). Corporate reports describe practices such as voluntary redundancy and redeployment as strategies to address potential job losses due to market flux (Barclays 2019).

Such initiatives enable organisations to repurpose existing resources towards fostering new capabilities and prioritising innovation. Some companies have directed their change management efforts towards environmental imperatives, seeking to reduce carbon emissions and operational costs through dynamic working initiatives (Sainsbury 2019). Meanwhile, others perceive change management as a regulatory hazard, where the inability to adapt technologically hampers the capacity to compete due to licensing requirements and other market constraints (Visa 2019c).

These elements are essential for **all resilience** attributes, allowing firms to adapt quickly and efficiently to market and regulatory changes. They reflect a broader understanding that change management is not solely a strategic imperative but also a prerequisite for sustainable operational agility (Han et al. 2017; Parreiras et al. 2019; Deloitte 2021; IIF and EY 2021).

5.5 Method’s reproducibility, stability, reliability, and accuracy

In this study, the stability and accuracy of the coding were enhanced by reiterating the processes of operationalisation, interpretation, and analysis after a three-month interval by the same researcher. This step affirmed stability but highlighted a limitation as these

tasks were not undertaken by a different independent coder, suggesting a direction for methodological refinement (Seuring and Gold 2012).

The dictionary-based examination was executed in R, adhering to the methodologies outlined by Welbers et al. (2017). This approach proved beneficial, particularly because the strategic reports' conversion into text, or a corpus, preserved certain punctuation, enabling the detection of compound terms and expressions linked by hyphens. With the dictionary established and automated, updating the lexicon and ascertaining the frequency of each factor within the documents became more straightforward.

An alternative coder should evaluate the dictionary-based text analysis for reliability validation to confirm that the terminology corresponds accurately with the intended concepts (Seuring and Gold 2012; Jizi et al. 2014). Instead of applying Krippendorff's alpha for reliability assessment, the same researcher conducted a re-evaluation after a quarter of a year to ensure the contextual accuracy of the factors, aiming for concordance in the factors' implications in at least 70% of occurrences (Smith and Taffler 2000). While this criterion was surpassed for over 90% of the factors, validating the consistency with a secondary coder remains an aspect to be addressed in future research.

6 Discussion

This research delivers a twofold contribution. Firstly, it applies a systems approach to discern strategic factors – specifically, resources and capabilities – within a defined context. Various frameworks for categorisation and clustering are employed to ascertain the alignment of stakeholders' factors and their impact on operational resilience and sustained viability. The second contribution illustrates the systems approach through a case study pertinent to the UK retail payment system comprising five distinct stakeholder groups.

Section 6.1 delves into the contributions of the method, the limitations encountered in the adopted approach, and the prospective directions for future inquiries. This includes acquiring inter-organisational PESTEL factors that influence the engagement with the UK retail payment system from the standpoint of stakeholders, interpreted through strategic reports and bespoke dictionary-based text analysis. It also presents diverse methodologies for sorting, grouping, and visually representing these factors from a systems theory perspective. Moreover, it aims to assess stakeholders' factor alignment to gauge the extent of their adoption and utilisation and their influence on operational resilience and sustainability, encompassing economic, social, and environmental dimensions.

In Section 6.2, the findings from the research method are encapsulated, drawing from the analysis in Chapter 5. Factors are articulated with the CERT resilience domains and the extent of stakeholders' alignment – whether common, shared, organisation-specific, or non-aligned, identifying where discrepancies lie. Critical insights are derived from juxtaposing these factors with industry analysts' reports and scholarly literature on operational resilience and sustainability, comprehensively examined in the fifth chapter.

6.1 Method discussion

6.1.1 Reports’ collection and pre-processing and dictionary-based text analysis

The methodology advanced in this research facilitates the construction of an integrated diagnostic tool for strategic, operational resilience and sustainability. It does so by

pinpointing the most pertinent PESTEL factors within the complex ecosystem under scrutiny, the UK retail payments system. This systems-oriented approach enabled the identification of strategic factors from the strategic reports, which serve as a primary source of secondary data (Porter 1996; Checkland and Scholes 1999). Initially, stakeholder interviews were considered but were deemed impractical due to time constraints and external factors, including the COVID-19 pandemic, which impeded primary research efforts.

Consequently, strategic reports emerged as a valuable secondary data source, providing structured and regulated insights into strategic factors. These reports, mandated for public companies, detail the organisations' strategies, initiatives, outcomes, constraints, and committed resources, hence offering a structured foundation for analysis (Law 2016; SEC 2021; Bryson and Alston 2011). Despite variability in content and length, the business sections of these reports have supported by prior readability and standardisation studies, been deemed reliable and fit-for-purpose (Humphreys and Wang 2018). For analytical precision, the first section of the 10-K reports was isolated, though it was noted that further subdivision could align more closely with specific PESTEL areas. The absence of standardised sub-titles across reports hints at potential enhancements to the 10-K format.

The use of the Resource-Based View (RBV) and Dynamic Capabilities View (DCV) aimed to distil resources from the reports, a process akin to benchmarking. These theoretical foundations underpin the methodology, facilitating the creation of comparable factors (Barney 1991; Nutt 2000; Teece et al. 2016). Initially, manual text analysis was required to construct the dictionary, a task fraught with complexity due to subjective interpretation of text passages. Subjectivity, particularly in the interpretation of verbs denoting intention or time, presents a challenge to reproducibility and stability in manual coding (Smith and Taffler 2000). The dictionary-based text analysis method, therefore, simplifies the task by focusing on keywords and phrases linked to distinct concepts, thereby diminishing subjective bias.

The creation of the dictionary, absent a pre-existing standard for banking-specific strategic factors, was an inductive process involving the meticulous manual coding of strategic reports into keywords or phrases, anchoring words to more definitive meanings. However, subjectivity is not entirely eliminated; the dictionary requires ongoing verification and enhancement to achieve standardisation and robustness. In this instance, the original coder conducted the dictionary's validation after three months, rather than by a secondary coder, highlighting a direction for future methodological refinement.

6.2.1 Categorisation, clustering, visualization, & comparison discussion

The classification and clustering of strategic factors enhance organisational visibility and foster alignment among these factors as they delineate the system's key components (Haimes 2018; Homburg et al. 2020). PESTEL and stakeholder factors were readily categorised, though occasional overlaps necessitated discerning enabling factors for distinct functions. For instance, specific digital technologies earmarked for climate change or net zero reporting were allocated to the 'Technological and Methodological' category, whereas their reporting function was placed under 'Environmental and Societal'. The PESTEL framework, while not without flaws, offers a comprehensive schema for categorisation, underpinned by the analytical contributions to each category (Gray 2021). Stakeholder factors were sorted based on their mention within strategic report sections, such as those related to Customers, Colleagues, or ESG concerns.

Our factor classification and clustering analysis elucidated commonalities and distinctions across organisations. Predominantly, the focus within PESTEL and stakeholder categories gravitates towards 'Technological and Methodological' and 'Customer-related' categories, respectively. A notable emphasis was also observed on 'Employee' or 'Colleague' and 'Society' or 'Community' initiatives. However, the variance between these focuses is marginal, precluding a clear preference. Following a tiering process based on the number of shared factors, we found that common factors represent approximately one-third of all factors, indicative of some fundamental strategic initiatives within the payment system. Another third, shared by three or two organisations, suggests common targeted objectives, albeit not dominantly. The remaining third, unique to individual organisations, highlights distinct strategic propositions, as evidenced by our findings.

The employed method effectively segmented the factors, delineating common and unique organisational emphases on particular areas. Moreover, these strategic factors could potentially be aligned with performance targets or attributes, such as sustainability or resilience, inclusive of economic, social, and environmental performance metrics (Carvalho et al. 2012). However, it is important to note the ontological distinctions between the initial approach and these performance metrics, which would necessitate an alternative method, like a comprehensive life cycle assessment (Gray 2006; Lagoarde-Segot 2019). Nonetheless, the findings were qualitatively juxtaposed with the CERT® Resilience framework, and relevant performance measures were deliberated.

The findings were juxtaposed with financial sector analysts' reports, which provide an industry panorama, outline present opportunities and risks, and forecast future tendencies. These reports, generated by consultancies, advisory firms, and regulatory bodies, offer insights into the banking and financial sectors. Key reports from 2019-2020 by firms such as Accenture and Gartner, PwC, Oliver Wyman, and institutions including the World Bank, IMF, BIS, OECD, UK Finance, and the Bank of England provided a comparative backdrop (Accenture 2019; Bank for International Settlements 2019; Cox et al. 2019; Gartner 2019; IMF 2019a; Innovate Finance 2019; PwC 2019; Steemis 2019; World Bank 2019b; KPMG 2020; Oliver Wyman 2020; Vives 2020; Deloitte 2021; UK Finance 2021). The comparison revealed that over 90% of the factors from these reports were captured by the method proposed, as detailed in **Appendix E**. Factors not identified pertained to the *'Technological and Methodological'* and *'Political and organisational'* PESTEL categories, missing elements like 5G, edge computing, BYOD, robotics, IoT, and QR payments, as well as control room implementation, the gig economy, and 24-7 service availability.

Approximately 17% of factors from the analyst reports were articulated differently but corresponded to those we had identified, as contextual analysis within the reports showed. For instance, various terms for cryptocurrencies and digital tokens essentially refer to the same concept (Vives 2020). This finding can augment our lexicon, improving future identification of published information and associated risks, with the potential for uncovering additional risks through cross-referencing industry reports.

To address the method's limitations, enhancements could involve 1) refining factor descriptions and keyword selection to minimise overlaps and/or 2) employing a term frequency-inverse document frequency (tf-idf) algorithm for automated learning of factor keywords, or defining keyword structures to bolster reproducibility, stability, accuracy, and reliability (Humphreys and Wang 2018). Additionally, segmenting document sections by specific stakeholder focus, such as customer, colleague, or ESG sections, could sharpen meaning accuracy.

According to Humphreys and Wang (2018), a dictionary can achieve saturation after analysing just 10% of the intended corpus. Therefore, this multi-factor analysis could be broadened to include a larger sample of organisations within the UK payment system, incorporating smaller local entities and other stakeholders like payment providers, retailers, and fintech organisations. Temporal expansion beyond a single year could also illuminate evolutionary trends (Humphreys and Wang 2018).

Complex Adaptive Systems (CAS) traits are apparent in the retail payment system, especially regarding aggregation, emergent behaviour, and contextual responses. These facilitate the discernment of factor interactions within the UK milieu. As mentioned in the findings, the ensuing section breaks down these clusters by factor. The communication trait, while partially recognised, has not been quantified. Future work could entail mapping environmental implications and factor interrelations using Systemigrams, informed by the CERT framework's feedback loops (Figure 6.1 and Table 6.1). Such loops could assimilate system impacts on resilience and sustainability, guiding the integration of pertinent measures, such as KPIs, and unravelling the influence of strategic factors on each resilience area (Coetzee et al. 2016; Snowden and Boone 2017; Jain et al. 2018). Delving into these details could enhance our understanding of the strategic factors shaping each area of CERT resilience.

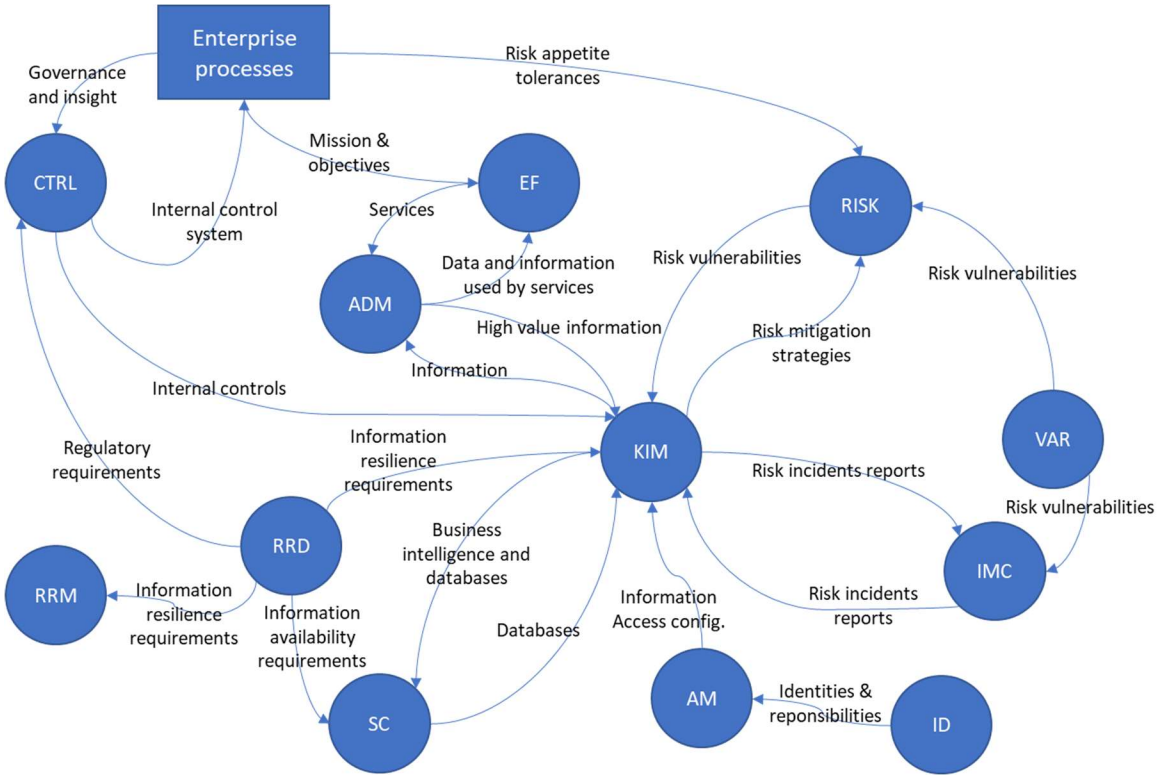


FIGURE 6.1 ADAPTED CERT RESILIENCE FEEDBACK LOOPS (CARALLI ET AL. 2010)

Engineering	
ADM	Asset Definition and Management
CTRL	Controls Management
RRD	Resilience Requirements Development
RRM	Resilience Requirements Management
RTSE	Resilient Technical Solution Engineering
SC	Service Continuity
Enterprise Management	
COMM	Communications
COMP	Compliance
EF	Enterprise Focus
FRM	Financial Resource Management
HRM	Human Resource Management
OTA	Organizational Training and Awareness
RISK	Risk Management
Operations	
AM	Access Management
EC	Environmental Control
EXD	External Dependencies Management
ID	Identity Management
IMC	Incident Management and Control
KIM	Knowledge and Information Management
PM	People Management
TM	Technology Management
VAR	Vulnerability Analysis and Resolution
Process Management	
MA	Measurement and Analysis
MON	Monitoring
OPD	Organizational Process Definition
OPF	Organizational Process Focus

TABLE 6.1 CERT RESILIENCE AREAS AND SUB AREAS (CARALLI ET AL. 2010)

Systemigrams offer a depiction of a system's network organisational structure and goals from a socio-technical perspective, identifying critical infrastructures, key resources, and assets (Folke et al. 2010; Coetzee et al. 2016; Gheorghe et al. 2018; Leo 2020; Soroka et al. 2020). The 'Playing-to-win' framework aids in discerning strategic intentions and pertinent performance factors of various companies, including risk exposure. However, the limitations of this systems thinking approach, notably the residual uncertainty (i.e., unknown unknowns), suggest areas for future research (Naim et al. 2002; Walker and

Cooper 2011; Snowden and Boone 2017; Parreiras et al. 2019; Leo 2020; Paul and Zhang 2020).

The development of Systemigrams necessitated a benchmark against Boardman's initial process and subsequent enhancements by other scholars, resulting in refined application guidelines. Expansion of sources, including financial research, strategic intent from additional stakeholders, and validation via stakeholder focus groups or interviews, could refine the Systemigrams further. Given the research's expansive nature, collating information from diverse participants demands a comprehensive strategy to form a complete narrative. Therefore, the Systemigrams, corroborated by strategic factor comparisons with industry analyst reports, summarise commonalities among stakeholders and the payment system at large.

A novel contribution to the Systemigram methodology is its structure, influenced by the 'Playing to win' decision framework, arranging identified factors into a cascading strategic decision-making process founded on Enterprise Architecture principles (Rhodes and Ross 2010; Lafley and Martin 2013; McDermott et al. 2015). Enhancing Systemigram presentation through storyboard techniques, colour-coded classifications, and various symbols improves comprehension of the graphical representation. Yet, customisation to cater to the varying needs of stakeholders within the retail payment system is advised, as relevance may differ according to the Systemigram's level of aggregation.

Proposed advancements for the Systemigram tool include:

- Refinement of Systemigram prose through revision of strategic plan components for a more robust creation process.
- Validation of Systemigrams with industry stakeholders and consumers, incorporating primary research.
- Elucidation of processes and intricate relationships impacting strategic shifts, potentially employing Causal Loop Diagrams or System’s life-cycle model analysis to facilitate a dynamic understanding of factors (Forrester 1961; Jain et al. 2018).

6.2 UK retail payment system analysis findings discussion

The subsequent subsections distil factors influencing specific operational resilience areas, categorising them into common, shared, organisation-specific, and non-aligned factor types. This categorisation reflects the narratives within strategic reports of various stakeholders. It aligns with insights from analyst reports that project future trends in the financial industry from the vantage point of an integrated retail payment system (detailed in **Appendix F**). These factors are interdependent and are thus grouped according to shared goals or objectives, as delineated by the CERT operational resilience framework areas: Engineering, Enterprise Management, Operations, and Process Management. This classification adopts a process-oriented development approach. The reader is directed to the preceding chapter for a comprehensive discussion of these factors and organisation-specific illustrations.

6.2.1 Common factors (system's alignment)

Within the PESTEL framework, the frequently cited common factors among retail payment system firms are *Technological and Methodological* enhancements, aligning with the CERT Enterprise Management and Operations areas. These areas significantly contribute to a company's reactive operational resilience, underpinning **agility** and **flexibility**. Conversely, the Engineering and Process Management areas lack common factors, indicating a potential gap in unified design or planning strategies. These areas are critical for product and process development and contribute to resilience through **robustness** and **leanness**.

The *Political and Organisational* category also contains numerous common factors, notably those concerning analytical approaches to topics, decision-making processes, and policies on engagement and collaboration. These factors are crucial for directing efforts and bolstering resilience at both organisational and systemic levels, necessitating alignment.

The subsequent sections will delve into factors from the Enterprise Management and Operations areas and their implications for operational resilience. Within Enterprise

Management, *regulation collaboration and compliance* are common factors. This necessitates an oversight function that not only ensures transparency and standard practice adherence but also enforces penalties, such as fines, for non-compliance. Intensified regulation is often linked to market competition, digital innovation, customer data protection, education, and various common risks, including systemic or network risks, cybersecurity, data management, and climate-related financial concerns (Giocoli 2014; Innovate Finance 2019).

Strategic planning must incorporate sustainability analysis to develop capabilities that cater to future needs while meeting current demands. Although a *long-term perspective* is identified as a common factor, the scope of Environmental, Social, and Governance (ESG) commitments like Net Zero varies, requiring tailored development programs based on existing organisational capabilities. Firms must often establish *partnerships and alliances*, including with governments, to develop new capabilities, underscoring the fundamental financial function of credit provision (Quelin et al. 2019). Accurate assessment of creditworthiness, integrating environmental and social criteria, has grown in complexity due to an intricate financial system and the incorporation of ESG principles (Vives 2020). Despite this, organisations report on their environmental and societal activities using various developing criteria, such as the UN Sustainable Development Goals (Schoenmaker 2018; IMF 2019a).

ESG compliance extends beyond asset investment, encompassing societal responsibilities like financial education. Tailoring *financial planning* to individual needs and delivering services (i.e., health, education, housing, retirement, etc.) through various channels, both physical and digital, enhances market efficiency, flexibility, and agility (Klee 2006; Teoh et al. 2013). In the digital domain, managing non-tangible payment infrastructures through *online and mobile services* must cater to user convenience and specific requirements (Yousafzai and Yani-de-Soriano 2012).

To effectively deliver these services and provide accurate advice, financial institutions must ensure their *employees are equipped with the necessary skills and tools*, particularly

in risk management and technological domains such as engineering, data science, and cybersecurity (Carabine and Wilkinson 2016).

Risk management is pivotal in addressing socio-economic challenges, such as *Brexit*, and environmental issues like *climate change*, which both the UK and the global community face. For the UK, a market leader, ensuring the economy has sufficient liquidity and appropriate mechanisms to navigate risks effectively (i.e., *Cash-flow focus*) and enhance business performance (Deloitte 2021). Although expertise in various risk types exists within organisations, responses are diverse. It is necessary to establish standardised approaches, as seen with Basel III and COSO frameworks, and reflect these within operational practices.

Strategic priorities set at the top echelons should mirror the operations at the ground level. In the operational domain, financial organisations utilise various platforms, like the *Enterprise Risk Management System*, to bolster activity robustness through both top-down and bottom-up approaches, preparing to address and rebound from risk events and scenarios (Scholz et al. 2012; Durach et al. 2015; Purvis et al. 2016; Deloitte 2021; IIF and EY 2021).

A critical area of common strategic initiatives across stakeholders is *knowledge and information management*, focusing on developing robust *data management infrastructures*, such as data centres, and maintaining customer data security while facilitating agile communication systems under system-wide policies like *GDPR for data privacy*. This ensures business and customer data management and transparency through *reports and statements* (Accenture 2019; KPMG 2020; Oliver Wyman 2020; Deloitte 2021; IIF and EY 2021).

Investment decisions in data and IT infrastructure aim for longevity adherence to data standards, protocols, and reports. These systems enable data sharing with third parties, leveraging business opportunities in line with open-source protocols utilised by *FinTechs*. However, this evolving competitive landscape is also susceptible to cyber-attacks, threatening the security of organisational and customer information (Accenture 2019; KPMG 2020; Oliver Wyman 2020; Deloitte 2021; IIF and EY 2021).

While customer data may be shared, *intellectual property* (IP) remains a guarded competitive asset, with the transformation of raw data into valuable business insights necessitating protection and regulation to mitigate risks (Open Banking Ltd. 2019). Operational controls sometimes fall short, leading to the advent of technologies like the *Legal Entity Identifier* (LEI), which uses blockchain to enhance digital system security and management (Bank of England 2019b). Such technological advancements should align with operational access management, providing secure, flexible, and personalised customer experiences (PwC 2019).

Acknowledging the previously mentioned *risk management* consensus among stakeholders, the concept of *resilience* is prevalent in various contexts, such as operational, cyber, cultural, and market resilience, with a broad spectrum of risks identified (see Risk Matrix in **Appendix G**) contributing to organisational **robustness**. The primary focus within the Vulnerability Analysis and Resolution area is on *cybersecurity and fraud protection*, with organisations implementing controls, standards, protocols, and models to preclude fraud, whether internal—like corrupt practices, anti-money laundering, and counterterrorism—or external, such as DDoS attacks or data breaches, which can incur significant reputational and financial costs (IIF and EY 2021). Financial entities devise *stress tests, business continuity plans*, and *recovery contingency strategies* to assess system **robustness**, collaborating with national and international entities like the Financial Services Cyber Collaboration Centre, the Government's National Cyber Crime Centre, the Cross-Market Operational Resilience Group, and the Cyber Defence Alliance (CDA) to fortify the resilience of the payment and financial system as a whole.

6.2.2 Shared and organisation-specific factors (system alignment gaps)

In the CERT resilience framework, shared factors span all four areas, with particular alignment observed in specific subareas concerning frequency and description. Project management emerges as a pivotal factor in the Engineering area, fostering the development and enhancement of new capabilities. The Enterprise Management domain

emphasises customer service improvement, with digitisation and a sustainable, customer-centric approach being prevalent, from education to rewards.

Within Operations, the advent of new digital technologies introduces challenges, notably cyber risks. Integrating controls into daily operations and training employees and suppliers are essential to prepare for unforeseen events. For Process Management, maintaining the visibility of processes and performance indicators is key for monitoring operational resilience.

The *project management* capability, as a shared factor in Engineering, enables organisations to navigate the creation of sustainable products, services, and infrastructure. Challenges arise with ESG projects, where standardisation is still nascent and requires delineation and regulation (Coetzee et al. 2016). In the digital realm, stakeholders often reference the resilience afforded by new technologies and platforms, particularly mobile and digital channels. However, project management challenges traditional organisational structures and must be carefully overseen to guarantee the success of new capabilities and resources (Salunke et al. 2011).

In Enterprise Management, *digitisation* is crucial for customer engagement, including *digital marketing*, *social media*, and *omnichannel communication strategies* that ensure flexibility and responsiveness. *Digital banking*, propelled by *digital wallets* and the rise of challenger banks, BigTechs, and FinTechs, facilitates tailored marketing and financial services based on customer data. This *customer-centric* approach, supported by *technology and innovation*, not only bolsters competitive advantage but also aligns with *process streamlining* through *operational improvements* and *legacy system migration*, providing *real-time, platform-based services* (Naim et al. 2002; PwC 2019; World Bank 2019b; Deloitte 2021). Digital banking services encompass a spectrum of functionalities; services include *expense management tools*, *electronic payment methods*, *data capture and reporting* capabilities, *social media bots or robo-advice*, personalised risk scores, *BNPL*, *P2P* lending, and *checkout* capabilities. In the physical realm, efficiency and adaptability to customer habits, such as the choice between corner shops and hypermarkets, are vital. *Integrating physical and digital channels* caters to diverse

customer preferences and supports a sustainable competitive business model, hinging on *service pricing and transaction fees*. Payment services prioritise attributes like accessibility, integrity, and confidentiality, with regulatory attention to surcharges and interchange fees, as new models, such as *digital currencies* using blockchain technology, seek to disrupt traditional business paradigms and promote equity (Klee 2006; Wang and Wolman 2016; Visa 2019a; Bank For International Settlements 2020; Bank of England 2020; Vives 2020).

The market proposals highlighted earlier offer substantial benefits from a customer standpoint, yet they necessitate *coordination and collaboration* among market players from a compliance perspective. *E-commerce* operations (i.e., electronic POS, order & collect), for instance, require agility and flexibility among retailers and third-party suppliers (Borzekowski et al. 2008; Bansal et al. 2018; Raconteur 2018; Conboy et al. 2020; Vives 2020). organisations are fostering community environments to provide data-shared services more conveniently, utilising *cloud services* and embracing the *gig or shared economy*. However, this interconnectedness increases *systemic risk* complexity, especially in *cyber risk management* (Morozov 2018; Bancorp 2019; IIF and EY 2021). Consequently, appropriate regulatory policies are essential to ensure service level agreements and adherence to good labour practices, including Diversity and Inclusion, CSR, and ESG initiatives.

In the Enterprise focus sub-area, customer behaviours are encouraged through *rewards or loyalty programs* that create competitive advantages, offering incentives like cashback services or travel miles. Some organisations may also incentivise socially and environmentally responsible behaviours, aligning rewards with personal consumer values (Dahlstrom et al. 2014).

Operational areas such as *cross-border payments* and *B2B services* are also significant development focuses (Bank For International Settlements 2020; Deloitte 2021). With cross-border payments, organisations strive for fast, cost-efficient services offering traceable transactions. However, varying international regulations and the absence of comprehensive trade agreements or standard payment frameworks present significant

barriers (i.e., taxing schemes and interchange fees) (Weiner and Wright 2009; Bolt and Schmiedel 2013; Gilmore 2018). Some companies are exploring alternatives like digital or *cryptocurrencies*, which propose a distributed business model as a resilient contrast to traditional centralised systems (Bank For International Settlements 2020; Vives 2020; UK Finance 2021).

Nevertheless, the UK financial market presents high entry barriers for smaller entities, dominated by larger institutions, which could impede market sustainability from social and environmental perspectives (Quelin et al. 2019; Bui et al. 2020). Additionally, digital services hinge on technological adoption (i.e., TAM) by customers, including disadvantaged groups who may benefit from *community financial education programs* (Yousafzai and Yani-de-Soriano 2012; Arvidsson 2014; Oliveira et al. 2016a; Hedman et al. 2017; Alderman 2018; Nelms et al. 2018; Bank of England 2020). Moreover, digital communication platforms threaten reputational damage; the absence of adequate information can have negative repercussions if customers are not properly informed (American Express 2019).

Sustainable initiatives in the financial sector are broadening their focus to encompass economic outcomes and the integration of appropriate regulatory measures. These include fiscal and risk evaluation policies, essential for delivering a resilient payment system equipped with diverse services that meet all segments of society (Bank for International Settlements 2019; Sani et al. 2021). Inclusion initiatives contributing to this resilience include maintaining *access to cash services and physical branches*, such as advanced service-integrated *ATMs*. Pop-up branches or post offices serve as additional access points, offering *financial education and advice* alongside conventional banking services, like check processing.

The development of traditional financial products typically revolves around *lending and debt focus*. However, there is a concerted effort among stakeholders to curtail high-risk financial activities, such as risk-weighted assets (RWAs), to enhance the robustness and adaptability of organisations. Despite the plethora of models and methods available for risk assessment, ensuring the sustainability of financial practices remains a challenge

(UK Finance 2019a). Industry collaboration is on the rise to fortify the sustainability of financial instruments. This includes mortgages, which represent a significant portion of market capital and risk, and *ESG products*, which, while capital-intensive and under-regulated, are gaining traction (Calomiris et al. 2004; HM Treasury 2016; Bank of England 2019a). Advances in *AI and ML algorithms* have improved risk evaluation methods, but a comprehensive view of financial processes is still required to further the sustainability of financial services, particularly from a resource efficiency standpoint (Ernst & Young 2020; Vives 2020; Deloitte 2021).

Firms are actively discussing and implementing *green investment products and infrastructure* to meet future environmental commitments, such as achieving net-zero emissions by 2030, and joining initiatives like EV100 and EP100. Various ESG standards and definitions, including those related to greenhouse gas (GHG) emissions scopes, are being considered. While companies mainly focus on scopes 1 and 2, there is an acknowledgement that scope 3 should also be incorporated. Investments are being channelled into *green renewable energies* to power infrastructures and distribution, and financial entities are introducing green financial products like green loans, renewable energy financing, and green bonds to their service offerings.

In examining socio-cultural and demographic factors, diversification of financial investment geography has been pinpointed as a strategy to bolster organisational robustness and reduce UK dependency. *Asia* is the most frequently mentioned investment region, with additional initiatives in the *U.S. and Latin America* also cited, though not consistently across all stakeholders.

Within industry or sector-focused strategies, initiatives are predominantly associated with *healthcare,* the *food industry, merchant or retail sectors,* and *SMEs*. Financial services are evolving to offer tailored solutions such as credit scores, insurance, financial planning, and card management options. These services are designed to assist customers in understanding their financial capacity (i.e., spending and lending), and to enhance their **agility** and **flexibility** in money management.

Open banking emerges as a distinctive, non-aligned factor that catalyses innovation in the payments industry. It presents risks and opportunities for incumbents by facilitating third-party development of new capabilities that respond to market dynamics and consumer demands. For example, disrupting current closed-loop business models, like the one developed by Amex. However, it also poses challenges to established business models and complicates data safeguarding (Porter 1996; Shukla et al. 2011; Hamish et al. 2018). *Internal controls* and *regulatory measures* like PSD2 and ISO20022, along with strong customer authentication (SCA) protocols, are crucial for ensuring secure payment operations and fraud prevention (Visa 2019a). Moreover, service accessibility must be expanded to include the unbanked population by customising services to their specific needs. Despite the growth of digital services, there remains a clear requirement for physical financial services, such as those provided by bank branches and cash transactions (Olaleye et al. 2017; Bech et al. 2018; Raconteur 2018). *Biometric authentication* is becoming a common method to enhance accessibility, complementing the two-factor authentication required by SCA protocols (Barkhordari et al. 2017; American Express 2019; Visa 2019a).

Corporate Governance initiatives, including forming *committees* and *councils* to ensure regulatory compliance and internal *policymaking*, play a crucial role in overseeing various organisational activities. These include authorising and supervising personnel, systems, processes, and documentation. *Ethical* practices are encouraged through *codes of conduct*, particularly concerning tax-related matters. Actions often address a spectrum of risks, such as fraud, data management with machine learning and AI, cybersecurity, financial risks, *CSR activities* including modern slavery and living wages and inclusion practices, as well as *charities, foundations, trusts, and fundraising and volunteering programs*, and *ESG issues* aligned with UN's SDGs like *climate change* and *preservation and safeguarding* efforts. The handling of colleagues' and unions' complaints, such as those related to fair payment and inclusion policies, along with auditing processes, are emphasised. Non-compliance in these areas can adversely affect a company's reputation and its ability to engage in competitive capacity-building activities like *M&A and partnerships*. Reporting on corporate governance is increasingly focused on bridging

knowledge gaps and holding companies accountable for their social and environmental impacts (Bloxham 2011).

From a Human Resources perspective, companies aim to attract, retain, and fairly reward talent, initiating efforts to reduce pay gaps, ensure equitable working hours, offer share plans, maintain health and safety standards, and foster diversity and inclusion reflective of local community demographics (i.e., Age, *Gender and Multi-cultural diversity development programs and networks*). Such initiatives are designed to provide equal opportunities based on individual capabilities and to boost motivation for strategy implementation, including digitisation.

organisational training and awareness initiatives are delivered through *learning and training programs, leadership development, coaching, mentoring, employee surveys, panels, reports, and engagement policies*. There is also a strong focus on graduate *recruitment programs* to attract innovative young talent. Current employee development is supported through educational sponsorships, such as *student loans or degree apprenticeships*. *Audit efforts* form part of these governance initiatives, scrutinising *speak-up and whistleblowing mechanisms, financial statements, treasury and tax affairs, risk management, procurement contracts*, data and human resource management (i.e., payment and other management practices), and operational practices, with particular attention to environmental practices (Amazon 2019; BIS 2019; BoE 2019; FIS 2019; Global Payments 2019; HSBC 2019; Morrison 2019; Sainsbury 2019; World Bank 2019b).

organisations address the External Dependencies Management area by engaging *shareholders* through *annual general meetings (AGMs), events, surveys, and tailored reports,* detailing their activities and strategies, particularly those associated with risk management. A primary focus in the realm of risk management is *climate change*. Companies acknowledge climate change as a significant risk and are initiating efforts to reduce carbon and GHG emissions through sustainable products, services, and investments in greener infrastructure. Targets are often aligned with new performance management and accounting principles, encompassing GHG scopes 1, 2, and 3, as well

as expanded CSR and Ecological Performance Standards (EPS) (Bloxham 2011; Callahan et al. 2011; Vigneau et al. 2015; Álvarez Jaramillo et al. 2019; Lagoarde-Segot 2019; Azahara and González 2021; Popescu et al. 2021). Technological investments are also being made to reduce the carbon footprint of operations and achieve energy efficiency (Callahan et al. 2011).

Mergers and acquisitions (M&As) are frequently mentioned as a means to acquire new market-resilient capabilities and adapt to a competitive environment (Johnson et al. 2007; Sluyts et al. 2011; Morgan et al. 2019; PwC 2019). M&As are pursued for expansion into digital services, sustainability, and market share but are managed cautiously to ensure the seamless integration of systems and organisations from a financial and organisational perspective (Nutt 2001; Ernst & Young 2020).

In the *Process Management area*, performance measurement and monitoring are essential, with organisations developing alternative or flexible KPIs. Stakeholders within the retail payment systems often implement a *performance goals measurement* approach to oversee operations, including the development of *performance platforms for customers and colleagues*. These platforms utilise *data analytics*, *machine learning, and AI* to monitor the rollout of new initiatives and identify associated risks and hazards. *Operational efficiency* is also a focus, encompassing management, personnel, technical performance, and internal financial control (IIF and EY 2021). Common KPIs pertain to customer satisfaction, colleague work culture and health, financial practices, and sustainability.

The discussion emphasises that resilience initiatives must be coherent across organisational and systemic levels. For instance, new digital initiatives should enable more resilient systems, ensuring the protection of customer needs and organisational objectives. Regulatory efforts from governments and market authorities are integral in supervising market operations. As the system constantly evolves, changes in one part can have wide-reaching effects, underscoring the need for adaptive mechanisms to respond to these dynamic shifts.

6.2.3 Non-aligned factors (capability gaps)

Non-aligned factors often represent elements that are either emerging or experiencing rapid changes within a system. In the context of banking digitisation, these factors pose new challenges that organisations address in various ways. Additionally, in the pursuit of market competitiveness, both from customer and employee perspectives, companies might withhold information on certain initiatives to preserve a first-mover advantage. This section will discuss factors highlighted by industry analysts.

Open banking is a non-aligned factor that intersects the Engineering, Enterprise Management, and Operations areas. Although all UK financial entities must comply with open banking regulations, there is no uniformity in implementing *internal controls* to manage the associated risks and enhance security. The goal is to foster innovation and enable financial services to adjust to technological advancements, intensifying market competition (Senge 1991; Porter 1996; Coetzee et al. 2016). *Strong Customer Authentication (SCA)* is commonly recognised as an industry standard for payment security (Visa 2019a). However, some organisations perceive market risk or disruption costs associated with closed-loop business models (Shukla et al. 2011; American Express 2019). Most analysts concur that this risk stems from low integration levels among market players, leading to increased competitiveness (Bank For International Settlements 2020; Deloitte 2021).

Regarding service resilience, the alignment on developing, engineering, and managing continuous *24/7 service availability, real-time responses, recovery contingency plans,* and *business continuity* is lacking. This lack of consensus challenges the industry's aim to deliver fast and convenient services. *Scenario planning* and *stress testing* are mentioned as methods to enable agile and flexible responses, augmenting traditional risk management approaches like ISO9001:2015 and COSO 2004. Nevertheless, many business continuity strategies are still predicated on subjective expectations and counterfactual reasoning (Pettit et al. 2010; Walker and Cooper 2011; Bank of England 2019a). Some system-wide tests are mandated by regulatory bodies such as the Bank of England and are part of compliance assessments like CCAR (American Express 2019;

Bancorp 2019; Bank for International Settlements 2019; Barclays 2019; BoE 2019; Discover 2019; Gandhi et al. 2019; Deloitte 2021).

Cross-border payments face hurdles like multi-currency funding costs, lowering barriers to multi-jurisdictional competition, and resolving fragmented payment processing data formats and efficiency depending on time zone operating hours. These challenges impede real-time processing and decision-making, elongate transaction chains, and spotlight the limitations of the current system led by SWIFT. This has sparked interest in exploring Central Bank Digital Currencies (CBDCs) as potential alternatives to enhance the payments infrastructure (Giannetti and Ransing 2016; Bank For International Settlements 2020).

In Enterprise Management, *stakeholders widely recognise and share sustainability initiatives* but vary significantly in their maturity and regulation. *Sustainable insurance* services, for instance, are seldom discussed due to challenges in quantifying and underwriting environmental risks (PwC 2019; Steemis 2019; Conboy et al. 2020).

Risk management is central to banking operations, focusing on reducing *Risk-weighted assets (RWAs)* to mitigate cash flow volatility. The COVID-19 pandemic, although initially underestimated, highlighted the importance of digitisation in payments, especially in Asia, where banks recognised the emerging threat early on. The pandemic has underscored the need for resilience against environmental and social risks that could disrupt markets (Visa 2019c; Deloitte 2021; IIF and EY 2021).

Internally*, remote and hybrid working models* offer opportunities for improved **leanness**, efficiency and time management **flexibility** but are adopted cautiously due to associated cyber risks (IIF and EY 2021). Cloud services, reflecting a broader shift toward servitisation – access over ownership – support open architecture and flexible information sharing. Nevertheless, the capital intensity and lack of regulation for emerging technologies, such as *BYOD, 5G-edge computing analytics, businesses learning, cloud computing, blockchain, crypto, ML, and AI*, constrain their widespread adoption.

In the payment sector, technologies like *QR payments*, which could streamline low-value transactions, are surprisingly not mentioned by major industry players despite their potential to create a more efficient payment ecosystem (World Bank 2019b). *Cryptocurrency*, while noted by some, remains a controversial topic due to regulatory and oversight challenges. However, it promises to enable faster and more transparent cross-border payments (Dodd 2018; Nelms et al. 2018; Deloitte 2019; PwC 2019; Bank of England 2020).

On the process management side, although a process simplification or streamlining approach was shared, there is still a lack of focus on *agility operational improvement* and *change management* that underlies with several internal collaboration capabilities (i.e., teams, groups, forums, and centres, meetings). These capabilities allow for a fast and flexible implementation of operations under changing circumstances, as seen by the lack of focus on some of the technologies that provide these competitive advantages (Deloitte 2019; IIF and EY 2021).

On the process management front, although there is consensus on the need for *process simplification and streamlining*, there appears to be an insufficient emphasis on *agility*, in terms of *operational improvement* and *change management*. These elements are critical for seamless internal collaboration (i.e., *teams, groups, forums, and centres, meetings*) and enable fast and flexible operational adjustments in response to evolving conditions. The lack of focus on technologies that enhance competitive advantage is noted as a gap (Deloitte 2019; IIF and EY 2021).

In summary, the UK retail payment system cultivates various factors to bolster different resilience attributes defined by the RALF framework. **Robustness** is a common theme, with many companies citing risk management practices to enhance it, alongside compliance with regulatory methods. However, the adaptive nature of risk management implies that not all factors are always recognised, especially as organisations recognise the limitations of current models that rely on predictive principles. Over-regulation can constrain services' **leanness, agility,** and **flexibility**, which are key trade-offs that need consideration.

Efficiency is a focal point for companies aiming for **lean** and **agile** processes facilitated by technological innovations. **Flexibility** is also highlighted, especially in offering diverse services informed by data access and management. Yet, development in cross-border payments and societal and environmental payment products, like QR codes, lags behind. A comprehensive approach to assessing the system's resources and capabilities is essential for enhancing the long-term resilience and sustainability of the UK retail payment structure.

The proposed research methods offer insights to compare different companies and understand potential shortcomings. Recognising that the system is imperfect due to reliance on company-disclosed information, it is understood that asymmetries might be mitigated through data integration from diverse sources. Data governance analysts currently extract and evaluate this information, which could lead to a common and transparent analysis if integrated and regulated effectively. The research explores various avenues and suggests solutions to enhance system information sharing and operational resilience.

7 Conclusions

Research questions and contributions

The systems approach employed in this thesis comprehensively assesses strategic business factors within the UK retail payment system. This approach integrates a Resource-Based View (RBV), Soft Systems Methodology (SSM), and PESTEL framework to holistically evaluate stakeholder strategies. The initial chapter outlined two significant contributions to research, addressing the research questions posed.

The first research question explored how a systems approach could be developed and utilised to discern and categorise inter-organisational strategic factors contributing to the UK's retail payment operations. The approach introduced includes a method for identifying, categorising, clustering, and visualising strategic organisational factors. The second contribution involves applying this method to pinpoint the UK retail payment system's strategic factors using dictionary-based text analysis. PESTEL perspectives and stakeholder characteristics organise these factors to illustrate the current mix that underpins operational resilience and sustainability goals. Additionally, it examines the alignment and coordination among stakeholders, identifying common, shared, specific, and non-aligned factors. This analysis offers insights into the payment ecosystem's influential factors and potential enhancement areas for the system's resilience and sustainability. It also allows for assessing the system or industry maturity level by evaluating environmental factors at micro- and meso-levels and potentially serving as a macro-level benchmark across different industries.

The second research question delves into how the systems approach can be expanded through clustering and visualisation techniques to pinpoint improvements to the UK retail payments system's operational resilience and sustainability, encompassing economic, social, and environmental facets. The ensuing paragraphs will synthesise the application of this method through the clustering of factors and identifying gaps, which are elaborated in Chapter 5. This includes using visualisation techniques such as PESTEL diagrams, Systemigrams, and CERT resilience area graphs to present findings comprehensively.

The final chapter will further detail the contributions, limitations, and directions for future research.

Common factors recognised by all stakeholders in the UK retail payment system include a concerted effort towards *regulation collaboration and compliance*, especially regarding *market competition* and the *innovation of digital financial services*. Stakeholders collectively prioritise a long-term competitive stance, with *partnerships and alliances* pivotal for acquiring innovative capabilities.

The exchange rails for payments are fundamental, yet the most lucrative service is often *customer credit*. The emerging ESG regulatory landscape has led stakeholders to improve offerings in *financial planning*, promoting these services through *online and mobile channels* to enhance customer engagement. In tandem, there is a concerted effort to upscale digital literacy among employees and customers, recognizing the importance of education in facilitating the adoption and effective use of financial services.

Risk management is a universal concern, with stakeholders developing *data and knowledge management systems* to protect against *cyber risks* and meet *reporting requirements*. Investment in resilience frameworks is also crucial to bolster the response to known and unknown risks.

Shared and organisation-specific factors include tactical program or *project management* capabilities, which are crucial for building competitive market capabilities. These are enhanced through *process streamlining* and *operational improvements or automation*. Stakeholders coordinate various digital and physical strategies to penetrate markets effectively, considering factors like pricing, transaction fees, and associated risks such as cyber threats and the implications of machine learning and AI.

Business strategies encompass digital marketing initiatives, *online and mobile banking* platforms with features like *BNPL (Buy Now, Pay Later) and P2P (Peer-to-Peer) lending,* as well as *rewards and loyalty programs*. There is also a focus on *cross-border payments*, *B2B services* like digital currencies, *ESG-aligned financial programs* (i.e., green investments and infrastructure), and *employee performance programs*, which include

learning and training programs, leadership, and expert development programs, coaching and mentoring, employees' surveys, panels, and *reports*.

Corporate governance is another shared focus, with implementing controls related to *Open Banking regulations, transaction authentication (SCA controls),* and *ethical considerations*, such as *CSR, ESG,* and *diversity development programs*. Additionally, initiatives are tailored to resonate with specific industries, like *healthcare, the food industry, merchants, retailers,* and *SMEs*, indicating a nuanced approach to sector-specific strategic planning.

The study has uncovered gaps in implementing specific strategies, particularly regarding organisation-specific *internal controls* that comply with *open banking* and *authentication* standards. These gaps reveal systemic vulnerabilities within the dynamic digital environment. Additionally, there is a lack of consensus on system resilience strategies such as *scenario planning* and *stress testing*.

Diverse perspectives on *cross-border payments* highlight the debate between the existing centralised infrastructure, like SWIFT, and emerging distributed networks, like *digital currencies*. *Digital currencies* offer a distinct advantage because they are not bound by national jurisdictions, which could circumvent some of the multi-jurisdictional issues and fragmented data formats that current systems face.

Sustainable investment products and *operational improvement strategies* are areas where organisations strive to create market competition. The discussion around internal digital infrastructure reveals a hybrid approach, with organisations providing *cloud services* and advocating for *hybrid work* arrangements yet still relying on owned *physical data centres and work sites*.

Regarding payment services, there is a focus on technologies that facilitate real-time payments for medium and large retailers. However, there seems to be a notable omission of *QR payments* as a method for smaller transactions despite its convenience for smaller players.

At a strategic level, there is alignment across organisations, yet tactically, the specific actions of each entity diverge significantly, impacting the system's operational resilience and long-term sustainability. Therefore, a comprehensive systems approach is crucial for ensuring top-down and bottom-up alignment and coordination across the industry. This is essential for maintaining a competitive yet secure retail payment ecosystem.

The RBV-PESTEL-SSM (Systemigram) research design has effectively addressed the study's two primary research questions. First, it has demonstrated the utility of the proposed systems method and applied it to analyse the inter-organisational factors identified from stakeholders' strategic reports using dictionary-based text analysis. Second, the method successfully identifies, classifies, and clusters these factors to discern trends and gaps in operational resilience and sustainability within the industry, using organisational alignment levels (common, shared, or specific, and non-aligned factors) and the CERT and RALF operational resilience frameworks as reference.

The next section provides in-depth methodological insights, outlines the limitations encountered, and suggests avenues for future research to broaden the applicability of the study's findings.

Research limitations

The research methodology outlined in this study introduces an ecosystem diagnostic tool that employs a dictionary-based text analysis to discern factors influencing the adoption and usage of retail payment systems, specifically within the UK context. This approach facilitates the classification (using PESTEL), visualisation (through Systemigrams), and comprehension of the alignment of stakeholder factors, which in turn aids in assessing the level of adoption and contribution to operational resilience and sustainability, as framed by the CERT model.

This initial systems approach quantifies the impact of organisational factors on resilience, identifying strategic contributions to relevant attributes with an integrative and holistic perspective. The approach enables stakeholders to devise quality-driven, innovative, and

sustainable initiatives and policies considering the triple bottom line: viability, equity, and bearability.

The dictionary-based text analysis, while simple, provides a traceable, reproducible, and general overview of crucial organisational initiatives or strategic factors. Given constraints related to readability, standardisation, symmetry, and complexity, it is a practical method for analysing extensive datasets within complex systems. Recognising the subjectivity limitations inherent in any analysis, this method is an effective preliminary step in understanding the factors that stakeholders in the payment system are addressing.

A unique facet of this technique is the treatment of factors such as organisational resources and capabilities. The method was applied to the UK's largest publicly listed commercial organisations, clustering the factors reported by stakeholders and analysts and accounting for a significant portion of the UK customer base across various payment system roles. This approach identifies industry-wide initiatives and individual market propositions, providing valuable insights for regulators, analysts, shareholders, and investors.

The dictionary-based text analysis identifies strategic initiatives using PESTEL classifications and discerns common and specific factors that may impact economic, social, and environmental performance. This contributes to the industry capability gap analysis literature by adopting a strategic, visual, and systems thinking approach, as demonstrated by the adapted Systemigram methodology. These adaptations enhance the method's communicability to diverse audiences, significantly contributing to SSM literature.

The CERT and RALF frameworks categorise and elucidate how different factors qualitatively contribute to an organisation's operational resilience and sustainability. The findings are substantiated by academic and industry literature to ensure validity from multiple perspectives. The initial research design also anticipated a secondary validation through in-person interviews with industry participants, which was not feasible due to COVID restrictions. This unrealised aspect remains an avenue for future refinement of

the method, acknowledging the potential subjectivity in the author's interpretation of the findings.

Future research areas

Future research opportunities arising from this study extend across several dimensions, including the scope and depth of the system analysed. The method developed can be applied to a broader array of organisations within the UK and internationally and expanded to include a broader range of stakeholders such as FinTechs or smaller retail chains. By analysing the textual information published by these entities, the method's efficacy can be tested further.

While the current analysis is qualitative, future research could incorporate quantitative measures, applying a proposed scale to assess the contributions to resilience and sustainability more rigorously and objectively. Correlations between the identified factors and financial performance indicators of organisations may also be explored, employing system dynamics methodologies.

From a temporal viewpoint, the method captures a snapshot based on 2019's 10-K reports. An extension across multiple years would enable the identification of evolutionary effects on the factors. The application of Technology Acceptance Models (TAM) could offer insights into the system's evolution and its interplay with customer attitudes. Horizon scanning techniques could also be utilised to anticipate technological developments or potential regulatory and business environment threats.

There is potential for this research to contribute to the correlation and predictive evaluation of strategic factors concerning organisational performance indicators. However, the subjective nature of text coding and the reliance on strategic reports present limitations must be acknowledged for future research applications. These limitations encompass issues such as stability, reproducibility, and accuracy of text coding, as well as standardisation, symmetry, readability, and complexity of the information used. Enhancing the reliability of the research method could involve validation by additional coders and verification through surveys or interviews with industry participants.

In summary, this research introduces a bottom-up approach to evaluating and categorising the various factors or capabilities developed by organisational stakeholders. It proposes a method for clustering these factors, offering insights into industry alignment on resilience and sustainability. This approach has limitations, particularly regarding subjectivity within its ontological and epistemological frameworks. However, it facilitates the development of a shared understanding of a complex environment, which is invaluable for those engaged with any system and can inform strategic decision-making.

8 References

Abraham, S. and Cox, P. 2007. Analysing the determinants of narrative risk information in UK FTSE 100 annual reports. *British Accounting Review* 39(3), pp. 227–248. doi: 10.1016/j.bar.2007.06.002.

Accenture 2019. Global Financial Services Consumer Study., pp. 1–57. Available at: https://www.accenture.com/_acnmedia/PDF-95/Accenture-2019-Global-Financial-Services-Consumer-Study.pdf.

Acheampong, A. and Elshandidy, T. 2021. Does soft information determine credit risk? Text-based evidence from European banks. *Journal of International Financial Markets, Institutions and Money* (2021), p. 101303. Available at: https://doi.org/10.1016/j.intfin.2021.101303.

Ajibolade, S. and Oyewo, B. 2017. Firm Characteristics and Performance Disclosure in Annual Reports of Nigerian Banks using the Balanced Scorecard. *Euro Economica* 36(01), pp. 94–112.

Alderman, L. 2018. Sweden's Push to Get Rid of Cash Has Some Saying, 'Not So Fast'. Available at: https://www.nytimes.com/2018/11/21/business/sweden-cashless-society.html [Accessed: 16 August 2019].

Alexander, D.E. 2013. Resilience and disaster risk reduction: An etymological journey. *Natural Hazards and Earth System Sciences* 13(11), pp. 2707–2716. doi: 10.5194/nhess-13-2707-2013.

Álvarez Jaramillo, J. et al. 2019. Barriers to sustainability for small and medium enterprises in the framework of sustainable development—Literature review. *Business Strategy and the Environment* 28(4), pp. 512–524. doi: 10.1002/bse.2261.

Amanatidou, E. et al. 2012. On concepts and methods in horizon scanning: Lessons from initiating policy dialogues on emerging issues. *Science and Public Policy* 39(2), pp. 208–221. doi: 10.1093/scipol/scs017.

Amazon 2019. Amazon Strategic Report.

American Express 2019. American Express Strategic Report. 81(5), p. 10.

Anderson, E.G. et al. 2000. Upstream volatility in the supply chain: The machine tool industry as a case study. *Production and Operations Management* 9(3), pp. 239–261. doi: 10.1111/j.1937-5956.2000.tb00136.x.

Apari, T.G. et al. 2013. User Experience approach in financial services. *2013 The International Conference on Technological Advances in Electrical, Electronics and Computer Engineering, TAEECE 2013* , pp. 400–403. doi: 10.1109/TAEECE.2013.6557308.

Arango, C. et al. 2015. Consumer payment choice: Merchant card acceptance versus pricing incentives. *Journal of Banking and Finance* 55, pp. 130–141. Available at: http://dx.doi.org/10.1016/j.jbankfin.2015.02.005.

Araz, O.M. et al. 2020. The importance of widespread testing for COVID-19 pandemic : systems thinking for drive- through testing sites. *Health Systems* 00(00), pp. 1–5. Available at: https://doi.org/10.1080/20476965.2020.1758000.

Arquitt, S. et al. 2005. A system dynamics analysis of boom and bust in the shrimp aquaculture industry. *System Dynamics Review* 21(4), pp. 305–324. doi: 10.1002/sdr.313.

Arvidsson, N. 2014. Consumer attitudes on mobile payment services - results from a proof of concept test. *International Journal of Bank Marketing* 32(2), pp. 150–170. doi: 10.1108/IJBM-05-2013-0048.

Azahara, L. and González, R. 2021. Una taxonomía de actividades sostenibles para Europa. Documentos Ocasionales N.º 2101.

BACS 2016. The UK's Interbank Payment Schemes., p. 24. Available at: https://www.bacs.co.uk/DocumentLibrary/An_Introduction_to_the_UKs_Interbank_Payment_Schemes.pdf.

Balakrishnan, R. et al. 2010. On the predictive ability of narrative disclosures in annual reports. *European Journal of Operational Research* 202(3), pp. 789–801. Available at: http://dx.doi.org/10.1016/j.ejor.2009.06.023.

Ballou, R.H. 2004. *Business Logistics/supply Chain Management: Planning, Organizing, and Controlling the Supply Chain*.

Bancorp 2019. Bancorp Strategic Report.

Bank for International Settlements 2003. Payment system in Sweden., pp. 340–363. Available at: https://www.bis.org/cpmi/paysys/swedencomp.pdf.

Bank for International Settlements 2017. Statistics on payment and settlement systems in the CPMI countries. *CPMI Papers* 172(December), pp. 1–564. Available at: https://www.bis.org/cpmi/publ/d172.htm.

Bank for International Settlements 2019. Payments and financial market infrastructures. Available at: https://stats.bis.org/statx/toc/CPMI.html [Accessed: 18 August 2019].

Bank For International Settlements 2020. Enhancing cross-border payments: building blocks of a global roadmap. *Bank For International Settlements* (July). Available at: https://www.bis.org/cpmi/publ/d193.pdf.

Bank of England 2019a. Financial market infrastructure supervision. Available at: https://www.bankofengland.co.uk/financial-stability/financial-market-infrastructure-

supervision [Accessed: 14 August 2019].

Bank of England 2019b. Payment and Settlement. Available at: https://www.bankofengland.co.uk/payment-and-settlement [Accessed: 19 August 2019].

Bank of England 2020. Central Bank Digital Currency, Opportunities, challenges and design. (March)

Bansal, S. et al. 2018. Global payments 2018: A dynamic industry continues to break new ground. *Global Banking* October(October). Available at: https://www.mckinsey.com/~/media/McKinsey/Industries/Financial Services/Our Insights/Global payments Expansive growth targeted opportunities/Global-payments-map-2018.ashx.

Barclays 2019. Barclays strategic report. (2), pp. 2–5. Available at: https://eur-lex.europa.eu/legal-content/PT/TXT/PDF/?uri=CELEX:32016R0679&from=PT%0Ahttp://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52012PC0011:pt:NOT.

Barclays 2021. Climate Fintech: Rise Insights report.

Barkhordari, M. et al. 2017. Factors influencing adoption of e-payment system: an empirical study on Iranian customers. *Information Systems and e-Business Management* 15(1), pp. 89–116. doi: 10.1007/s10257-016-0311-1.

Barney, J. 1991. Firm Resources and Sustained Competitive Advantage. *Journal of Management* 17(1), pp. 99–120. doi: 10.1177/014920639101700108.

Barringer, B.R. et al. 2005. A quantitative content analysis of the characteristics of rapid-growth firms and their founders. *Journal of Business Venturing* 20(5), pp. 663–687. doi: 10.1016/j.jbusvent.2004.03.004.

Barthélemy, J. and Brucker, F. 2008. Binary clustering. *Discrete Applied Mathematics* 156, pp. 1237–1250. doi: 10.1016/j.dam.2007.05.024.

Batiz-Lazo, B. and Del Angel, G.A. 2018a. The Ascent of Plastic Money: International Adoption of the Bank Credit Card, 1950-1975. *Business History Review* 92(3), pp. 509–533. doi: 10.1017/S0007680518000752.

Batiz-Lazo, B. and Del Angel, G.A. 2018b. The Ascent of Plastic Money: International Adoption of the Bank Credit Card, 1950-1975. *Business History Review* 92(3), pp. 509–533. doi: 10.1017/S0007680518000752.

Bech, M. et al. 2018. Payments are a-changin' but cash still rules. *BIS Quarterly Review* (March), pp. 67–80.

Berry, D. and Towill, D.R. 1992. Material flow in Electronic Product Based Supply Chains. *The International Journal of Logistics Management* 3(2), pp. 78–94.

BIS 2019. *Annual Economic Report*.

Blair, C.D. et al. 2007a. Communicating strategic intent with systemigrams: Application to the network-enabled challenge. *Systems Engineering* . doi: 10.1002/sys.20079.

Blair, C.D. et al. 2007b. Communicating Strategic Network-Enabled Application to the Intent with Systemigrams: Challenge. *Systems Engineering* 10(4), pp. 309–322. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1002/sys.20079.

Bloomfield, R. 2008. Annual report readability, current earnings, and earnings persistence. *Journal of Accounting and Economics* 45(2–3), pp. 221–247. doi: 10.1016/j.jacceco.2008.02.003.

Bloxham, E. 2011. The knowledge gap between investors and companies. *Journal of Sustainable Finance and Investment* 1(2), pp. 156–158. doi: 10.1080/20430795.2011.582326.

BNP PARIBAS and Capgemini 2019. *World Payments Report (WPR) 2018*. Available at: https://worldpaymentsreport.com/.

Boardman, J. and Sauser, B.J. 2008. *Systems Thinking: Coping with 21St Century Problems*. Boca Raton, FL. doi: 10.1002/9780470926963.ch2.

BoE 2019. Bank of England Strategic Report.

Bolt, W. 2012. *Retail Payment system: Competition, Innovation, and Implications*. Available at: http://www.rug.nl/staff/l.spierdijk/panzar_rosse.pdf.

Bolt, W. and Schmiedel, H. 2013. Pricing of payment cards, competition, and efficiency: A possible guide for SEPA. *Annals of Finance* 9(1), pp. 5–25. doi: 10.1007/s10436-011-0177-7.

Borzekowski, R. et al. 2008. Consumers' use of debit cards: Patterns, preferences, and price response. *Journal of Money, Credit and Banking* 40(1), pp. 149–172. doi: 10.1111/j.1538-4616.2008.00107.x.

Brianti, M. and Cormun, V. 2019. What are the sources of boom-bust cycles?, p. 2016.

British Sociological Association *Statement of Ethical Practice*. Available at: https://www.britsoc.co.uk/media/24310/bsa_statement_of_ethical_practice.pdf.

Bryson, J.M. and Alston, F.K. 2011. Creating and implementing your strategic plan: a workbook. *Journal of applied animal welfare science : JAAWS* . doi: 10.1080/10888705.2011.576987.

Bughin, J. and Woetzel, J. 2019. *Navigating a World of Disruption*. Available at: https://www.mckinsey.com/featured-insights/innovation-and-growth/navigating-a-world-of-disruption.

Bui, T.D. et al. 2020. Challenges and Trends in Sustainable Corporate Finance: A Bibliometric Systematic Review. *Journal of Risk and Financial Management* 13(11), p. 264. doi: 10.3390/jrfm13110264.

Cachon, G.P. 2003. Supply Chain Coordination with Contracts. *Handbooks in Operations Research and Management Science* 11(C), pp. 227–339. doi: 10.1016/S0927-0507(03)11006-7.

Callahan, W. et al. 2011. *Corporate Value Chain (Scope 3) Accounting and Reporting Standard Supplement to the GHG Protocol Corporate Accounting and Reporting Standard GHG Protocol Team*.

Calomiris, C.W. et al. 2004. A Taxonomy of Financial Crisis Resolution Mechanisms: Cross-Country Experience. *World Bank Policy Research Working* Paper 3379, p. 75.

Capgemini 2021. World Payments Report., p. 48.

Carabine, E. and Wilkinson, E. 2016. How can local governance systems strengthen community resilience? A social-ecological systems approach. *Politics and Governance* 4(4DisasterPoliciesandGovernancePromotingCommunityResilience), pp. 62–73. doi: 10.17645/pag.v4i4.746.

Caralli, R.A. et al. 2010. Improving operational resilience processes: The CERT® resilience management model. *Proceedings - SocialCom 2010: 2nd IEEE International Conference on Social Computing, PASSAT 2010: 2nd IEEE International Conference on Privacy, Security, Risk and Trust* , pp. 1165–1170. doi: 10.1109/SocialCom.2010.173.

Carvalho, H. et al. 2012. Computers & Industrial Engineering Supply chain redesign for resilience using simulation. *Computers & Industrial Engineering* 62(1), pp. 329–341. Available at: http://dx.doi.org/10.1016/j.cie.2011.10.003.

CFA Institute 2013. *Financial reporting disclosures: Investor perspectives on transparency, trust, and volume*. Available at: https://www.cfainstitute.org/-/media/documents/article/position-paper/financial-reporting-disclosures-investor-perspectives-on-transparency-trust-volume.ashx.

Checkland, P. and Poulter, J. 1999. *Systems thinking, systems practice: a thirty year retrospective*.

Checkland, P. and Scholes, J. 1999. *Soft systems methodology in action: a thirty year retrospective*. Sussex, England.

Chris Bail 2021. Dictionary-Based Text Analysis in R. Available at: https://cbail.github.io/SICSS_Dictionary-Based_Text_Analysis.html [Accessed: 11 October 2020].

Clegg, B.T. and Boardman, J.T. 1996. Process Integration and Improvement Using

Systemic Diagrams and a Human-Centred Approach. *Concurrent Engineering Research and Applications* 11(3), p. 18. doi: 10.1177/106329303039729.

Coetzee, C. et al. 2016. Disaster resilience and complex adaptive systems theory: Finding common grounds for risk reduction. *Disaster Prevention and Management* 25(2), pp. 196–211. doi: 10.1108/DPM-07-2015-0153.

Conboy, K. et al. 2020. Using business analytics to enhance dynamic capabilities in operations research: A case analysis and research agenda. *European Journal of Operational Research* 281(3), pp. 656–672. Available at: https://doi.org/10.1016/j.ejor.2019.06.051.

Cox, J. et al. 2019. Future of Banking. *Racounteur* . Available at: www.capco.com.

Cummins, J. and Bawden, D. 2010. Accounting for information: Information and knowledge in the annual reports of FTSE 100 companies. *Journal of Information Science* 36(3), pp. 283–305. doi: 10.1177/0165551510361429.

Currivan, D.B. and Gilbert, N. 1994. Researching Social Life. *Teaching Sociology* . doi: 10.2307/1318574.

Dahlstrom, R. et al. 2014. How to recover trust in the banking industry? A game theory approach to empirical analyses of bank and corporate customer relationships. *International Journal of Bank Marketing* 32(4), pp. 268–278. doi: 10.1108/IJBM-03-2014-0042.

Davis, A.K. et al. 2012. Beyond the Numbers: Measuring the Information Content of Earnings Press Release Language. *Contemporary Accounting Research* 29(3), pp. 845–868. doi: 10.1111/j.1911-3846.2011.01130.x.

Davydov, D. and Sihvonen, J. 2021. *Who cares about sanctions ? Observations from annual reports of European firms BOFIT Discussion Papers*.

Deloitte 2019. 2019 Banking and Capital Markets Outlook: Reimagining transformation., p. 40. Available at: https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-fsi-dcfs-2019-banking-cap-markets-outlook.pdf.

Deloitte 2021. Resilience by Design Financial services operating models and operational resilience Contents.

Dhananjay, B. and Suresh Chandra, B. 2015. The electronic banking revolution in India. *Journal of Internet Banking and Commerce* 20(2). doi: 10.4172/1204-5357.1000110.

Ding, X.D. et al. 2011. Customer experience in online financial services: A study of behavioral intentions for techno-ready market segments. *Journal of Service Management* 22(3), pp. 344–366. doi: 10.1108/09564231111136863.

Discover 2019. Discover Strategic Report. 18

Disney, S.M. et al. 2008. The value of coordination in a two-echelon supply chain. In: *IIE Transactions (Institute of Industrial Engineers)*. doi: 10.1080/07408170701488003.

Dodd, N. 2018. The Social Life of Bitcoin. *Theory, Culture and Society* . doi: 10.1177/0263276417746464.

Durach, C.F. et al. 2015. Antecedents and dimensions of supply chain robustness: A systematic literature review. *International Journal of Physical Distribution and Logistics Management* 45, pp. 118–137. doi: 10.1108/IJPDLM-05-2013-0133.

Edge, S. et al. 2021. FinTech Partnerships and the technologies that enable them. *Amazon Web Services* (April)

Ernst & Young 2020. Banking in the new decade contents. *Global Banking Outlook*

Eskici, H.B. and Koçak, N.A. 2018. A text mining application on monthly price developments reports. *Central Bank Review* 18(2), pp. 51–60. Available at: https://doi.org/10.1016/j.cbrev.2018.05.001.

Fair, R.C. 2005. Estimates of the Effectiveness of Monetary Policy. *Journal of Money, Credit, and Banking* . doi: 10.1353/mcb.2005.0041.

Falasca, M. et al. 2008. A decision support framework to assess supply chain resilience. *Proceedings of ISCRAM 2008 - 5th International Conference on Information Systems for Crisis Response and Management* (May), pp. 596–605.

FCA 2019a. FCA Strategic Report.

FCA 2019b. The UK Financial Conduct Authority and the US Securities and Exchange Commission sign updated supervisory cooperation arrangements., p. 2. Available at: https://www.fca.org.uk/news/press-releases/uk-financial-conduct-authority-and-us-securities-and-exchange-commission-sign-updated-supervisory/printable/print.

FIS 2019. FIS Strategic Report.

Fiserv 2019. Fiserv Strategic Report.

Folke, C. et al. 2010. Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society* 15(4). doi: 10.5751/ES-03610-150420.

Forrester, J.W. 1961. *Industrial dynamics*. Cambridge, Mass: Productivity Press.

Forrester, J.W. 2012. Industrial Dynamics: A Major Breakthrough for Decision Makers. In: *The Roots of Logistics*. doi: 10.1007/978-3-642-27922-5_13.

Furrer, O. et al. 2008. The structure and evolution of the strategic management field: A content analysis of 26 years of strategic management research. *International Journal of*

Management Reviews 10(1), pp. 1–23. doi: 10.1111/j.1468-2370.2007.00217.x.

Gandhi, P. et al. 2019. Using Annual Report Sentiment as a Proxy for Financial Distress in U.S. Banks. *Journal of Behavioral Finance* 20(4), pp. 424–436. Available at: https://doi.org/10.1080/15427560.2019.1553176.

Gartner 2019. Retail Banking Outlook for 2019. *Gartner* , pp. 1–13.

Gheorghe, A. V. et al. 2018. *Critical infrastructures, key resources, and key assets*. doi: 10.1007/978-3-319-69224-1_1.

Giannetti, C. and Ransing, R.S. 2016. Risk based uncertainty quantification to improve robustness of manufacturing operations. *Computers and Industrial Engineering* 101, pp. 70–80. Available at: http://dx.doi.org/10.1016/j.cie.2016.08.002.

Gilmore, X. 2018. Credit card processing fees. Available at: https://startups.co.uk/credit-card-processing-fees/ [Accessed: 15 August 2019].

Giocoli, N. 2014. Network efficiency and the banking system. *International Review of Economics* 61(3), pp. 203–218. doi: 10.1007/s12232-014-0212-x.

Global Payments 2019. Global Payments Strategic Report. 1, pp. 1–27.

Gold, S. et al. 2010. Sustainable supply chain management and inter-organisational resources: A literature review. *Corporate Social Responsibility and Environmental Management* 17(4), pp. 230–245. doi: 10.1002/csr.207.

Goparaju, H. 2017. Digital Payment Sector : The Sunrise Industry in India : A Review. *International Tax Review* 8(7), pp. 7–20. Available at: http://www.nfc-forum.org/resources/white_papers/NFC_in_Public_Transport.pdf%0Ahttp://www.aicit.org/ijact/global/paper_detail.html?jname=IJACT&q=1414%0Ahttp://search.ebscohost.com/login.aspx?direct=true%7B&%7Ddb=bth%7B&%7DAN=115372144%7B&%7Dsite=ehost-live.

Gosling, J. et al. 2020. Relational Investments and Contractual Choices for Diverse Engineering Designs. *IEEE Engineering Management Review* 5(d), pp. 1–13.

Government, W. and Division, P. 2015. Horizon Scanning : Future trends and the skills needed to deliver the planning system in Wales. (April)

Gray, D. 2021. *What Makes Successful Frameworks Rise Above the Rest*. MIT Sloan Management Review.

Gray, R. 2006. Social, environmental and sustainability reporting and organisational value creation?: Whose value? Whose creation? *Accounting, Auditing and Accountability Journal* 19(6), pp. 793–819. doi: 10.1108/09513570610709872.

Größler, A. et al. 2008. System dynamics as a structural theory in operations

management. *Production and Operations Management* . doi: 10.3401/poms.1080.0023.

Haimes, Y.Y. 2018. Risk Modeling of Interdependent Complex Systems of Systems: Theory and Practice. *Risk Analysis* 38(1), pp. 84–98. doi: 10.1111/risa.12804.

Hájek, P. 2018. Combining bag-of-words and sentiment features of annual reports to predict abnormal stock returns. *Neural Computing and Applications* 29(7), pp. 343–358. doi: 10.1007/s00521-017-3194-2.

Hamish, T. et al. 2018. *FinTech Open Banking Snapshot Minds made for shaping financial services*. Available at: https://www.ey.com/Publication/vwLUAssets/EY-fintech-open-banking-snapshot/$FILE/EY-fintech-open-banking-snapshot.pdf.

Han, J.H. et al. 2017. Reconceptualization of information technology flexibility for supply chain management: An empirical study. *International Journal of Production Economics* 187(November 2016), pp. 196–215. Available at: http://dx.doi.org/10.1016/j.ijpe.2017.02.018.

Han, J.H. et al. 2020. Narrowing the gaps: Assessment of logistics firms' information technology flexibility for sustainable growth. *Sustainability (Switzerland)* 12(11). doi: 10.3390/su12114372.

Haniffa, R. and Hudaib, M. 2007. Exploring the ethical identity of Islamic Banks via communication in annual reports. *Journal of Business Ethics* 76(1), pp. 97–116. doi: 10.1007/s10551-006-9272-5.

Hasan, I. et al. 2012. Retail Payments and Economic Growth. *SSRN Electronic Journal* . doi: 10.2139/ssrn.2100651.

Hasan, I. et al. 2013a. *Retail payments and the real economy*. Frankfurt.

Hasan, I. et al. 2013b. *Retail payments and the real economy*.

Hayes, S. et al. 2019. Leveraging socio-ecological resilience theory to build climate resilience in transport infrastructure. *Transport Reviews* 39(5), pp. 677–699. Available at: https://doi.org/10.1080/01441647.2019.1612480.

Hedman, J. et al. 2017. Taxonomy of payments: a repertory grid analysis. *International Journal of Bank Marketing* 35(1), pp. 75–96. doi: 10.1108/IJBM-12-2015-0187.

HM Treasury 2016. HM Treasury Strategic Report. Available at: https://www.gov.uk/government/publications/hm-treasury-single-departmental-plan-2015-to-2020/hm-treasury-single-departmental-plan-2015-to-2020.

HM Treasury 2021. Greening Finance: A Roadmap to Sustainable Investing. (October)

Holmes, G. et al. 2019. *UK housing: Fit for the future?* Available at: www.theccc.org.uk/publications.

Homburg, C. et al. 2020. Marketing Excellence: Nature, Measurement, and Investor Valuations. *Journal of Marketing* 84(4), pp. 1–22. doi: 10.1177/0022242920925517.

Homer, J.B. 1996. Why we iterate: scientific modeling in theory and practice. *System Dynamics Review* 12(1), pp. 1–19. doi: 10.1002/(sici)1099-1727(199621)12:1<1::aid-sdr93>3.3.co;2-g.

HSBC 2019. HSBC Strategic Report.

Humphreys, A. and Wang, R.J.H. 2018. Automated text analysis for consumer research. *Journal of Consumer Research* 44(6), pp. 1274–1306. doi: 10.1093/jcr/ucx104.

IFRS Technical Readiness Working Group 2021. General Requirements for Disclosure of Sustainability-related Financial Information Prototype Developed by the Technical Readiness Working Group , chaired by the IFRS Foundation , to provide recommendations to the International Sustainability Standards Bo. (November)

IIF and EY 2021. Resilient banking: capturing opportunities and managing risks over the long term.

IMF 2019a. Global Financial Stability Report. *Global Financial Stability Report*

IMF 2019b. IMF Annual Report 2019: Our Connected World. *Editorial and Publications Division of the IMF's Communications department* , pp. 10–12.

Innovate Finance 2019. *UK FinTech - State of the Nation*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/801277/UK-fintech-state-of-the-nation.pdf%0Ahttps://www.fintechandpayments.com/2019/05/uk-fintech-state-of-the-nation-report-highlights-uks-leading-position/?u.

Innovate Finance 2020. The Role of FinTech in Net Zero., pp. 1–14. Available at: https://www.innovatefinance.com/.

Jain, P. et al. 2018. Process Resilience Analysis Framework (PRAF): A systems approach for improved risk and safety management. *Journal of Loss Prevention in the Process Industries* 53, pp. 61–73. Available at: https://doi.org/10.1016/j.jlp.2017.08.006.

Japp, K.P. and Kusche, I. 2009. Systems Theory and Risk. *Social Theories of Risk and Uncertainty: An Introduction* (August), pp. 76–105. doi: 10.1002/9781444301489.ch4.

Jizi, M.I. et al. 2014. Corporate Governance and Corporate Social Responsibility Disclosure: Evidence from the US Banking Sector. *Journal of Business Ethics* 125(4), pp. 601–615. doi: 10.1007/s10551-013-1929-2.

Johnson, G. et al. 2014. *Exploring Strategy*. doi: 10.1017/CBO9781107415324.004.

Johnson, P.F. et al. 2007. Utilizing e-business technologies in supply chains: The impact of firm characteristics and teams. *Journal of Operations Management* 25(6), pp. 1255–1274. doi: 10.1016/j.jom.2007.01.005.

Jonker, N. et al. 2017. Did a Public Campaign Influence Debit Card Usage? Evidence from the Netherlands. *Journal of Financial Services Research* 52(1–2), pp. 89–121. doi: 10.1007/s10693-017-0281-6.

Jun, M. and Cai, S. 2001. The key determinants of Internet banking service quality: A content analysis. *International Journal of Bank Marketing* 19(7), pp. 276–291. doi: 10.1108/02652320110409825.

Kalifa, R. 2021. Kalifa Review of UK Fintech. *HM Treasury* . Available at: https://www.gov.uk/government/publications/the-kalifa-review-of-uk-fintech.

Karapandza, R. 2016. Stock returns and future tense language in 10-K reports. *Journal of Banking and Finance* 71, pp. 50–61. Available at: http://dx.doi.org/10.1016/j.jbankfin.2016.04.025.

Katsafados, A.G. et al. 2021. Using textual analysis to identify merger participants: Evidence from the U.S. banking industry. *Finance Research Letters* (April 2020), p. 101949. Available at: https://doi.org/10.1016/j.frl.2021.101949.

Kawamura, K. et al. 2019. Strategic central bank communication: Discourse analysis of the Bank of Japan's Monthly Report. *Journal of Economic Dynamics and Control* 100, pp. 230–250. doi: 10.1016/j.jedc.2018.11.007.

Kazakov, R. et al. 2020. Managing complex adaptive systems: A resource/agent qualitative modelling perspective. *European Journal of Operational Research* (xxxx), pp. 1–15. Available at: https://doi.org/10.1016/j.ejor.2020.08.007.

Khadjeh Nassirtoussi, A. et al. 2014. Text mining for market prediction: A systematic review. *Expert Systems with Applications* 41(16), pp. 7653–7670. Available at: http://dx.doi.org/10.1016/j.eswa.2014.06.009.

Kim, D. and Kim, S. 2017. Sustainable supply chain based on news articles and sustainability reports: Text mining with Leximancer and DICTION. *Sustainability (Switzerland)* 9(6). doi: 10.3390/su9061008.

Klee, E. 2006. Families' Use of Payment Instruments During a Decade of Change in the U.S. Payment System. *Finance and Economics Discussion Series* 2006(01), pp. 1–52. doi: 10.17016/feds.2006.01.

Klee, E. 2008. How people pay: Evidence from grocery store data. *Journal of Monetary Economics* 55(3), pp. 526–541. doi: 10.1016/j.jmoneco.2008.01.009.

Kleindorfer, P.R. et al. 2005. Sustainable operations management. *Production and Operations Management* 14(4), pp. 482–492. doi: 10.1111/j.1937-5956.2005.tb00235.x.

Kolios, A. and Read, G. 2013. A Political, economic, social, technology, legal and environmental (PESTLE) approach for risk identification of the tidal industry in the United Kingdom. *Energies* 6(10), pp. 5023–5045. doi: 10.3390/en6105023.

Kosse, A. 2013. Do newspaper articles on card fraud affect debit card usage? *Journal of Banking and Finance* 37(12), pp. 5382–5391. Available at: http://dx.doi.org/10.1016/j.jbankfin.2013.01.016.

Koulayev, S. et al. 2016. Explaining adoption and use of payment instruments by US consumers. *RAND Journal of Economics* 47(2), pp. 293–325. doi: 10.1111/1756-2171.12129.

KPMG 2020. Operational resilience. *The Art of Organisational Resilience* (September), pp. 81–114. doi: 10.4324/9781315164014-3.

Lafley, A.G. and Martin, R.L. 2013. Strategy is choice. *Playing to win: How strategy really works*

Lagoarde-Segot, T. 2019. Sustainable finance. A critical realist perspective. *Research in International Business and Finance* 47(April 2018), pp. 1–9. Available at: https://doi.org/10.1016/j.ribaf.2018.04.010.

Landrum, N.E. 2008. A narrative analysis revealing strategic intent and posture. *Qualitative Research in organisations and Management: An International Journal* 3(2), pp. 127–145. doi: 10.1108/17465640810900540.

Langley, S. 2019. *Landscaping UK Fintech*.

Law, J. 2016. A Dictionary of Business and Management. Available at: https://www-oxfordreference-com.abc.cardiff.ac.uk/view/10.1093/acref/9780199684984.001.0001/acref-9780199684984-e-6185.

Lee, C.K.H. 2022. How guest-host interactions affect consumer experiences in the sharing economy: New evidence from a configurational analysis based on consumer reviews. *Decision Support Systems* 152(July 2021), p. 113634. Available at: https://doi.org/10.1016/j.dss.2021.113634.

Lee, J. and Hong, Y.S. 2016. Extraction and visualization of industrial service portfolios by text mining of 10-K annual reports. *Flexible Services and Manufacturing Journal* 28(4), pp. 551–574. doi: 10.1007/s10696-015-9235-1.

Leo, M. 2020. Operational resilience disclosures by banks: Analysis of annual reports. *Risks* 8(4), pp. 1–15. doi: 10.3390/risks8040128.

Li, F. 2010. The information content of forward- looking statements in corporate filings-A naïve bayesian machine learning approach. *Journal of Accounting Research* 48(5), pp. 1049–1102. doi: 10.1111/j.1475-679X.2010.00382.x.

Li, J. et al. 2017. Coordination strategies in a three-echelon reverse supply chain for economic and social benefit. *Applied Mathematical Modelling* 49(71471105), pp. 599–611. Available at: http://dx.doi.org/10.1016/j.apm.2017.04.031.

Lindskog, M. 2012. Systems theory: Myth or mainstream? *Logistics Research* 4(1–2), pp. 63–81. doi: 10.1007/s12159-011-0062-9.

Lloyds 2019. Lloyds strategic report.

Loughran, T. and McDonald, B. 2015. The Use of Word Lists in Textual Analysis. *Journal of Behavioral Finance* 16(1), pp. 1–11. doi: 10.1080/15427560.2015.1000335.

Machado, C.G. et al. 2017. Framing maturity based on sustainable operations management principles. *International Journal of Production Economics* 190(December 2016), pp. 3–21. Available at: http://dx.doi.org/10.1016/j.ijpe.2017.01.020.

Maier, F.H. 1998. New product diffusion models in innovation management - A system dynamics perspective. *System Dynamics Review* 14(4), pp. 285–308. doi: 10.1002/(SICI)1099-1727(199824)14:4<285::AID-SDR153>3.0.CO;2-F.

Mastercard 2018. *Going Global : Payment Insights to Achieve Growth at Scale*.

Mastercard 2019. Mastercard Strategic Report.

Mayring, P. 2000. Qualitative Content Analysis. *Forum : Qualitative Social Research* 1(2)

McDermott, T. et al. 2015. Use of systemigrams to identify emergence in complex adaptive systems. *9th Annual IEEE International Systems Conference, SysCon 2015 - Proceedings* , pp. 778–784. doi: 10.1109/SYSCON.2015.7116845.

McIntyre, A. 2019. Inside OR November 2021., pp. 1–7. Available at: https://www.forbes.com/sites/alanmcintyre/2019/01/07/10-major-trends-driving-banking-in-2019-bankings-evolution-accelerates/#5564fec37050.

Mello, M.H. et al. 2017. Improving coordination in an engineer-to-order supply chain using a soft systems approach. *Production Planning and Control* 28(2), pp. 89–107. Available at: http://dx.doi.org/10.1080/09537287.2016.1233471.

Milling, P.M. 1996. Modeling innovation processes for decision support and management simulation. *System Dynamics Review* 12(3), pp. 211–234. doi: 10.1002/(sici)1099-1727(199623)12:3<211::aid-sdr105>3.3.co;2-#.

Mintzberg, H. 1987. *THE STRATEGY CONCEPT I: FIVE Ps FOR STRATEGY*.

Mintzbergt, H. 1978. *PATTERNS IN STRATEGY FORMATION**. Available at: https://about.jstor.org/terms.

Mishra, S. et al. 2020. The effects of an articulated customer value proposition (CVP) on promotional expense, brand investment and firm performance in B2B markets: A text based analysis. *Industrial Marketing Management* 87(October 2019), pp. 264–275. doi: 10.1016/j.indmarman.2019.10.005.

Morgan, R.E. et al. 2019. Capability-driven industrial firms: Considering resources, capabilities, and competencies for marketing developments. *Industrial Marketing Management* 83(September), pp. 1–7. doi: 10.1016/j.indmarman.2019.08.007.

Morozov, E. 2018. From Airbnb to city bikes, the 'sharing economy' has been seized by big money. Available at: https://www.theguardian.com/commentisfree/2018/nov/27/airbnb-city-bikes-sharing-economy-big-money [Accessed: 18 August 2019].

Morrison 2019. Morrison Strategic Report. 2507(February), pp. 1–9.

Mugurusi, G. and de Boer, L. 2019. Are You Receiving Me? A Viable System Model (VSM) Analysis of Purchasing Coordination in a Firm Engaged in Offshoring of Manufacturing Activities. *Systemic Practice and Action Research* 32(3), pp. 239–272. doi: 10.1007/s11213-019-09483-y.

Naher, E. and Aya, R. 2013. Some criticisms to corporate social responsibility (CSR) and radical CSR as a proposal to overcome them. *Jorge Tadeo Lozano University* 1(12), pp. 12–34.

Naim, M.M. et al. 2002. A supply chain diagnostic methodology: Determining the vector of change. *Computers and Industrial Engineering* 43(1–2), pp. 135–157. doi: 10.1016/S0360-8352(02)00072-4.

Naim, M.M. et al. 2003. On systems thinking, engineering and dynamics – their influence on modern logistics management., pp. 549–558.

Nedopil Wang, C. et al. 2020. Addressing the missing linkage in sustainable finance: the 'SDG Finance Taxonomy'. *Journal of Sustainable Finance and Investment* 0(0), pp. 1–8. Available at: https://doi.org/10.1080/20430795.2020.1796101.

Nelms, T.C. et al. 2018. Social Payments: Innovation, Trust, Bitcoin, and the Sharing Economy. *Theory, Culture and Society* 35(3), pp. 13–33. doi: 10.1177/0263276417746466.

Norrestad, F. 2019. Statistics and facts on the leading banks in the United Kingdom (UK). Available at: https://www.statista.com/topics/6033/leading-uk-banks/ [Accessed: 10 August 2019].

Nutt, P.C. 2000. Context, tactics, and the examination of alternatives during strategic decision making. *European Journal of Operational Research* 124(1), pp. 159–186. doi: 10.1016/S0377-2217(99)00165-4.

Nutt, P.C. 2001. A taxonomy of strategic decisions and tactics for uncovering alternatives. *European Journal of Operational Research* 132(3), pp. 505–527. doi: 10.1016/S0377-2217(00)00141-7.

Ojo/Roedl, M. 2021. Sustainable Finance, Current and Future Implications for Banks and Monetary Policy: Assessing COVID Impacts. *SSRN Electronic Journal* (108844). doi: 10.2139/ssrn.3852247.

Olaleye, S.A. et al. 2017. Users experience of mobile money in Nigeria. *2017 IEEE AFRICON: Science, Technology and Innovation for Africa, AFRICON 2017* (December 2016), pp. 929–934. doi: 10.1109/AFRCON.2017.8095606.

Oliveira, T. et al. 2016a. Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior* 61. doi: 10.1016/j.chb.2016.03.030.

Oliveira, T. et al. 2016b. Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior* 61(2016), pp. 404–414. Available at: http://dx.doi.org/10.1016/j.chb.2016.03.030.

Oliver Wyman 2020. The State of the Financial Services Industry., p. 33. Available at: https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2020/January/Oliver-Wyman-State-of-the-Financial-Services-Industry-2020.pdf.

ONS 2019. UK Economy. Available at: https://www.ons.gov.uk/economy.

Open Banking Ltd. 2019. Open Banking Standard. Available at: https://standards.openbanking.org.uk/ [Accessed: 19 August 2019].

Pagani, M. and Fine, C.H. 2008. Value network dynamics in 3G-4G wireless communications: A systems thinking approach to strategic value assessment. *Journal of Business Research* 61(11), pp. 1102–1112. doi: 10.1016/j.jbusres.2007.11.004.

Parreiras, R.O. et al. 2019. A flexible multicriteria decision-making methodology to support the strategic management of Science, Technology and Innovation research funding programs. *European Journal of Operational Research* 272(2), pp. 725–739. Available at: https://doi.org/10.1016/j.ejor.2018.06.050.

Paul, J.A. and Zhang, M. 2020. Decision support model for cybersecurity risk planning: A two-stage stochastic programming framework featuring firms, government, and attacker. *European Journal of Operational Research* (xxxx). Available at: https://doi.org/10.1016/j.ejor.2020.09.013.

Payments.com 2019a. *Payments and the platform economy*.

Payments.com 2019b. *Why Pride Vendors Are Forgoing Cash For mPOS*.

Paymentsforum.uk *The Open Banking Standard*. Available at: https://www.paymentsforum.uk/sites/default/files/documents/Background Document No. 2 - The Open Banking Standard - Full Report.pdf.

Paysafe 2018. *Lost in Transaction: Payment Trends 2018: Will consumers get to grips with frictionless?* Available at: https://www.paysafe.com/fileadmin/content/pdf/Lost_in_Transaction_2018_-_Paysafe_-_web_spreads.pdf.

Pettit, T.J. et al. 2010. Ensuring Supply Chain Resilience: Development of a Conceptual Framework. *Journal of Business Logistics* 31(1), pp. 1–21. doi: 10.1002/j.2158-1592.2010.tb00125.x.

Ponomarov, S.Y. and Holcomb, M.C. 2009. Understanding the concept of supply chain resilience. *The International Journal of Logistics Management* 20(1), pp. 124–143. doi: 10.1108/09574090910954873.

Popescu, I.S. et al. 2021. Measuring the sustainability of investment funds: A critical review of methods and frameworks in sustainable finance. *Journal of Cleaner Production* 314(May), p. 128016. Available at: https://doi.org/10.1016/j.jclepro.2021.128016.

Porter, M. 1996. What is strategy? *Harvard Business Review* , pp. 61–78.

Porter, M.E. 2008. Strategy Strategy the Five Competitive. *Harvard Business Review* 86(January), pp. 78–94. doi: Article.

PRA 2019. PRA Strategic Report., p. 6.

Purvis, L. et al. 2016. Developing a resilient supply chain strategy during 'boom' and 'bust'. *Production Planning and Control* 27(7–8), pp. 579–590. Available at: http://dx.doi.org/10.1080/09537287.2016.1165306.

Puschmann, T. 2017. Fintech. *Business and Information Systems Engineering* 59(1), pp. 69–76. doi: 10.1007/s12599-017-0464-6.

PwC 2019. Global Fintech Report 2019. *PwC Global Fintech Report* , pp. 1–29. Available at: https://www.pwc.com/gx/en/industries/financial-services/assets/pwc-global-fintech-report-2019.pdf.

PWC 2016. The main regulatory changes introduced PSD2 in a nutshell. Available at: http://www.pwc.com/it/en/industries/banking/assets/docs/psd2-nutshell-n03.pdf.

Pyka, I. and Nocoń, A. 2021. Banks' capital requirements in terms of implementation of the concept of sustainable finance. *Sustainability (Switzerland)* 13(6). doi: 10.3390/su13063499.

Quelin, B. V. et al. 2019. The private scope in public–private collaborations: An

institutional and capability-based perspective. *organisation Science* 30(4), pp. 831–846. doi: 10.1287/orsc.2018.1251.

Raconteur 2018. Future of Payments. *Raconteur* , pp. 1–20. Available at: https://www.raconteur.net/future-payments-2018.

Radhika, K.P. 2018. Use of Electronic Payment Instruments and Effect on Cash Management: A Micro Analysis. *Economic Affairs* 63(3), pp. 717–723. doi: 10.30954/0424-2513.3.2018.17.

Ratha, M. 1997. The Credit Card Model. *MIT System Dynamics in Education Project* (October), pp. 1–33. Available at: https://ocw.mit.edu/courses/sloan-school-of-management/15-988-system-dynamics-self-study-fall-1998-spring-1999/readings/creditcardmodel.pdf.

RBS 2019. RBS strategic report.

Repenning, N.P. 2002. A simulation-based approach to understanding the dynamics of innovation implementation. *organisation Science* 13(2), pp. 109–127. doi: 10.1287/orsc.13.2.109.535.

Rhodes, D.H. and Ross, A.M. 2010. *Shaping Socio-technical System Innovation Strategies using a Five Aspects Taxonomy*.

Roy, D. and Sahoo, A. 2016. *Payment system in India: Opportunities and challenges*.

Rysman, M. 2007. An Empirical Analysis of Payment Card Usage. *The Journal of Industrial Economics* 55(1), pp. 1–36.

Rysman, M. and Schuh, S. 2017. New innovations in payments. *Innovation Policy and the Economy* 17(1). doi: 10.1086/688843.

Sainsbury 2019. Sainsbury Strategic Report. 45(45), pp. 95–98.

Salunke, S. et al. 2011. Towards a model of dynamic capabilities in innovation-based competitive strategy: Insights from project-oriented service firms. *Industrial Marketing Management* 40(8), pp. 1251–1263. Available at: http://dx.doi.org/10.1016/j.indmarman.2011.10.009.

Sanchez-Rodrigues, V. et al. 2010. Evaluating the causes of uncertainty in logistics operations. *International Journal of Logistics Management* 21(1), pp. 45–64. doi: 10.1108/09574091011042179.

Sani, D. et al. 2021. An overview of the transition to a circular economy in emilia-romagna region, Italy considering technological, legal–regulatory and financial points of view: A case study. *Sustainability (Switzerland)* 13(2), pp. 1–23. doi: 10.3390/su13020596.

Santander 2019. Santander Strategic Report. *Annual Report and Accounts* , pp. 1–80. Available at: https://s3.eu-west-2.amazonaws.com/document-api-images-live.ch.gov.uk/docs/36Vc4TEa2isfiP-5kIJyyGLFaGy32dw7gaV0870jZvw/application-pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Content-Sha256=UNSIGNED-PAYLOAD&X-Amz-Credential=ASIAWRGBDBV3H32RHHU3%252F2019050.

Saunders, M. et al. 2008. *Research Methods for Business Students 5th Ed*. doi: 10.1007/s13398-014-0173-7.2.

Schoenmaker, D. 2018. A Framework for Sustainable Finance. *SSRN Electronic Journal* , pp. 1–26. doi: 10.2139/ssrn.3125351.

Scholz, R.W. et al. 2012. Risk, vulnerability, robustness, and resilience from a decision-theoretic perspective. *Journal of Risk Research* 15(3), pp. 313–330. doi: 10.1080/13669877.2011.634522.

Schuh, S. and Stavins, J. 2013. How Consumers Pay: Adoption and Use of Payments. *Accounting and Finance Research* 2(2). doi: 10.5430/afr.v2n2p1.

SEC 2021. Form 10-K., p. 1. Available at: https://www.investor.gov/introduction-investing/investing-basics/glossary/form-10-k.

Senge, P.M. 1991. The fifth discipline, the art and practice of the learning organisation. *Performance + Instruction* . doi: 10.1002/pfi.4170300510.

Seuring, S. and Gold, S. 2012. Conducting content-analysis based literature reviews in supply chain management. *Supply Chain Management* 17(5), pp. 544–555. doi: 10.1108/13598541211258609.

Shapiro, J.F. 1999. On the connections among activity-based costing, mathematical programming models for analyzing strategic decisions, and the resource-based view of the firm. *European Journal of Operational Research* 118(2), pp. 295–314. doi: 10.1016/S0377-2217(99)00027-2.

Shi, Z.R. et al. 2020. Artificial Intelligence for Social Good: A Survey., pp. 1–78. Available at: http://arxiv.org/abs/2001.01818.

Short, J.C. and Palmer, T.B. 2008. The application of DICTION to content analysis research in strategic management. *organisational Research Methods* 11(4), pp. 727–752. doi: 10.1177/1094428107304534.

Shukla, A. et al. 2011. Optimizing efficiency-robustness trade-offs in supply chain design under uncertainty due to disruptions. *International Journal of Physical Distribution and Logistics Management* 41(6), pp. 623–646. doi: 10.1108/09600031111147844.

Sivadasan, S. and Sauser, B. 2009. UNDERSTANDING PLAGIARISM USING BOARDMAN'S SOFT-SYSTEMS METHODOLOGY. In: *In proceedings of the 2009*

American Society for Engineering Education (ASEE) Annual Conference and Exposition, Austin TX, June 14-17, 2009.

Sluyts, K. et al. 2011. Building capabilities to manage strategic alliances. *Industrial Marketing Management* 40(6), pp. 875–886. Available at: http://dx.doi.org/10.1016/j.indmarman.2011.06.022.

Smith, M. and Taffler, R.J. 2000. The chairman's statement: A content analysis of discretionary. *Auditing* 13(5), pp. 624–646. Available at: http://www.emeraldinsight.com/10.1108/09513570010353738.

Snowden, D. and Boone, M. 2017. Snowden Cynefin: Leadership framework. *Harvard Business Review* , pp. 69–76.

Soroka, A. et al. 2020. Measuring regional business resilience. *Regional Studies* 54(6), pp. 838–850. doi: 10.1080/00343404.2019.1652893.

Sprenger, C. and Stavins, J. 2012. *Credit Card Debt and Payment Use*.

Squires, A. et al. 2010. Applying systems thinking via Systemigrams™ for defining the body of knowledge and curriculum to advance systems engineering (BKCASE) project. *20th Annual International Symposium of the International Council on Systems Engineering, INCOSE 2010* 1(July), pp. 739–753. doi: 10.1002/j.2334-5837.2010.tb01101.x.

Srinivasan, P. et al. 2015. Narrative Analysis of Annual Reports - A Study of Communication Efficiency. *SSRN Electronic Journal* , pp. 1–36. doi: 10.2139/ssrn.2611890.

Starr, D. and Els, S. 2013. CREDIT CARD MARKET SIMULATION : QUANTIFYING THE IMPACT OF CHANGE LEADS TO DRAMATIC STRATEGIC. Available at: https://docplayer.net/18596104-Credit-card-market-simulation-quantifying-the-impact-of-change-leads-to-dramatic-strategic-innovation.html [Accessed: 19 August 2019].

Statista 2019. Banks & Financial Services. Available at: https://www.statista.com/statistics/872716/uk-issued-credit-and-debit-cards-number-of-fraud-cases/ [Accessed: 16 August 2019].

Stavins, J. 2018. *Credit Card Debt and Consumer Payment Choice : What Can We Learn from Credit Bureau Data ?*

Steemis, H. van 2019. Future of Finance—Review on the Outlook for the UK Financial System. *Bank of England* (June), p. 146. Available at: https://www.bankofengland.co.uk/report/2019/future-of-finance.

Strohhecker, J. 2005. Scenarios and simulations for planning Dresdner Bank's E-day. *System Dynamics Review* 21(1), pp. 5–32. doi: 10.1002/sdr.303.

Subramanian, N. et al. 2017. Sustainable global operations management and frugal innovative sustainable production methods: Advancing theory and practice for a truly sustainable society. *Sustainable Production and Consumption* 11, pp. 1–4. Available at: http://dx.doi.org/10.1016/j.spc.2017.06.002.

Sveriges Riksbank 2018. Payment patterns in Sweden 2018. *Sveriges Riksbank* (May), pp. 1–10. Available at: https://www.riksbank.se/globalassets/media/statistik/betalningsstatistik/2018/payments-patterns-in-sweden-2018.pdf.

Tate, W.L. et al. 2010. Corporate social responsibility reports: A thematic analysis related to supply chain management. *Journal of Supply Chain Management* 46(1), pp. 19–44. doi: 10.1111/j.1745-493X.2009.03184.x.

Taylor, E. 2016. Mobile payment technologies in retail: a review of potential benefits and risks. *International Journal of Retail & Distribution Management* 44(2), pp. 159–177.

Teece, D. et al. 2016. Dynamic capabilities and organisational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review* 58(4), pp. 13–35. doi: 10.1525/cmr.2016.58.4.13.

Teece, D.J. et al. 1997. Dynamic Capabilities and Strategic Management Authors (s): David J . Teece , Gary Pisano and Amy Shuen Published by : Wiley Stable URL : http://www.jstor.org/stable/3088R archive indicates your a148 Accessed : 24-03-2016 16 : 22 UTC Your use of the JSTO. *Strategic Management Journal* 18(7), pp. 509–533.

Teoh, W.M.Y. et al. 2013. Factors affecting consumers' perception of electronic payment: An empirical analysis. *Internet Research* 23(4), pp. 465–485. doi: 10.1108/IntR-09-2012-0199.

Tesco 2019. Tesco Strategic Report.

The UK Cards Association 2017. *Annual Report 2017 What we do*. Available at: http://www.theukcardsassociation.org.uk/wm_documents/UK Cards Annual Report 2017.pdf.

The World Bank 2019. World Bank Open Data: Free and open access to global development data. Available at: https://data.worldbank.org/ [Accessed: 19 August 2019].

Theißen, S. and Spinler, S. 2014. Strategic analysis of manufacturer-supplier partnerships: An ANP model for collaborative CO2 reduction management. *European Journal of Operational Research* 233(2), pp. 383–397. Available at: http://dx.doi.org/10.1016/j.ejor.2013.08.023.

UK Finance 2018a. UK Card Payments 2018. Available at: www.ukfinance.org.uk.

UK Finance 2018b. UK Payment Markets Summary 2017.

UK Finance 2019a. UK Finance Strategic Report. 1(1), p. 9. doi: 10.1080/14760400108522883.

UK Finance 2019b. UK Payment Markets Summary. *UK Finance* (June 2019)

UK Finance 2021. FUTURE READY PAYMENTS 2030. (February)

Urban, M.A. and Wójcik, D. 2019. Dirty banking: Probing the gap in sustainable finance. *Sustainability (Switzerland)* 11(6). doi: 10.3390/su11061745.

Vigneau, L. et al. 2015. How Do Firms Comply with International Sustainability Standards? Processes and Consequences of Adopting the Global Reporting Initiative. *Journal of Business Ethics* 131(2), pp. 469–486. Available at: http://dx.doi.org/10.1007/s10551-014-2278-5.

Visa 2019a. PSD2 SCA for Remote Electronic Transactions: Implememntation Guide. (February), pp. 1–163.

Visa 2019b. The history of Visa. Available at: https://www.visa.co.uk/about-visa/our_business/history-of-visa.html [Accessed: 19 August 2019].

Visa 2019c. Visa Strategic Report. 2507(February), pp. 1–9.

Vives, X. 2020. Digital Disruption in Banking and its Impact on Competition. *OECD* , pp. 1–50. Available at: http://www.oecd.org/daf/competition/digital-disruption-in-financial-markets.htm.

Wales. Welsh Assembly Government. 2009. *Towards zero waste : one Wales : one planet : the overarching waste strategy document for Wales.* Welsh Assembly Government.

Walker, B. et al. 2004. Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society* 9(2). doi: 10.5751/ES-00650-090205.

Walker, J. and Cooper, M. 2011. Genealogies of resilience: From systems ecology to the political economy of crisis adaptation. *Security Dialogue* 42(2), pp. 143–160. doi: 10.1177/0967010611399616.

Walker, P.H. et al. 2014. Sustainable operations management: recent trends and future directions. *International Journal of Operations & Production Management* 34(5), pp. 1–14. doi: 10.1108/ijopm-12-2013-0557.

Walmart 2019. Walmart Strategic Report.

Wang, Y. et al. 2018. An exploration of solutions for improving access to affordable fresh food with disadvantaged Welsh communities. *European Journal of Operational Research* 268(3), pp. 1021–1039. Available at: https://doi.org/10.1016/j.ejor.2017.11.065.

Wang, Z. and Wolman, A.L. 2016. Payment choice and currency use: Insights from two billion retail transactions. *Journal of Monetary Economics* 84. doi: 10.1016/j.jmoneco.2016.10.005.

Warren, K. 2005. Improving strategic management with the fundamental principles of system dynamics. *System Dynamics Review* 21(4), pp. 329–350. doi: 10.1002/sdr.325.

Weerawardena, J. and Mavondo, F.T. 2011. Capabilities, innovation and competitive advantage. *Industrial Marketing Management* 40(8), pp. 1220–1223. Available at: http://dx.doi.org/10.1016/j.indmarman.2011.10.012.

Weiner, S.E. and Wright, J. 2009. Interchange Fees in Various Countries: Developments and Determinants. *Review of Network Economics* 4(4). doi: 10.2202/1446-9022.1078.

Welbers, K. et al. 2017. Text Analysis in R. *Communication Methods and Measures* 11(4), pp. 245–265. doi: 10.1080/19312458.2017.1387238.

Willis, G. et al. 2018. Strategic workforce planning in healthcare: A multi-methodology approach. *European Journal of Operational Research* 267(1), pp. 250–263. Available at: https://doi.org/10.1016/j.ejor.2017.11.008.

Winkler, P. and Etter, M. 2018. Strategic Communication and Emergence: A Dual Narrative Framework. *International Journal of Strategic Communication* 12(4), pp. 382–398. doi: 10.1080/1553118X.2018.1452241.

World Bank 2019a. Doing Business 2019: Training for Reform. *World Bank* , p. 304. doi: 10.1596/978-1-4648-1326-9.

World Bank 2019b. *World Development Report 2019: The Changing Nature of Work*. doi: 10.1596/978-1-4648-1328-3.

Worthington, S. and Edwards, V. 2000. Changes in payments markets, past, present and future: A comparison between Australia and the UK. *International Journal of Bank Marketing* 18(5), pp. 212–221. doi: 10.1108/02652320010356771.

Yousafzai, S. and Yani-de-Soriano, M. 2012. Understanding customer-specific factors underpinning internet banking adoption. *International Journal of Bank Marketing* 30(1), pp. 60–81. doi: 10.1108/02652321211195703.

Zhou, L. et al. 2007. Soft systems analysis of reverse logistics battery recycling in China. *International Journal of Logistics Research and Applications* 10(1), pp. 57–70. doi: 10.1080/13675560600717847.

9 Appendices

Appendix A NVivo and R coding for Dictionary-based text analysis

A.1 Manual coding process in NVivo

To create a dictionary-based analysis, first we have to identify the words and phrases that we want to be related with the concepts, in the case of this research the strategic factors. Therefore, first, some passages were identified referring to a concept and then the words and phrases extracted to form the dictionary (Saunders et al. 2008).

Here are some examples of the coding done over strategic reports in NVivo for the different strategic reports with the selected words and phrases in *Italics*:

- **Strategic factor: Financial Crime**
    - Reference 1: <Files\\HSBC_Annual-report-2019> - 1 reference coded [0.10% Coverage]

      In order to help protect the integrity of the global financial system, we have made, and continue to make, significant investments in our ability to detect, deter and prevent *financial crime*. We are also working with governments and other banks to advance our collective interests in this area. These steps are enabling us to reduce the risk of *financial crime* more effectively. Our risk appetite has been set formally.

- **Strategic factor: Algorithm-based capabilities**
    - Reference 2: <Files\\Barclays_Annual_report_2019> - § 1 reference coded [0.05% Coverage]

      We have also released a range of products and services to help keep customers safe, ranging from *algorithm-based* fraud detection to card freezing capabilities in the mobile banking app

- **Strategic factor: Bank statement mobile access**

- Reference 3: <Files\\Lloyds_Annual_report_2019> - 2 references coded [0.01% Coverage]

  app statement searches, the latter of which is being used c.1.2 million times per month on average and is helping us to reduce our use of paper.

  Digital statement search helping customers find transactions quicker and easier, with c.300,000 searches per week

  Reference 4: <Files\\RBS_Annual_report_2019> - 1 reference coded [0.01% Coverage]

  Using our market leading app, customers can set up a savings goal, *download statements.*

A.2 Dictionary creation

To identify the common phrases there were performed some text mining commands that helped with the creation of the dictionary keywords. These include the bigrams connections and frequency, which are the connection between two words that appear in the texts mined and the tf-idf frequency in which they appear in the texts, for example, “internal control” is a bigram that appears in some texts with a certain frequency. The same can be done with trigrams, connections among three words, for example, “bank national association”. In the following diagrams and plots the bigrams and trigrams connections are shown by using the Acquirers’ strategic reports examples.

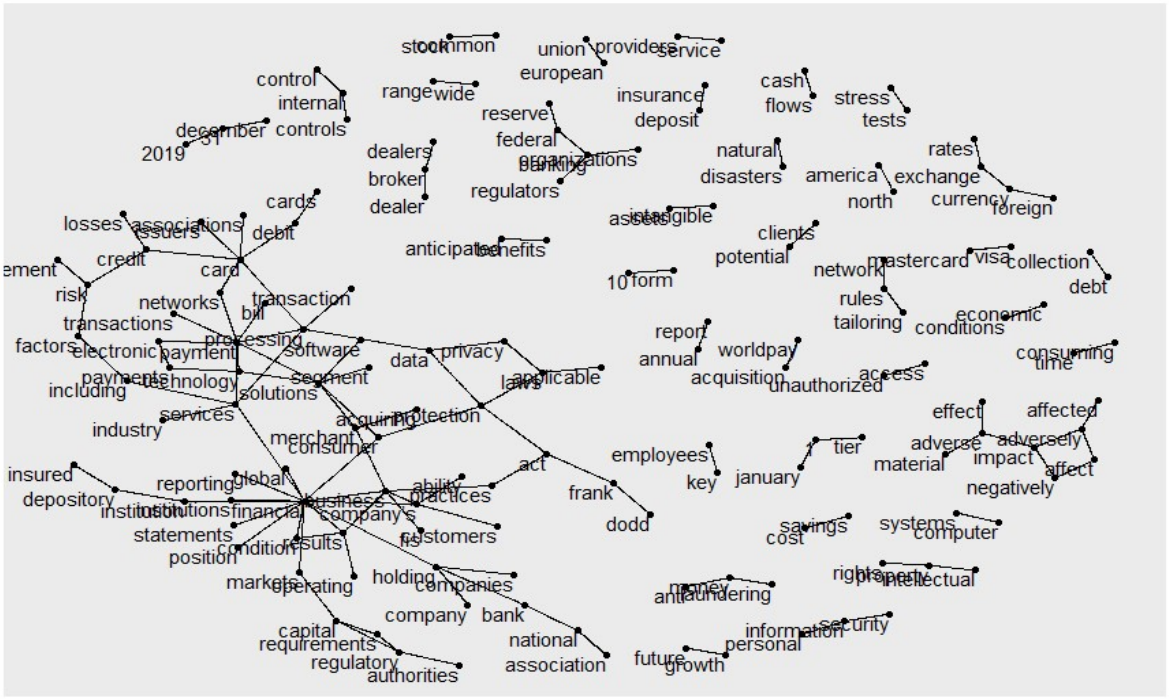


FIGURE 9.1 ACQUIRERS' STRATEGIC REPORTS BI-GRAMS CONNECTIONS PLOT

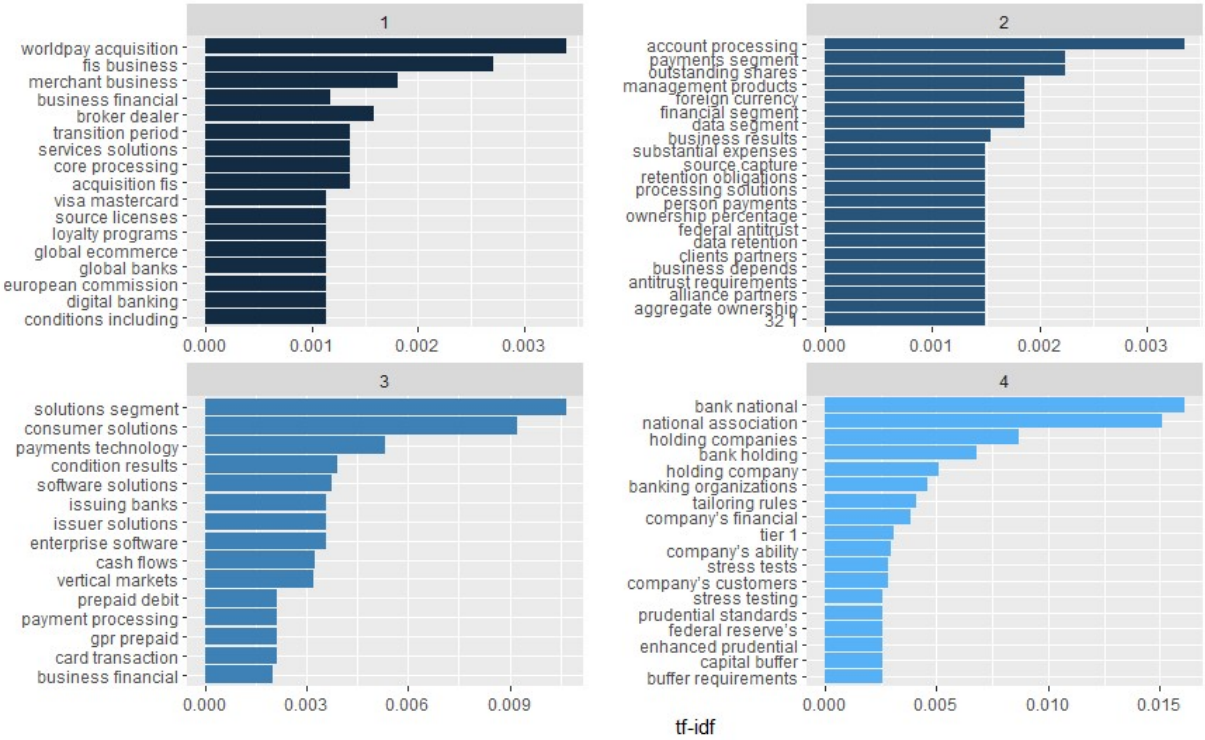


FIGURE 9.2 ACQUIRERS' BI-GRAMS TF-IDF FREQUENCY

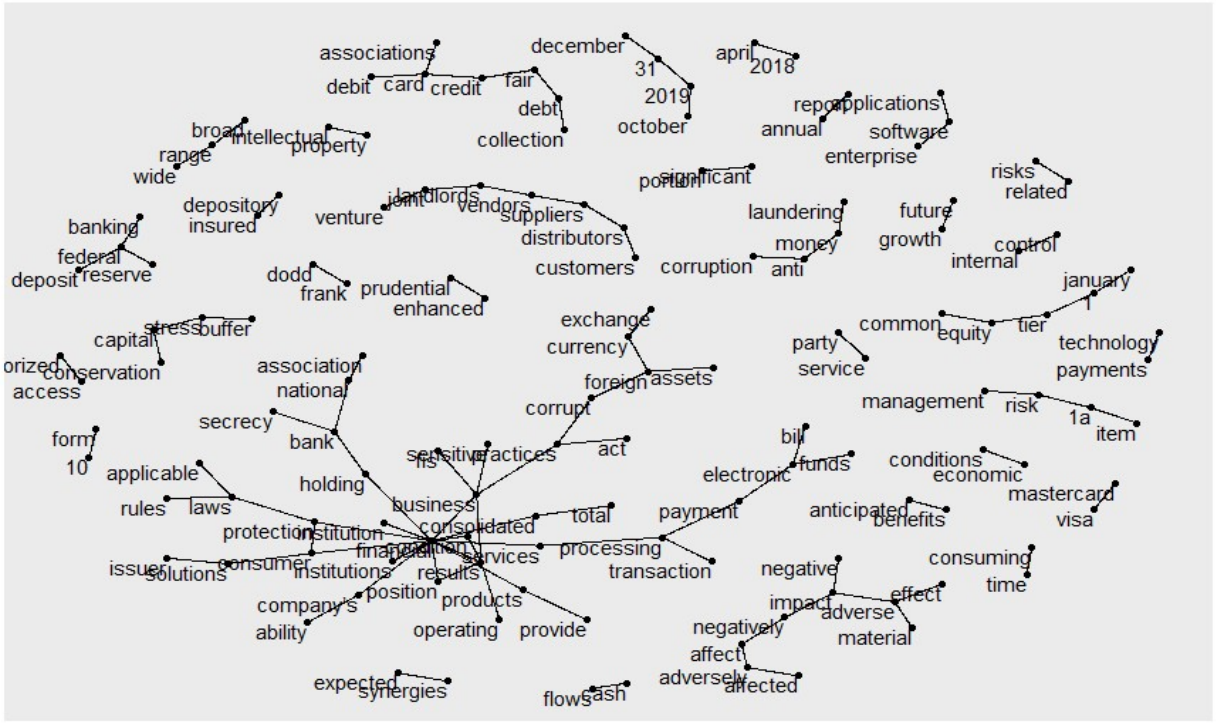


FIGURE 9.3 ACQUIRERS' STRATEGIC REPORTS TRI-GRAMS CONNECTIONS PLOT

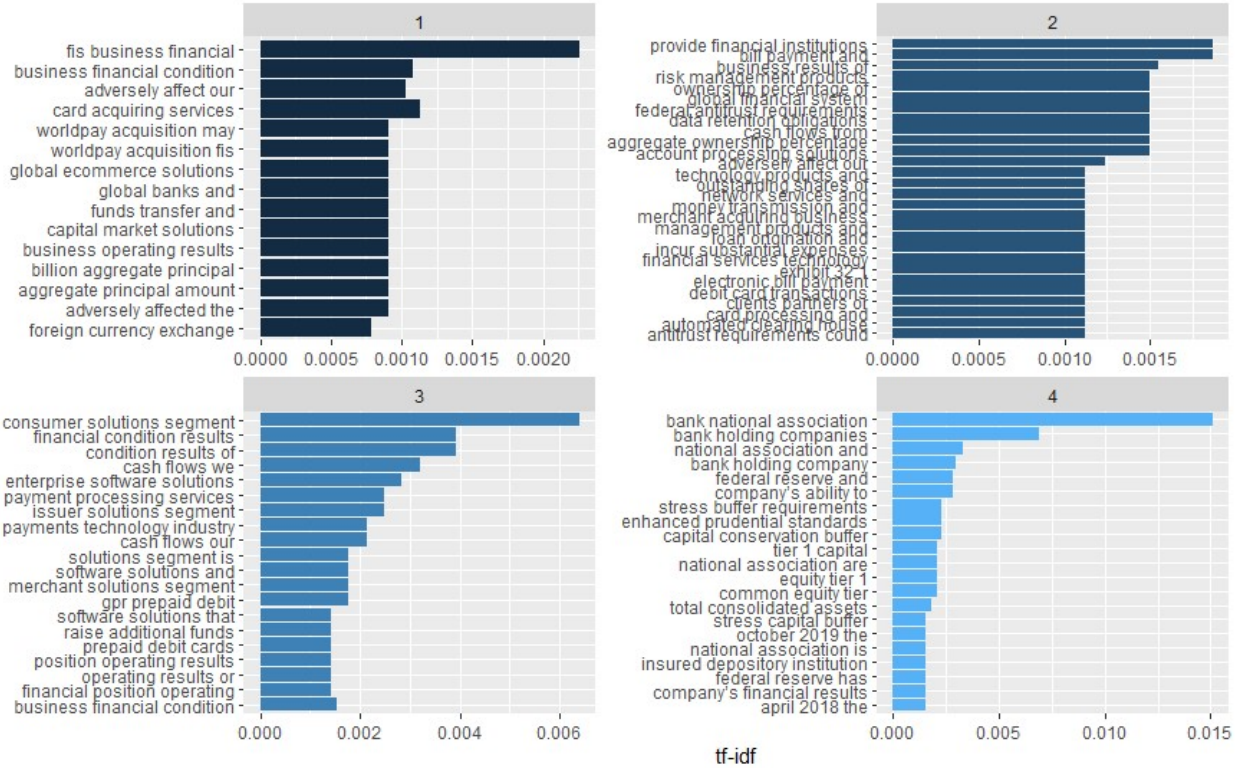


FIGURE 9.4 ACQUIRERS' BI-GRAMS TF-IDF FREQUENCY

Once we have identified the words and phrases used for the dictionary, we must create the dictionary in R (Silge and Robinson 2017; Chris Bail 2021). The code is provided as a separate file.

Appendix B Dictionary of phrases and words associated with Strategic Factors

To perform a categorization and clustering of the different strategic factors, each of them was assigned a stakeholder categorization and a PESTEL classification. Here we can find an extract of the dictionary to exemplify:

Capabilities/Resources/Strategic initiatives	**Keyword associated (phrases: they have to be exactly as they appear in the text)**	**By stakeholders**	**PESTEL classification**
Abuse_related_initiatives =	c("domestic abuse", "financial abuse", "abuse", "money mule", "abusive"),	Customers	Socio-Cultural_Demographic
Accelerator_and_incubators =	c("accelerator", "incubator"),	Suppliers and Strategic partners	Technological_Methodological
Accessible_services =	c("accessibility", "accessible", "customer easy access"),	Customers	Socio-Cultural_Demographic
Age_group_diversity_initiaves =	c("multigenerational", "age group"),	Colleagues	Socio-Cultural_Demographic
Algorithm_capability =	c("algorithm", "algorithm-based"),	Customers	Technological_Methodological
Annual_General_Meeting =	c("annual general meeting", "agm"),	Investors and Board	Political_Organizational
Anti_bribery_or_Corruption =	c("anti-bribery", "bribe", "anti-bribe", "anti corruption", "bribery act", "anti bribery"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Anti_money_laundering =	c("anti-money laundering", "anti money laundering", "money laundering", "laundering"),	Regulators, Governments, and Policy Makers	Legal_Ethical
App_capabilities =	c("balance tracking", "spending category", "spending category", "controls hub"),	Customers	Technological_Methodological

Apprenticeship =	c("apprenticeship", "apprentice", "apprentices"),	Colleagues	Technological_Methodological
Asia_focus =	c("asia", "china", "india", "asia pacific", "japan"),	Customers	Socio-Cultural_Demographic
Asset_finance =	c("asset", "asset finance"),	Investors and Board	Economic_Financial
ATM_cash_services =	c("cash from an atm", "cash withdraw", "atm", "cash machine", "atms", "cash deposit machine", "atm processing"),	Customers	Technological_Methodological
Autistic_related_initiatives =	c("autistic", "autism"),	Customers	Socio-Cultural_Demographic
Bank_statement_mobile_access =	c("app statement", "download statement", "digital statement", "digital statements"),	Customers	Technological_Methodological
Banking_collection_services =	c("collection services", "collect"),	Customers	Technological_Methodological
Banking_standard =	c("banking standard", "banking standards", "ifrs"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Biometric_authentication =	c("biometric", "biometric login", "face authentication", "touch authentication", "biometric card", "biometric authentication", "biometric approval", "customer authentication"),	Customers	Technological_Methodological
Blockchain =	"blockchain",	Customers	Technological_Methodological
Board_engagement =	c("board engage", "townhall", "board meeting", "board engagement", "informal lunch", "breakfast", "advisory panel"),	Colleagues	Political_Organizational

Face_to_face =	c("face-to-face", "face to face"),	Customers	Technological_Methodological
Board_tours =	c("listening tour", "tour", "tours", "visit branch", "office visit", "branch visit"),	Investors and Board	Political_Organizational
Middle_east_focus =	c("middle-east", "middle east"),	Customers	Socio-Cultural_Demographic
Branch_store_service_improvement_and_automation =	c("branch", "closure", "remote location", "branch location", "last-in-town", "concierge", "branches more digital", "physical location", "pop-up", "fully-automated facilities", "new format", "innovative store", "convenience stores", "physical stores"),	Customers	Technological_Methodological
Business_solutions_b2b =	c("corporate card", "business-to-business", "supplier payment solution", "b2b", "b2b payments", "corporate clients"),	Customers	Technological_Methodological
Business_travel_mobility =	c("business travel", "mobility"),	Society/Communities/Environment	Technological_Methodological
Carbon_red_initiatives =	c("net zero carbon", "zero carbon", "carbon footprint", "net carbon", "decarbonize", "low-carbon", "environmental footprint", "carbon dioxide", "carbon intensity", "carbon emission", "carbon emissions", "carbon trust", "carbon economy", "carbon neutral", "funding low carbon", "low carbon economy"),	Society/Communities/Environment	Environmental_Societal
Non_cash_initiatives =	"non-cash",	Customers	Technological_Methodological
Smart_card_managing_capabilities =	c("card freeze", "lock their card", "lock card", "card lock", "block transact", "block card", "card block", "lock and unlock", "smart card", "smart cards"),	Customers	Technological_Methodological

Career_development =	c("career development", "talent development", "development opportunities", "qualified", "qualification", "high potential colleague", "future leader"),	Colleagues	Technological_Methodological
Career_break_or_change =	c("career break", "career-break", "career transition"),	Colleagues	Socio-Cultural_Demographic
Cash_services =	c("cash access", "access cash", "cash management", "cash services", "cash transfers"),	Customers	Technological_Methodological
Change_management_programme =	c("change programmes", "organizational change", "organisational change", "change management"),	Colleagues	Political_Organizational
Charities =	c("charity", "charities", "charitable"),	Society/Communities/Environment	Environmental_Societal
Checkout_capabilities =	c("checkout", "check-out"),	Suppliers and Strategic partners	Technological_Methodological
Climate_change_risk_management =	c("climate change risk", "climate change governance", "climate change report", "climate change monitoring", "climate risk", "climate risks", "climate change", "climate financial risk", "climate related risk", "climate related risks", "climate transition"),	Colleagues	Environmental_Societal
Climate_initiatives =	c("climate challenge", "climate positive", "clean growth", "climate"),	Society/Communities/Environment	Environmental_Societal
Cloud_based_digital_environment =	c("cloud", "private cloud", "cloud computing"),	Customers	Technological_Methodological
Coaching_and_mentoring =	c("mentor", "mentoring", "coach", "coaching"),	Colleagues	Technological_Methodological
Code_of_conduct =	c("code of conduct", "conduct code", "business conduct", "governance code"),	Suppliers and Strategic partners	Legal_Ethical

Collaborative_focus =	c("recommendation", "collaborative", "collaboration", "co-operation", "synergies"),	Regulators, Governments, and Policy Makers	Political_Organizational
GHG_emissions =	c("greenhouse gases", "scope 1", "scope 2", "scope 3", "emissions", "ghg", "gas emissions"),	Society/Communities/Environment	Environmental_Societal
Analytics_insight =	c("analytics", "analytics insights"),	Colleagues	Technological_Methodological
Performance_management =	c("performance-based", "evidence-based", "high performance", "performance management", "performance", "performance measures", "track", "financial and non-financial performance", "cma", "comparative market analysis", "financial performance"),	Colleagues	Technological_Methodological
Data_management =	c("data-driven", "data", "data innovation", "data strategy"),	Customers	Technological_Methodological
Colleague_benefits =	c("reward employees", "reward colleagues", "employee rewards", "colleague rewards", "employee benefits", "colleague benefits", "benefit employees", "benefit colleagues", "compensation", "compensation package", "wage", "holidays"),	Colleagues	Technological_Methodological
Consultative_employee_capacity =	c("consultative", "consultation"),	Colleagues	Political_Organizational
People_digital_capabilities_development =	c("digital learning", "digital training", "learning lab", "data academy", "chatbot", "querie", "digital skills", "digital skill", "software development engineers", "data science", "e-learning", "engineer", "training data", "digital journey"),	Colleagues	Technological_Methodological
Colleague_engagement_policies =	c("engaging colleagues", "engage colleagues", "workforce disclosure", "workforce engagement", "colleague engagement", "employee engagement",	Colleagues	Technological_Methodological

	"open culture", "awareness", "concern", "track engagement", "colleague enagagement"),		
Colleague_engagement_report =	c("colleague engagement report", "employee engagement report"),	Colleagues	Technological_Methodological
Colleague_entrepreneurial_capabilities =	c("intrapreneur", "intrapreneurs", "culture of innovation"),	Colleagues	Technological_Methodological
Colleague_share__and_pension_plans =	c("share plan", "employees pension", "colleagues pension", "retirement benefit", "retirement income"),	Colleagues	Political_Organizational
Colleague_support =	c("colleague network", "colleague network", "support and advice", "support colleague", "employee network", "employee networks", "colleague led network", "empower our colleagues", "feedback", "colleague advisory", "colleague advisory panel", "associate", "associates"),	Colleagues	Technological_Methodological
Survey =	c("survey", "surveys"),	Customers	Technological_Methodological
Colleague_survey =	c("colleague survey", "employee survey", "opinion survey", "intranet survey", "employee opinion", "people survey"),	Colleagues	Technological_Methodological
Committees =	c("committee", "committees"),	Customers	Political_Organizational
Common_Equity_Tier_1_ratio_CET_1 =	c("common equity tier 1", "cet 1", "cet1"),	Investors and Board	Economic_Financial
Community_financial_accesibility_programmes =	c("community", "local council", "local economies", "local economy", "financial inclusion", "access to financial services", "regional ambassador", "social debate", "local communities", "local community", "local bank", "community reinvestment", "alternative financial services", "integrated locally",	Society/Communities/Environment	Environmental_Societal

	"inclusion week", "regional economy", "regional economies"),		
Academy_school_workshop_education =	c("academy", "school", "workshop"),	Society/Communities/Environment	Environmental_Societal
Community_financial_education =	c("digital gap", "save money", "digital benefits", "online safety", "financial education", "financial access", "guidance", "financial lives"),	Society/Communities/Environment	Environmental_Societal
Employment_job_creation_focus =	c("job", "new job", "work placement", "employment skills", "job loss", "jobs created", "increase employment", "employment rate", "strong employment"),	Society/Communities/Environment	Political_Organizational
Complaint_focus =	c("complain", "complaints", "complaint"),	Customers	Political_Organizational
Consumer_lending =	c("unsecured lending limit", "consumer lending"),	Customers	Economic_Financial
contactless_payment =	c("contactless", "nfc", "rfid", "radio-frequency"),	Customers	Technological_Methodological
Corruption =	c("corrupt", "corruption", "corrupted"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Council =	c("council", "councils"),	Investors and Board	Political_Organizational
Counter_terrorism =	c("counter terrorism", "counter-terrorism", "counter terrorist", "counter-terrorist", "terrorist", "anti terrorism", "terrorists", "activists", "terrorist attacks"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Co_working_capabilities =	c("co-working", "co working"),	Suppliers and Strategic partners	Technological_Methodological

Credit_card =	c("credit card", "credit cards"),	Customers	Technological_Methodological
Credit_focus =	"credit",	Investors and Board	Political_Organizational
Cross_asset_capabilities =	c("cross-asset", "cross asset"),	Customers	Economic_Financial
Cross_border_payment_solutions =	c("cross-border", "cross border", "cross-border payment", "cross-border payments", "global pay", "travelling customer", "travel", "border transactions"),	Customers	Technological_Methodological
Crowdfunding =	c("crowdfund","crowdfunding"),	Customers	Technological_Methodological
Crypto_digital_currency =	c("crypto", "cryptocurrency", "cryptocurrencies", "cbdc", "central bank digital currency", "digital currencies"),	Customers	Technological_Methodological
Cultural_focus =	c("culture", "organizational culture", "corporate culture"),	Colleagues	Political_Organizational
Culture_planning_and_measure =	c("culture dashboard", "culture survey", "culture metrics", "culture plan", "culture assessment report"),	Colleagues	Political_Organizational
Cyber_security_and_data_protection =	c("data protection", "cyber", "cyber-security", "cybersecurity", "cyber security", "cyber attacks", "multi-layered security", "protect customer data", "it failure", "data corrupt", "data breaches", "security breaches", "hacking", "third party failure", "customer data", "customers' data", "customers' information", "digital security platform", "potential service issue", "cyber threat", "cyber threats", "malware", "data leak", "infiltrate", "denial of service attack", "dos attack", "threat detection", "access control", "back-up", "recovery", "defence strategy", "cyber control", "data safe", "data security", "data compromise", "data localization",	Customers	Technological_Methodological

	"consumer protection", "identity theft", "information security", "security protocols", "security services", "security standards", "virus", "hacker", "hackers", "cyber attackers", "information systems", "security issues", "consumer vulnerability", "cyber collaboration", "cyber resilience", "cyber risk", "data theft", "penetration"),		
Customer_feedback =	c("customer feedback", "contact centre", "customer service", "insight-driven", "feedback", "customers' voices", "consumer voice"),	Customers	Technological_Methodological
Customer_consumer_focus =	c("customer facing", "customer satisfaction", "customer experience", "client facing roles", "support clients", "customer-centric", "customer centric", "acquiring customers", "user experience", "channel experience", "customer base", "customer service centers", "service centers", "customers lives easier", "shoppers", "consumer champion", "support costumers"),	Colleagues	Political_Organizational
Customer_networking_platform =	c("networking", "share opportunities", "face-to-face meeting", "linkedIn"),	Customers	Technological_Methodological
Customer_performance_platform =	c("customer dashboard", "customer performance"),	Customers	Technological_Methodological
Customer_reward_programs =	c("benefit", "customer benefit", "loyalty", "reward", "rewards", "membership rewards", "loyalty reward", "customer loyalty", "cashback bonus", "loyalty platform", "club membership", "club", "gift cards"),	Customers	Technological_Methodological

Customer_satisfaction_and_trust_scores =	c("net promoter scores", "nps", "benchmark performance", "customer indices", "focus group", "customer facing time", "overall service", "customer trust", "customer advocacy", "customer engagement", "customer engagement index", "customer satisfaction scores"),	Customers	Technological_Methodological
Customer_surveys =	c("customer survey", "quality survey", "customer engagement survey"),	Customers	Technological_Methodological
Customisation =	c("personalised experience", "customised", "personalised", "customisation", "customization", "personalized", "personal experience", "client-facing", "client facing"),	Customers	Socio-Cultural_Demographic
Dashboard_capability =	"dashboard",	Customers	Technological_Methodological
Data_privacy_and_protection =	c("personal information", "personal data", "privacy statement", "customer privacy", "identity privacy", "data ethics", "data privacy", "customer information", "confidentiality integrity", "privacy data", "privacy data protection", "proprietary information", "financial protection", "data retention", "privacy rights", "sensitive business information", "data governance", "digital rights management", "bank secrecy"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Debit_card_focus =	c("debit card", "consumer card", "debit payment"),	Customers	Political_Organizational
Digital_marketing =	c("digital proposition", "digital channels", "digital channel", "digital marketing", "next generation bank", "digital offering", "digital proposition", "digital content", "browse", "smartshop"),	Customers	Technological_Methodological
Digital_bank_company =	c("digitisation", "digital solution", "digital", "smart tool", "digital infrastructure", "digital banking", "digitally active", "digital	Customers	Technological_Methodological

	companies", "digital innovation", "digital technology"),		
Digital_communication =	c("blogs", "vlogs", "podcasts", "video", "webcast", "intranet"),	Colleagues	Technological_Methodological
Digital_investment =	c("digital investment", "investment platform", "online investment"),	Customers	Technological_Methodological
Digital_notification_message_service =	c("digital message", "payment notification", "payment alert", "payment remind", "payment confirmation", "overdraft warn", "push notification", "notification alert"),	Customers	Technological_Methodological
Disability_related_initiatives =	c("disabled", "disability", "autistic", "disability smart", "accessibility", "accessible service", "accessibility standards"),	Customers	Socio-Cultural_Demographic
Pay_gap_initiatives =	"pay gap",	Colleagues	Socio-Cultural_Demographic
Dividend_related =	c("dividend", "dividend pay", "pay dividends"),	Investors and Board	Economic_Financial
Donations =	c("donations", "donation", "donating", "gifts", "beneficiary", "beneficiaries"),	Investors and Board	Environmental_Societal
eCommerce =	c("e-commerce", "e commerce", "remote commerce", "click collect", "commerce applications", "mobile commerce", "online commerce"),	Customers	Technological_Methodological
Electric_car =	c("electric car", "electric vehicle"),	Society/Communities/Environment	Environmental_Societal
Employee_human_rights_and_rights_to_work_policy =	c("human right", "right to work", "digni", "bullying", "harass", "victim"),	Colleagues	Legal_Ethical
Employee_leadership_development_program =	c("leadership develop", "future leaders", "quality leadership", "leadership programme", "leader", "leadership development", "key personnel"),	Colleagues	Technological_Methodological

Employee_mental_and_physical_health_and_safety =	c("mental health", "safety", "welfare", "safe work", "health and safety", "well-being", "employee assistance", "workplace health", "health survey", "expert advice and guidance", "physical and mental health", "physical and mental", "raise awareness", "stigma", "mental ill-health", "culture of openness and support", "personal resilience", "employee assistance", "behavioural therapy", "working responsibly", "live well", "health awareness", "public health"),	Colleagues	Legal_Ethical
Regulation_and_compliance_focus =	c("regulation", "compliance", "law enforcement", "supervisory", "supervision", "law"),	Regulators, Governments, and Policy Makers	Political_Organizational
Employee_regulation_and_compliance_training =	c("regulation training", "compliance training"),	Colleagues	Technological_Methodological
Employee_whistleblowing_and_speak_up_channels_policy =	c("whistleblowing", "speak-up", "escalation channel", "raise concern", "speak up"),	Colleagues	Legal_Ethical
Enhanced_shareholding_platform =	c("shares online", "shareholding"),	Investors and Board	Technological_Methodological
Enterprise_Risk_Management_Framework =	c("enterprise risk management framework", "ermf", "risk appetite", "risk and compliance", "risk committee", "risk", "chief risk officer", "risk profile", "risk governance", "risk report", "risk culture", "manage risk", "risk appetite", "risk compliance", "risk factors", "risk management", "risk oversight", "risk management process", "risk forum"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Model_risk =	c("model risk", "risk model", "risk modelling", "risk models"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Financial_risk =	c("financial risk", "financial risks"),	Regulators, Governments, and Policy Makers	Political_Organizational

Non_financial_risk =	c("non financial risk", "non-financial risk", "non financial risks"),	Regulators, Governments, and Policy Makers	Political_Organizational
Entrepreneurial_initiatives =	c("business proposal", "entrepreneur", "entrepreneurs", "crowdfunding", "crowfund", "innovate"),	Customers	Political_Organizational
ESG_approach =	c("environment", "sustainable", "social", "environmental social governance", "esg", "future generation", "good citizen", "impact bank", "sustainable growth", "social engineering"),	Society/Communities/Environment	Environmental_Societal
Business_advising =	c("advise", "advice"),	Society/Communities/Environment	Environmental_Societal
ESG_business_financing_products_and_services =	c("green finance", "sustainable lending", "responsibly insured", "sme lending", "sustainable insurance", "responsible insurance"),	Society/Communities/Environment	Environmental_Societal
Project_programme_approach =	c("project", "programme"),	Investors and Board	Technological_Methodological
Strategy_commitments =	c("commitment", "initiative", "framework", "agenda", "agreement", "strategy"),	Society/Communities/Environment	Environmental_Societal
Sustainable_Initiatives =	c("sustainability", "sustainable finance", "green finance", "sustainable development goals", "sustainable development", "sustainable footing", "sustainable future"),	Colleagues	Environmental_Societal
Expert_leadership_development =	c("expert", "experts", "leader", "leaders"),	Colleagues	Technological_Methodological
ESG_groups_and_committees =	c("chapter zero", "coalition","energy productivity", "ep100", "ev100", "task-force", "task force","tcfd"),	Society/Communities/Environment	Environmental_Societal
ESG_partnerships_and_trusts =	c("united nations", "trust", "association", "academic institution"),	Society/Communities/Environment	Environmental_Societal

Scorecard =	c("scorecard", "balance scorecard", "score"),	Investors and Board	Technological_Methodological
Performance_goals_measurement =	c("metric", "objective", "goal", "target", "rating", "performance objectives", "key performance indicators", "kpis"),	Investors and Board	Technological_Methodological
ESG_personal_financing_products =	c("sustainability-linked loan", "green loan", "sustainable financing", "sustainable investment", "energy efficiency", "green credit", "green bond", "sustainability bond", "sustainability bonds", "green deposit"),	Society/Communities/Environment	Environmental_Societal
Principles =	c("principles", "principle"),	Society/Communities/Environment	Environmental_Societal
ESG_recognition =	c("sustainability all-stars list", "sustainable finance provider", "employer", "good citizen"),	Society/Communities/Environment	Environmental_Societal
ESG_reports_and_statement =	c("climate related disclosure", "climate-related disclosure", "ESG statement", "climate related financial"),	Society/Communities/Environment	Environmental_Societal
Risk_Impact_mitigation =	c("impact", "risk exposure", "negative impact", "risk free", "risk mitigation plans", "mitigate"),	Society/Communities/Environment	Technological_Methodological
ESG_SME_financing_services_and_support =	c("innovation finance", "green business", "sme", "sustainability improvement", "green revolving credit", "green hire", "green loan", "sme loan", "small business", "small and medium enterprise", "mid-market", "medium sized businesses", "medium sized enterprises"),	Society/Communities/Environment	Environmental_Societal
ESG_standards =	c("ethical standard", "ethical standards", "social standard", "social standards", "sustainability standard", "sustainability standard"),	Society/Communities/Environment	Environmental_Societal
ESG_survey =	c("esg survey", "climate change survey"),	Society/Communities/Environment	Environmental_Societal

Ethical_behaviour =	"ethical behaviour",	Regulators, Governments, and Policy Makers	Legal_Ethical
Corporate_governance =	c("corporate governance", "governance report", "report governance"),	Regulators, Governments, and Policy Makers	Political_Organizational
Ethical_values_governance =	c("ethical responsibility", "values", "behaviours", "ethical", "ethical risk", "values integrity", "values strategy"),	Society/Communities/Environment	Legal_Ethical
Europe_focus =	c("europe", "european", "euro"),	Customers	Socio-Cultural_Demographic
Events =	c("event", "events"),	Investors and Board	Political_Organizational
Feedback =	"feedback",	Colleagues	Political_Organizational
Executives_remuneration_reports =	c("remuneration", "directors' remuneration", "executive pay"),	Regulators, Governments, and Policy Makers	Political_Organizational
Accountability =	c("accountable", "accountability"),	Society/Communities/Environment	Technological_Methodological
Partnerships_Alliances =	c("partnership", "current partner", "strategic data partnership", "strategic partner", "trusted partner", "partner", "business partners", "partners", "referral partner", "strategic alliance", "commercial agreements"),	Suppliers and Strategic partners	Political_Organizational
Fair_payment_and_reward_policy =	c("fair payment", "living wage", "reward policies", "remuneration", "remuneration policies", "sustainable performance", "long-term incentive", "fair reward", "recognition", "paid fair", "hourly wage", "fair day's pay", "wage rates", "fairness equality"),	Colleagues	Legal_Ethical

Fast_digital_payments_service_process =	c("instant money", "money transfers", "payments capabilities", "payments api", "fast payment", "send money", "money instant", "fast payment", "transact faster", "digital payments", "false declines", "rtgs", "real time gross settlement", "transfer advice"),	Customers	Technological_Methodological
Digital_account =	c("digital account opening", "automated account"),	Customers	Technological_Methodological
Fast_resolution_process =	c("same day", "next working day", "same working day", "instant answer", "response time", "quickest route"),	Customers	Technological_Methodological
Financial_crime =	c("finance crime", "financial crime", "crime laws", "crime access", "economic crime", "crime agency"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Financial_educational_tools =	c("digital knowhow", "workshop", "public awareness", "campaign", "teach", "pop-up learning", "learning sessions", "financial habit", "learn", "digital divide", "digital engagement"),	Customers	Environmental_Societal
Financial_inclusion =	c("vulnerable", "free bank", "basic current account", "basic account", "community account", "vulnerable customer", "homeless", "financial inclusion", "social mobility", "bank account", "social mobility employer"),	Customers	Environmental_Societal
Financial_planning_health =	c("financial plan", "savings goal", "savings", "control of their spending", "expenses management", "card spending", "household budget", "financial goal", "financial health"),	Customers	Economic_Financial
Financial_strategies =	c("low-returning capital", "credit portfolio returns", "fee-led advisory", "equity origination", "capital efficiency"),	Customers	Economic_Financial
Fintech =	c("fintech", "fintechs", "emerging technologies", "financial technology", "technology companies"),	Suppliers and Strategic partners	Technological_Methodological

Food_surplus_and_waste =	c("food waste", "food surplus", "waste food", "surplus food", "loose fruit"),	Society/Communities/Environment	Environmental_Societal
Forestry_and_agriculture =	c("forestry", "agriculture"),	Society/Communities/Environment	Environmental_Societal
Foundation_and_fundraising_programs =	c("non-profit", "raise", "fundraise", "civil society", "tackling social", "social disadvantage", "foundation", "grant", "self-catering"),	Society/Communities/Environment	Environmental_Societal
Fraud_capabilities =	c("fraud", "fraud detection", "fraud scene investigator", "stay safe online", "online fraud", "abandoned transaction", "fraud management", "fraud scoring", "fraudulent", "fraud awareness"),	Customers	Technological_Methodological
Frequently_asked_questions =	c("frequently asked questions", "faq", "faqs"),	Colleagues	Technological_Methodological
Gambling_related_initiatives =	c("gamble", "gambling"),	Customers	Socio-Cultural_Demographic
Gender_diversity_initiatives =	c("gender", "lgbt+", "lgbt", "knowledge of identity", "identity pass", "pride", "gender diversity"),	Colleagues	Socio-Cultural_Demographic
General_data_protection_regulation =	c("general data protection regulation", "gdpr", "data protection regulation"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Germany =	"germany",	Customers	Socio-Cultural_Demographic
Graduate_programs =	"graduate",	Colleagues	Socio-Cultural_Demographic
Green_Infrastructure =	c("renewable", "energy", "electric", "energy productivity", "reduced energy consumption", "energy consumption", "staff business travel", "alternative energy", "clean technology",	Society/Communities/Environment	Environmental_Societal

	"clean water", "renewable energy asset", "energy recovery"),		
Green_lending =	c("green loan", "green credit"),	Society/Communities/Environment	Environmental_Societal
Impaired_hearing_related_initiatives =	c("hard of hearing", "hearing difficulties", "deaf", "impaired hear", "unable to hear"),	Customers	Socio-Cultural_Demographic
Inclusion_focus =	c("inclusive", "inclusive environment", "diversity", "under-represented", "inclusive employer", "underrepresented background", "equal opportunities", "inclusive culture", "equitable", "equality", "equality objectives"),	Colleagues	Socio-Cultural_Demographic
Income_based_focus =	c("income based", "income-based", "income"),	Customers	Environmental_Societal
Innovation_program =	c("prototype", "new product idea", "high-growth tech business", "start-up", "start up", "new business"),	Suppliers and Strategic partners	Technological_Methodological
Integrated_access_capabilities =	c("access everything", "integrated bank", "one app", "account access", "core operating platform", "common platform", "core platform", "core operating function", "single customer view", "single platform", "app-based business account", "digital platform", "digital platforms"),	Customers	Technological_Methodological
International_focus =	c("international", "international network", "international payments", "global financial", "global", "globally", "multi regional", "global challenges"),	Customers	Socio-Cultural_Demographic
Interviews_and_focus_groups =	c("interview", "interviews", "focus groups", "focus group"),	Colleagues	Technological_Methodological
Investment_products_and_services =	c("investment product", "investment products", "investment service", "invest", "fund manager", "fund managers", "investment decisions"),	Customers	Economic_Financial

Invoice_capabilities =	c("invoice discounting", "invoice", "invoice discount"),	Customers	Technological_Methodological
IT_and_communications_improvement =	c("information technology", "it infrastructure", "communications infrastructure", "operational support infrastructure", "data infrastructure", "data centers", "technology enabled productivity", "IT modernisation", "new technology", "adoption of new technologies", "legacy system", "computer systems", "computer science", "computer scientist"),	Customers	Technological_Methodological
Large_branch_network =	c("large branch", "largest branch network"),	Customers	Technological_Methodological
Learning_and_training_employee_strategy =	c("learning organisation", "people capabilities", "employee capabilities", "knowledge", "behaviour", "mindset", "continuous learning", "knowledge sharing", "reflective practice"),	Colleagues	Political_Organizational
Lending_focus =	c("lend", "loan products", "loans", "lending"),	Customers	Political_Organizational
Letters_and_briefs =	c("letter", "brief", "letters", "briefs"),	Investors and Board	Political_Organizational
Local_initiatives =	c("thriving local", "local charities", "local food", "local food maker", "local products", "street market"),	Society/Communities/Environment	Environmental_Societal
Local_retailers_or_post_office_cash_services =	c("cashback", "local retailer", "post office", "over-the-counter access"),	Customers	Technological_Methodological
Long_term_approach =	c("long-term", "long-term savings", "financial future", "future growth", "balanced growth"),	Customers	Legal_Ethical
Low_touch_electronic_execution_platforms =	"low-touch electronic execution platforms",	Colleagues	Technological_Methodological

Machine_learning_and_artificial_intelligence =	c("machine-learning", "machine learning", "artificial intelligence", "a.i.", "intelligence technologies", "intelligence"),	Customers	Technological_Methodological
Manufacturing_focus =	"manufacturing",	Customers	Political_Organizational
Measure_capability =	c("measure", "measurement"),	Customers	Technological_Methodological
Membership_capability =	c("member", "members", "membership"),	Colleagues	Political_Organizational
Gender_balance_initiatives =	c("gender balance", "gender balanced", "female entrepreneur", "women entrepreneur", "women executive", "female-only", "gender gap", "male", "female representation", "balanced leadership", "representation of women", "women representation", "senior women", "women executive", "graduate female hire", "female hire", "female", "gender parity"),	Colleagues	Socio-Cultural_Demographic
Merchant_acquiring_solutions =	c("merchant acquiring solution", "merchant solutions", "card reader", " pos ", "merchant acquirers", "merchant acquiring", "merchant acceptance", "merchant settlement", "merchant processing", "merchant locations"),	Suppliers and Strategic partners	Technological_Methodological
Merchant_focus =	c("merchant", "merchants"),	Suppliers and Strategic partners	Political_Organizational
Mergers_and_acquisitions =	c("acquire", "organic strategy", "acquisition", "m&a", "merge","merger"),	Investors and Board	Technological_Methodological
Misconduct_policy =	c("misconduct", "compensation claim", "negligent"),	Colleagues	Legal_Ethical
Mitigation_approach =	c("mitigate", "mitigating"),	Regulators, Governments, and Policy Makers	Technological_Methodological

Mobile_banking_capabilities =	c(" app ", "mobile bank", "mobile", "banking app", "mobile app", "bank app", "mobile adoption", "mobile channel", "mobile device", "mobile channels", "mobile devices", "mobile providers", "wechat", "modern banking", "card app", "electronic devices", "mobile pay"),	Customers	Technological_Methodological
Modern_slavery_policy =	c("modern slavery", "human traffic", "human trafficking", "human rights"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Monitor_capability =	c("monitor", "monitoring"),	Customers	Technological_Methodological
Mortgage_process_improvement_and_automation =	c("new house", "mortgage", "mortgage process", "re-mortgage application", "home buying", "home ownership", "home buying platform", "mortgage application", "housing", "home equity loans", "home equity loan", "mortgage banking", "mortgage originations", "landlords", "loan and mortgage applications"),	Customers	Economic_Financial
Multi_channel_communication =	c("multi-channel", "multi channel"),	Colleagues	Technological_Methodological
Multicultural_diversity_initiatives =	c("cultural", "multicultural", "ethnic", "black, asian and minority ethnic", "ethnic minority", "bame", "minority", "ethnically diverse", "cultural difference", "cultural capability", "cultural change", "race", "faith", "background"),	Colleagues	Socio-Cultural_Demographic
NGOs =	c("not-for-profit", "ngos", "non-governamental organization", "ngo", "non-governamental organization"),	Society/Communities/Environment	Environmental_Societal
Office_location_focus =	c("location", "site", "workplace", "strategic location", "hub location", "office", "offices"),	Colleagues	Political_Organizational

Process_streamlining =	c("enhance", "streamline", "transform"),	Investors and Board	Technological_Methodological
Onboarding_process_focus =	"onboarding",	Customers	Political_Organizational
Online_banking_capabilities =	c("online bank", "website", "online channels", "web services"),	Customers	Technological_Methodological
Open_banking =	"open banking",	Customers	Technological_Methodological
Collaboration_improvement =	c("improve collaboration", "collaborate", "collaborating", "co-ordination"),	Customers	Technological_Methodological
Effective_communication =	c("effective communication"),	Customers	Technological_Methodological
Operational_improvement_cost =	c("reduce costs", "reduce our costs", "reducing operating expense", "cost base", "operating costs", "cost reduction", "cost base"),	Customers	Technological_Methodological
Operational_improvement_efficiency =	c("operational efficiency", "efficiency", "operational excellence", "industry excellence"),	Customers	Technological_Methodological
Operational_improvement_service =	c("improve service", "service disruptions", "service improvement"),	Customers	Technological_Methodological
Operational_improvement_simplification =	c("simpler", "redundant", "re-engineer", "reduce duplication", "simplify", "easy as possible", "made it simpler", "improvement"),	Customers	Technological_Methodological
Operational_improvement_faster_time =	c("fast", "faster", "fast track collection"),	Customers	Technological_Methodological

Operations_improvement_agile =	c("agile", "dynamic working", "agile method", "agility"),	Customers	Technological_Methodological
Organizational_model_simplification =	c("reducing complex", "duplication", "remodelling", "matrix organisational structure", "structure of our organisation"),	Colleagues	Political_Organizational
P2P =	c("p2p", "peer-to-peer"),	Customers	Technological_Methodological
Palm_oil =	"palm oil",	Society/Communities/Environment	Environmental_Societal
Panel =	c("panel", "panels"),	Investors and Board	Political_Organizational
Paperless =	c("paperless", "reliant on paper", "digital correspondence"),	Colleagues	Environmental_Societal
Parental_program =	c("parent", "matern, paternity", "shared parental", "expectant mother", "parenting room", "flexible work"),	Colleagues	Socio-Cultural_Demographic
Paris_climate_agreement =	c("paris climate", "paris agreement"),	Society/Communities/Environment	Environmental_Societal
PSD2 =	c("payment service directive", "psd2"),	Customers	Technological_Methodological
Payment_integration_capabilities =	c("accept payment", "in-app payment", "payments experience", "end-to-end payment service", "payments business", "payments integration", "payment integration", "payments solution", "payment solution", "account based payment", "account based payments", "ach payments", "direct banking", "integrated payments platform", "integrated payments", "integrated payment", "card balance payments", "push payment"),	Customers	Technological_Methodological
Pension_products =	c("pension", "pensions", "retirement"),	Customers	Economic_Financial

Cash_Performance_measurement =	"average time to cash",	Investors and Board	Technological_Methodological
Personal_data_app_management_capabilities =	c("change address", "profile"),	Customers	Technological_Methodological
Personalisation =	c("personalised product", "customised", "personalised", "self-service", "personal banking"),	Customers	Technological_Methodological
Platform_portal_development =	c("platforms", "platform", "portal"),	Customers	Technological_Methodological
POS_focus =	c("point-of-sale lending", "point-of-sale finance", "finance solution", "point-of-sale", "point of sale"),	Suppliers and Strategic partners	Technological_Methodological
Preservation_and_safeguarding =	c("preservation", "preserving", "safeguard", "safeguarding", "preserve"),	Society/Communities/Environment	Environmental_Societal
Printed_communication =	c("print communication", "letter"),	Colleagues	Technological_Methodological
Process_improvement =	c("process and policy changes", "behavioural experiments", "business process", "technological change"),	Colleagues	Technological_Methodological
Profitability_focus =	c("higher-returning", "profit", "profitability"),	Customers	Political_Organizational
Real_time_response =	c("real time", "real-time"),	Colleagues	Technological_Methodological
Fast_convenience_services =	c("convenience", "speed"),	Customers	Technological_Methodological
Recovery_contingency_plan =	c("recovery plan", "contingency plan", "recovery"),	Regulators, Governments, and Policy Makers	Technological_Methodological

Recruitment_programs =	c("attract", "recruit", "university", "hire", "hiring"),	Colleagues	Technological_Methodological
Regulatory_approach =	c("regulator", "regulatory"),	Regulators, Governments, and Policy Makers	Political_Organizational
Regulator_collaboration =	c("banking regulators", "disclosure recommendation", "government", "financial conduct authority", "fca", "prudential regulatory authority", "pra", "authority alliance", "cross-market regulation", "federal", "legislation", "authority", "authorities", "regulatory compliance", "regulatory requirements", "sec filings", "oversight", "european commission", "regulatory", "cross sector", "regulatory framework", "payment system regulator", "prudential regulation", "regulated", "regulation authority", "statutory framework", "banking system"),	Regulators, Governments, and Policy Makers	Political_Organizational
Requirement =	c("require", "requirements", "requirement"),	Suppliers and Strategic partners	Technological_Methodological
Resilience_focus =	c("resilient", "resilience", "event of a failure"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Resolving_capabiity =	c("resolve", "resolving"),	Customers	Technological_Methodological
Corporate_Responsible_culture =	c("responsible banking", "recompense", "corporate responsibility", "social corporate responsibility", "responsible business", "corporate social reponsibility", "csr", "responsibility plans", "responsibility report", "corporate responsibility committee", "corporate responsibility report", "responsibility committee"),	Society/Communities/Environment	Environmental_Societal

Retailing_focus =	c("retail", "retail banking", "integrating retail", "retail market", "retail stores", "retail wholesale", "supermarket", "hypermarket", "retail consumers", "retail investments", "retail investors"),	Customers	Political_Organizational
Review_capability =	c("review", "reviewing", "reviews"),	Customers	Technological_Methodological
Ringfencing =	c("ring-fenced", "non-ring-fenced", "fenced bank"),	Regulators, Governments, and Policy Makers	Political_Organizational
Risk_management =	c("safe bank", "robust bank", "financial stability", "operational resiliency", "stability", "stability risk"),	Regulators, Governments, and Policy Makers	Political_Organizational
Risk_Weighted_Assets =	c("rwa", "consolidate rwa", "fixed income activities", "risk weighted assets", "rwas", "reduce rwas", "risk-weighted", "risk weighted"),	Customers	Economic_Financial
Roundtable =	c("roundtable", "roundtables"),	Investors and Board	Political_Organizational
Shareholder_focus =	c("shareholder", "stakeholder"),	Investors and Board	Political_Organizational
Local_clinic_training_programs =	c("clinic", "local clinic", "training centre", "fast-growing"),	Society/Communities/Environment	Environmental_Societal
Social_media_and_web_chat_bots_customer_communication =	c("social media", "facebook", "social network", "instagram", "tiktok", "social platform"),	Customers	Technological_Methodological
Solar_energy_initiatives =	"solar",	Society/Communities/Environment	Environmental_Societal
Sponsorships =	c("sponsor", "sponsorship"),	Suppliers and Strategic partners	Political_Organizational
Assessment_and_reports =	c("assessment", "report"),	Investors and Board	Technological_Methodological

Stress_test =	c("stress test", "stress-test", "stress tests", "stress testing", "stress scenario", "stress scenario risk", "macroeconomic test", "scenario analysis", "shock", "scenario model", "stress buffer", "insurance stress"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Supplier_accountability =	c("supplier code", "supply control", "supply obligations", "accountability", "supply code"),	Suppliers and Strategic partners	Environmental_Societal
Supplier_prompt_payment_commitment =	c("prompt payment code", "prompt payment", "payment on time", "commitment to paying", "payment procedures", "payment practic", "delayed payment"),	Suppliers and Strategic partners	Legal_Ethical
Supplier_support =	"active suppliers",	Suppliers and Strategic partners	Technological_Methodological
Supply_chain_suppliers_focus =	c("supply chain", "supply base", "supplier", "suppliers", "sub-contract", "third-party", "sourcing", "professional service", "support suppliers", "supplier relation", "distributors"),	Suppliers and Strategic partners	Environmental_Societal
Sustainable_housing =	c("green mortgage", "affordable housing", "sustainable housing", "sustainable homes", "social housing", "affordable homes", "mortgage market"),	Society/Communities/Environment	Environmental_Societal
Sustainable_insurance =	"sustainable insurance",	Society/Communities/Environment	Environmental_Societal
Sustainable_investment =	c("sustainable investment", "renewable energy fund", "energy fund", "portfolio emission", "green asset", "sustainable project", "energy project", "green market", "sustainable market"),	Society/Communities/Environment	Environmental_Societal
Sustainable_supply_chain_finance =	c("sustainable supply chain finance", "sustainable supply chain"),	Society/Communities/Environment	Environmental_Societal
Tax_code_of_conduct =	c("tax", "tax code", "tax principles", "tax affairs", "tax risk", "tax compliance", "tax policy", "income tax", "tax rate", "tax laws", "tax payments", "tax rates", "tax benefits", "tax expense", "taxing", "deferred tax", "fiscal",	Regulators, Governments, and Policy Makers	Legal_Ethical

	"tax collection", "sustainable tax", " government collections", "tax system"),		
Teams =	c("team", "specialist team", "teams"),	Customers	Political_Organizational
Technological_infrastructure_renovation_and_support_programs =	c("equipping our people", "old devices", "technology support"),	Colleagues	Technological_Methodological
Technology_and_innovation_focus =	c("innovation", "technology", "innovative"),	Customers	Political_Organizational
Third_party_supplier =	c("contractor", "permanent colleagues", "external resource", "service provider", "service providers", "third-party", "third party", "party obligations"),	Colleagues	Political_Organizational
Topic_analysis_decision_making =	c("deep dive", "in-depth", "well-informed decision", "key market issues", "specific focus", "thematic review"),	Colleagues	Political_Organizational
Trade_portal =	c("trade portal", "trade platform", "etrade", "e-trade", "trading platfrom", "electronic trading", "trading environment"),	Customers	Technological_Methodological
Training_and_skilling =	c("train", "tools", "skills", "skill", "capabilities", "up-skilling", "upskilling", "retain"),	Colleagues	Technological_Methodological
Transaction_fees =	c("fee", "fees"),	Customers	Economic_Financial
Unions_partnership_communication_and_negotiations =	c("union", "collective", "partnership union", "collective pay", "collective bargaining", "employee representative", "trade union", "work council"),	Colleagues	Political_Organizational
United_Kingdom_focus =	c("uk", "united kingdom", "britain", "britain prosper", "united kingdom's", "british"),	Customers	Socio-Cultural_Demographic

United_States_focus =	c("united states", "u s "),	Customers	Socio-Cultural_Demographic
Ventures =	c("venture", "ventures"),	Suppliers and Strategic partners	Technological_Methodological
Veteran_initiatives =	c("armed forces", "veteran", "veterans"),	Customers	Socio-Cultural_Demographic
Viability_statement =	"viability statement",	Regulators, Governments, and Policy Makers	Legal_Ethical
Video_banking_capabilities =	c("video bank", "video chat", "video banking"),	Customers	Technological_Methodological
Virtual_reality =	c("vr", "virtual reality", "virtual"),	Customers	Technological_Methodological
Voice_banking_capabilities =	c("voice recognition", "voice id", "telephone banking customer", "voice banking"),	Customers	Technological_Methodological
Volunteering =	c("volunteering", "volunteer", "volunteers"),	Society/Communities/Environment	Environmental_Societal
Volunteering_programmes =	c("volunteer", "community activities", "fundraising", "community group", "social work", "community champions"),	Colleagues	Environmental_Societal
Waste_initiatives =	c("zero waste", "landfill", "biomass"),	Society/Communities/Environment	Environmental_Societal
Wealth_investment =	c("wealth", "personal wealth"),	Customers	Economic_Financial
Web_chat_capability =	c("service bot", "web chat", "wechat", "sina weibo", "whatsapp", "messaging app", "virtual assistant", "webchat", "bot", "clients instant response", "web chat"),	Customers	Technological_Methodological

Wide_products_service_range_focus_strategy =	c("broad range", "universal banking", "diversification", "multi-brand", "multi-channel", "product range", "service range", "integrated products", "omnichannel", "omni channel"),	Customers	Socio-Cultural_Demographic
Wind_energy_initiatives =	c("onshore wind", "offshore wind", "wind farm", "wind"),	Society/Communities/Environment	Environmental_Societal
Workshops_and_bootcamp =	c("workshop", "bootcamp"),	Colleagues	Technological_Methodological
Zero_fee =	c("zero transaction fees", "zero fee"),	Customers	Economic_Financial
Financial_indicators =	c("cet1", "capital ratio"),	Investors and Board	Political_Organizational
Sustainable_SC =	"sustainable supply chain",	Regulators, Governments, and Policy Makers	Environmental_Societal
Operational_risk =	c("operational risk", "operational risks"),	Investors and Board	Political_Organizational
Libor_transition =	"libor transition",	Regulators, Governments, and Policy Makers	Political_Organizational
Branded_products =	c("branded", "brand", "argos card", "brand products", "differentiated brand"),	Customers	Socio-Cultural_Demographic
Social_innovation =	"social innovation",	Customers	Environmental_Societal
Groups_forums_centre =	c("forum", "group", "groups", "centre", "center"),	Investors and Board	Political_Organizational
Ethicity_pay_gap_initiatives =	"ethnicity pay gap",	Colleagues	Socio-Cultural_Demographic

Gender_pay_gap_initiatives =	"gender pay gap",	Colleagues	Socio-Cultural_Demographic
Social_financing_products =	"social bond",	Customers	Environmental_Societal
Reports_and_statement =	c("report", "paper", "disclosure", "statement", "reports", "papers", "studies", "disclosures", "statements", "publication", "publications"),	Regulators, Governments, and Policy Makers	Political_Organizational
ESG_investment =	c("esg investment", "esg-linked investment", "socially responsible investment"),	Regulators, Governments, and Policy Makers	Environmental_Societal
ESG_risk =	"esg risk",	Investors and Board	Environmental_Societal
Private_banking_focus =	"private banking",	Customers	Economic_Financial
Transition_risk =	c("transition risk", "risk transition"),	Regulators, Governments, and Policy Makers	Political_Organizational
ESG_metrics =	"esg metrics",	Regulators, Governments, and Policy Makers	Environmental_Societal
Transaction_banking =	"transaction banking",	Customers	Economic_Financial
Investment_banking_focus =	c("investment banking", "volcker rule", "investor"),	Customers	Economic_Financial
Emerging_markets_focus =	"emerging markets",	Investors and Board	Socio-Cultural_Demographic
Commercial_banking_focus =	c("commercial banking", "commercial finance"),	Customers	Economic_Financial
Coronarvirus_pandemic =	c("coronavirus", "covid", "covid 19"),	Regulators, Governments, and Policy Makers	Environmental_Societal

Airline_industry_focus =	c("airline industry", "british airways"),	Investors and Board	Socio-Cultural_Demographic
Alternative_payments =	"alternative payments systems",	Customers	Technological_Methodological
Audit_capability =	c("audit committee", "internal audit", "audit department", "audit evidence", "audit", "auditing", "auditor's report", "external audit"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Authorization_capability =	"authorization clearing",	Regulators, Governments, and Policy Makers	Technological_Methodological
Automated_clearing_house =	c("automated clearing house", "clearing services"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Basel_committee =	"basel committee",	Regulators, Governments, and Policy Makers	Political_Organizational
Benchmarking =	c("benchmark", "benchmarking", "benchmarks", "benchmarked"),	Investors and Board	Political_Organizational
Business_continuity =	c("business continuity", "continuing operations", "business readiness"),	Customers	Technological_Methodological
Capital_planning =	c("capital planning", "capital plan", "capital ratio", "capital restoration plan", "capital rules", "capital buffer", "capital conservation buffer", "capital level", "capital distributions", "capital expenditures", "capital expenditure", "capital requirements", "capital needs", "capital allocation", "overhead allocations", "capital contributions"),	Customers	Economic_Financial
Card_acceptance =	c("card acceptance", "accept card"),	Customers	Technological_Methodological

Card_issuance =	c("card issuer", "card issuers", "cards issued", "issuing banks"),	Customers	Technological_Methodological
Card_loans =	c("card loan", "card loans"),	Customers	Economic_Financial
Card_offers =	"card offers",	Customers	Economic_Financial
Unionpay =	"unionpay",	Customers	Technological_Methodological
Closed_loop_architecture =	c("closed loop", "closed-loop"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Compliance_risk =	"compliance risk",	Regulators, Governments, and Policy Makers	Political_Organizational
Consulting_costumer_capability =	c("consulting", "consult"),	Customers	Technological_Methodological
Consumer_banking_focus =	"consumer banking",	Customers	Economic_Financial
Green_washing =	c("green washing", "green wash", "green washed"),	Regulators, Governments, and Policy Makers	Environmental_Societal
Corruption_laws =	"corruption laws",	Regulators, Governments, and Policy Makers	Environmental_Societal
Transaction_securitization =	c("card securitization", "securitization transactions"),	Customers	Technological_Methodological
Credit_Risk =	c("credit risk", "credit losses"),	Regulators, Governments, and Policy Makers	Political_Organizational

CRM =	"crm",	Customers	Technological_Methodological
Communist_countries =	c("cuba", "iran", "north korea"),	Investors and Board	Socio-Cultural_Demographic
Interchange_fee_rates =	c("interchange fee", "interchange fees", "interchange reimbursement", "interchange_rates"),	Regulators, Governments, and Policy Makers	Economic_Financial
Digital_credentials =	c("digital credentials", "social security", "social security number"),	Customers	Technological_Methodological
Digital_economy =	"digital economy",	Customers	Technological_Methodological
Dodd_frank_act =	"dodd frank",	Regulators, Governments, and Policy Makers	Political_Organizational
Domestic_market =	c("domestic payments", "domestic switching", "domestic transactions", "national", "domestic market", "domestic markets", "market leadership"),	Investors and Board	Socio-Cultural_Demographic
Economic_sanctions =	c("fines", "sanctions", "penalties"),	Regulators, Governments, and Policy Makers	Political_Organizational
Electronic_payments =	c("electronic funds transfer", "electronic payment", "electronic payments", "electronic bill"),	Customers	Technological_Methodological
Fee_caps_discounts =	c("fee caps", "fee discounts"),	Customers	Economic_Financial
Sport_sponsorships =	c("game", "sport", "athletes", "sports sponsorship"),	Customers	Socio-Cultural_Demographic

Football_sponsorship =	"football",	Customers	Socio-Cultural_Demographic
Foreign_exchange_risk =	c("foreign exchange risk", "currency exchange", "exchange rates"),	Regulators, Governments, and Policy Makers	Political_Organizational
Government_solution_g2c =	c("g2c payments", "g2c"),	Customers	Technological_Methodological
Australia_focus =	"australia",	Customers	Socio-Cultural_Demographic
Industry_standard =	c("industry standards", "industry standard"),	Regulators, Governments, and Policy Makers	Technological_Methodological
Information_security_risks =	"information security risks",	Investors and Board	Political_Organizational
Intellectual_property =	c("intellectual property", "property rights", "proprietary rights", "trade secrets", "trade secret", "registration rights", "trademark", "trademarks", "copyright", "copyrights", "patented", "patents", "patent"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Joint_venture =	c("joint venture", "joint ventures"),	Investors and Board	Political_Organizational
Brexit =	c("brexit", "kingdom's withdrawal"),	Regulators, Governments, and Policy Makers	Political_Organizational
Latin_america_Focus =	c("latin america", "argentina", "mexico", "brasil", "brazil", "chile"),	Investors and Board	Socio-Cultural_Demographic
Legal_risk =	c("legal risk", "legal requirements", "civil liability"),	Regulators, Governments, and Policy Makers	Political_Organizational

Liquidity_risk =	c("liquidity risk", "liquid assets", "sufficient liquidity"),	Regulators, Governments, and Policy Makers	Political_Organizational
Student_focus =	c("student", "students"),	Investors and Board	Socio-Cultural_Demographic
Market_risk =	c("market risk", "cva risk", "inflation", "market study"),	Regulators, Governments, and Policy Makers	Political_Organizational
Material_adverse_effect =	c("material adverse", "materially adversely", "adverse effect", "adversely effect", "material effect", "material uncertainties", "material misstatement"),	Regulators, Governments, and Policy Makers	Political_Organizational
Merchant_discount_rate =	c("merchant discount rate", "discount rate"),	Regulators, Governments, and Policy Makers	Economic_Financial
Network_Exclusivity =	"network exclusivity",	Regulators, Governments, and Policy Makers	Political_Organizational
Olympic_paralympic_sponsor =	c("olympic committee", "olympics", "olympic", "paralympic"),	Customers	Socio-Cultural_Demographic
Payments_focus =	c("payment products", "payment providers", "payment solutions", "payments industry", "payments network", "payments system", "payments technology", "payment technology", "global payments", "payments ecosystem", "card networks", "network solutions", "payment card networks", "payment methods", "payment claims", "payment deferrals"),	Investors and Board	Political_Organizational
Planning_risk =	"planning risk",	Regulators, Governments, and Policy Makers	Political_Organizational

Policies_procedures =	"policies procedures",	Regulators, Governments, and Policy Makers	Technological_Methodological
Prudential_standards =	c("prudential standards", "prudential standard", "reporting standard"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Reimbursement =	c("reimbursement", "reimburse"),	Customers	Economic_Financial
Reputational_risk =	c("reputational risk", "brand reputation", "reputational damage"),	Investors and Board	Political_Organizational
Resolution_planning_critical_functions =	c("resolution plan", "resolution planning", "dispute resolution", "resolvability assessment framework", "solvency"),	Regulators, Governments, and Policy Makers	Political_Organizational
Short_term_focus =	"short term",	Investors and Board	Political_Organizational
Long_term_focus =	"long term",	Investors and Board	Political_Organizational
Africa_focus =	c("africa", "south africa"),	Investors and Board	Socio-Cultural_Demographic
Strategic_risk =	"strategic risk",	Investors and Board	Political_Organizational
Transaction_volume =	c("transaction volume", "volume transactions"),	Regulators, Governments, and Policy Makers	Economic_Financial
Transaction_value =	c("transaction value", "value transactions"),	Regulators, Governments, and Policy Makers	Economic_Financial
Tokenizing =	c("token", "tokens", "tokenizing"),	Customers	Technological_Methodological
Buy_now_pay_later =	c("buy now pay later", "bnpl"),	Customers	Technological_Methodological

As_a_service =	"as a service",	Customers	Technological_Methodological
Transaction_processing =	c("transaction processing", "processing requirements", "processing services"),	Customers	Technological_Methodological
Natural_disasters =	c("natural disasters", "extreme weather", "disasters"),	Investors and Board	Environmental_Societal
Digital_players =	c("digital players", "digital player"),	Investors and Board	Technological_Methodological
Student_loan =	"student loan",	Customers	Socio-Cultural_Demographic
Switching_capabilities =	c("switch", "switching"),	Customers	Technological_Methodological
Russia_focus =	c("russia", "russian", "russians"),	Customers	Socio-Cultural_Demographic
Financial_statements =	"financial statements",	Investors and Board	Political_Organizational
Account_processing_services =	c("account processing services", "account processing solutions"),	Customers	Technological_Methodological
Accounting_policies =	c("accounting policies", "accounting policy", "financial accounting", "accounting practice", "accounting practices", "accounting records", "accounting standards"),	Regulators, Governments, and Policy Makers	Political_Organizational
Antitrust_law =	"antitrust",	Regulators, Governments, and Policy Makers	Legal_Ethical
Goodwill =	"goodwill",	Investors and Board	Economic_Financial

Holding_company_practices =	c("holding company", "holding companies"),	Investors and Board	Political_Organizational
Broker_dealer_services =	"broker dealer",	Customers	Economic_Financial
Canada_focus =	c("canada", "canadian"),	Investors and Board	Socio-Cultural_Demographic
Mexico_focus =	c("mexico", "mexican"),	Investors and Board	Socio-Cultural_Demographic
Card_acquiring_services =	"card acquiring services",	Customers	Technological_Methodological
Card_association =	c("card association", "card_associations"),	Investors and Board	Political_Organizational
Card_Processing =	"card processing",	Customers	Technological_Methodological
Card_services_lease =	"card services lease",	Customers	Economic_Financial
Check_services =	c("checks", "cash checks"),	Customers	Technological_Methodological
Cash_flow_focus =	c("cash flow", "free cash", "cash equivalents", "cash flow risks"),	Investors and Board	Economic_Financial
Pandemic =	c("pandemic", "pandemics"),	Regulators, Governments, and Policy Makers	Environmental_Societal
Chargebacks =	c("chargeback", "chargebacks"),	Customers	Technological_Methodological
Stock_market =	c("common_stock", "stock price", "outstanding shares", "securities"),	Investors and Board	Economic_Financial

Segmenting =	c("segment", "segments"),	Investors and Board	Political_Organizational
Corrupt_practices_act =	"corrupt practices act",	Regulators, Governments, and Policy Makers	Political_Organizational
Drug_dealing =	c("narcotics", "traffickers", "drug", "drugs"),	Regulators, Governments, and Policy Makers	Political_Organizational
Credit_reporting =	c("credit reporting act", "fair credit reporting"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Credit_unions =	c("credit union","credit unions"),	Investors and Board	Political_Organizational
Data_Processing =	"data processing",	Colleagues	Technological_Methodological
Debt_focus =	c("debt", "debts"),	Investors and Board	Economic_Financial
Debt_reduction_collect =	c("debt collection", "debt reduction"),	Investors and Board	Economic_Financial
Unfair_trade =	c("unfair trade", "deceptive trade", "fair prices"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Deposit_insurance =	c("deposit insurance", "insurance deposit", "insured depository"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Escheat_laws =	"escheat laws",	Regulators, Governments, and Policy Makers	Legal_Ethical
Fair_Debt_collection =	c("fair debt collection", "unfair debt collection"),	Regulators, Governments, and Policy Makers	Legal_Ethical

Financial_crisis =	c("financial crisis", "financial distress"),	Regulators, Governments, and Policy Makers	Political_Organizational
Foreign_focus =	"foreign",	Investors and Board	Socio-Cultural_Demographic
GPRS_technology =	c("general packet radio service", "gprs", "gpr"),	Customers	Technological_Methodological
Prepaid_card =	c("prepaid debit", "prepaid card"),	Customers	Technological_Methodological
Gramm_leach_bliley_law =	"gramm leach bliley",	Regulators, Governments, and Policy Makers	Legal_Ethical
Insured_deposit =	c("insured depository", "insured deposit"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Internal_control =	c("internal control", "control expenses", "internal operations"),	Investors and Board	Political_Organizational
Libor_focus =	"libor",	Regulators, Governments, and Policy Makers	Economic_Financial
Lockbox_banking =	c("lockbox", "lock box"),	Customers	Economic_Financial
Monetary_policies_focus =	c("monetary policies", "monetary policy"),	Regulators, Governments, and Policy Makers	Political_Organizational
Money_transmission =	c("money transmission", "money transmitter", "money transmitters"),	Customers	Technological_Methodological
Mutual_savings =	"mutual savings",	Customers	Economic_Financial

Network_rules =	"network rules",	Regulators, Governments, and Policy Makers	Legal_Ethical
North_america =	"north america",	Investors and Board	Socio-Cultural_Demographic
Sarbanes_Oxley_act =	c("sarbanes oxley", "sarbanes"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Payment_processing =	"payment processing",	Customers	Technological_Methodological
Payroll_cards =	"payroll cards",	Customers	Technological_Methodological
Repurchase_stock =	"repurchase stock",	Investors and Board	Economic_Financial
Licensing =	c("licensing", "licensed"),	Investors and Board	Political_Organizational
Private_label_retail =	c("retail private label", "private brands"),	Investors and Board	Political_Organizational
Sales_force =	c("sales force", "sales partners"),	Suppliers and Strategic partners	Political_Organizational
Services_industry =	c("services industry", "service industry"),	Investors and Board	Socio-Cultural_Demographic
Wholesale_focus =	c("wholesale", "wholesalers", "wholesaler"),	Investors and Board	Socio-Cultural_Demographic
Vendor_management =	c("vendor", "vendors"),	Investors and Board	Technological_Methodological
SWAPs =	c("swap", "swaps"),	Investors and Board	Economic_Financial

Variable_rate_products =	"variable rate",	Customers	Economic_Financial
Vertical_markets =	c("vertical markets", "vertical market", "niche market", "niche markets"),	Investors and Board	Socio-Cultural_Demographic
Intangible_assets =	c("intangibles", "acquired intangibles", "intangible"),	Regulators, Governments, and Policy Makers	Economic_Financial
Alternative_performance =	c("alternative performance", "alternative performance measures"),	Regulators, Governments, and Policy Makers	Political_Organizational
Animal_feed =	"animal feed",	Society/Communities/Environment	Environmental_Societal
Farming_industry =	c("farming", "farmer", "farmers"),	Investors and Board	Political_Organizational
Central_america =	"central america",	Investors and Board	Socio-Cultural_Demographic
Cancer_focus =	"cancer",	Investors and Board	Political_Organizational
Consumer_behaviour =	c("consumer behaviour", "consumer tastes", "shopping habits", "shopping patterns", "behavioural"),	Customers	Technological_Methodological
CEO_focus =	c("ceo", "chief executive officer"),	Investors and Board	Political_Organizational
CFO_focus =	c("cfo", "chief financial officer"),	Investors and Board	Political_Organizational
Collection_obligations =	c("collection obligation", "collection obligations"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Fulfillment_focus =	c("ecommerce fulfillment", "distribution centers", "distribution facilities", "fulfillment centers", "fulfilment network", "truck fleet"),	Investors and Board	Socio-Cultural_Demographic

Ethical_trading =	c("ethical trading", "ethical trade"),	Regulators, Governments, and Policy Makers	Environmental_Societal
Trade_focus =	c("trade", "foreign trade", "trade asset"),	Investors and Board	Socio-Cultural_Demographic
Geopolitical_risk =	c("geopolitical", "geo political", "geographic", "global risk"),	Regulators, Governments, and Policy Makers	Political_Organizational
Financial_instruments =	"financial instruments",	Customers	Economic_Financial
Food_industry_focus =	c("food maker", "food makers", "food safe", "food safety", "foods market", "groceries", "fresh food"),	Investors and Board	Political_Organizational
Online_groceries =	c("groceries online", "grocery delivery", "grocery pickup"),	Customers	Technological_Methodological
Hand_held_device =	"hand held device",	Customers	Technological_Methodological
Health_focused_products =	c("affordable healthy", "eating well", "health care", "healthcare", "healthier choices", "healthy sustainable", "healthier lives", "healthy cultures"),	Customers	Legal_Ethical
Information_security_laws =	"information security laws",	Regulators, Governments, and Policy Makers	Legal_Ethical
IPOs =	c("initial public offering", " ipo "),	Investors and Board	Economic_Financial
Inventory_risk =	c("inventory risk", "risk inventory", "significant inventory"),	Investors and Board	Political_Organizational
Leasing =	c("lease", "leasing", "leased"),	Customers	Economic_Financial

Trading_focus =	"trading",	Investors and Board	Socio-Cultural_Demographic
Treasury_policy =	c("treasury policy", "treasury"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Clothing_industry =	c("clothing", "cloth", "cloths"),	Investors and Board	Socio-Cultural_Demographic
Vegan_vegetarian =	c("vegan", "vegetarian", "vegans", "vegetarians"),	Customers	Socio-Cultural_Demographic
Viability_scenarios =	"viability scenarios",	Regulators, Governments, and Policy Makers	Political_Organizational
Operating_cashflow =	"operating cash flow",	Investors and Board	Economic_Financial
Operational_resilience =	"operational resilience",	Investors and Board	Political_Organizational
Bonds =	c("bond", "bonds"),	Customers	Economic_Financial
Pharmacy_focus =	c("pharmacy", "pharmaceutical", "pharmacies", "pharmaceuticals"),	Investors and Board	Socio-Cultural_Demographic
Political_issues =	c("political", "politics"),	Investors and Board	Political_Organizational
Principal_risk =	"principal risk",	Investors and Board	Political_Organizational
Quality_focus =	"quality",	Investors and Board	Socio-Cultural_Demographic
Merchandise =	"merchandise",	Customers	Socio-Cultural_Demographic

Recycling =	c("recycle", "recycling", "recycled"),	Society/Communities/Environment	Environmental_Societal
Financial_disclosure =	c("financial disclosure", "financial disclosures"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Religious =	c("religious", "religion", "religions"),	Colleagues	Socio-Cultural_Demographic
Sales_growth =	"sales growth",	Investors and Board	Political_Organizational
Research_science =	c("research and development", "r&d", "science"),	Investors and Board	Technological_Methodological
Strategic_business_planning =	c("strategic planning", "strategic priorities", "business plan", "business plans", "delivery plan", "strategic enablers", "strategic goals"),	Investors and Board	Political_Organizational
Strategic_report =	"strategic report",	Regulators, Governments, and Policy Makers	Legal_Ethical
Trading_regulations =	c("trading regulations", "trading regulation", "trade regulations"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Tracking =	c("tracking delivery", "tracked", "track delivery"),	Customers	Technological_Methodological
Trade_policy =	c("trade policies", "trade policy"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Vicepresident =	c("vice president", " vp "),	Investors and Board	Political_Organizational
Positive_views =	"positive",	Investors and Board	Political_Organizational
Negative_views =	"negative",	Investors and Board	Political_Organizational

Policymaking =	c("policymaking", "policy", "policy makers"),	Regulators, Governments, and Policy Makers	Legal_Ethical
Competition_report =	"competition report",	Regulators, Governments, and Policy Makers	Legal_Ethical
Balance_sheet_analysis =	"balance sheet",	Regulators, Governments, and Policy Makers	Economic_Financial
BAME_pay_gap =	"bame pay",	Colleagues	Socio-Cultural_Demographic
BAME_taskforce =	"bame taskforce",	Colleagues	Socio-Cultural_Demographic
Building_societies =	c("building society", "building societies"),	Investors and Board	Economic_Financial
Industry_certification =	"certification",	Regulators, Governments, and Policy Makers	Legal_Ethical
Companies_act =	"companies act",	Regulators, Governments, and Policy Makers	Legal_Ethical
Competitive_focus =	"competitive",	Investors and Board	Political_Organizational
Economic_focus =	"economic",	Investors and Board	Economic_Financial
Economic_financial_planning =	c("economic plan", "economic policy", "financial policy", "financial architecture"),	Investors and Board	Economic_Financial
Effective_competition =	"effective competition",	Regulators, Governments, and Policy Makers	Political_Organizational

Emerging_risks =	c("emerging risks", "emerging risk"),	Regulators, Governments, and Policy Makers	Political_Organizational
Executive_directors_focus =	c("executive director", "executive directors"),	Investors and Board	Political_Organizational
Financial_market =	"financial market",	Investors and Board	Economic_Financial
Financial_focus =	"financial",	Investors and Board	Economic_Financial
Financial_reporting =	"financial reporting",	Regulators, Governments, and Policy Makers	Legal_Ethical
GDP_focus =	"gdp ",	Investors and Board	Economic_Financial
Government_focus =	c("government", "public sector"),	Investors and Board	Political_Organizational
Productivity_focus =	"productivity",	Investors and Board	Political_Organizational
Pricing_practice =	"pricing",	Investors and Board	Economic_Financial
Interest_rate =	"interest rate",	Investors and Board	Economic_Financial
Major_banks_focus =	c("major banks", "Systemically important financial institution", "sifi ", "systemically important banks", "sib"),	Regulators, Governments, and Policy Makers	Political_Organizational
Senior_managers =	c("senior managers", "senior manager"),	Investors and Board	Political_Organizational
Systemic_risk =	"systemic risk",	Regulators, Governments, and Policy Makers	Political_Organizational
Risk_buffer =	"risk buffer",	Regulators, Governments, and Policy Makers	Legal_Ethical

Tier_banking =	c("tier banking", "bank tiers"),	Regulators, Governments, and Policy Makers	Political_Organizational
Travel_insurance =	"travel insurance",	Customers	Economic_Financial
Meetings =	c("meeting", "meetings", "meet"),	Investors and Board	Political_Organizational

Appendix C Complementary results for payment system stakeholders.

C.1 Retailers

C.1.1 Retailers' dictionary-based factor clustering results

Retailers level analysis

PESTEL categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Political_Organizational	119	99	19.60%
Economic_Financial	57	29	5.74%
Socio-Cultural_Demographic	60	39	7.72%
Technological_Methodological	168	101	20.00%
Environmental_Societal	65	48	9.50%
Legal_Ethical	46	31	6.14%
Retailers' identified factors		347	68.71%
Grand Total	515	505	98.06%

TABLE 9.1 NUMBER OF FACTORS PER PESTEL CATEGORY AT A RETAILERS' LEVEL ANALYSIS

Note: Percentages are related to the Factors Identified (505)

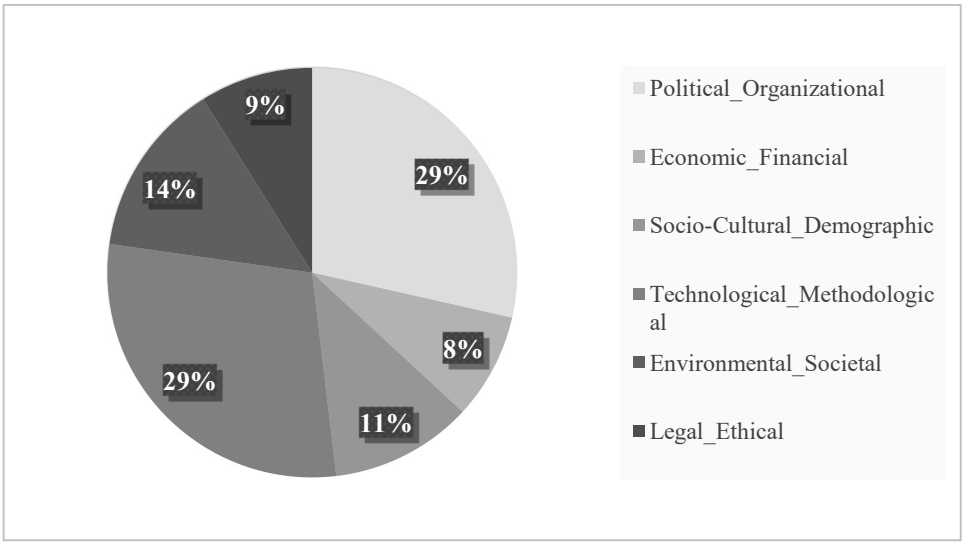


FIGURE 9.1 PERCENTAGE OF FACTORS PER PESTEL CATEGORY

PESTEL categories	Amazon (A)	Morrisons (M)	Sainsbury s (S)	Tesco (T)	Walmart-ASDA (W)
Political_Organizational	56	66	67	67	59
Economic_Financial	14	17	21	20	17
Socio-Cultural_Demographic	21	23	24	20	24
Technological_Methodological	63	61	70	61	52
Environmental_Societal	28	38	35	34	18
Legal_Ethical	16	16	18	22	18
Grand Total	198	221	235	224	188

PESTEL categories	Amazon (A)	Morrisons (M)	Sainsbury s (S)	Tesco (T)	Walmart-ASDA (W)
Political_Organizational	28.28%	29.86%	28.51%	29.91 %	31.38%
Economic_Financial	7.07%	7.69%	8.94%	8.93%	9.04%
Socio-Cultural_Demographic	10.61%	10.41%	10.21%	8.93%	12.77%
Technological_Methodological	31.82%	27.60%	29.79%	27.23 %	27.66%
Environmental_Societal	14.14%	17.19%	14.89%	15.18 %	9.57%
Legal_Ethical	8.08%	7.24%	7.66%	9.82%	9.57%
Grand Total	39.21%	43.76%	46.53%	44.36 %	37.23%

TABLES 9.2 & 9.3 NUMBER OF FACTORS PER PESTEL CATEGORY PER RETAILER

Stakeholders' categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Colleagues	66	48	9.50%
Customers	176	99	19.60%
Investors and Board	103	84	16.63%
Regulators, Governments, and Policy Makers	104	67	13.27%
Society/Communities/Environment	48	39	7.72%
Suppliers and Strategic partners	18	12	2.38%
Banks' identified factors		347	68.71%
Grand Total	515	505	98.06%

TABLE 9.4 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY AT A RETAILERS' LEVEL ANALYSIS

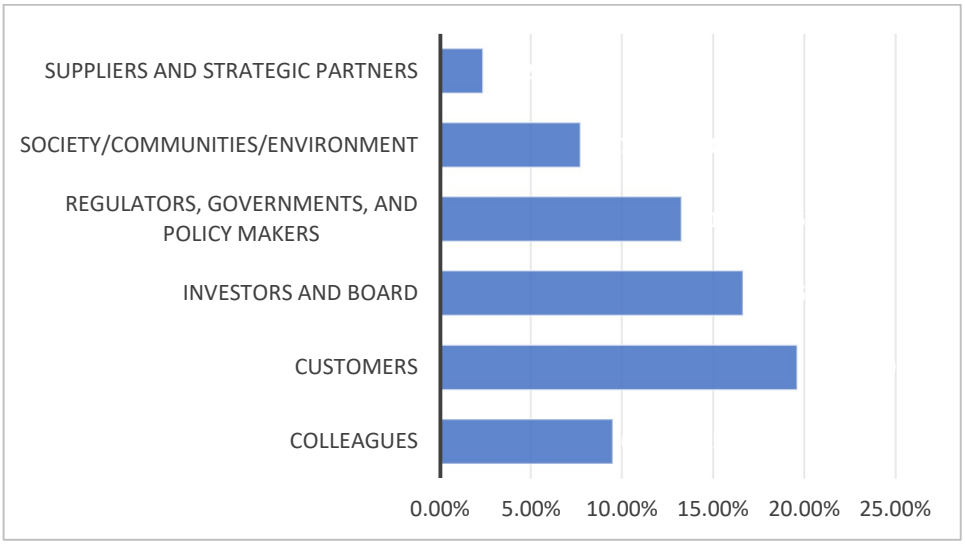


FIGURE 9.2 PERCENTAGE OF FACTORS PER STAKEHOLDERS' CATEGORIES

Stakeholders' categories	Amazon (A)	Morrisons (M)	Sainsburys (S)	Tesco (T)	Walmart -ASDA (W)
Colleagues	48	30	34	35	25
Customers	84	61	67	55	55
Investors and Board	40	50	58	53	55
Regulators, Governments, and Policy Makers	26	40	40	44	31
Society/Communities/Environment	31	32	28	30	14
Suppliers and Strategic partners	13	8	8	7	8
Grand Total	242	221	235	224	188

Stakeholders' categories	Amazon (A)	Morrisons (M)	Sainsbury s (S)	Tesco (T)	Walmart-ASDA (W)
Colleagues	19.83%	13.57%	14.47%	15.63%	13.30%
Customers	34.71%	27.60%	28.51%	24.55%	29.26%
Investors and Board	16.53%	22.62%	24.68%	23.66%	29.26%
Regulators, Governments, and Policy Makers	10.74%	18.10%	17.02%	19.64%	16.49%
Society/Communities/Environment	12.81%	14.48%	11.91%	13.39%	7.45%
Suppliers and Strategic partners	5.37%	3.62%	3.40%	3.13%	4.26%
Grand Total	100.00 %	100.00%	100.00%	100.00 %	100.00 %

TABLES 9.5 & 9.6 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY PER RETAILER

Number of sharing organizations	Sharing factors count	Percentage	Organizational cluster	Sharing factors count	Percentage
5	88	17.43%	AMSTW	88	17.43%
4	53	10.50%	AMST	15	2.97%
			AMSW	5	0.99%
			AMTW	7	1.39%
			ASTW	11	2.18%
			MSTW	15	2.97%
3	67	13.27%	AMS	4	0.79%
			AMT	3	0.59%
			AMW	3	0.59%
			AST	4	0.79%
			ASW	6	1.19%
			ATW	1	0.20%
			MST	37	7.33%
			MSW	1	0.20%
			MTW	4	0.79%
			STW	4	0.79%
2	74	14.65%	AM	6	1.19%
			AS	3	0.59%
			AT	5	0.99%
			AW	23	4.55%
			MS	10	1.98%
			MT	10	1.98%
			MW	2	0.40%
			ST	6	1.19%
			SW	6	1.19%
			TW	3	0.59%
1	65	12.87%	A	14	2.77%
			M	11	2.18%
			S	20	3.96%
			T	11	2.18%
			W	9	1.78%
Total	347	68.71%		347	68.71%

TABLE 9.7 SHARED FACTORS BY NUMBER OF RETAILERS CLUSTERED AND ORGANIZATIONAL CLUSTERS

	A	M	S	T	W	
A						
M	131					
S	136	175				
T	134	179	180			
W	144	125	136	133		

	A	M	S	T	W
A					
M	25%				
S	26%	34%			
T	26%	35%	35%		
W	28%	24%	26%	26%	

TABLE 9.8 SHARED FACTORS BETWEEN ANY TWO RETAILERS

C.1.2 Retailers' strategic reports' categorization and clustering

In this section, we first summarise some relevant categorization and clustering statistics, detailed in the tables and figures in the previous sub section**.** Then a brief description of the relevant factor findings is given. The strategic factors categorization and clustering results can be graphically seen in Figures 9.7 to 9.9. The organization clusters are referred by their initial letter: Amazon (A), Morrisons (M), Sainsburys (S), Tesco (T), and Walmart-ASDA (W). From the total 505 identified factors, only 347 factors were detected (68.71%).

In the *PESTEL categorization*, Technological and Methodological (20%) is the most frequent, followed by Political and Organizational (19.6%) and Environmental and Societal (9.5%). In terms of *stakeholder's categorization*, 19.21% of the factors are focused on Customers, 16.63% on Investors and Board, and 13.27% on Regulators, Governments, and Policy Makers. This distribution is maintained almost by all retailers, in the case of Morrison, Tesco, and Walmart-ASDA the Political and Organizational overtakes the Technological and Methodological category, Walmart-ASDA had less Environmental and Societal factors (9.57%) mentioned, which is the same as the Legal

and Ethical category but mentions more Socio-Cultural and Demographic factors (12.77%). In respect of stakeholders' categories, Amazon mentions more Colleagues factors (19.83) than Investors and Board (16.53%).

The strategic factors' *organizational clustering* shows 17.43% shared by all retailers, 10.50% by four retailers, 13.27% by three retailers, 14.65% by two retailers, and 12.87% retailer specific. In the shared by four-three-two banks tier, the largest clusters are Morrisons-Sainsburys-Tesco (MST)- 7.33%, followed by Amazon-Walmart/ASDA (AW)- 4.55%, and all other clusters are equal or less than 3%.

By comparing all the shared factors, without tiering them, the most similar organizations are Morrison with Tesco, and Sainsburys with Tesco with 35% of the identified factors, Sainsbury and Morrison share also 34% of factors identified, while Morrisons and Walmart-ASDA share the least with 24%. Most of these factors are in the *Technological and Methodological* category, followed closely by the *Political and Organizational*, and then the *Environmental and Societal*.

The next paragraphs detail Figures 9.7 to 9.9 PESTEL categorization and clustering analysis of all shared initiatives. For the PESTEL tiering analysis, please refer to the Figures 5.1 to 5.6.

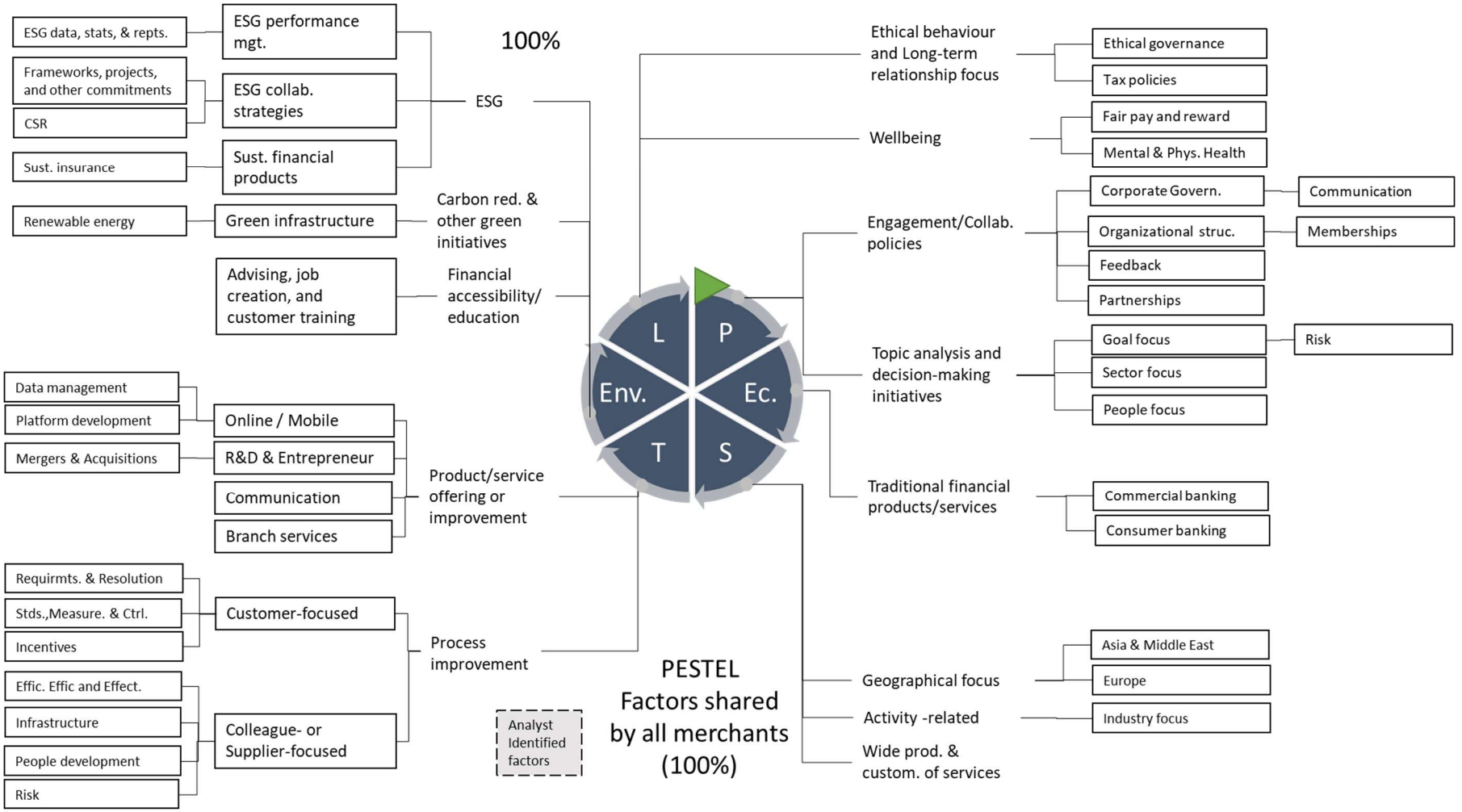


FIGURE 9.3 STRATEGIC FACTORS SHARED BY ALL BANKS

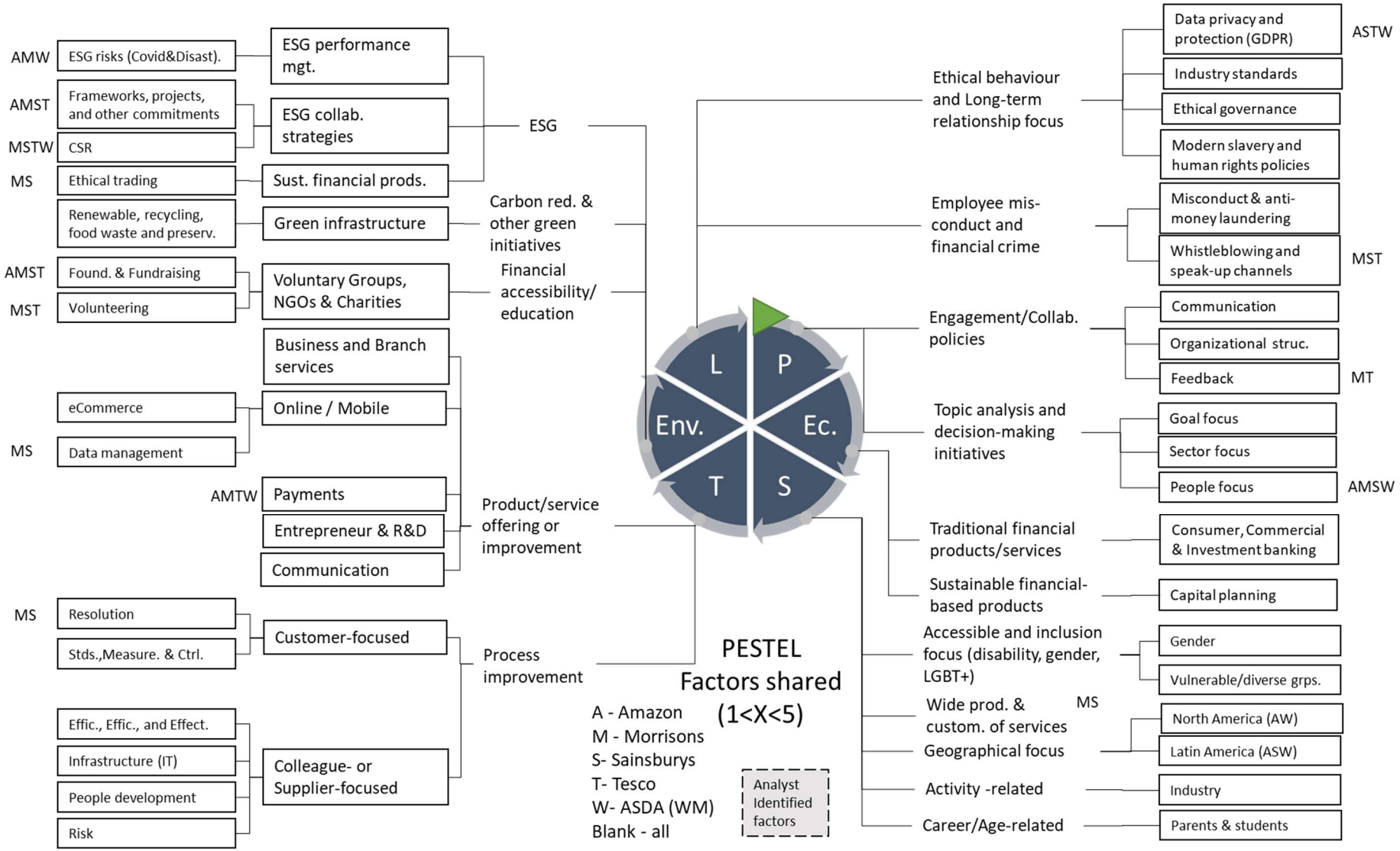


FIGURE 9.4 STRATEGIC FACTORS SHARED BY BANKS (INCLUDING SHARED BY 4, 3, AND 2 BANKS)

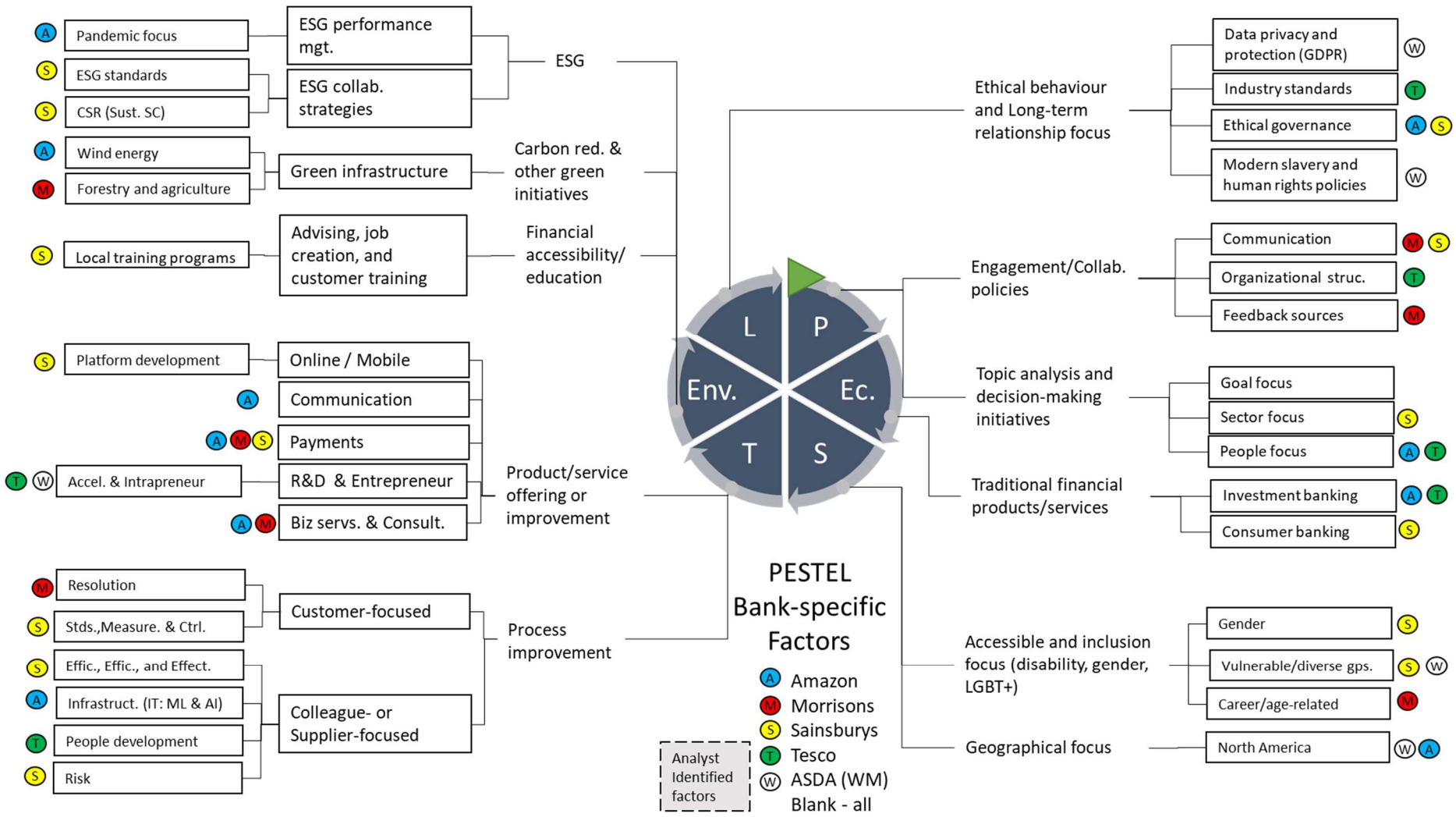


FIGURE 9.5 STRATEGIC FACTORS SPECIFIC BY BANK

For the ***Technological and Methodological (T&M)*** factors, regarding *Product or service offering or improvement,* all retailers comment on *Branch services, such as* Branch or store service improvement and automation, *Entrepreneurship* like Mergers and Acquisitions and Ventures. *Mobile and Online* capabilities, along the lines of Data management, Digital bank company, and Platform or Portal development.

In respect of shared initiatives, they focus on *Communication* capabilities, such as developing a customer networking platform (MS) and establishing multi-channel communication (MS), through digital marketing (AS) and communication (AW), as well as printed communication (AST). In relation to *Entrepreneurship*, they mention innovation programs (AMS). On the *Mobile and Online* aspects, they include eCommerce (AW), Fintech (AW), Integrated access capabilities (MTW), Personal data app management capabilities (MS), Personalization (MST), Social media and web chat bots customer communication (MW), and Online groceries (ASW). In relation to *Payments*, the capabilities identified are Banking collection services (AMSW), Non-cash initiatives (MT), Checkout capabilities (STW), Credit cards (ASTW), Cross-border payment solutions (AMS), Fast digital payments service (AW), Payment integration capabilities (SW), Card issuance (AW), Closed loop architecture (MT), Transaction processing (AW) and Check services (AMTW).

In allusion to specific initiatives, the retailers focus on *Business services,* such as Business travel mobility in the case of Morrisons. In *Communication*, Amazon mentions Virtual reality. As well, as offering a Consulting customer capability. In the case of *Entrepreneurship*, Wal-Mart/ASDA includes Accelerators and incubators. On *Online & Mobile* capabilities, Sainsbury's focuses on Trade portal. Finally, in terms of Payments, Sainsbury's highlights ATM cash services and Switching capabilities, Morrisons, Invoice capabilities and POS development focus, while Amazon mentions specifically Payments processing.

Related with *process improvement*, all retailers focus on *Efficient, effective, efficacious capabilities such as* Customer feedback, Operational improvement simplification, and Fast convenience services. In terms of *Incentives,* they focus on Customer reward programs. Related with *IT infrastructure,* they focus on Cyber security and data

protection. On *People development,* they mention Colleague support, Expert leadership development, Recruitment programs, and Training and skilling. They acknowledge a focus on Customers' *Requirements,* as well as *Risk Management capabilities,* such as Enterprise Risk Management Framework and Risk Impact mitigation. Related to *Standards, measurement, and control,* Performance management, Performance goals' measurement, a Reviewing capability, Assessment and reports, and Audit capability are mentioned.

In terms of shared initiatives, retailers focus on *Efficient, effective, efficacious capabilities,* such as a Fast resolution process (MS), Process streamlining (STW), Collaboration improvement (AS), Cost Operational improvement (ASTW), Efficiency operational improvement (AMST), Service operational improvement (AM), and Operational improvement related with time reduction (AMSW). On *IT infrastructure,* they mention a Cloud based digital environment (AMT) and IT and communications improvement (ASTW). On *People development,* they include Apprenticeship (MST), Career development (ASTW), Colleague benefits (ASTW), People digital capabilities development (AT), Employee leadership development program (AMSW), and Vendor management (AW) initiatives. Related with *R&D,* they include Research science (AMST) capabilities. In regard to *Risk capabilities,* they mention Accountability (MTW), Fraud capabilities (ASTW), a Mitigation approach (AMST), Recovery contingency plans (AMST), a Resilience focus (MST), Stress tests (MST), and Business continuity (MST) initiatives. In *Standards, measurement, and control,* the factors mentioned are Banking standards (MST), Surveys (MST), Customer satisfaction and trust scores (ST), a Project programme management approach (AMST), Scorecard visualizations (MST), Measuring (AMTW) and Monitoring capabilities (MST), and a Consumer behaviour focus (ASW).

In terms of *bank-specific initiatives*, retailers focus on *Efficient, effective, efficacious capabilities*, Amazon mentions Interviews and focus groups and Sainsbury's a Real-time response objective. In relation to *People development*, Tesco includes Coaching and mentoring, Colleague entrepreneurial capabilities, Colleague survey, and Employee regulation and compliance training. Morrisons highlights *Resolution* capabilities. In *Risk management capabilities*, Tesco mentions Model risk. And in *Standards, measurement,*

and control, Sainsbury's include a Tracking and Analytics insight approach, while Amazon mentions Machine learning and artificial intelligence.

On the ***Environmental and Societal*** factors category, all retailers focus on *Carbon reduction & other green initiatives* such as Climate and GHG emissions reduction, and the development of a *Green infrastructure.* In relation with *ESG collaboration strategies,* on *Frameworks, projects, and other commitments,* they include sustainable initiatives such as ESG partnerships and trusts, and in *CSR,* they focus on Supply chain suppliers' sustainable development. Also, on *ESG performance management,* such as *ESG data, stats, and reports,* they remark Climate change risk management. In terms of *Financial accessibility & education,* in the case of *Advising, job creation, and customer training,* they mention Community financial education, Strategic commitments, and Financial educational tools. In relation with *Voluntary Groups, NGOs & Charities,* they include an Income-based focus.

In terms of *shared initiatives*, *Carbon reduction & other green initiatives,* related with *Green infrastructure*, they mention Food surplus and waste (MST), Palm oil (MST), Preservation and safeguarding (MT), Solar energy initiatives (AM), Waste initiatives (SW), Animal feed (ST), and Recycling (MST). In *ESG collaboration strategies* such as *Frameworks, projects, and other commitments,* they include ESG groups and committees (AMST), ESG Principles (AMTW), Local initiatives (MST), and the Paris climate agreement (AT). In *CSR,* they mention a Corporate Responsible culture (MST), Supplier accountability (MSTW), and Volunteering programmes (MST). In terms of *ESG performance management,* they focus on *ESG data, stats, and reports,* such as ESG recognition (AMS), and tracking Natural disasters (AW), and the Pandemic (AM). In relation with *Sustainable financial products,* they mention Electric cars (MT), ESG personal financing products (AMST), and Ethical trading (MS). On *Financial accessibility & education,* in the case of *Advising, job creation, and customer training*, they include Community financial accessibility programmes (MST), an Academy development or school workshops (AMT), and Business advising (MT). On *Voluntary Groups, NGOs & Charities,* retailers include Charities (AMST), Donations (AMST), Financial inclusion (AMW), Foundation and fundraising programs (AMST), and Volunteering (MST).

In regard to *retailer-specific* initiatives, they mention *Carbon reduction & other green initiatives* related with *Green infrastructure*, such as Forestry and agriculture for Morrisons and Wind energy initiatives for Amazon. In terms of *ESG collaboration strategies, on the Frameworks, projects, and other commitments subcategory, Sainsbury's* includes ESG standards. On *CSR,* Sainsbury's is focused on developing a Sustainable supply chain, with a specific focus on finance. On *ESG performance management* there are *ESG data, stats, and reports* related with the Coronavirus pandemic from Amazon. In relation with *Financial accessibility & education,* on the *Advising, job creation, and customer training* subcategory*,* Sainsbury's mentions Local clinic training programs.

In the ***Socio-cultural and Demographic*** classification, all retailers focus on *Activity-related Industry* initiatives like Trade and Quality focus. In the *Geographical focus*, they all highlight both Foreign/International and Domestic markets, such as Asia and Middle East, Europe and UK. As well, they all mention a Wide products service range focus strategy.

In terms of shared initiatives, related with *Accessibility and inclusion focus (disability, gender, LGBT+),* specifically in *Vulnerable or diverse groups,* Retailers mention an Inclusion focus (MST), Multicultural diversity initiatives (AMST), Vegan vegetarian (MS), and Accessible services (MS). And in *Gender*, they include Gender diversity initiatives (AMST) and Gender balance initiatives (MSTW). On the *Activity-related/Industry* category, they focus on Sport sponsorships (TW), Football sponsorship (AM), a Wholesale focus (MTW), a Fulfilment focus (AW), a Trading focus (AMST), a Clothing industry focus (MST), and a Pharmacy focus (AW). In terms of *Career/Age -related* initiatives, they focus on Parental programs (MTW) and a Students' focus (ASW). On the *Geographical focus*, they mention North America; in specific, a United States (AW) and Canada focus AW, also a Latin America (AW), Africa (SW), and Central America (SW) focus. They talk about *Wide prod. & custom. of services*, related with Customisation (MS) and Merchandise (ASTW).

In the matter of *Retail-specific* initiatives, in the *Accessibility and inclusion focus (disability, gender, LGBT+)* related with *Vulnerable or diverse groups*, Sainsbury's mentions Disability-related and Pay gap initiatives, while Walm-Mart/ASDA includes

Religious groups. In *Gender*, Sainsbury's highlights Gender pay gap initiatives. On *Career/Age -related* initiatives, Morrisons mentions Graduate programs and Veteran initiatives. In the *Geographical focus*, Amazon centres on North America, and Walm-Mart/ASDA in Mexico.

For the ***Political and Organization*** category, all retailers focus on *Engagement and collaboration policies,* such as *Communication* capabilities, like Events, Reports and statements, specifically Financial ones. In terms of *Feedback sources*, there is Regulatory approach and collaboration. On *Organizational structure* initiatives, they mention a Membership capability, Teams, Unions' partnerships, communication and negotiations, Groups, Forums centers, and Meetings. They all include Partnerships Alliances. In terms of *Topic analysis and decision-making*, the *Goal focus* is on Employment job creation, Credit, Customer, Regulation and compliance, Corporate governance, Offices' or branches' location, Profitability, Economic sanctions, Joint ventures, Political issues, Positive views, and a Competitive focus. In *People's focus,* they all mention CFOs and Shareholders. In the *Sector focus* category, the sectors mentioned are Retailing, Technology and innovation, Food industry, and Government.

In the case of shared initiatives, the *Engagement and collaboration policies* are related with Communication *capabilities*, such as Annual General Meetings (MT), Councils (AST), a Cultural focus (AMTW), Feedback (MSTW), Executive's remuneration reports (MST), Letters and briefs (AST), and Alternative performance focus (MST). On *Feedback sources*, Benchmarking (MT) is mentioned. On the *Organizational structure,* some of the common factors are Committees (MST), Panels (MSTW), Roundtables (ST), Associations (AW), and Licensing (AW). On *Topic analysis and decision-making*, the *Goals' focus* in on *Risk*, including Financial risk (SW), Risk management (AM), Operational risk (MSTW, Credit Risk (MST, Foreign exchange risk (AMTW), Brexit (MST), Liquidity risk (ST), Market risk (MSTW), Material adverse effect (ASTW), Reputational risk (MSTW), Resolution planning critical functions (MT), Corrupt practices act (AW), Internal control (MW), Geopolitical risk (MW), Principal risk (MST), and Emerging risks (MST); other topics are Collaborative focus (AMST), Complaint focus (AM), Entrepreneurial initiatives (AT), Learning and training employee strategy (MSTW),

Lending focus (AST, Payments focus (AW), Long term focus (ASTW), Segmenting (AW), Cancer focus (MST), Sales growth (STW), Strategic business planning (MST), Negative views (AMSW), and Productivity focus (MSW). In the case of *People's focus*, they highlight CEOs (ASW) and Executive directors (MS) responsibilities. On the *Sector focus*, they look to the Manufacturing (AMS) and Farming industry (MST), and they mention Third party suppliers (AMTW).

Regarding *retail-specific* initiatives, in terms of *Engagement and collaboration policies*, on *Communication capabilities,* Morrisons talks about Executive Board tours. On *Feedback sources,* Morrisons includes Accounting policies. Related with *Organizational structure* initiatives, Tesco mentions Change management programme, and in terms of *Partnerships*, Sainsbury's mentions Sponsorships.

In *Topic analysis and decision-making*, the *Goals' focus*, in the case of *Risk*, Morrisons talks about Compliance risk, Wal-Mart/ASDA includes Legal risk and Drug dealing, Tesco targets Strategic risk and Viability scenarios, while Amazon focuses on Financial crisis and Inventory risk and Sainsbury's on Operational resilience initiatives. Other relevant goals are Colleague share and pension plans, according to Morrisons, a Debit card focus for Amazon, and a Short-term focus and Private label retail with Wal-Mart/ASDA. In relation with *People's focus*, Amazon focuses on the Vice-presidents roles, and Tesco on Senior managers. In terms of *Sector focus*, Sainsbury's focuses on a Consultative employee capacity.

In the ***Ethical and Legal*** categories, all banks have a *Ethical behaviour and Long-term relationship focus*, and specifically, on a Long-term approach in *Ethical behaviour*. On *Modern slavery and human rights policies*, related with *Tax policies & Codes*, they mention a Tax code of conduct, and in *Industry standards*, Treasury policies. In relation to *Wellbeing*, they focus on *Mental & Physical Health* initiatives, such as Employee mental and physical health, and Safety and Health-focused products. As well as a *Fair payment and reward policy*.

In terms of shared initiatives, in *Ethical behaviour and Long-term relationship* focus, on the *Ethical governance subcategory*, they mention a Code of conduct (AMT), Ethical values governance (MSTW), the Antitrust law (AW), and Financial disclosures (MT). On

Data privacy and protection (GDPR), they talk about Data privacy and protection (ASTW), General data protection regulation (ST), and Intellectual property (AW). In relation with *Modern slavery and human rights policies*, they highlight Counter terrorism (AW) and Modern slavery (AMST) policies. On *Industry standards*, they include Viability statements (MST), Strategic reports (MST), Trading regulations (TW), Policymaking initiatives (MSTW), Industry certifications (AT), Companies' acts (MST), and Financial reporting (AT). In terms of *Employee misconduct and financial crime*, they focus on *Misconduct & anti-money laundering policies*, such as Anti bribery or Corruption (MSTW), Anti money laundering (AW), and Corruption (ASW). As well as Employee whistleblowing and a speak up channels policy (MST).

In terms of *bank-specific* initiatives, on *Ethical behaviour and Long-term relationship* focus, they focus on *Data privacy and protection (GDPR)*, specifically, Wal-Mart/ASDA includes Information security laws. On *Ethical governance*, Sainsbury's mentions Unfair trade and Amazon Collection obligations. On *Industry standards*, Tesco mentions Prudential standards and Wal-Mart/ASDA includes a Trade policy focal point.

On the ***Economic and Financial*** category, *all banks* focus on *Traditional financial products/services*, in General, with an Economic and Financial focus. In terms of *Consumer banking*, they all mention a Debt focus, and in *Commercial banking*, a Cash flow focus.

In terms of *shared initiatives*, on the *Traditional financial products/services* category and in *Commercial banking*: they mention Dividend-related actions (MSTW), Transaction fees (ASW), Merchant discount rates (ST), Reimbursements (AW), Operating cashflow (STW), and Balance sheet analysis (MSTW). On *Consumer banking*, they highlight Mortgage process improvement and automation (SW), Pension products (MSTW), Leasing (MST), a Pricing practice (AMSW), and Interest rate (MS) focus. In relation with *Investment banking*, the factors mentioned are Asset finance (MST), Investment products and services (AMST), Investment banking focus (AMW), Goodwill (ATW), Stock market (AS), SWAPs (MT), Intangible assets (AMTW), and Bonds (MST). In terms of *Sustainable financial-based products*, they focus on *Capital planning* with Financial planning health (ASTW) and Capital planning (MSTW) approach.

In terms of *bank-specific* initiatives, in relation with *Traditional financial products/services*, and in *Consumer banking*, Sainsbury's focuses on Debt reduction collection initiatives, and on *Investment banking*, Tesco looks at Financial strategies and Financial instruments, while Amazon talks about IPOs.

C.1.3 Retailers' strategic reports' systemigram

For the Systemigram development, first, a categorisation of the different factors was used with the "Playing to win" framework, as seen in Table 9.9.

	Systems (Infrastructure)	Capabilities (Process)	How we will win?	Where we will play?	Winning aspirations
Definition	Support systems structures, and measures	Set of reinforcing activities and specific configuration	Value proposition and competitive advantage	Geographies, product categories, costumer segments, channels, vertical stages of production	Purpose or guiding aspirations
Factors	T&M: Branch or store service improvement and automation, Operational improvement simplification, Data management, protection & Cyber security Colleague support, Expert leadership development, Recruitment programs, and Training and skilling, Enterprise Risk Management Framework (Climate change) P&O: Communication capabilities, like Events, Reports and statements, Membership capability, Teams, Unions' partnerships, communication and negotiations, Groups, Forums centers, and Meetings, E&S: Climate and GHG emissions reduction & Green infrastructure, Supply chain suppliers' sustainable development, Community financial educational tools	T&M: Digital platform development Customer reward programs Mergers and Acquisitions and Joint Ventures, Partnerships Alliances (incl. ESG) E&S: Green & local products L&E: Health-focused products P&O: Customer credit services & good shop location	*E&S:* Environmental and community/socially oriented products and services (Strategic commitments*)* P&O: CFOs and Shareholders focus Corporate governance with a Regulation, Collaboration, & Compliance approach , Economic sanctions &Political issues, Office or branches location, Wide products service range focus strategy L&E: Long-term approach E&F: Debt and cash flow focus (moving inventory) T&M: Fast convenience services	*S&D:* Trade and Quality focus, Foreign/International and Domestic markets, such as Asia and Middle East, Europe and UK, P&O: Retailing, Technology and innovation, Food industry, and Government. E&S: Income-based focus and ESG	*P&O:* Customer-led and feedback approach *E&S:* Environmentally& socially conscious & resilient *L&E:* Employee & supplier wellbeing & job creation, including fair payment, health and safety. P&O: Economic & Financial Profitability, and a Competitive focus.

TABLE 9.9 RETAILERS' "PLAYING TO WIN" DECISION-BASED FRAMEWORK CATEGORIZATION

Then, the Systemigram prose was developed, as seen in the next paragraphs, alongside, the Systemigram graphic and complete storyboard as seen in Figure 9.10.A-F, shown progressively.

Retailers have developed *Long-term goals* on three main areas related with *Customers*, *Employees or Colleagues & Regulators*, and *Environmental, Social, and Governance (ESG).* Mainly competing on specific **Markets**, competing in the *Quality dimension*, inside the *Trade sector*, and geographically, looking after the *UK & Europe* mainly, with a minor focus on *Asia & Middle East (ME).*

From an *ESG focus*, they have been developing *Environmental and community or socially oriented products and services, through Strategic commitments,* highlighting an *Income-based focus*. They offer *Healthy, green, and local products and services*. To deliver this products and services, they are developing a *Sustainable supply chain* and s*uppliers' development practices*, offering *Community financial educational tools,* and investing in *Green infrastructure,* to reduce *GHG emissions* and *Climate change*.

From a general *Customers' focus* perspective, they are offering *Wide products, services, and merchandise* with *Fast convenience services* approach, *Improving shops' location,* and a *Credit and Cash flow or Moving inventory* focus. In terms of *Fast convenience services*, they are investing on *Digital platform development capabilities*, backed up by *Data management and protection, and Cyber security* resources. They are also *Improving shops' location* to offer a *Good shop location* supported by *Store service improvement and automation* capabilities. Finally, a *Credit and Cash flow or Moving inventory focus* to offer *Credit customer services* initiative, with the help of *Customer rewards* capabilities.

From a Colleagues or Employees *& Regulators* perspective, they have a *Corporate governance Regulation, Collaboration, and Compliance approach*, as well as looking after *Economic sanctions and Political issues*, focusing those that apply to the *Chief Financial Officer (CFO)* and *Shareholders*. The main **Internal support infrastructure** capabilities mentioned are *Colleague support, Expert leadership development, Recruitment programs, and Training and skilling* resources. Also, they mention *Communication and Working* capabilities, like *Events, Reports and Statements, Teams, Unions' partnerships, Negotiation, Groups, Forums, Centers, and Meetings*.

To develop all these initiatives, Retailers highlight specific **Support Infrastructure**, such as *Operational improvement simplification* and *Enterprise Risk Management Framework* capabilities, as well as *M&As, Joint Ventures, Partnerships and Alliances*.

The common goals highlighted are in terms of *Social & Environmental sustainability*, specifically mentioning *Gender & cultural balance and diversity*, *Environmental and Social consciousness*, and *Employee & supplier wellbeing,* including *fair payment, health* and *safety.* In terms of *Economic profitability*, they continue to focus on *Economic and Financial competitive performance*, and of course maintain *Operational resilience.*

FIGURE 9.6.A RETAILERS' STRATEGIC REPORTS' SYSTEMIGRAM STORYBOARD

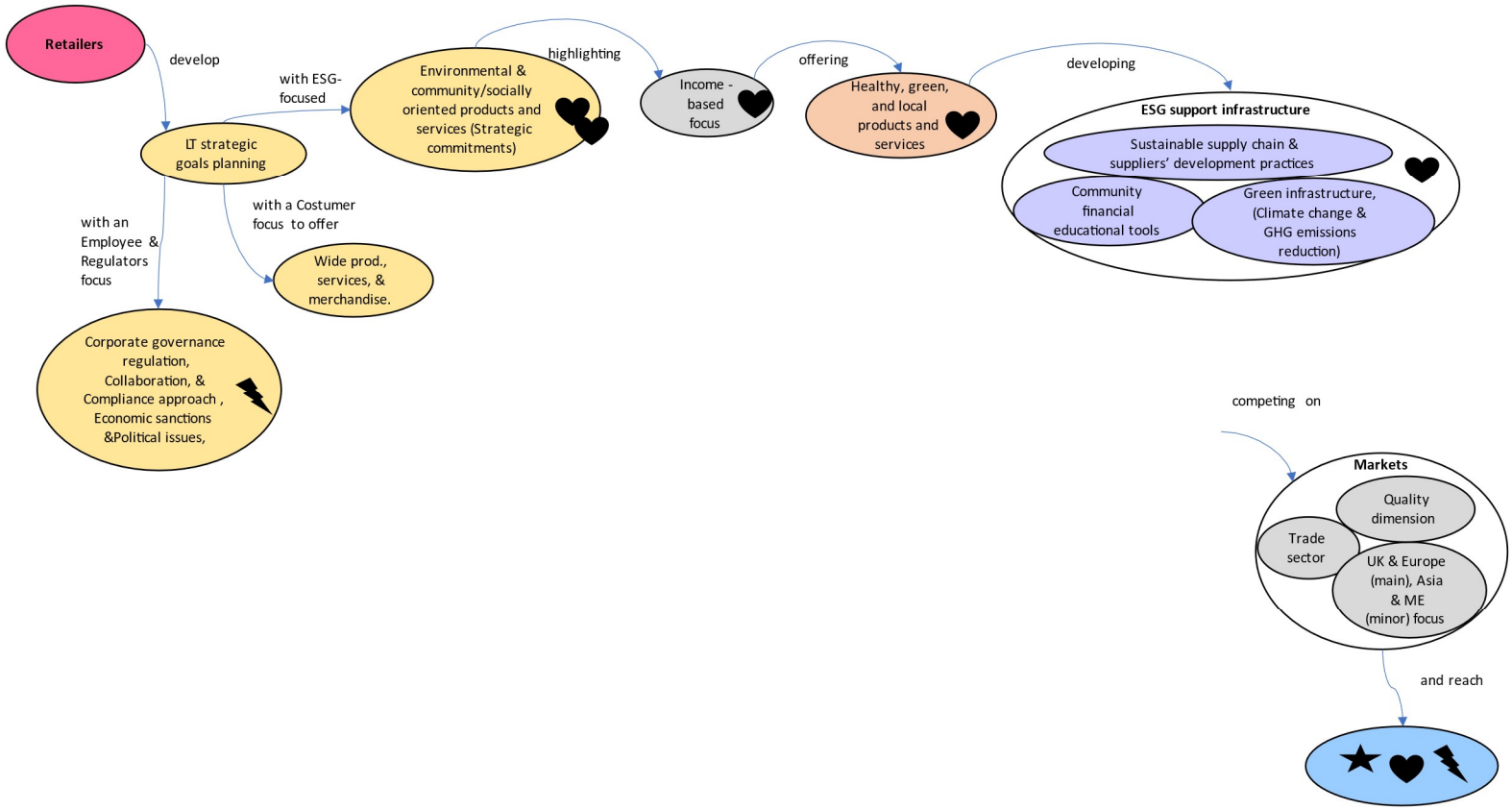


FIGURE 9.10.B RETAILERS' STRATEGIC REPORTS' SYSTEMIGRAM STORYBOARD

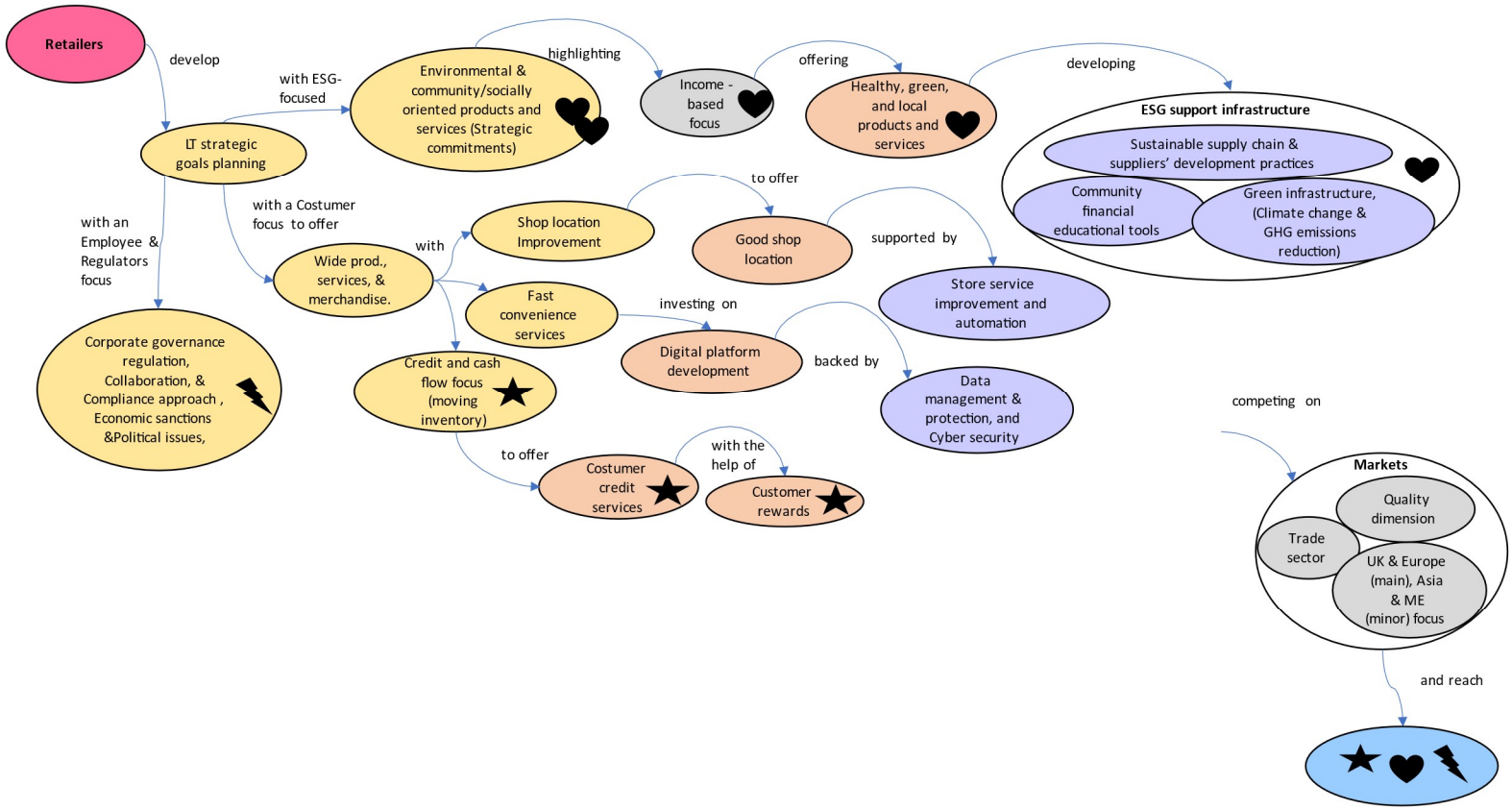


FIGURE 9.10.C RETAILERS' STRATEGIC REPORTS' SYSTEMIGRAM STORYBOARD

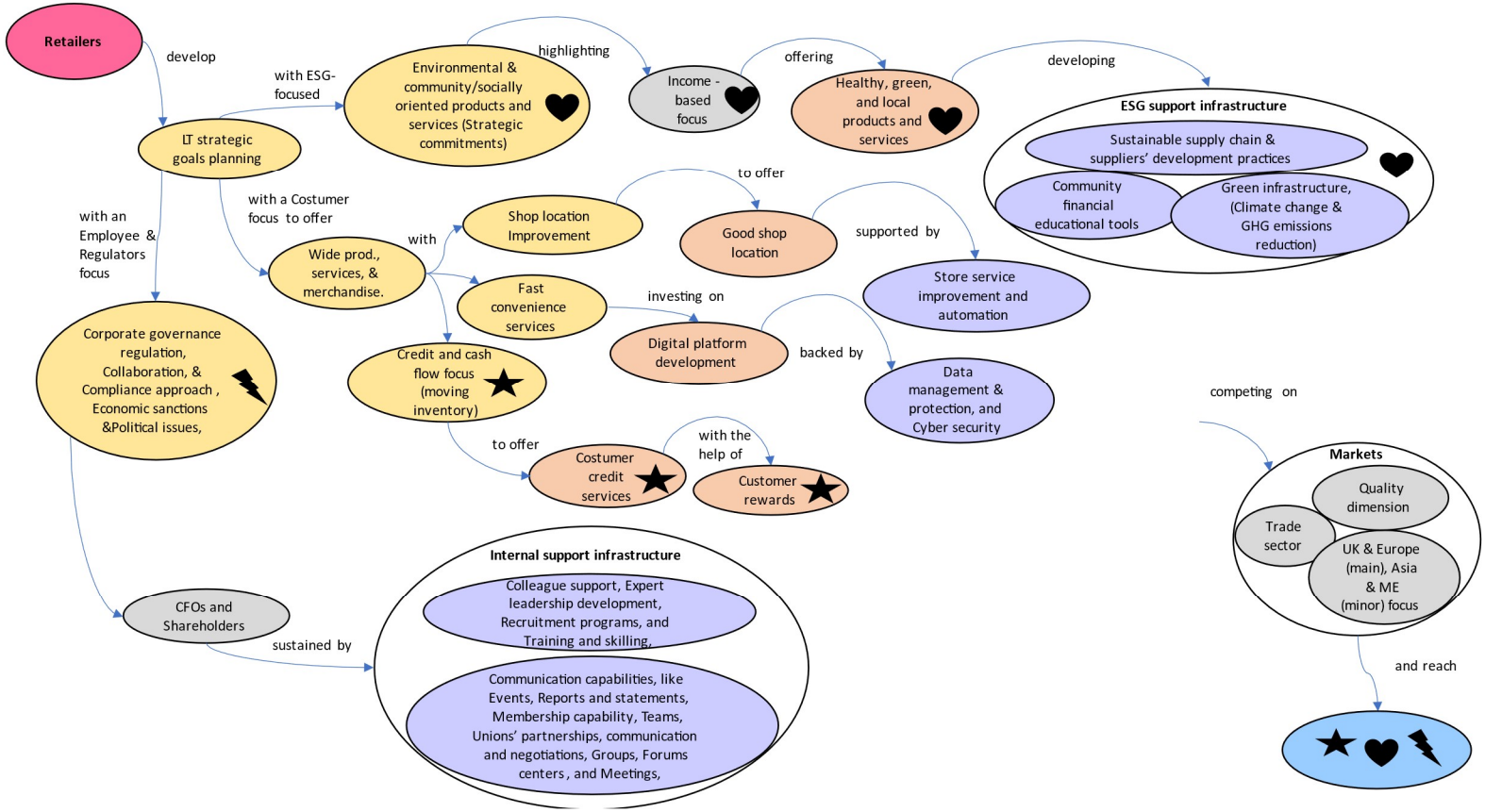


FIGURE 9.10.D RETAILERS' STRATEGIC REPORTS' SYSTEMIGRAM STORYBOARD

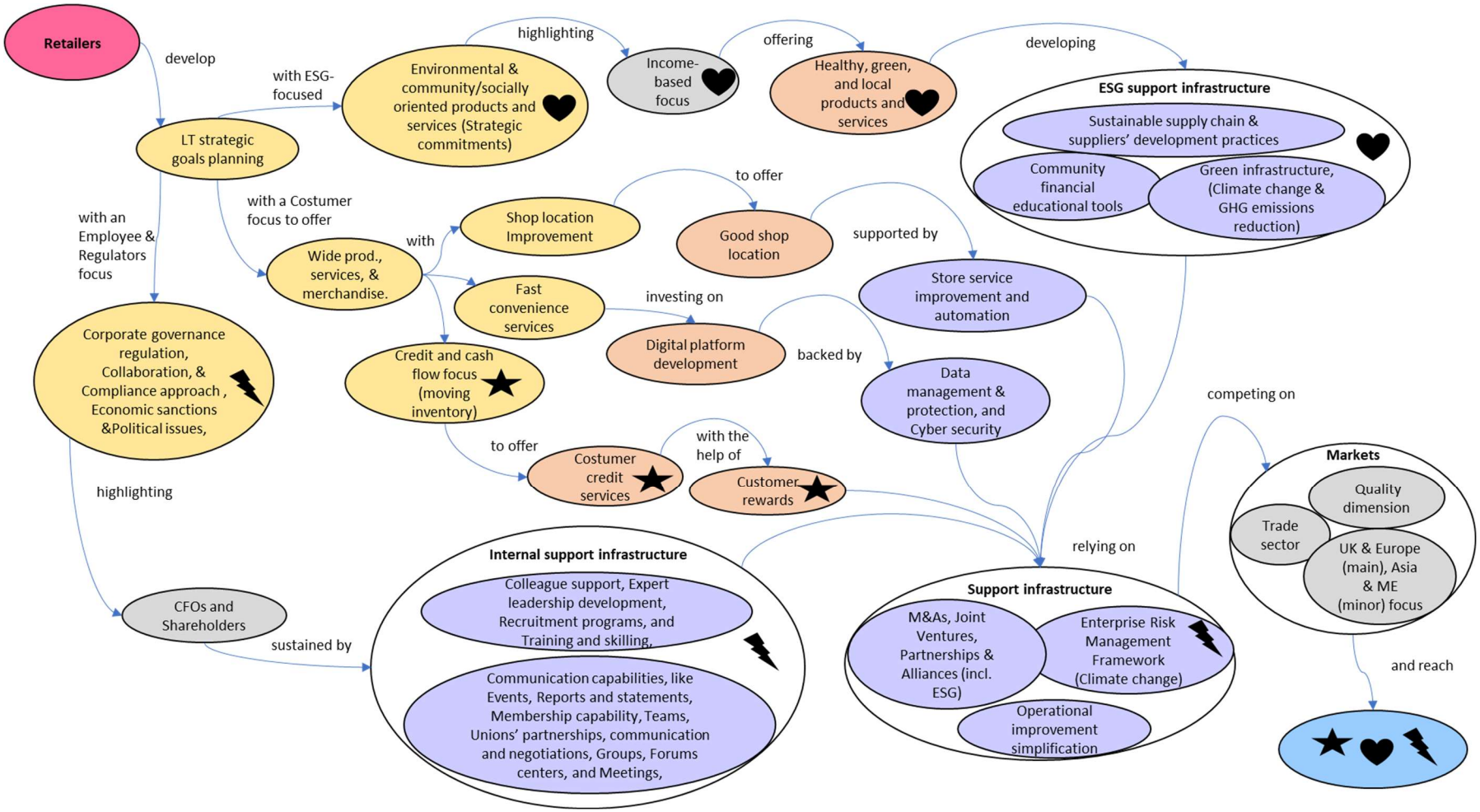


FIGURE 9.10.E RETAILERS' STRATEGIC REPORTS' SYSTEMIGRAM STORYBOARD

C.1.4 Retailers' degree of operational resilience alignment

In the following figures, the different strategic factors identified in the retailers' strategic reports and analyst reports are classified based on the CERT ® operational resilience framework areas and sub areas, based as well on the common, shared, and specific clustering.

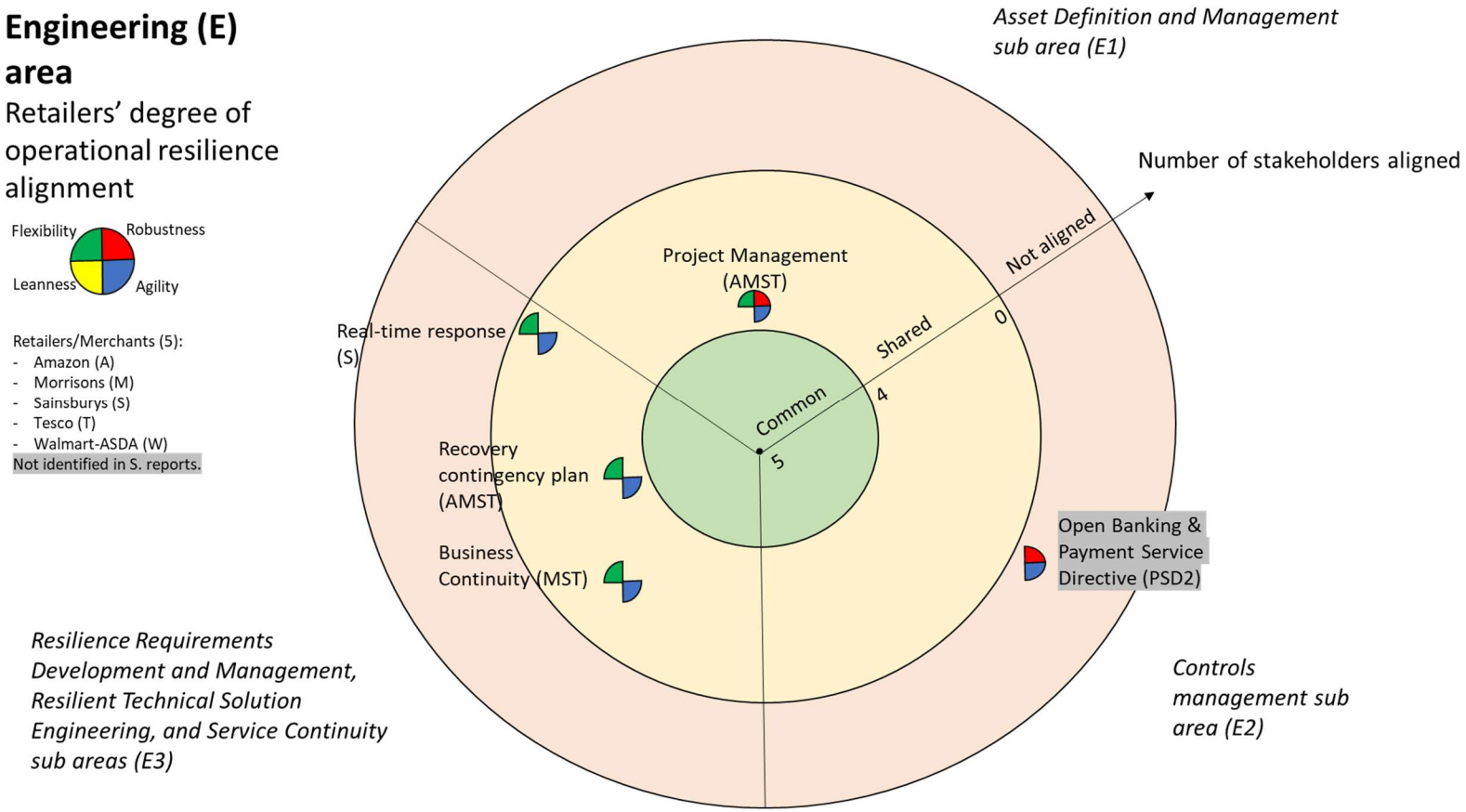


FIGURE 9.7 ENGINEERING AREA RETAILERS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

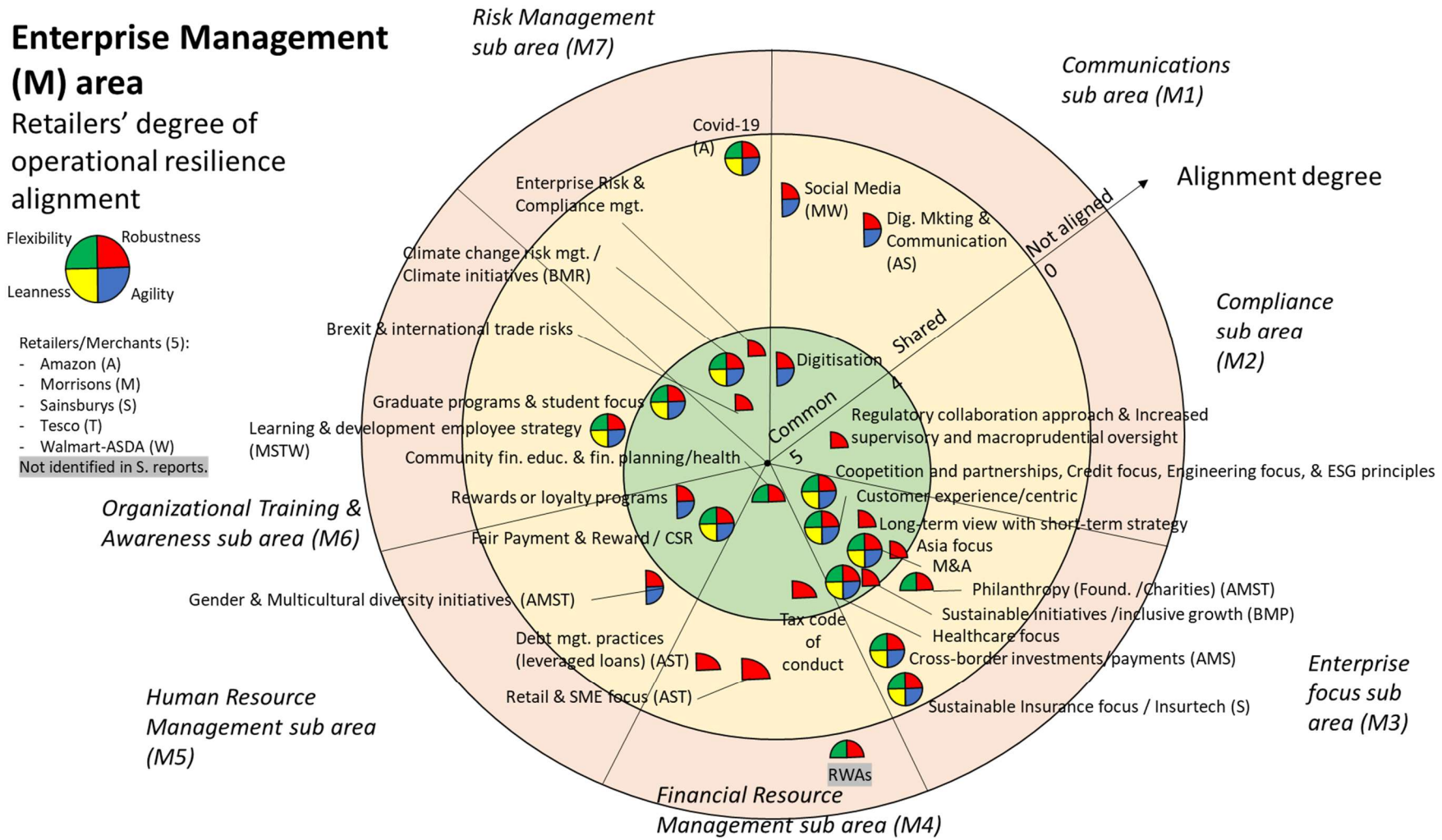


FIGURE 9.8 ENTERPRISE MGT. AREA RETAILERS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

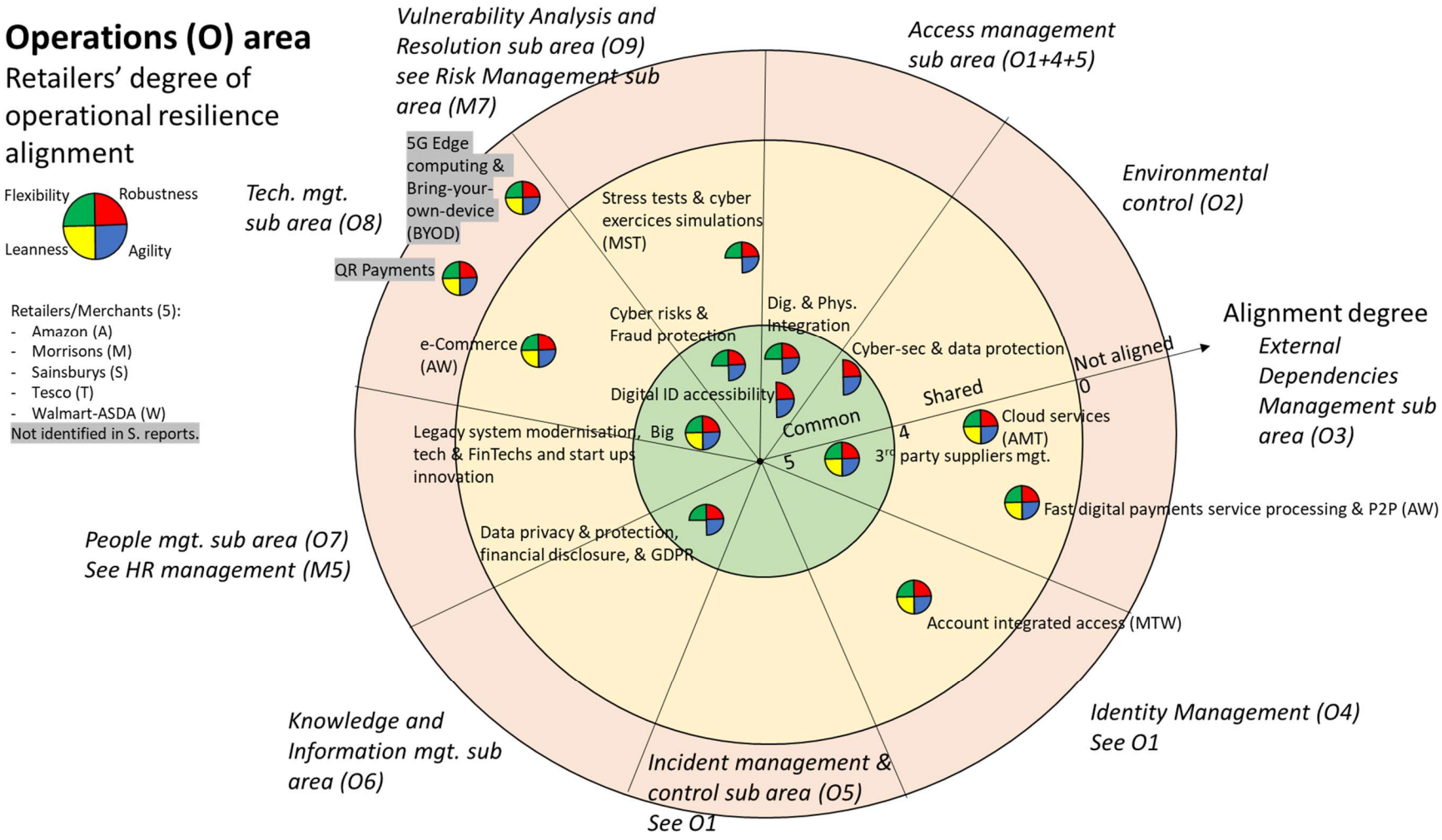


FIGURE 9.9 OPERATIONS AREA RETAILERS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

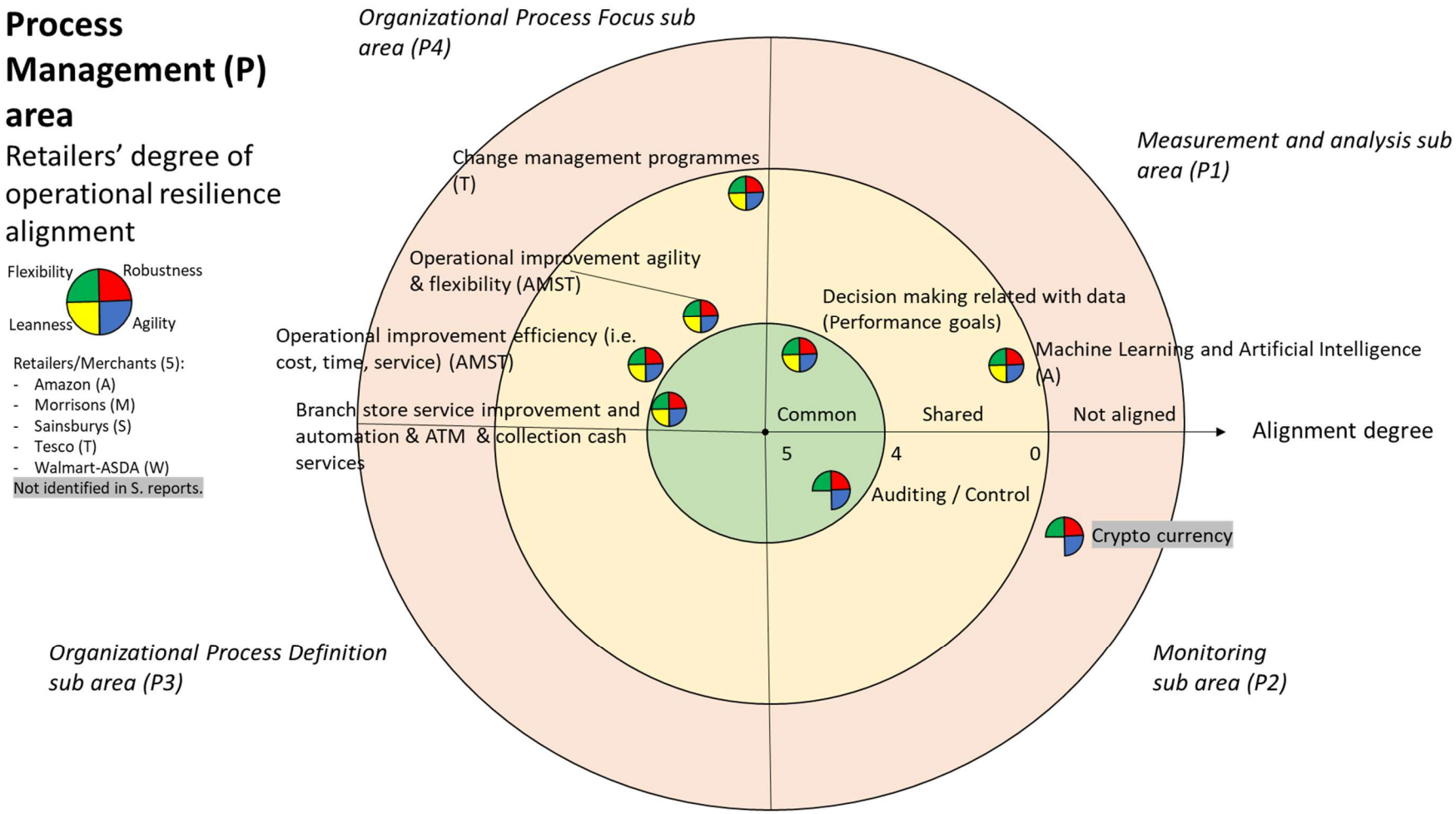


FIGURE 9.10 PROCESS MGT. AREA RETAILERS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

C.2 Payment networks

C.2.1 Payment networks' dictionary-based factor clustering results

Payment Networks level analysis

PESTEL categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Political_Organizational	119	89	17.62%
Economic_Financial	57	35	6.93%
Socio-Cultural_Demographic	60	40	7.92%
Technological_Methodological	168	124	24.55%
Environmental_Societal	65	31	6.14%
Legal_Ethical	46	26	5.15%
Acquirers' identified factors		345	68.32%
Grand Total	515	505	98.06%

TABLE 9.10 NUMBER OF FACTORS PER PESTEL CATEGORY AT A PAYMENT NETWORKS' LEVEL ANALYSIS

Note: Percentages are related to the Factors Identified (505)

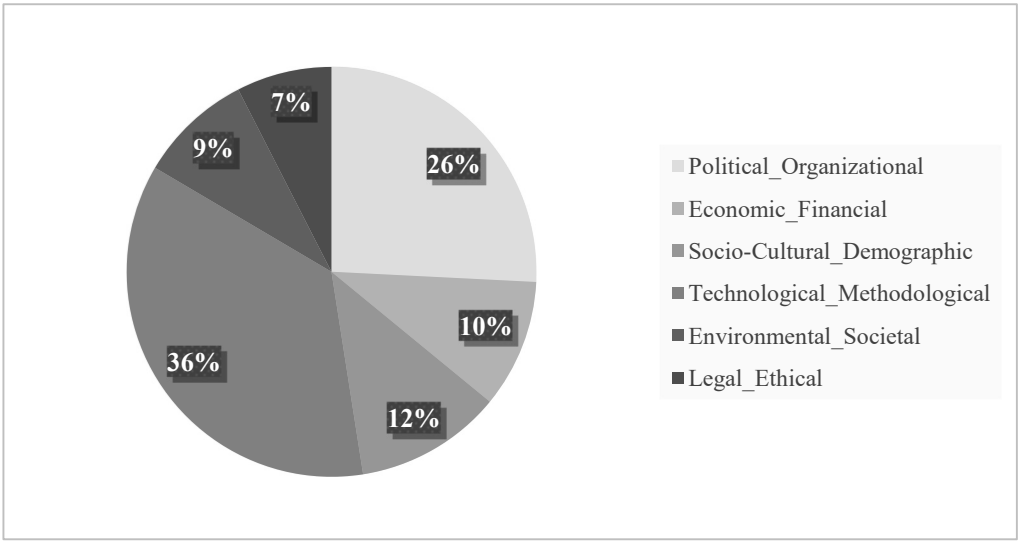


FIGURE 9.11 PERCENTAGE OF FACTORS PER PESTEL CATEGORY

PESTEL categories	American Express (A)	Discover (D)	Mastercard (M)	Visa (V)
Political_Organizational	64	74	48	60
Economic_Financial	29	29	11	14
Socio-Cultural_Demographic	26	24	20	29
Technological_Methodological	76	83	89	89
Environmental_Societal	27	17	18	21
Legal_Ethical	21	19	16	15
Grand Total	243	246	202	228

PESTEL categories	American Express (A)	Discover (D)	Mastercard (M)	Visa (V)
Political_Organizational	26.34%	30.08%	23.76%	26.32%
Economic_Financial	11.93%	11.79%	5.45%	6.14%
Socio-Cultural_Demographic	10.70%	9.76%	9.90%	12.72%
Technological_Methodological	31.28%	33.74%	44.06%	39.04%
Environmental_Societal	11.11%	6.91%	8.91%	9.21%
Legal_Ethical	8.64%	7.72%	7.92%	6.58%
Grand Total	48.12%	48.71%	40.00%	45.15%

TABLES 9.11 & 9.12 NUMBER OF FACTORS PER PESTEL CATEGORY PER PAYMENT NETWORK

Stakeholders' categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Colleagues	66	38	7.52%
Customers	176	125	24.75%
Investors and Board	103	73	14.46%
Regulators, Governments, and Policy Makers	104	71	14.06%
Society/Communities/Environment	48	25	4.95%
Suppliers and Strategic partners	18	13	2.57%
Banks' identified factors		345	68.32%
Grand Total	515	505	98.06%

TABLE 9.13 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY AT A PAYMENT NETWORKS' LEVEL ANALYSIS

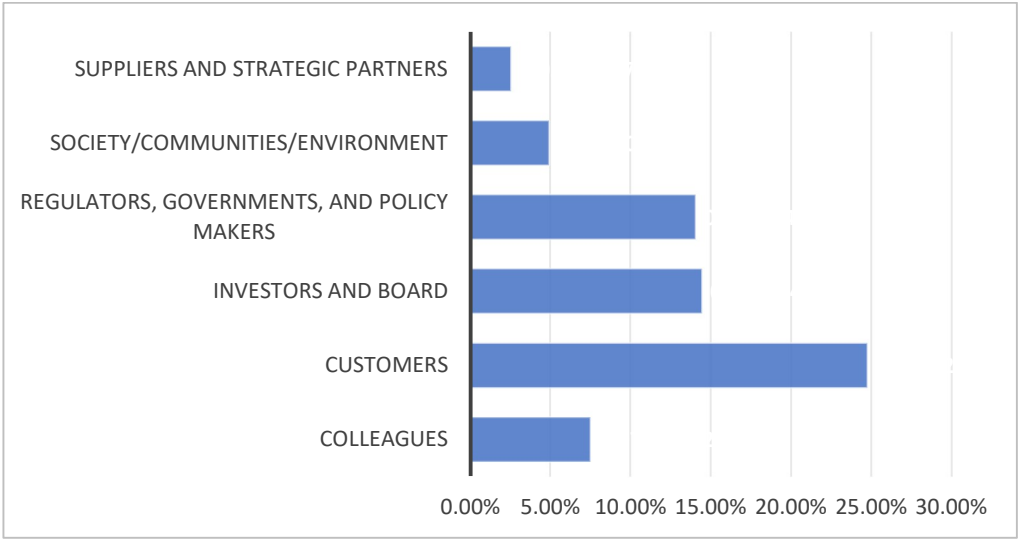


FIGURE 9.12 PERCENTAGE OF FACTORS PER STAKEHOLDERS' CATEGORIES

Stakeholders' categories	American Express (A)	Discover (D)	Mastercard (M)	Visa (V)
Colleagues	24	28	26	27
Customers	75	84	81	86
Investors and Board	54	55	39	49
Regulators, Governments, and Policy Makers	59	51	31	38
Society/Communities/Environment	21	17	14	17
Suppliers and Strategic partners	10	11	11	11
Grand Total	243	246	202	228

Stakeholders' categories	American Express (A)	Discover (D)	Mastercard (M)	Visa (V)
Colleagues	9.88%	11.38%	12.87%	11.84%
Customers	30.86%	34.15%	40.10%	37.72%
Investors and Board	22.22%	22.36%	19.31%	21.49%
Regulators, Governments, and Policy Makers	24.28%	20.73%	15.35%	16.67%
Society/Communities/Environment	8.64%	6.91%	6.93%	7.46%
Suppliers and Strategic partners	4.12%	4.47%	5.45%	4.82%
Grand Total	100.00%	100.00%	100.00%	100.00%

TABLES 9.14 & 9.15 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY PER PAYMENT NETWORK

Number of sharing organizations	Sharing factors count	Percentage	Organizational cluster	Sharing factors count	Percentage
4	119	23.56%	ADMV	119	23.56%
3	68	13.47%	ADM	12	2.38%
			ADV	21	4.16%
			AMV	23	4.55%
			DMV	12	2.38%
2	81	16.04%	AD	38	7.52%
			AM	4	0.79%
			AV	9	1.78%
			DM	9	1.78%
			DV	8	1.58%
			MV	13	2.57%
1	77	15.25%	A	17	3.37%
			D	27	5.35%
			M	10	1.98%
			V	23	4.55%
Total	345	68.32%		345	68.32%

TABLE 9.16 SHARED FACTORS BY NUMBER OF PAYMENT NETWORKS CLUSTERED AND ORGANIZATIONAL CLUSTERS

	A	D	M	V
A		190	158	172
D			152	160
M				167
V				

	A	D	M	V
A		37%	31%	33%
D			30%	31%
M				32%
V				

TABLE 9.17 SHARED FACTORS BETWEEN ANY TWO PAYMENT NETWORKS

C.2.2 Payment networks' strategic reports' categorization and clustering

In this section, we first summarise some relevant categorization and clustering statistics, detailed in the tables and figures in the previous sub section. Then a brief description of the relevant factor findings is given. The strategic factors categorization and clustering results can be graphically seen in Figures 9.17, 9.18, and 9.19. The organization clusters are referred by their initial letter: American Express (A), Discover (D), Mastercard (M), and Visa (V). From the total 515 factors, only 345 factors were detected (67%).

In the *PESTEL categorization*, Technological and Methodological (24.55%) is the most frequent, followed by Political and Organizational (17.62%) and Socio-cultural and Demographic (7.92%). Amex mentions more Economic and Financial (11.93%) and Environmental and Societal (11.11%) factors than Socio-cultural and Demographic (10.70%), similar to Discover with Economic and Financial (11.79%) factors than Socio-cultural and Demographic (9.76%). In terms of *stakeholder's categorization*, 24.75% of the factors are focused on Customers, 14.46% on Investors and Board, and 14.06% on Regulators, Governments, and Policy Makers. Only Amex mentions more factors in terms of Regulators, Governments, and Policy Makers (24.28%), than Investors and Board (22.22%).

The strategic factors' *organizational clustering* shows 23.56% shared by all payment networks, 13.47% shared by three, 16.04% by two, and 15.25% payment network specific. In the shared by three and two tier, the largest cluster is AD with 7.52%, then AMV with 4.55%, and ADV with 4.16% and all other are under 3%, most of the factors in the *Technological and Methodological* category.

By comparing all the shared factors, without tiering them, the two most similar are American Express and Discover with 37% of the total factors, while Discover and Mastercard the least similar with 30%. Most of these factors are in the *Technological and Methodological* category, followed by the *Political and Organizational*, and then the *Socio-cultural and Demographic*.

The next paragraphs detail Figures 9.17 to 9.19 PESTEL categorization and clustering analysis of all shared initiatives. For the PESTEL tiering analysis, please refer to the figures 5.1- 5.6.

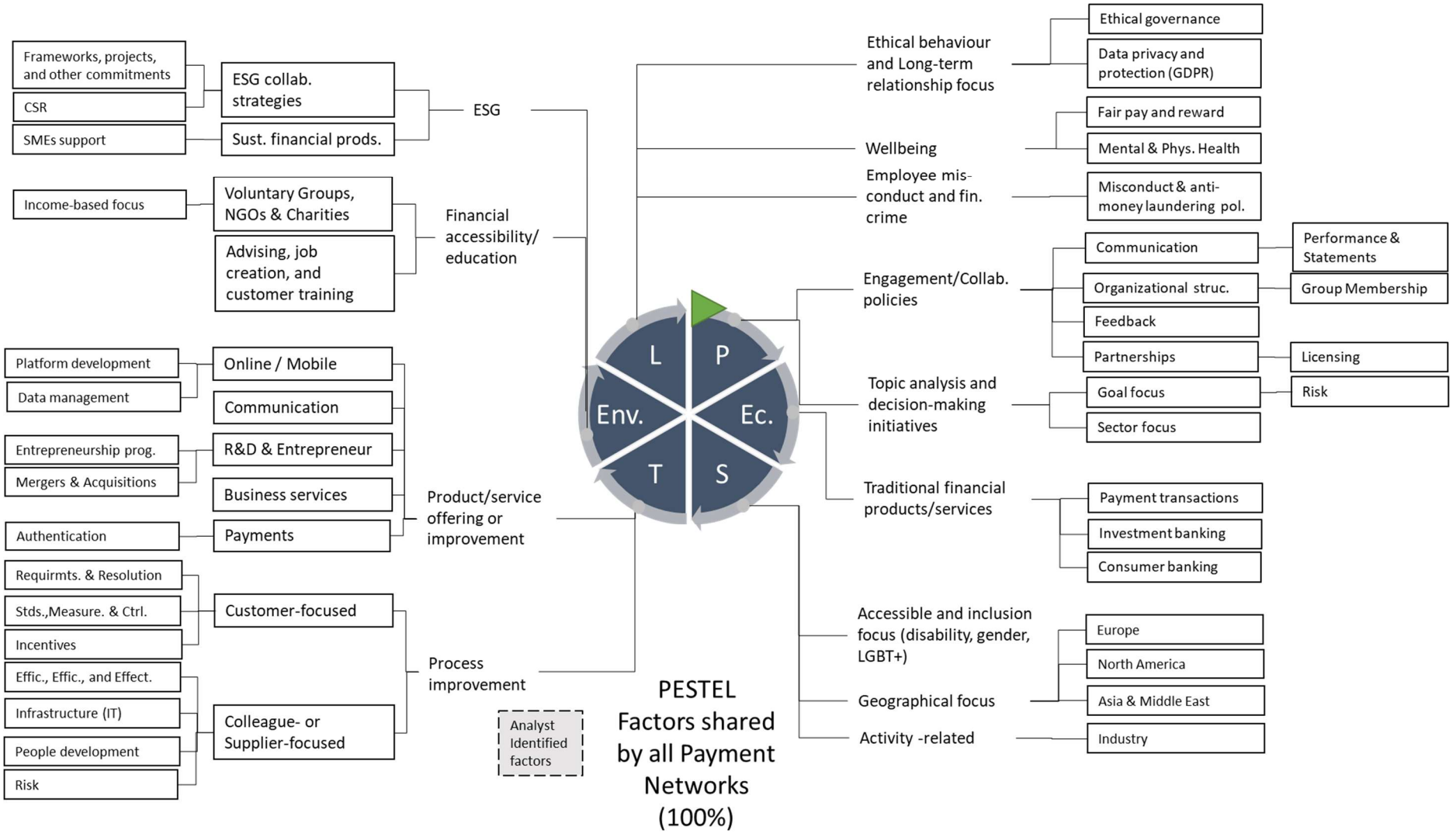


FIGURE 9.13 STRATEGIC FACTORS SHARED BY ALL PAYMENT NETWORKS

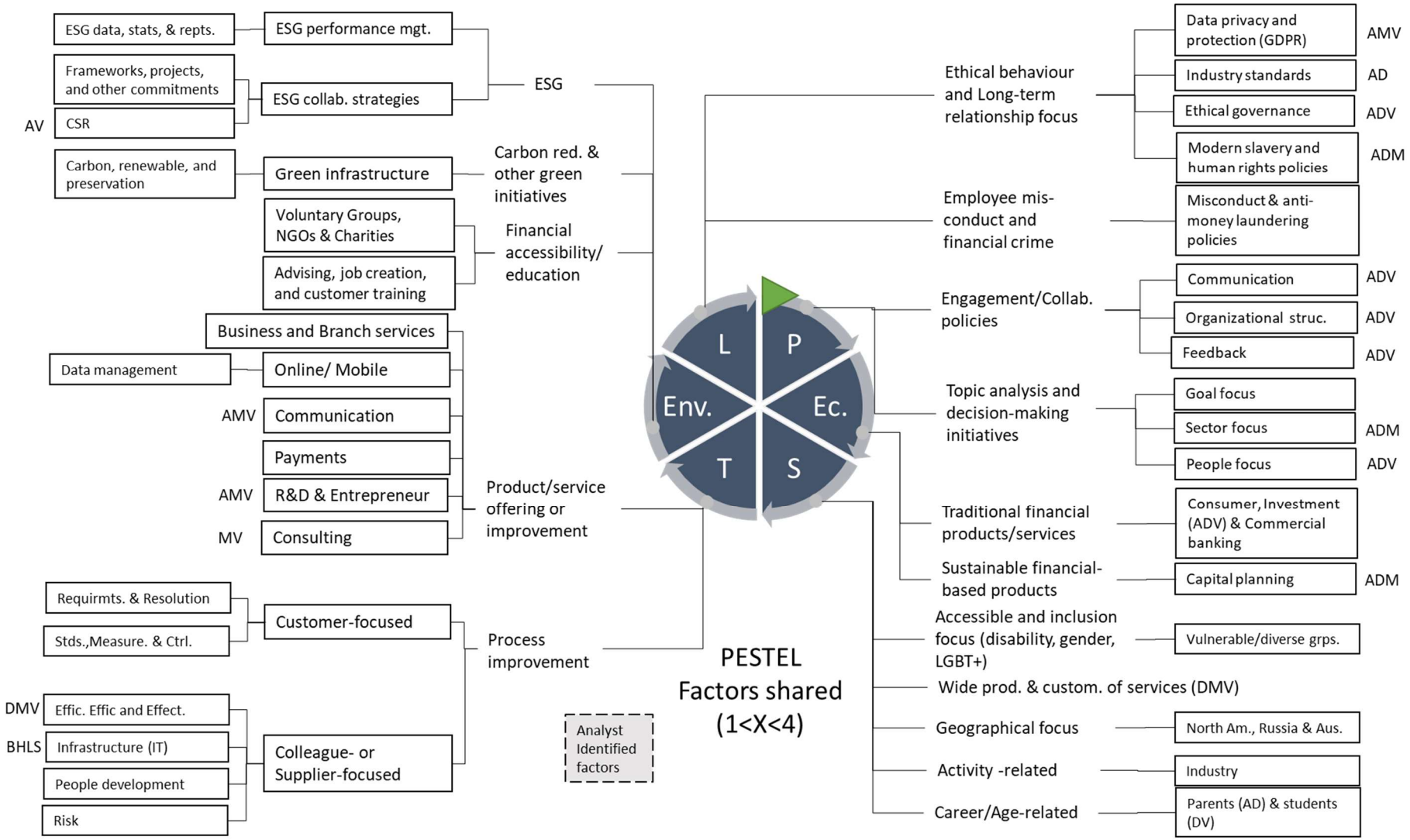


FIGURE 9.14 STRATEGIC FACTORS SHARED BY 3 AND 2 PAYMENT NETWORKS

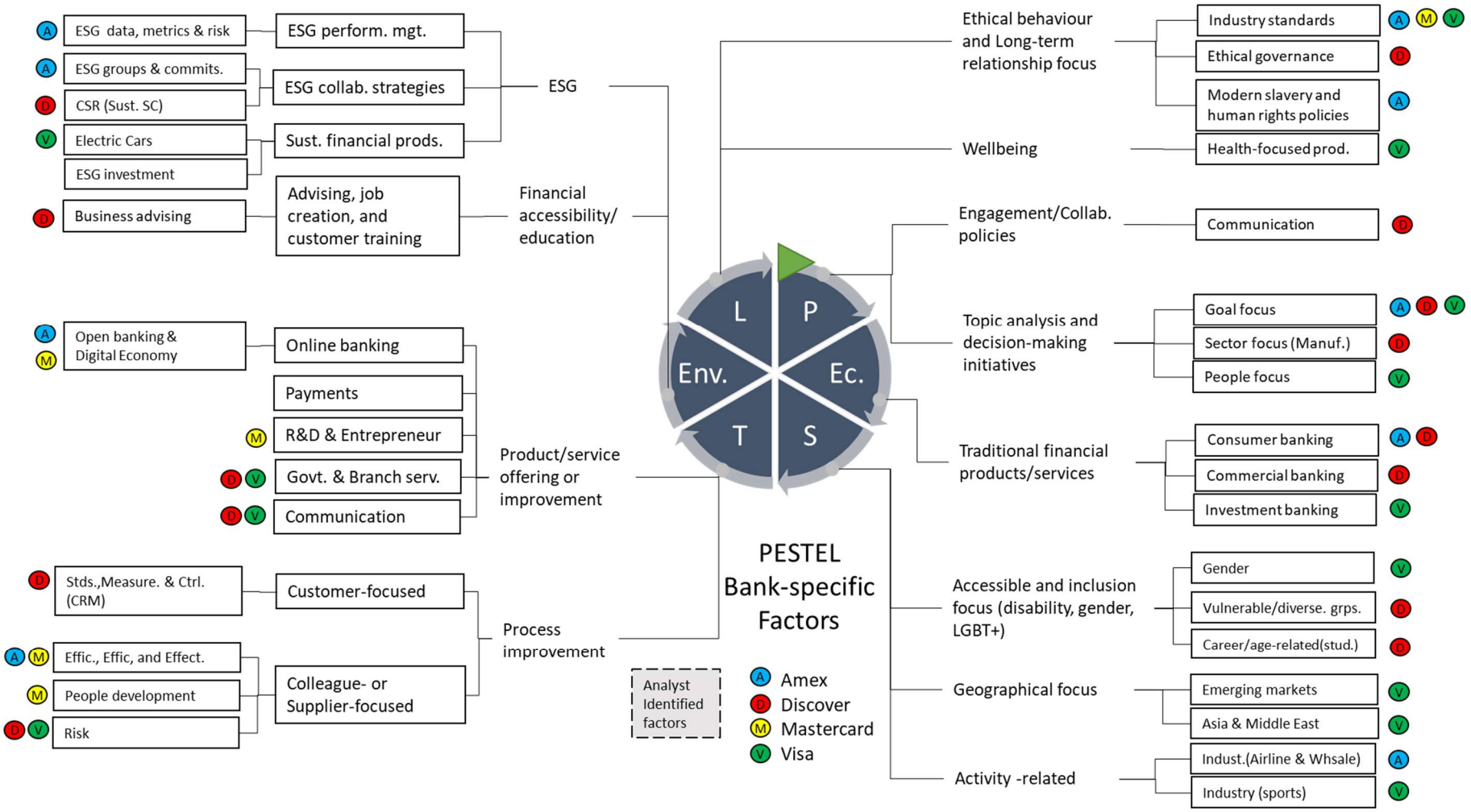


FIGURE 9.15 STRATEGIC FACTORS SPECIFIC BY PAYMENT NETWORKS

For the ***Technological and Methodological (T&M)*** factors, in terms of *product or service offering or improvement*, all payment networks focus on *Business Services* (B2B), *Entrepreneurship*; in terms of Innovation program and Mergers and acquisitions, and *Mobile and Online* capabilities; such as Biometric authentication, Data management, Fintech, Digital, Online, or Mobile banking capabilities and Platform portal development. In the *Payments* area, they mention a Credit card focus, Cross-border payment solutions, Merchant acquiring solutions, Payment integration capabilities, a POS focus, Card issuance, Electronic payments, Transaction processing, and Check services.

Regarding shared initiatives by 2 or 3 payment networks, related with *Branch services*, they include Branch store service improvement and automation (DMV). In *Business services*, they mention Business travel mobility (ADV), and in *Communication*, Digital marketing (AD) and Virtual reality (AMV). In *Consulting and* in *Entrepreneurship*, they include Consulting customer capability (AMV) and Ventures (MV) initiatives. In *Mobile and Online*, they highlight eCommerce (DMV), Integrated access capabilities (AV), P2P (MV), Personal data app management capabilities (DM), Social media and web chat bots customer communication (ADM), Digital credentials (DMV), As-a-service approach (MV), and Data Processing (AV). On *Payments*, they include ATM cash services (DMV), Banking collection services (ADM), Cash services (DMV), Checkout capabilities (MV), contactless payment (DMV), Crypto digital currency (AMV), Fast digital payments service process (MV), PSD2 (AMV), Authorization capability (AMV), Automated clearing house (AMV), Card acceptance (ADV), UnionPay (AMV), Closed loop architecture (AV), Tokenizing (MV), Switching capabilities (DM), Chargebacks (DMV, Prepaid card (AD) and Payment processing (DV).

In terms of specific initiatives, related with *Branch services,* they mention Face to face (V) and Local retailers or post office cash services (D). On *Communication*, they include Multi channel communication (DV), Printed communication (D), and Web chat capability (V). On *Government services*, they include Government solutions (G2C) (V). On *Online & Mobile* capabilities, they include Open banking (A), Digital economy (M), and Digital players (M). On *Payments*, they mention Smart card managing capabilities (M), Invoice

capabilities (A), Alternative payments (M), Transaction securitization (D), Buy now pay later (BNPL) (V), Money transfer services (A), and Payroll cards (M).

Related with process improvement, all payment networks focus on *Efficient, effective, efficacious*, mentioning Process streamlining, Operational improvement in service, Operational improvement in terms of simplification, and Fast convenience services. On *Incentives,* they include Customer reward programs. On *IT infrastructure*, they mention Cyber security and data protection and IT and communications improvement. Related with *People development*, they highlight Career development, Employee leadership development program, Expert leadership development, Recruitment programs, Training and skilling, and Vendor management. Also, they include *Requirements*, as an important approach. On *Risk Management,* they mention an Enterprise Risk Management Framework, Risk Impact mitigation strategies, Fraud capabilities, and a Mitigation approach. On *Standards, measurement, and control*, they include Analytics insights, Performance management capabilities, Performance goals measurement, Machine learning and artificial intelligence, a Monitoring capability, a Reviewing capability, Assessments and reports, and Industry standards.

Regarding shared initiatives by 3 and 2 payment networks, on *Efficient, effective, efficacious capabilities,* they mention a Fast resolution process (MV), Operational improvement related with efficiency (DMV), Operational improvement in terms of faster time (MV), Process improvement initiatives (MV), and a Real-time response (AMV), On *IT infrastructure,* they highlight a Cloud based digital environment (AD). On the *People development* category*,* they highlight Colleague benefits (AD), Colleague engagement policies (DV), and Colleague support (DMV). They mention *Resolution*, as a Resolving capability (ADM), and *Risk capabilities,* such as Model risk (AD), Stress testing (AD), and Business continuity (DMV). In terms of *Standards, measurement, and control,* they include Blockchain (AMV), Surveys (AD), Customer satisfaction and trust scores (AD), Scorecards (DMV), a Measuring capability (ADV), an Audit capability (AD), and Policies procedures (DM).

In terms of bank-specific initiatives, related with *Efficient, effective, efficacious capabilities*, they include Customer feedback (D), Operational improvement in cost (M),

and Operations improvement on agile implementation (A). On *People development*, they include People digital capabilities development (M) and Workshops and bootcamp (M). On *Research and Development,* they highlight Research science (M); and in *Risk Management*, they include Accountability (D), Recovery contingency plan (V), Resilience focus (V). On *Standards, measurement, and control*, they mention a Project or programme management approach (V) and CRM (D).

On the ***Environmental and Societal*** factors category, all retailers focus on Carbon reduction & other green initiatives, such as developing a *Green infrastructure*. *ESG collaboration strategies*, and highlight an *ESG approach*, in terms of *Frameworks, projects, and other commitments*, like ESG partnerships and trusts. In *CSR*, they include a Supply chain or suppliers focus. On *Sustainable financial products*, they focus on ESG SME financing services and support. On *ESG performance management*, they include *ESG data, stats, and reports*, and *Financial accessibility & education*, such as, *Advising, job creation, and customer training* related with Community financial accessibility programmes, Community financial education, and Strategic commitments. In *Voluntary Groups, NGOs & Charities*, they mention Foundation and fundraising programs and an Income-based focus.

In terms of shared initiatives, Carbon reduction (AV) & other green initiatives, such as Climate (AMV), are mentioned. In terms of *Green infrastructure* (ADV), they also mention Preservation and safeguarding (AM) initiatives. On *ESG collaboration strategies*, such as, *Frameworks, projects, and other commitments*, they include Sustainable Initiatives (AMV) and Principles (ADV). Related with *CSR*, there is a Corporate Responsible culture (AV). In terms of *ESG performance management*, such as *ESG data, stats, and reports*, they highlight risks like Climate change (AMV), Natural disasters (ADV), and Pandemics (AV). In terms of *Financial accessibility & education,* in relation with *Advising, job creation, and customer training*, they refer to Academy or school workshop education (ADM) and Financial educational tools (AMV); and in terms of *Voluntary Groups, NGOs & Charities*, Charities (ADM), Donations (AD), Financial inclusion (MV), and NGOs (AM) are mentioned.

In terms of specific initiatives, the initiatives mentioned are related with *Carbon reduction (AV) & other green initiatives,* such as Climate (AMV), and *Green infrastructure*, in terms of Electric cars (V). On *ESG collaboration strategies*, in relation to *Frameworks, projects, and other commitments*, they highlight ESG groups and committees (A), and on *CSR*, Supplier accountability (D). Related with *ESG performance management*, specifically *ESG data, stats, and reports,* they mention ESG recognition (A) and the Coronavirus pandemic (A). In the case of *Financial accessibility & education*, in the subcategory of *Advising, job creation, and customer training*, Business advising (D) is included.

In the ***Socio-cultural and Demographic*** classification, all payment networks include an *Accessibility and inclusion focus (disability, gender, LGBT+),* in terms of *Vulnerable or diverse groups* with an Inclusion focus. In terms of *Activity-related* and *Industry*, they highlight a Trade focus. In terms of *Geographical focus*, the spotlight is on Asia, Europe, U.S. and Latin America. Also mentioning general International/Foreign initiatives, and a United Kingdom or Domestic focus. In terms of *Wide prod. & custom. of services,* they have started strategies on Branded products.

Regarding shared initiatives by 2 or 3 payment networks*, Accessibility and inclusion focus (disability, gender, LGBT+)* in relation with *Vulnerable or diverse groups*, Abuse related initiatives (AD), Accessible services (AM), Gambling-related initiatives (MV), and Multicultural diversity initiatives (ADV) are mentioned. In terms of *Activity-related* and *Industry focus*, they focus on the Services industry (AD), Trading (ADM), and a Quality focus (ADV). In *Career/Age -related initiatives*, they focus on Parental programs (AD) and a Student focus (DV). In terms of *Geographical* focus, they talk about Communist countries (AMV), Australia (AV), Africa (AV), Russia (AMV), Canada (AMV), Mexico (AMV), and North America (DV). Finally, related to *Wide product & customization of services*, in specific, they mention Customization (DM) and a Wide products service range focus strategy (DMV).

In terms of specific initiatives, they focus on *Accessibility and inclusion focus (disability, gender, LGBT+)* in terms of *Vulnerable or diverse groups*, writing about Disability-related initiatives (D), and Gender, such as Gender diversity (V) and Gender balance (V) initiatives. In terms the category of *Activity-related* and *Industry*, they look into the Airline

industry (A), Football sponsorships (V), Olympic paralympic sponsorships (V), and a Wholesale focus (A). In terms of *Career/Age -related* initiatives, they focus on developing Graduate programs (D) and Student loans (D). In relation to *Geographical* focus, they include a Middle east (V), and Emerging markets (V) focus.

For the ***Political and Organization*** category, all payment networks focus on *Engagement and collaboration policies*, developing *Communication capabilities* with a Cultural focus, and including promoting Events, Reports, and statements, especially Financial statements, also looking for *Feedback sources*, from a Regulatory approach and Regulator collaboration perspective. In relation with *Organizational structure,* they mention a Membership capability, working Teams, Unions' partnerships, communication and negotiations, Groups or forums, Licensing agreements, and work Meetings. They include *Partnerships*, such as Alliances and Sponsorships. In terms of *Topic analysis and decision-making*, their *Goal focus* is on *Risk*, such as Risk management initiatives, Economic sanctions, Liquidity risk, Material adverse effect, Reputational risk, the Corrupt practices act, and Geopolitical risk; other *General topics* are a Credit focus, a Customer consumer focus, a Regulation and compliance focus, a Lending focus, an Office location focus, a Profitability focus, a Payments focus, Segmenting capabilities, Political issues, Negative views, and a Competitive focus. In terms of *Sector focus*, they spotlight Merchants, Retailing, Technology, and innovation, Third-party suppliers, and Government, as their main sectors.

In terms of shared initiatives, on *Engagement and collaboration policies*, they mention *Communication capabilities*, like Councils (DV), on *Feedback sources*, they mention Benchmarking (ADV), Accounting policies (AD), and Holding company practices (AD). On Organizational structure, they include Committees (ADV), the Basel committee (AD), and Credit unions (ADV). In terms of *Topic analysis and decision-making*, the *Goals' focus* on *General* topics, is on an Employment job creation focus (DV), a Complaint focus (MV), a Debit card focus (DV), Entrepreneurial initiatives (AMV), Corporate governance (AD), Learning and training employee strategies (DM), Financial indicators (AD), Joint ventures (AMV), Monetary policies focus (AD, Positive views (DM) and a Productivity focus (MV). In terms of *Risk*, they focus on Operational risk (ADM), Compliance risk (AD), Credit risk

(ADV), Foreign exchange risk (ADV), Information security risks (DM), Brexit (AMV), Legal risk (ADV), Market risk (ADV), Resolution planning critical functions (AD), Drug dealing (AD), Financial crisis (AD), and Emerging risks (DV). In terms of *People's focus*, they centre on the CEO roles (ADV), and in the *Sector focus*, they focus on a Consultative employee capacity (DM), a Shareholder focus (DM), and a Major banks focus (AD).

Regarding specific initiatives, on *Engagement and collaboration policies*, such as *Communication capabilities*, they include Feedback (D) and Letters and briefs (D). On *Topic analysis and decision-making* in terms of *Goals' focus*, from *General* perspective, they include a Collaborative focus (V), an Onboarding process focus (V), Topic analysis decision making (V), a Long-term focus (A) and Strategic business planning (D). In terms of *Risk*, they mention Financial risk (D), Libor transition (A), the Dodd frank act (A), Network Exclusivity (V), a Planning risk (D), a Strategic risk (D), an Inventory risk (D, Operational resilience (V), and a Systemic risk (A). In terms of *People's focus*, they centre in the Vice president (V) role, and in the *Sector focus*, the sector mentioned is Manufacturing (D).

In the ***Ethical and Legal*** category, all payment networks focus on *Employee misconduct and financial crime*, related with *Misconduct & anti-money laundering policies* and specifically on Anti money laundering and Corruption policies. Also, in terms *of Ethical behaviour and Long-term relationship focus*, from a *Data privacy and protection (GDPR*) approach, they mention Data privacy and protection, and Intellectual property policies. On *Ethical governance,* they mention Ethical values governance, a Long-term approach, and the Antitrust law. On *Tax policies & Codes*, they mention a Tax code of conduct. In terms of *Wellbeing,* related with *Mental & Physical Health*, they include Employee mental and physical health and safety. Also, they include a Fair payment and reward policy focus.

In terms of shared initiatives by 2 or 3 payment networks, in the *Ethical behaviour and Long-term relationship focus*, we have *Ethical governance* initiatives, such as Deposit insurance (ADV) and Insured deposit (AD). On *Data privacy and protection (GDPR)*, they mention General data protection regulations (AMV). On *Modern slavery and human rights policies*, there is a focus on Counterterrorism (ADM). Also on *Industry standards*, they include Prudential standards (AD), Treasury policies (ADM), and a Policymaking (AD)

focus. In terms of *Employee misconduct and financial crime*, related with *Misconduct & anti-money laundering policies*, they include Anti bribery or Corruption (AMV) and Misconduct (ADM) policies.

In terms of specific initiatives, on *Ethical behaviour and Long-term relationship focus*, the *Ethical governance*, focus on Code of conduct (D) and Credit reporting (D); *Industry standards*, such as Trade policy (M), Industry certification (V), and Financial reporting (A). As well as *Modern slavery and human rights policies modern slavery*, and Modern slavery policy (A). In terms of *Wellbeing*: Health focused products (V).

On the ***Economic and Financial*** category, all payment networks focus on *Traditional financial products/services* with an Economic and Financial focus. In specific, in terms of *Consumer banking*, they highlight a Pricing practice. On *Commercial banking*, they spotlight Transaction fees and Interchange fee rates. And on *Investment banking*, they have an Investment banking focus and Stock market.

Related to shared initiatives, on *Traditional financial products/services* such as *Commercial banking,* they mention Dividend-related initiatives (AD), Fee caps discounts (AV), Merchant discount rates (AM), Reimbursements (AMV), Transaction volumes (ADM) and a Cash flow focus (ADV). In terms of *Consumer banking*, they include Mortgage process improvement and automation (AD), a Debt focus (ADV), Leasing services (AD), and an Interest rate (AD) target. On *Investment banking*, they emphasize Asset finance (ADV), the Common Equity Tier 1 ratio (AD), Investment products and services (ADV), Risk Weighted Assets (AD), Goodwill (AD), a Libor focus (AD), Intangible assets (AD), and Financial instruments (AD). In *Sustainable financial-based products*, related with *Capital planning*, they highlight Financial planning health (ADM) and Capital planning (AD).

In terms of bank-specific initiatives, on *Traditional financial products/services* related with *Commercial banking,* they talk about Balance sheet analysis (D). On *Consumer banking*, they write about Consumer lending services (D), Card loans (D), Card offers (D), a Consumer banking focus (D), and Debt reduction or collection focus (A). In terms of *Investment banking*, there talk about Financial markets (A), and a GDP focus (V).

C.2.3 Payment networks' strategic reports' systemigram

For the Systemigram development, first, a categorisation of the different factors was used with the "Playing to win" framework, as seen in Table 9.18.

	Systems (Infrastructure)	Capabilities (Process)	How we will win?	Where we will play?	Winning aspirations
Definition	Support systems structures, and measures	Set of reinforcing activities and specific configuration	Value proposition and competitive advantage	Geographies, product categories, costumer segments, channels, vertical stages of production	Purpose or guiding aspirations
Factors	T&M: Process streamlining, Operational improvement Cyber security and data protection IT and communications improvement. Career development, Employee leadership development program, Expert leadership development, Recruitment programs, Training and skilling, and Vendor management. Enterprise Risk Management Framework (Fraud), Analytics insight, Machine learning and artificial intelligence, Monitoring and Reviewing capability, Assessment and reports, and Industry standards. E&S: Green infrastructure (Carbon Reduction) P&O: Communication (Events, Reports and statement and Financial statements, Teams, Unions' partnerships and communication and negotiations, Groups or forums, Licensing, and Meetings) L&E: Anti money laundering and Corruption. Data privacy and protection, , Intellectual property & Tax code of conduct Employee mental and physical health and safety, Fair payment and reward policy	T&M: Innovation programs and Mergers and acquisitions ESG partnerships and trusts, Partnerships Alliances and Sponsorships Biometric authentication, Data management, Fintech, Digital, Online, or Mobile banking capabilities and Platform portal development. Credit card, Cross-border payment solutions, Merchant acquiring solutions, Payment integration capabilities, POS focus, Card issuance, Electronic payments, Transaction processing and Check services. Customer reward & Membership programs. E&S: ESG SME financing services and support, Community financial accessibility programmes, Community financial education, and Strategic commitments. Foundation and fundraising programs	T&M: Fast convenience services, management, Performance goals mgt. & measurement S&D: Branded products. Cultural focus, Regulator collaboration Long-term approach and Risk Management (Risk management, Economic sanctions, Liquidity risk, Material adverse effect, Reputational risk, Corrupt practices act, and Geopolitical risk) Regulation and compliance focus, Office location focus, Payments focus, Segmenting, Political issues. E&F: Transaction fees and Interchange fee rates.focus and Investment banking focus and Stock market.	E&S: Income-based focus. S&D: Trade focus Domestic: UK and International: Asia, Europe, U.S. and Latin America Sectors: Merchants, Retailing, Technology, and innovation, Third-party suppliers, and Government.	*P&O:* Customer-led and Inclusive approach *E&S:* Environmentally& socially conscious & resilient S&D: Inclusion *L&E:* Employee & supplier wellbeing & job creation, including fair payment, health and safety. P&O: Economic & Financial Profitability, and a Competitive focus.

TABLE 9.18 PAYMENT NETWORKS' "PLAYING TO WIN" DECISION-BASED FRAMEWORK CATEGORIZATION

Then, the Systemigram prose was developed, as seen in the next paragraphs, alongside, the Systemigram graphic and complete storyboard as seen in Figures 9.20.A-F, shown progressively.

Payment networks are developing *Long Term strategic goals planning* and *Risk management* on 3 main areas: **Payments**, **Organizational management**, and a Socio-cultural focus. In the **Payments** area, they are concentrated on developing *Fast convenience services,* and *Transaction fees and Interchange fee rates focus*. From an **Organizational management** perspective, centred on *Analytics insight* & *Performance management goals*, as well as *Regulation and Compliance,* with a focus on *3rd party suppliers & Government*. Finally, from a more sustainable perspective, on a *Socio-cultural focus*.

The **Payment services** that all payment networks offer are general *Customer credit services*, *Card Issuance*, *Cross-border payments*, and *Check services*. While also focusing on *Merchant acquiring solutions*, such as Points-of-Sale (POS). To provide these services they rely on **Payment support capabilities**, such as *Innovation programs* and *Mergers &Acquisitions, Joint Ventures, Partnerships & Alliances*. On the Customer side, they have *Customer rewards & Membership programs*. And on the IT side, they are developing *Digital & integrated payments platform*, supported by *Data management & Cyber security infrastructure*, such as *Biometric authentication*.

On the **Employee or Colleague capabilities** side, they are relying on *Employee mental and physical health and safety*, and *Fair payment and reward policies*. As well as *Recruitment programs, Career development, Employee leadership development programs, Training and skilling,* and *Vendor management*. While using Communication and Work capabilities such as *Events, Reports, Statement (i.e. Financial statements) Teams, Unions' partnerships and communication, Negotiations, Groups or forums, Licensing, and Meetings*.

On the **Analytics insight & Performance management** goals, they are aided *Business Analytics,* such as *Machine Learning (ML) & Artificial Intelligent (AI), a Monitoring &*

Reviewing capability, *Assessment and reports*, *Industry standards*, *Anti money laundering*, and *Corruption capabilities*. Also, they mention *Data privacy and protection, Intellectual property*, and *Tax policies*. Supported by an *Enterprise Risk Management Framework*, with a focus on *Fraud*, and a *Process streamlining & Operational improvement* capability.

On the *Socio-cultural* side, they include *ESG Community financing & education programs*, with an *Income-based focus*, as well as developing *Foundations & fundraising services* that are supported by *Green infrastructure*, to reduce *Climate change and GHG emissions*.

Mainly focused on competing in the *Trade* sector, related with *Merchants and Retailers, as well as the Technology and innovation sectors*, and geographically looking after the *UK, Europe, and Asia*, mainly but also showing a focus in *U.S. and Latin America.*

The common goals highlighted are in terms of Social & Environmental sustainability, specifically mentioning *Gender & cultural balance and diversity inclusion*, *Environmental and Social consciousness*, and *Employee & supplier wellbeing,* including *fair payment, health,* and *safety.* In terms of Economic profitability, they continue to focus on *Economic and Financial competitive performance*, and of course maintain Operational resilience.

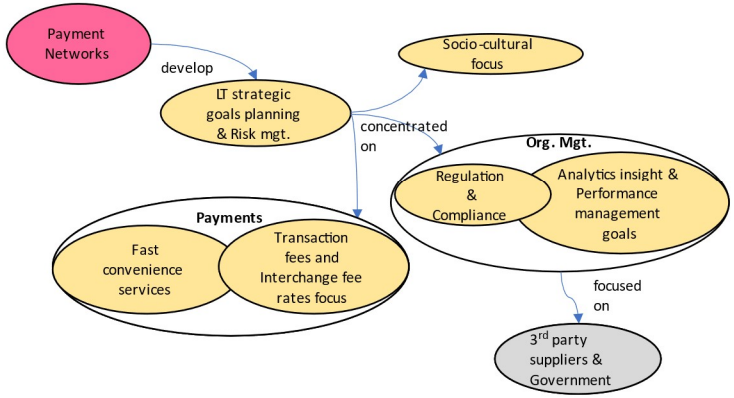


FIGURE 9.16.A PAYMENT NETWORKS' SYSTEMIGRAM

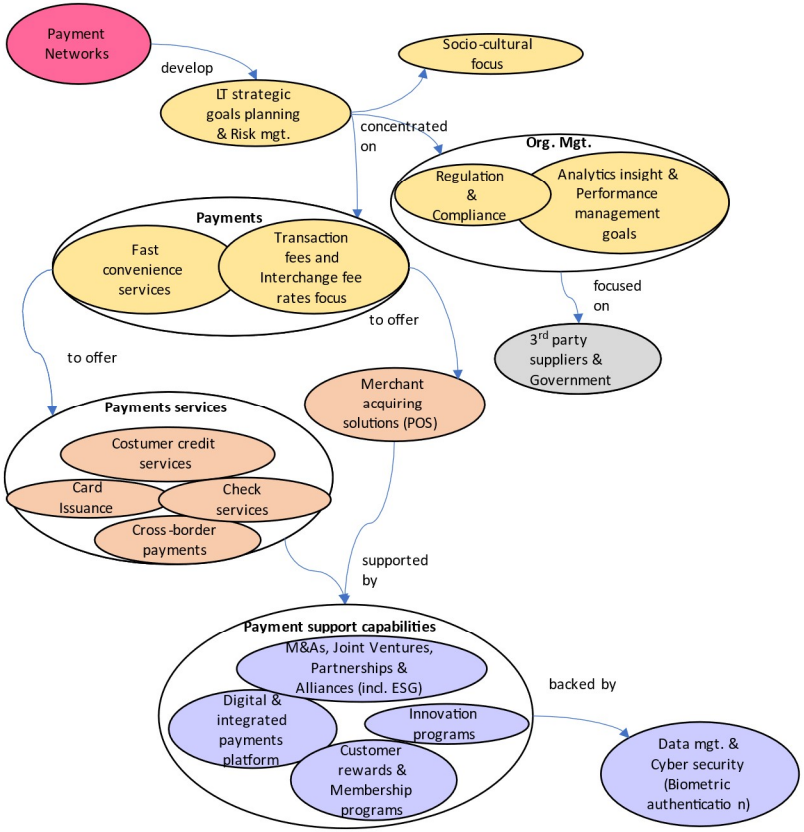


FIGURE 9.20.B PAYMENT NETWORKS' SYSTEMIGRAM

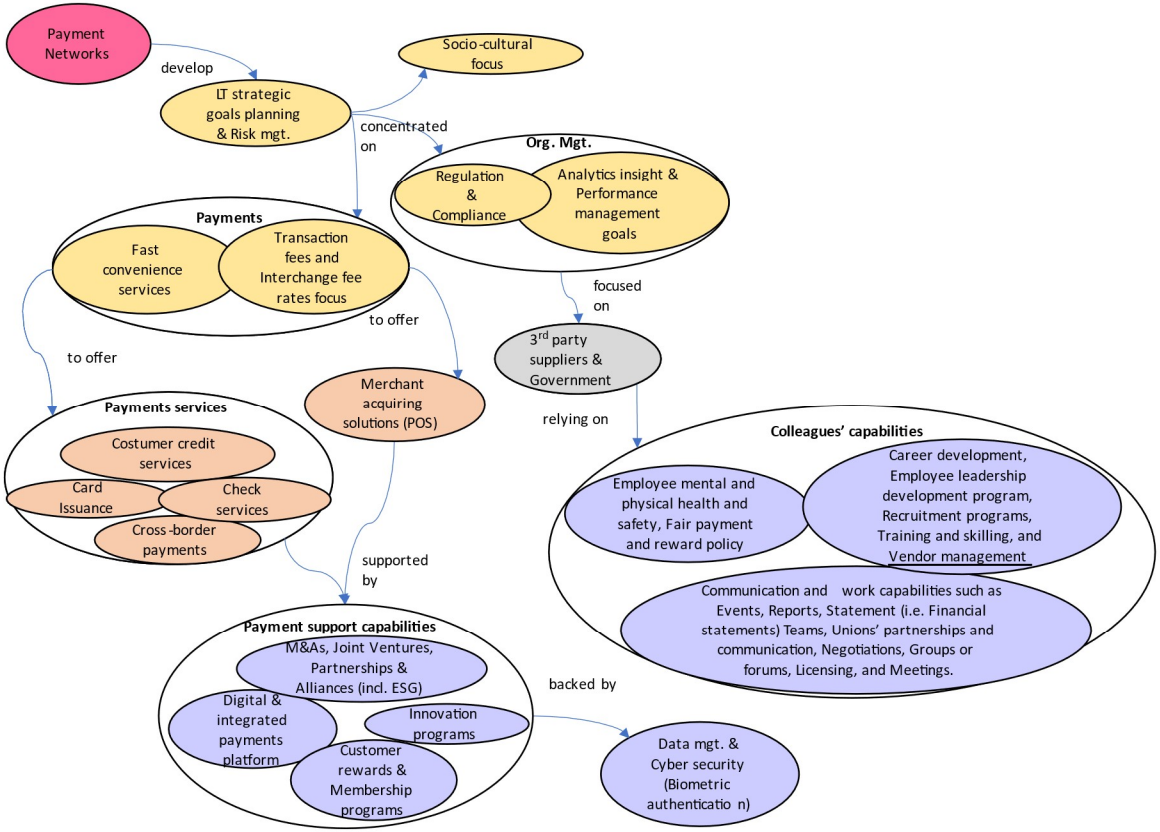


FIGURE 9.20.C PAYMENT NETWORKS' SYSTEMIGRAM

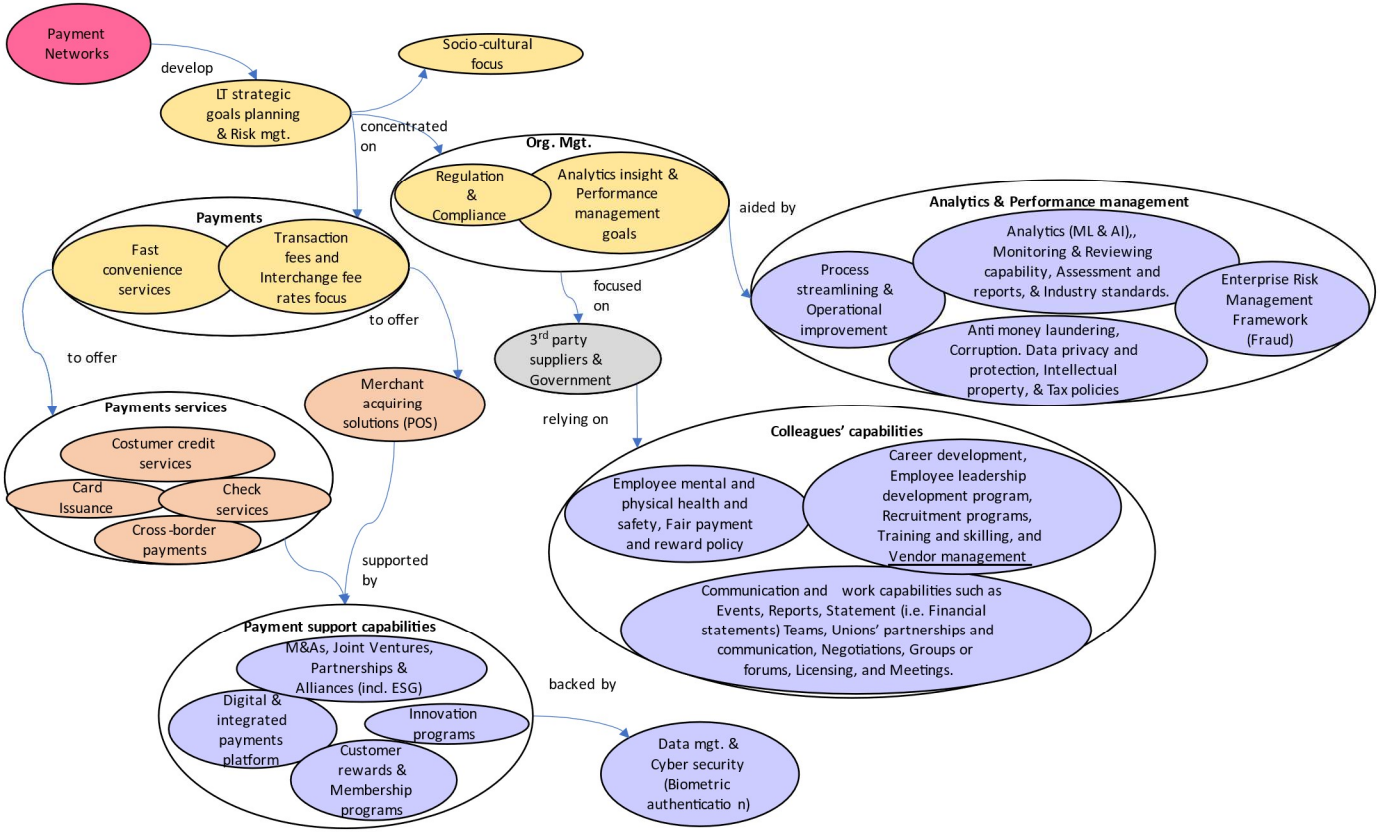


FIGURE 9.20.D PAYMENT NETWORKS' SYSTEMIGRAM

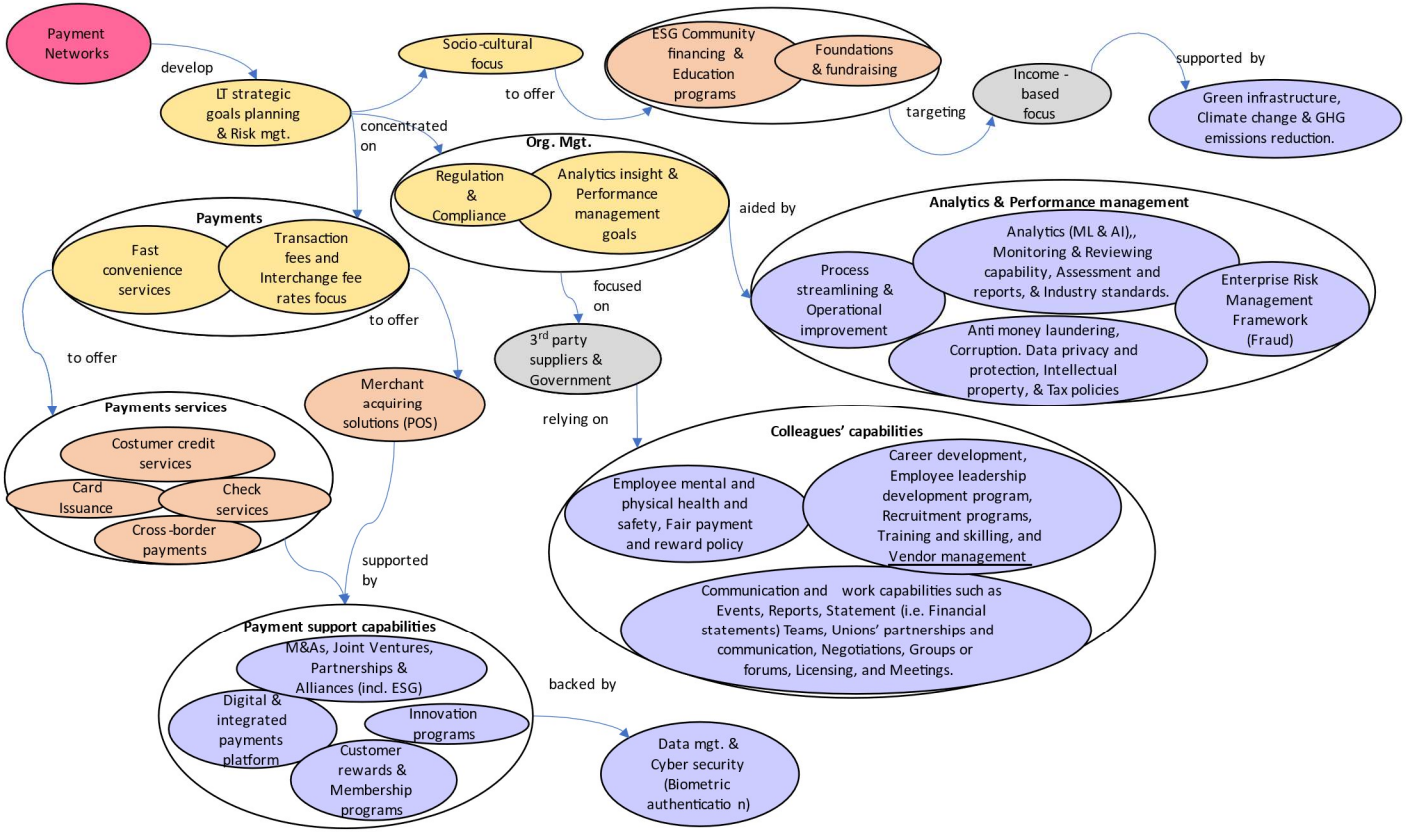


FIGURE 9.20.E PAYMENT NETWORKS' SYSTEMIGRAM

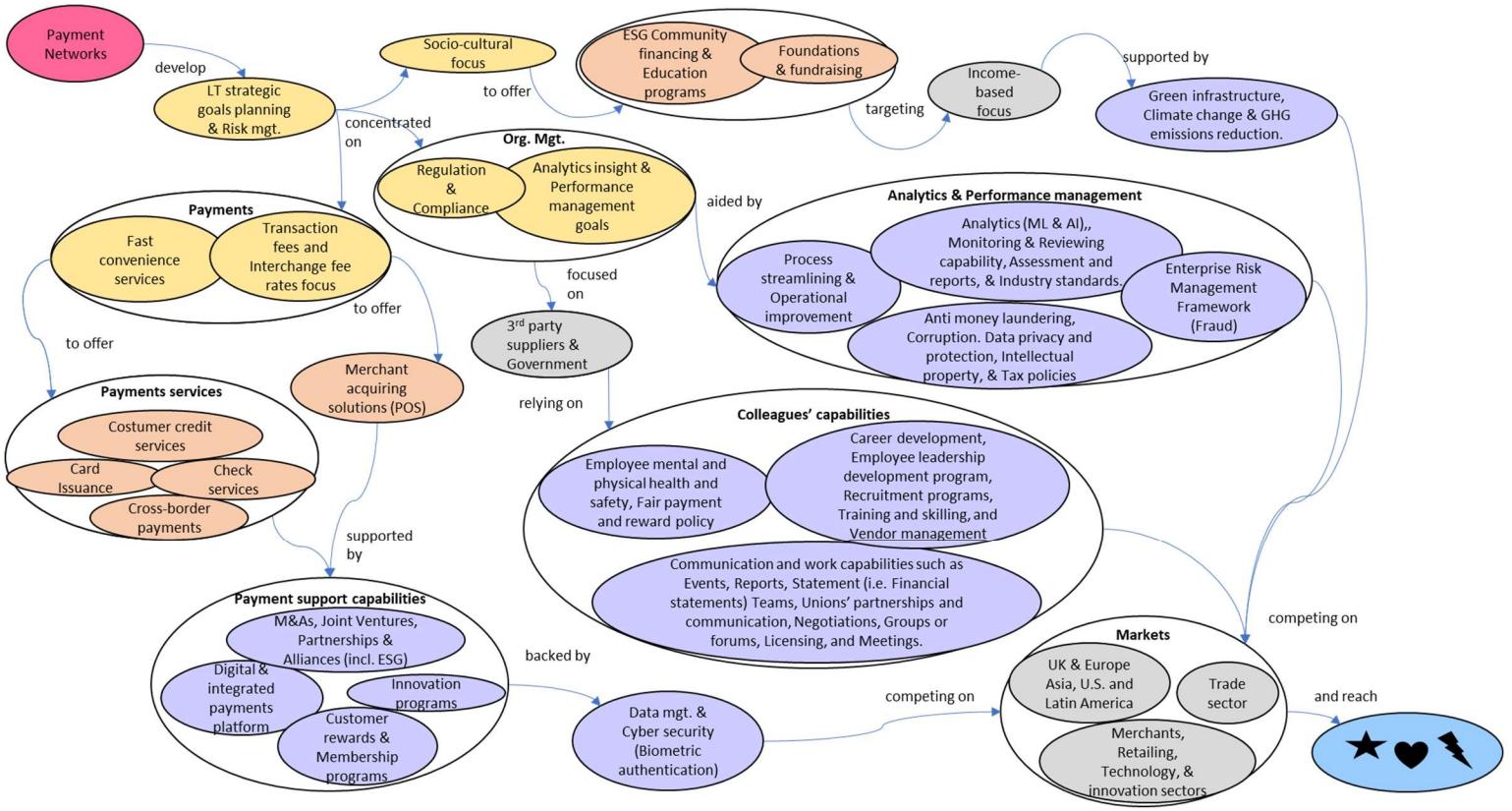


FIGURE 9.20.F PAYMENT NETWORKS' SYSTEMIGRAM

C.2.4 Payment networks' degree of operational resilience alignment

In the following figures, the different strategic factors identified in the payment networks' strategic reports and analyst reports are classified based on the CERT ® operational resilience framework areas and sub areas, based as well on the common, shared, and specific clustering.

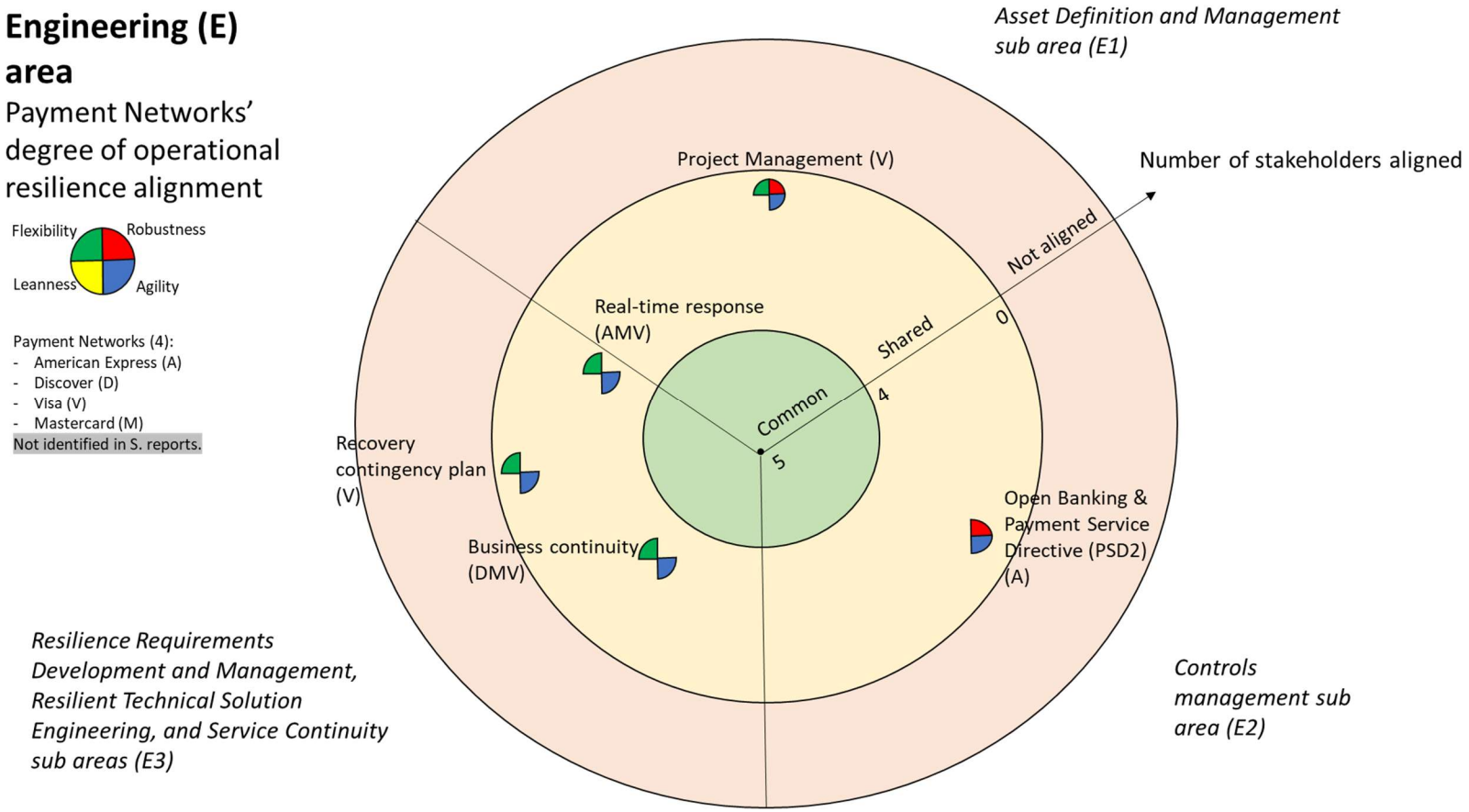


FIGURE 9.17 ENGINEERING AREA PAYMENT NETWORKS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

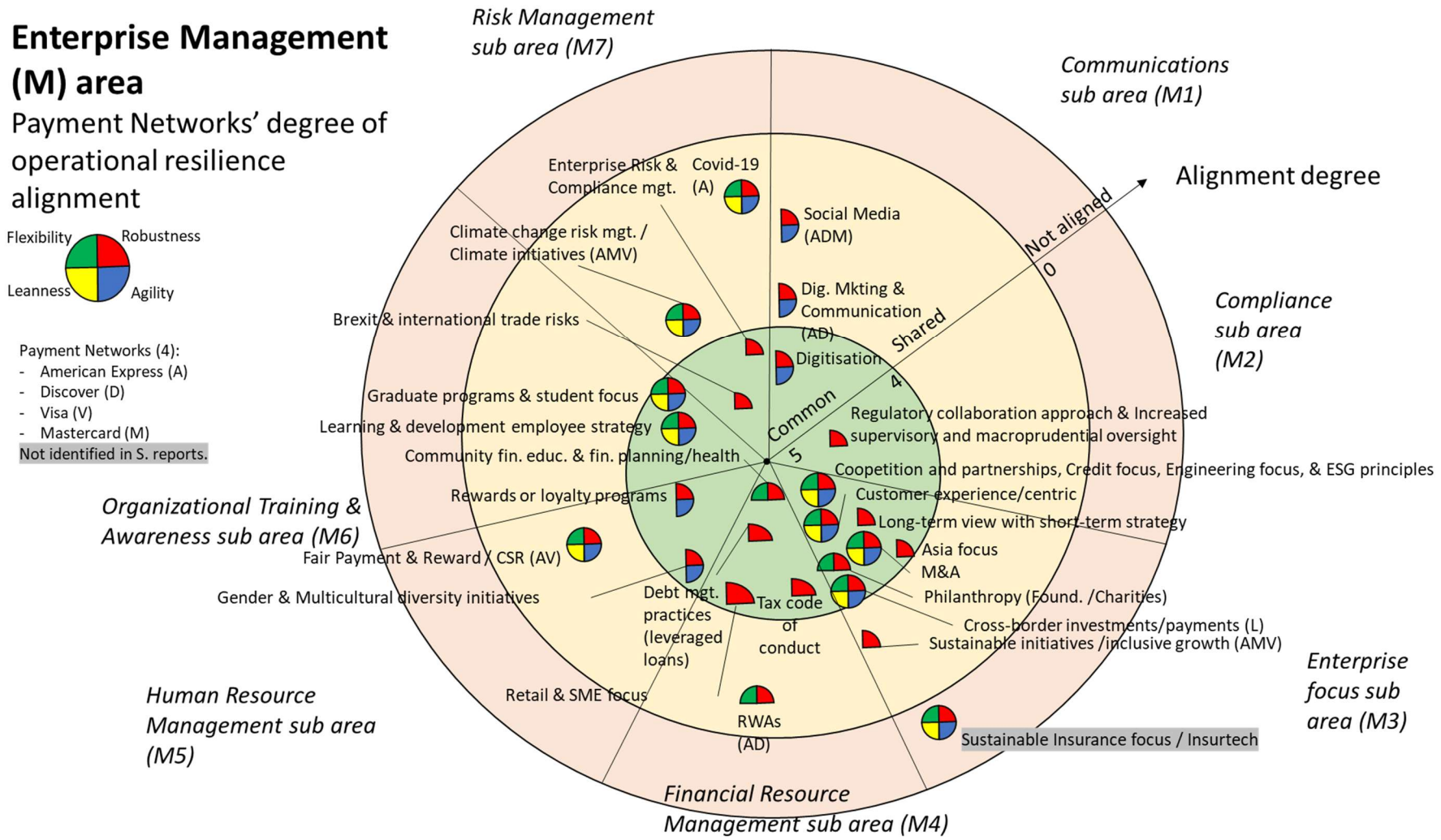


FIGURE 9.18 ENTERPRISE MGT. AREA PAYMENT NETWORKS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

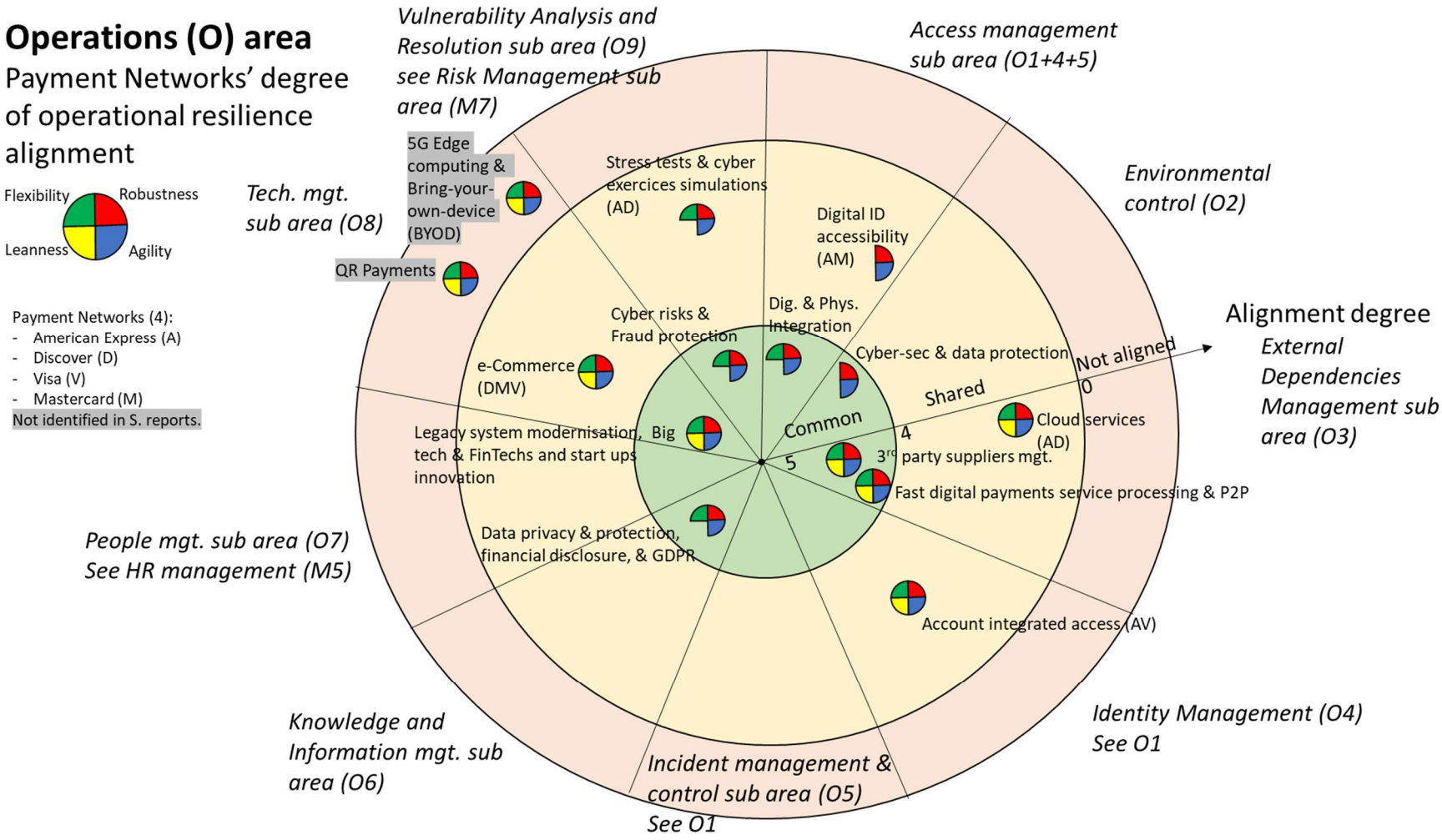


FIGURE 9.19 OPERATIONS AREA PAYMENT NETWORKS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

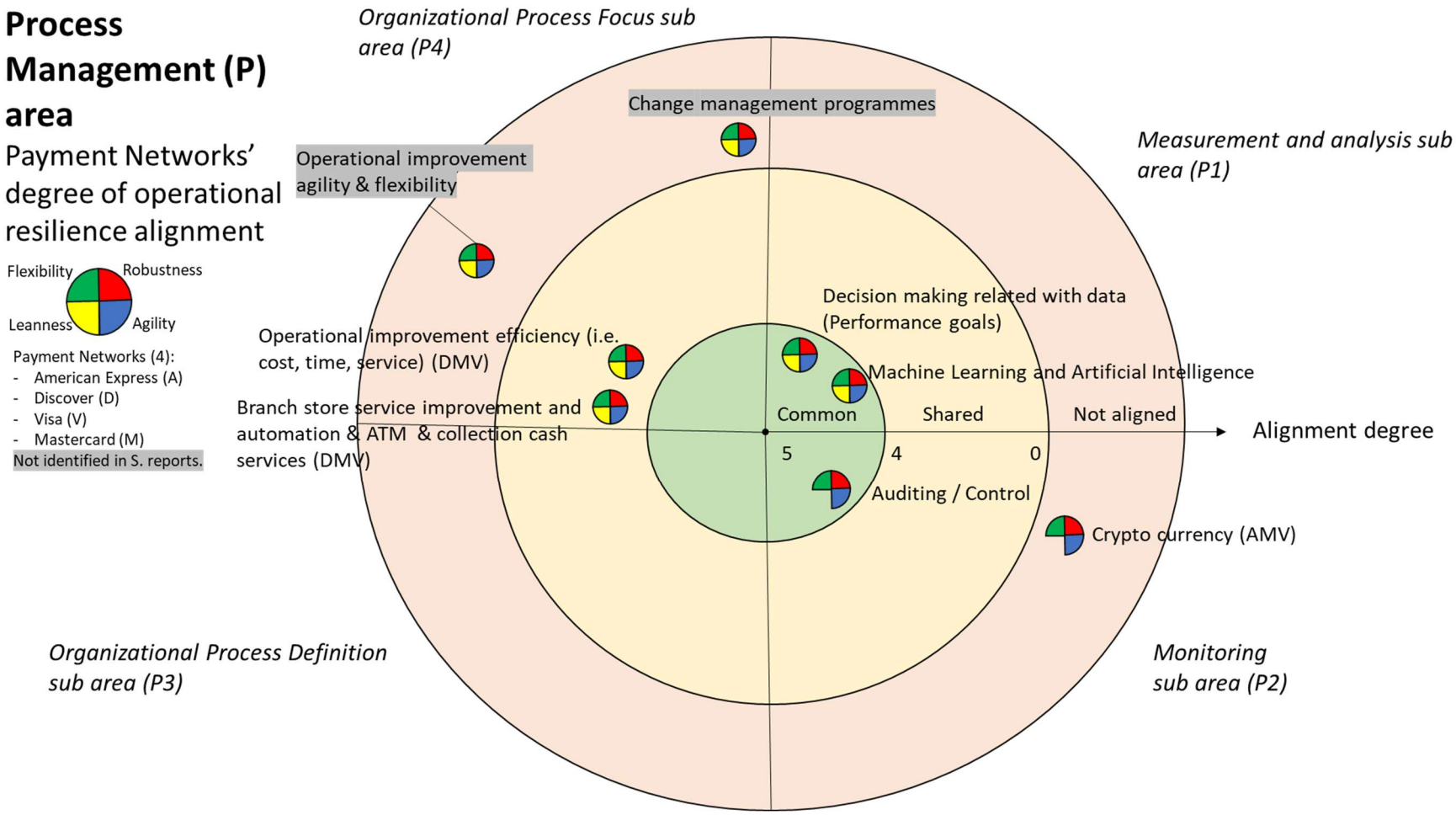


FIGURE 9.20 PROCESS MGT. AREA PAYMENT NETWORKS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

C.3 Acquirers

C.3.1 Acquirers' dictionary-based factor clustering results

Acquirers level analysis

PESTEL categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Political_Organizational	119	87	17.23%
Economic_Financial	57	37	7.33%
Socio-Cultural_Demographic	60	30	5.94%
Technological_Methodological	168	104	20.59%
Environmental_Societal	65	25	4.95%
Legal_Ethical	46	32	6.34%
Acquirers' identified factors		315	62.38%
Grand Total	515	505	98.06%

TABLE 9.19 NUMBER OF FACTORS PER PESTEL CATEGORY AT A ACQUIRERS' LEVEL ANALYSIS

Note: Percentages are related to the Factors Identified (505)

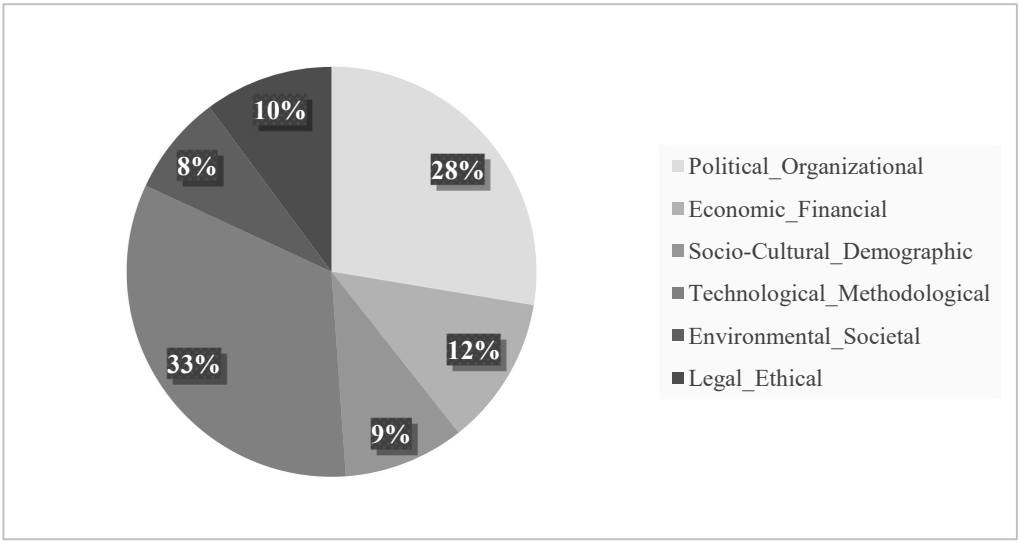


FIGURE 9.21 PERCENTAGE OF FACTORS PER PESTEL CATEGORY

PESTEL categories	FIS (F)	Fiserv (I)	GPN (G)	US Bancorp (U)
Political_Organizational	61	57	53	59
Economic_Financial	23	19	25	26
Socio-Cultural_Demographic	22	20	17	21
Technological_Methodological	82	72	76	54
Environmental_Societal	18	12	11	18
Legal_Ethical	22	20	15	21
Grand Total	228	200	197	199

PESTEL categories	FIS (F)	Fiserv (I)	GPN (G)	US Bancorp (U)
Political_Organizational	26.75%	28.50%	26.90%	29.65%
Economic_Financial	10.09%	9.50%	12.69%	13.07%
Socio-Cultural_Demographic	9.65%	10.00%	8.63%	10.55%
Technological_Methodological	35.96%	36.00%	38.58%	27.14%
Environmental_Societal	7.89%	6.00%	5.58%	9.05%
Legal_Ethical	9.65%	10.00%	7.61%	10.55%
Grand Total	45.15%	39.60%	39.01%	39.41%

TABLES 9.20 & 9.21 NUMBER OF FACTORS PER PESTEL CATEGORY PER ACQUIRER

Stakeholders' categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Colleagues	66	32	6.34%
Customers	176	109	21.58%
Investors and Board	103	68	13.47%
Regulators, Governments, and Policy Makers	104	72	14.26%
Society/Communities/Environment	48	19	3.76%
Suppliers and Strategic partners	18	15	2.97%
Banks' identified factors		315	62.38%
Grand Total	515	505	98.06%

TABLE 9.22 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY AT A ACQUIRERS' LEVEL ANALYSIS

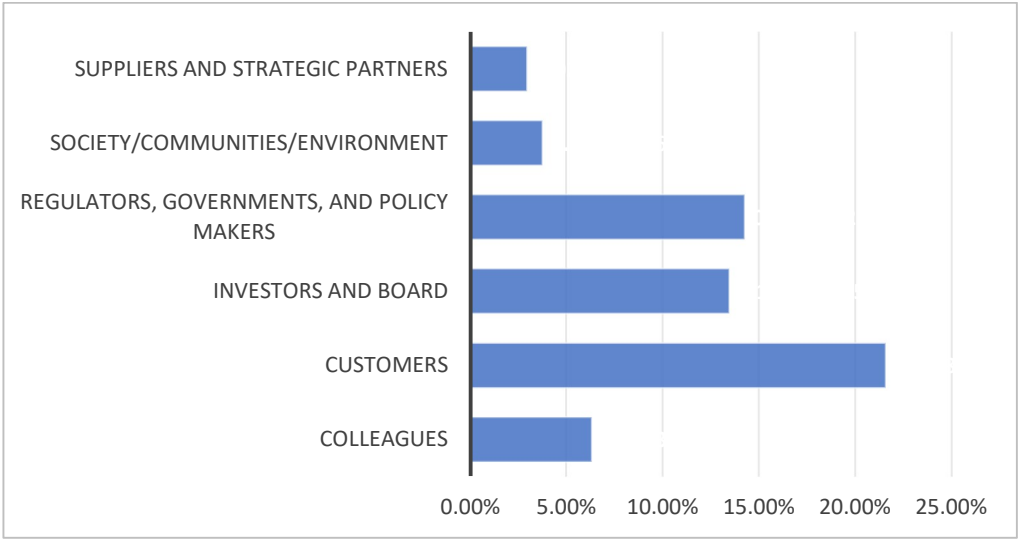


FIGURE 9.22 PERCENTAGE OF FACTORS PER STAKEHOLDERS' CATEGORIES

Stakeholders' categories	FIS (F)	Fiserv (I)	GPN (G)	US Bancorp (U)
Colleagues	21	21	17	24
Customers	77	69	73	56
Investors and Board	53	45	43	51
Regulators, Governments, and Policy Makers	50	46	43	44
Society/Communities/Environment	14	10	9	15
Suppliers and Strategic partners	13	9	12	9
Grand Total	228	200	197	199

Stakeholders' categories	FIS (F)	Fiserv (I)	GPN (G)	US Bancorp (U)
Colleagues	9.21%	10.50%	8.63%	12.06%
Customers	33.77%	34.50%	37.06%	28.14%
Investors and Board	23.25%	22.50%	21.83%	25.63%
Regulators, Governments, and Policy Makers	21.93%	23.00%	21.83%	22.11%
Society/Communities/Environment	6.14%	5.00%	4.57%	7.54%
Suppliers and Strategic partners	5.70%	4.50%	6.09%	4.52%
Grand Total	100.00%	100.00%	100.00%	100.00%

TABLES 9.23 & 9.24 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY PER ACQUIRER

Number of sharing organizations	Sharing factors count	Percentage	Organizational cluster	Sharing factors count	Percentage
4	110	21.78%	FIGU	110	21.78%
3	61	12.08%	FGU	12	2.38%
			FIG	34	6.73%
			FIU	11	2.18%
			IGU	4	0.79%
2	57	11.29%	FG	8	1.58%
			FI	21	4.16%
			FU	10	1.98%
			GU	11	2.18%
			IG	3	0.59%
			IU	4	0.79%
1	87	17.23%	F	22	4.36%
			G	15	2.97%
			I	13	2.57%
			U	37	7.33%
Total	315	62.38%		378	74.85%

TABLE 9.25 SHARED FACTORS BY NUMBER OF ACQUIRERS CLUSTERED AND ORGANIZATIONAL CLUSTERS

	F	G	I	U
F		176	164	143
G			151	129
I				137
U				

	F	G	I	U
F		34%	32%	28%
G			29%	25%
I				27%
U				

TABLE 9.26 SHARED FACTORS BETWEEN ANY TWO ACQUIRERS

C.3.2 Acquirers' strategic reports' categorization and clustering

In this section, we first summarise some relevant categorization and clustering statistics, detailed in the tables and figures in the previous sub section. Then a brief description of the relevant factor findings is given. The strategic factors categorization and clustering results can be graphically seen in Figures 9.27 to 9.29. The organization clusters are referred by their initial letter: FIS (F), GPN (G), Fiserv (I), US Bancorp (U). From the total 505 factors identified in all strategic reports, only 315 factors were detected (62.38%).

In the *PESTEL categorization*, Technological and Methodological (20.59%) is the most frequent, followed by Political and Organizational (17.23%) and Economic and Financial (7.33%). Only Fiserv mentions more Socio-Cultural and Demographic (10%) factors than Economic and Financial (9.50%). In terms of *stakeholder's categorization*, 21.58% of the factors are focused on Customers, 14.26% on Regulators, Governments, and Policy Makers, and 13.47% on Investors and Board. FIS and US Bancorp mention more Investors and Boards focused factors than Regulators, Governments, and Policy Makers, while GPN mentions the same amount.

The strategic factors' *organizational clustering* shows 21.78% shared by all banks, 12.08% shared by three banks, 11.29% by two banks, and 17.23% bank specific. In the shared by three and two banks tier, the largest cluster is FIS-GPN-Fiserv (FGI) – 6.73%, followed by FIS-Fiserv (FI) – 4.16%, most of the factors in the *Technological and Methodological* category.

By comparing all the shared factors, without tiering them, the two most similar are FIS and GPN with 34% of the identified factors, while GPN and US Bancorp the least with 25%. Most of these factors are in the *Technological and Methodological* category, followed by the *Political and Organizational*, and then the *Economic and Financial*.

The next paragraphs detail Figures 5.27 to 5.29 PESTEL categorization and clustering analysis of all shared initiatives. For the PESTEL tiering analysis, please refer to the figures 5.1- 5.6.

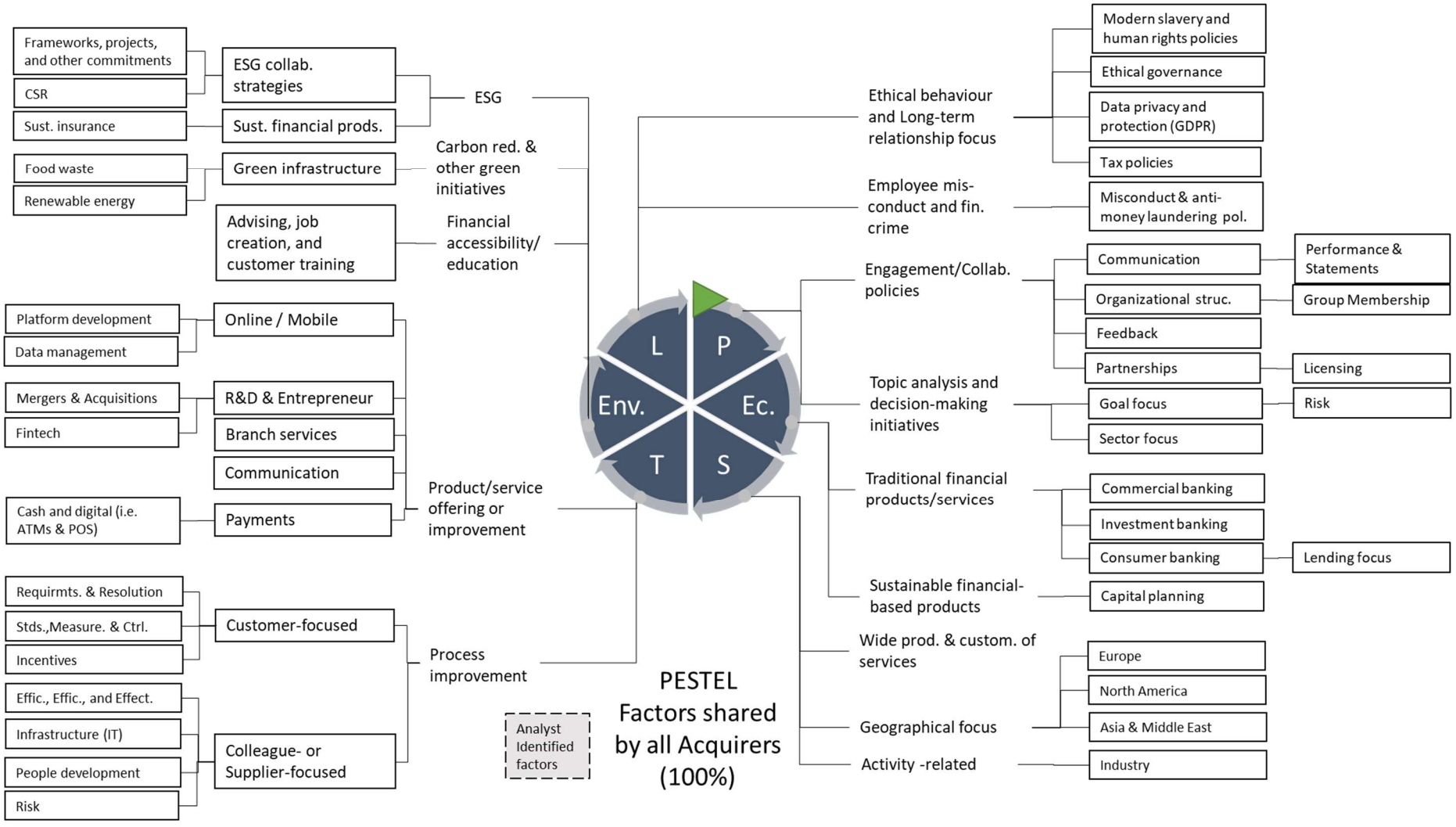


FIGURE 9.23 STRATEGIC FACTORS SHARED BY ALL ACQUIRERS

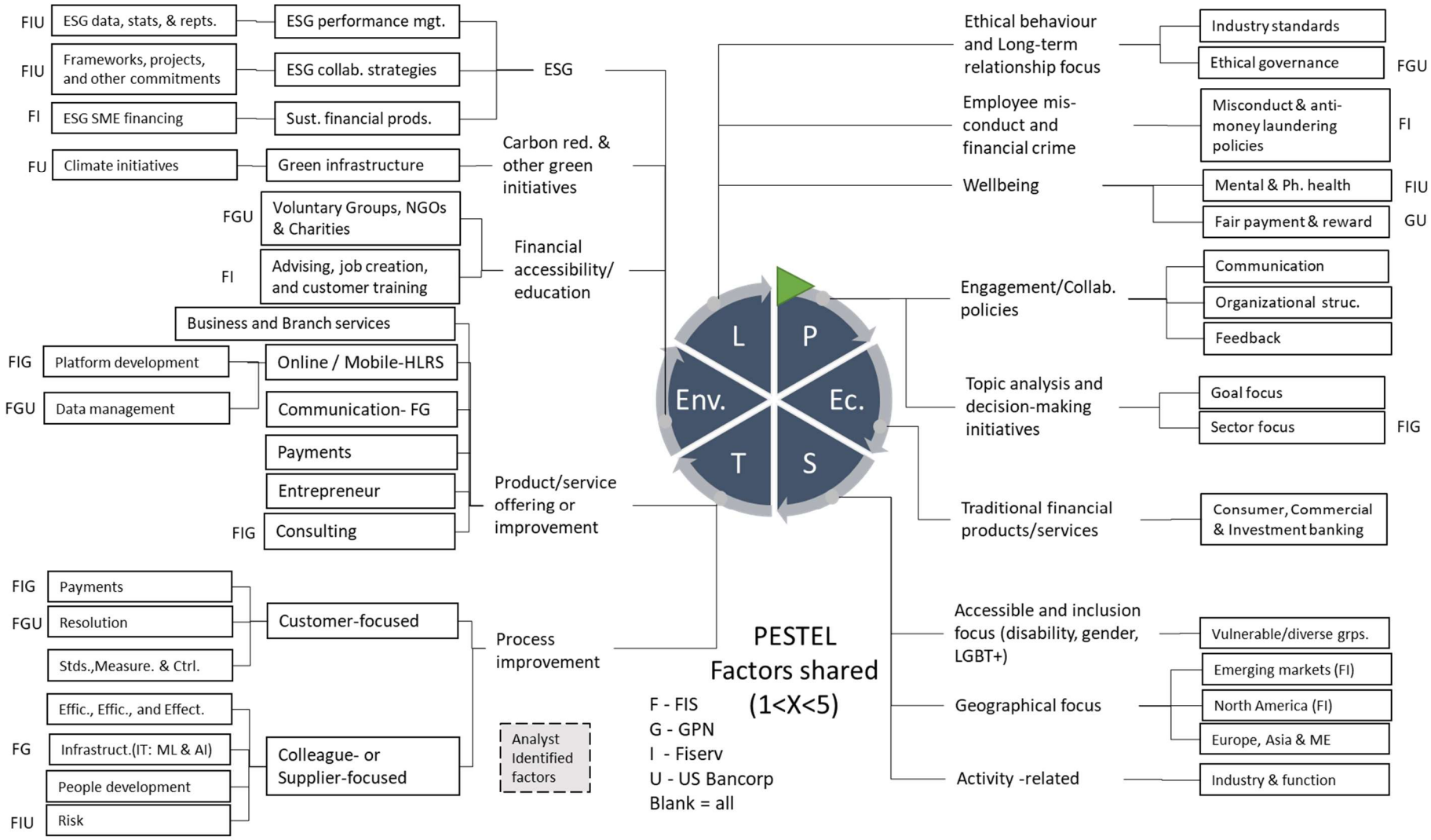


FIGURE 9.24 STRATEGIC FACTORS SHARED BY 3 AND 2 ACQUIRERS

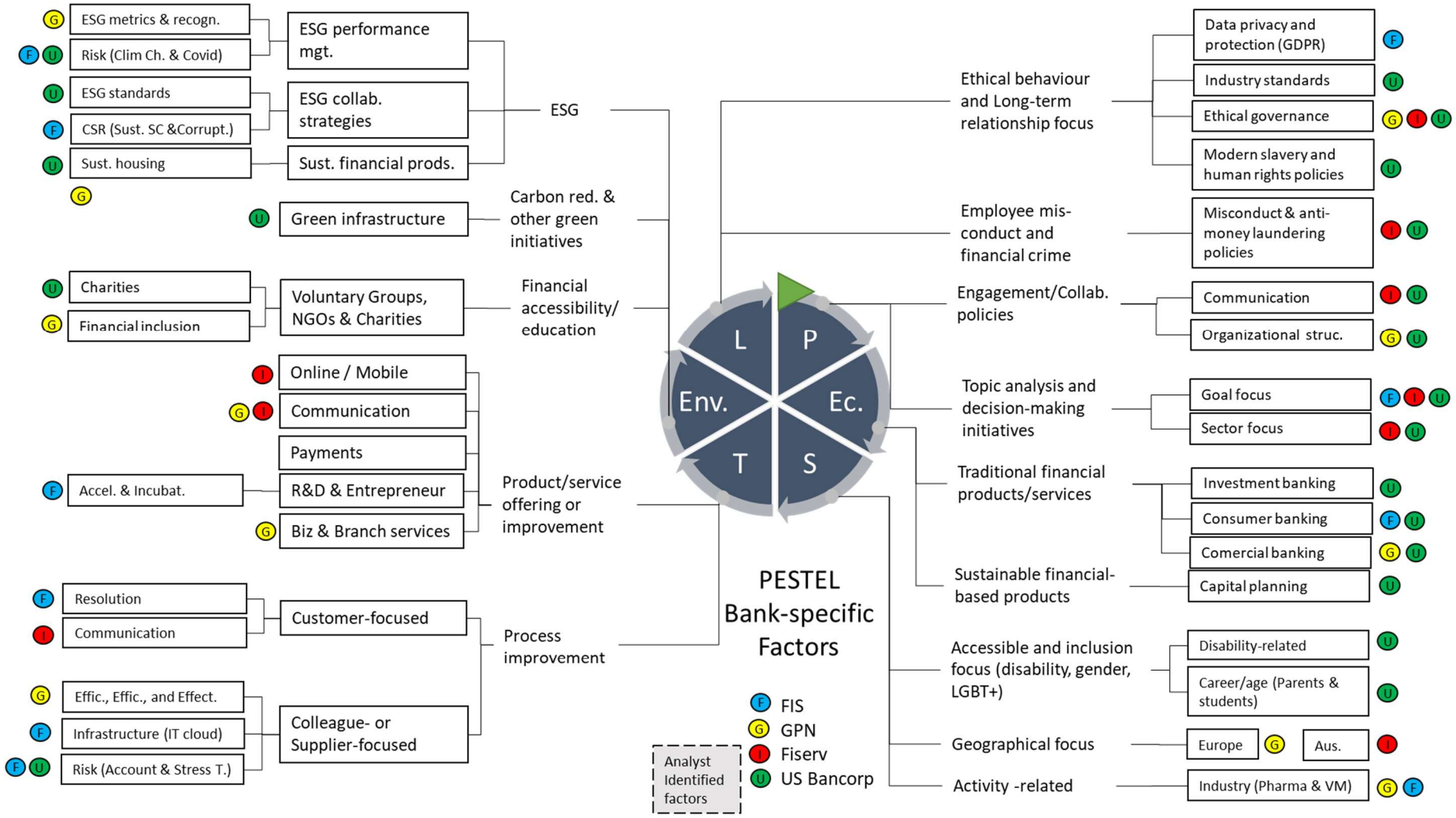


FIGURE 9.25 STRATEGIC FACTORS SPECIFIC BY ACQUIRERS

For the ***Technological and Methodological (T&M)*** factors, in terms of *Product or service offering or improvement,* all acquirers focus on *Branch Services*, related with Branch store service improvement and automation, on *Entrepreneurship*, with Mergers and acquisitions, related with *Mobile and Online*, there are mentioned Data management, Fintech, Digital, such as Mobile, Online banking capabilities, Platform portal development, and Data Processing initiatives. In terms of *Payments*, they include ATM cash services, Banking collection services, Cash services, Credit card, Merchant acquiring solutions, Electronic payments, and Transaction processing.

Regarding shared initiatives by 2 or 3 acquirers, related with *Communication*, they focus on Multi channel communication (FI). On *Consulting and Entrepreneurship*, they mention a Consulting customer capability (FGI) and Ventures (FGI). On *Mobile and Online* initiatives, there are Integrated access capabilities (GI), Personal data app management capabilities (FIU), Personalization (FG), Digital credentials (FI), and As-a-service offerings (FI). On *Payments*, they talk about Cross border payment solutions (FG), Payment integration capabilities (FGI), a POS focus (FGI), Automated clearing houses (FGI), Card acceptance (FI), Card issuance (FGI), a Closed loop architecture (FGI), Card Processing (FGI), Check services (FGI), Chargebacks (FGI), Prepaid card (FGI), Money transfer (FGI), and Payment processing (FI).

In terms of specific initiatives, there are *Branch services*, offering Face-to-face services (I), and *Business services*, in terms of Business B2B solutions (I). On *Communication* initiatives, they include Digital marketing (G), Virtual reality (I) and Voice banking capabilities (G). While in *Entrepreneurship*, there are Accelerator and incubators (F) capabilities. On *Online & Mobile*, they include eCommerce (G). And *Payments*, such as Noncash initiatives (G), Smart card managing capabilities (F), contactless payment (F), Crypto digital currency (U), PSD2 (G), UnionPay (I), Switching capabilities (F), Account processing services (G), GPRS technology (I), and Payroll cards (I).

Related with process improvement, all acquirers focus on *Efficient, effective, efficacious* initiatives, such as Customer feedback, Process streamlining, Operational improvement cost, Process improvement, and Fast convenience services. On *IT infrastructure* initiatives, they include Cyber security and data protection, and IT and communications

improvement. Related with *People development*, there is a focus on Career development, Recruitment programs, Training and skilling, and Vendor management, as well as Customer Requirements. On *Risk management* strategies, they include an Enterprise Risk Management Framework, Risk Impact mitigation, Fraud capabilities, and a Mitigation approach. Related with *Standards, measurement, and control,* they mention Analytics insights, Performance management, a Monitor capability, a Review capability, Assessments and reports, and Industry standards.

In the case of shared initiatives by 3 and 2 acquirers, in terms of *Efficient, effective, efficacious capabilities,* they mention Operational improvement related to efficiency (FU), Operational improvement related with simplification (IU), Operational improvement to improve faster time delivery (FG), and Real-time response (FG). Regarding *Incentives,* they focus on Customer reward programs (FGI). On *People development,* they include Colleagues' benefits (IU), Colleagues' support (GU), Employee leadership development programs (FGI), and Expert leadership development (FGU). Also, they mention *Resolution*, in terms of Resolving (FIU) capabilities. Related with *Risk*, they talk about contingency plans (GU), Resilience focus (FG), and Business continuity (GU). On *Standards, measurement, and control,* they include a Project and programme management approach (FU), Performance goals measurement (FIU), Machine learning and artificial intelligence (FI), a Measuring capability (IU), an Auditing capability (FGI), and Policies procedures (FGI).

In terms of bank-specific initiatives, related with *Efficient, effective, efficacious* capabilities, there is a focus on Fast resolution process (F), and Collaboration improvement (I). Concerning *IT infrastructure,* they highlight a Cloud-based digital environment (F). In reference to *People development*, they mention Colleague engagement policies (G). And in *Research and Development,* there is Research science (F) capability mentioned, and on *Risk management*, they include Accountability (F) and Stress tests (U).

On the ***Environmental and Societal*** factors category, all acquirers focus on *Carbon reduction & other green initiatives*, such as Preservation and safeguarding. On *ESG collaboration strategies*, with *ESG approach,* specifically on *Frameworks, projects, and*

other commitments, they talk about ESG partnerships and trusts, and in *CSR*, they mention a Supply chain or suppliers focus. In terms of *Financial accessibility & education*, related with *Advising, job creation, and customer training*, there are Community financial accessibility programmes, a Community financial education focus, and Strategic commitments, Voluntary Groups, NGOs & Charities, and an Income-based focus.

In terms of shared initiatives, on *Carbon reduction & other green initiatives*, they mention Climate initiatives (FU), and *ESG collaboration strategies*, related with *Frameworks, projects, and other commitments*, such as ESG Principles (FGU). On *ESG performance management*, related to *ESG data, stats, and reports*, they include a Natural disaster (FGU) and Pandemic (FU) focus. In terms of *Sustainable financial products*, they have ESG SME financing services and support (FG).

In respect of specific initiatives, there are *ESG collaboration strategies*, such as *Frameworks, projects, and other commitments*, that include ESG standards (U), and in *CSR*, Supplier accountability (F) and Corruption laws (F). In terms of *ESG performance management*, related with *ESG data, stats, and reports*, they highlight Climate change risk management (U), ESG recognition (I), Coronavirus pandemic (F). And in *Sustainable financial products*, they mention Sustainable housing (U).

In the ***Socio-cultural and Demographic*** classification, all acquirers focus on *Activity-related or Industries,* such as Trade, and they mention a Quality focus. In terms of *Geographical focus*, they mention Asia, Europe, U.S. and Latin America, and an International/Foreign focus. In regard to Domestic initiatives, they have a United Kingdom focus. In terms of *Wide prod. & custom. of services*, they mention a Wide products service range focus strategy.

In terms of shared initiatives, there are *Accessibility and inclusion focus (disability, gender, LGBT+)* initiatives, related with *Vulnerable or diverse groups*, such as Abuse related initiatives (FIU), Inclusion focus (FG), and Multicultural diversity initiatives (FGU). In terms of an *Activity-related/Industry* focus, the focus on the Service industry (FGU), Trading (FGU), and a Quality focus (IU). Related with *Geographical focus*, they focus on Middle east (FG), Germany (FG), Emerging markets (FG), Africa (FG), Canada (GIU),

Mexico (FU), and North America (FI). There are *Wide prod. & custom. of services* initiatives related with Branded products (FGI) and Merchandise (FG).

In terms of specific initiatives, on *Accessibility and inclusion focus* (disability, gender, LGBT+), related with *Vulnerable or diverse groups,* they mention Disability related initiatives (U). In terms of *Activity-related/ Industry,* they tend to focus on Vertical markets (I) and a Pharmacy industry focus (F). In terms of *Career/Age -related*, they write about Parental programs (U) and a Student focus (U). On the *Geographical focus*, they invest on Australia (G) and Russia (I).

For the ***Political and Organization*** category, all acquirers focus on *Engagement and collaboration policies*, related with *Communication capabilities*, such as Councils, Events, and Reports and statements, mainly Financial statements. In terms of *Feedback sources*, they include a Regulatory approach and Regulator collaboration. In terms of *Organizational structure*, they talk about a Membership capability, Union's partnership communication and negotiations, Licensing, and Meetings. On *Partnerships*, they mention Partnerships Alliances. Related with *Topic analysis and decision-making*, they investigate a *Goal focus*, in specific with *Risk*, like Economic sanctions, Market risk, Material adverse effect, Internal control, and Geopolitical risk. On the *General* category, they mention a Collaborative focus, a Credit focus, a Regulation and compliance focus, a Lending focus, an Office location focus, a Profitability focus, Segmenting, Political issues, Negative views, and a Competitive focus. Related with *Sector focus*, they mention a Merchant focus, Retailing focus, a Technology and innovation focus, a Third party supplier focus, and a Government focus.

In relation to shared initiatives by 2 and 3 acquirers, concerning *Engagement and collaboration policies*, there are *Communication capabilities*; such as Letters and briefs (IU), *Feedback sources;* like Benchmarking (FIU), Accounting policies (GIU), Holding company practices (GU), *Organizational structure*; related to Committees (IU), Teams (FG), Groups, forums and centres (FGU), Card associations (GI), and Credit unions (FGU), and *Partnerships*; related with Sponsorships (FGI). In relation with *Topic analysis and decision-making*, there are *Goals' focus*, *General*, such as a Customer consumer focus (FGI), a Debit card focus (FGI), Corporate governance (FGI), a Learning and

training employee strategy (FGI), Joint ventures (FGI), a Payments focus (FGI), and in relation to *Risk*, such as Risk management (FIU), Operational risk (FU), Credit Risk (GIU), Foreign exchange risk (FGI), Brexit (FGI), Legal risk (IU), Network Exclusivity (GI), Reputational risk (FGU), Corrupt practices act (FG) and Drug dealing (FG). In terms of *Sector focus*, they focus on Shareholder focus (FGI).

In terms of specific initiatives, there are *Engagement and collaboration policies* related with *Communication capabilities*; such as a Cultural focus (U) and Feedback (U), *Organizational structure*; related to the Basel committee (U), and Sales force (I). In regard to *Topic analysis and decision-making*, they have a *Goals' focus*; concerning *General* practices*, such as* Colleague share and pension plans (F), a Complaint focus (F), Entrepreneurial initiatives (F), an Onboarding process focus (F), Financial indicators (U), a Long term focus (F), a Monetary policies focus (U), Private label retail strategies (G), Strategic business planning (F), Positive views (U), and a Productivity focus (F). In respect of *Risk*, they include Libor transition (U), Compliance risk (U), Liquidity risk (U), Resolution planning critical functions (U), Strategic risk (U), Financial crisis (U) and Systemic risk (F). Related with *Sector focus*, there are highlighted a Consultative employee capacity (U), a Manufacturing focus (G), and a Major banks focus (U).

In the ***Ethical and Legal*** categories, all acquirers focus on *Employee mis-conduct and financial crime*, related with *Misconduct & anti-money laundering policies*, they mention Anti money laundering. With an *Ethical behaviour and Long-term relationship focus*, they include *Data privacy and protection (GDPR)initiatives,* specifically in relation with Data privacy and protection, General data protection regulation, and Intellectual property, on *Ethical governance*, there is a Long-term approach, and a focus on Credit reporting, Deposit insurance, and Fair Debt collection. Related with *Industry standards*, they focus on Treasury policies. Last, they include *Modern slavery and human rights policies*, like Counter terrorism, and *Tax policies & Codes,* such as a Tax code of conduct.

In terms of shared initiatives, with an *Ethical behaviour and Long-term relationship focus*, they focus on *Ethical governance*, such as a Code of conduct (FIU) and Ethical values' governance (FU). On *Industry standards*, they write about Network rules (FGI), Trade policies (FU), Policymaking (FGU), Industry certifications (FG), and Financial reporting

(FI). On *Employee misconduct and financial crime*, and *Misconduct & anti-money laundering policies*, they highlight Anti bribery or Corruption (FG) and Corruption (FG) related. In terms of *Wellbeing*, related with *Mental & Physical Health*, they include Employee mental and physical health and safety (FGU) and Health focused products (FG), and a *Fair payment and reward policy* (IU).

In terms of specific initiatives, *Employee mis-conduct and financial crime* initiatives, related to *Misconduct & anti-money laundering policies*, they include Financial crime (G) and Misconduct policies (U), in respect of *Ethical behaviour and Long-term relationship focus*, and specifically related with *Data privacy and protection (GDPR),* they focus on Information security laws (F). On *Ethical governance*, they include Supplier prompt payment commitments (U), Antitrust law (G, Unfair trade (G), Escheat laws (I), and Insured deposits (U). On *Industry standards,* they mention Prudential standards (U). And finally, regarding *Modern slavery and human rights policies modern slavery*, acquirers include Employee human rights and rights to work policies (U).

On the ***Economic and Financial*** category, all acquirers focus on *Traditional financial products/services*, from an Economic and Financial focus. In terms of *Consumer banking*, they include Mortgage process improvement and automation, a Debt focus, and Debt reduction collections. Related with *Commercial banking*, they highlight Transaction fees, and on *Investment banking*, related with Asset finance, they include Investment products and services, and refer to the Stock market. In terms of *Sustainable financial-based products*, related with Capital planning, they include Financial planning health and Capital planning.

In terms of shared initiatives, on *Traditional financial products and services* in relation with *Commercial banking*, they highlight Dividend related initiatives (IU), a Commercial banking focus (FU), Interchange fee rates (FGI), Reimbursements (IU), Transaction volumes (FU), a Cash flow focus (FGI), and a Balance sheet analysis (FGI). In terms of *Consumer banking,* they mention Leasing (GIU), a Pricing practice (FGI), and Interest rates (FIU). And on *Investment banking*, they include Wealth investment (FG), an Investment banking focus (IU), Goodwill (FGI), a Libor focus (FIU), Variable rate products (FGI), and Intangible assets (FGI).

In terms of bank-specific initiatives, on *Traditional financial products/services* such as C*ommercial banking*, they mention the Merchant discount rate (I), Transaction values (I), and Card services lease (U). On *Consumer banking*, they include Consumer lending (U) and Pension products (F). And in *Investment banking*, they mention the Common Equity Tier 1 ratio (U), Risk Weighted Assets (U), Repurchasing of Stocks (U), SWAPs (U), and Financial instruments (U), in general. In terms of *Sustainable financial-based products*, related with *Capital planning*, they include Mutual savings (U).

C.3.3 Acquirers' strategic reports' Systemigram

For the Systemigram development, first, a categorisation of the different factors was used with the "Playing to win" framework, as seen in Table 9.27.

	Systems (Infrastructure)	Capabilities (Process)	How we will win?	Where we will play?	Winning aspirations
Definition	Support systems structures, and measures	Set of reinforcing activities and specific configuration	Value proposition and competitive advantage	Geographies, product categories, costumer segments, channels, vertical stages of production	Purpose or guiding aspirations
Factors	-Branch store service improvement and automation (ATM cash services, Banking collection services, Cash services) -Data management & platform developments -Process streamlining & Operational improvement cost, - Cyber security and data protection - IT and communications improvement. -Training and skilling: Career development, Recruitment programs, & Vendor management -Enterprise Risk Management Framework, (Risk Impact mitigation, Fraud capabilities and Mitigation approach) -Performance management (Analytics insight, Monitor capability, Review capability, Assessment and reports, and Industry standards) -Anti-money laundering, counter terrorism, data privacy, Intellectual property & Tax codes & policies -Communication capabilities: council, events, reports and statement, Union's partnership communication and negotiations, & meetings.	-Mergers & acquisitions, partnerships, and licensing -Financial planning health and Capital planning. -Fin products: Asset finance, Wealth & Stock Investment, mortgage & debt -Community financial accessibility/education programmes -Voluntary Groups, NGOs & Charities -Customer & Membership rewards programs -Merchant acquiring solutions, Electronic payments, and Transaction processing.	Fast convenience services (payments) Regulator compliance and collaboration Risk management focus (Economic sanctions, Political issues, Market risk, Material adverse effect, Internal control, and Geopolitical risk) Credit focus & Debt reduction collect. Office location focus, Long term approach Wide products service range focus strategy (all segments)	Income-based focus. UK, Asia, Europe, U.S. and Latin America focus. Sectors: Merchant focus, Retailing focus, Technology and innovation focus, Third party supplier, and Government focus, Trade and quality	Customer-led (feedback) Environmental focus (Preservation and safeguarding) Supply chain or suppliers focus (CSR) Economic and financial profitability focus Competitive focus.

TABLE 9.27 ACQUIRERS' "PLAYING TO WIN" DECISION-BASED FRAMEWORK CATEGORIZATION

Then, the Systemigram prose was developed, as seen in the next paragraphs, alongside, the Systemigram graphic and complete storyboard as seen in Figures 9.30.A to F, shown progressively.

Acquirers are developing their strategies on four main areas. First, related with a *Long-term planning approach* or more sustainable approach. Second, on a more **Customer approach**, they are focusing on *Wide products service range focus strategy*, trying to focus on all different customer segments, *Fast convenience services*, related with *Payments*, and a *Credit & debt collection* focus. Third, but as important, *Regulation & Compliance*, and a *Risk management* focus, or as commonly known **Governance, Risk, and Compliance (GRC)** approach, mainly on *Economic sanctions, Political issues, Market risk, Material adverse effect, Internal control, and Geopolitical risk*. This GRC resource targets *3rd party suppliers & Government* stakeholders. Last, they have a *Location focus*, enabled by a *Branch store service improvement and automation*, offering *ATM cash services, Banking collection services*, and *Cash services*.

From a *Long-term (LT) planning approach,* they offer **LT planning services**, with an *Income-based focus*, such as *Financial health planning* and *Capital planning* services, *Community financial accessibility and education programmes*, as well as mentioning *Voluntary Groups, NGOs, and Charities*

On **Customer services**, they mention *Customer credit services,* as well as *Customer rewards & Membership programs,* and their main services*, Merchant acquiring solutions, Electronic payments, & Transaction processing, and Financial products, related with Asset finance, Wealth & Stock Investment, mortgage and debt.* To enable these services, they mention *Mergers and Acquisitions (M&A), partnerships, & licensing*. As well as **Digital support**, developing an *IT and communications improvement* capability, a *Data management & platform development* resource, and *Cybersecurity and Data protection* capabilities.

On the GRC side, Acquirers mention an *Enterprise Risk Management Framework* as part of their **GRC support** activities, and *Anti-money laundering, Counter terrorism, data privacy, Intellectual property,* and *Tax codes policies.* They mention **Performance and Improvement** practices as *Performance management* related with *Business Analytics*

insights, *Monitoring, Reviewing, Assessments and reports*, and the implementation of *Industry standards*. As well as a *Process streamlining & Operational improvement* capabilities.

Some common **Organizational** capabilities, in terms of Communication and work, are *Councils, Events, Reports, Statement, Union's partnerships and negotiations,* and *Meetings.* As well, *Training and skilling,* such as *Career development, Recruitment programs,* and *Vendor management.*

Mainly targeting the *Trade* sector with a *Quality* dimension focus, related with *Merchants and Retailers, as well as the Technology and innovation sectors*, and geographically looking after the *UK, Europe, and Asia*, mainly, but also showing a focus in *U.S. and Latin America.*

The common goals highlighted are in terms of Social & Environmental sustainability, specifically mentioning *Preservation and safeguarding*, *CSR*, such as *Supply chain or supplier's accountability.* In terms of Economic profitability, they continue to focus on *Economic and Financial competitive performance*, and of course maintain Operational resilience.

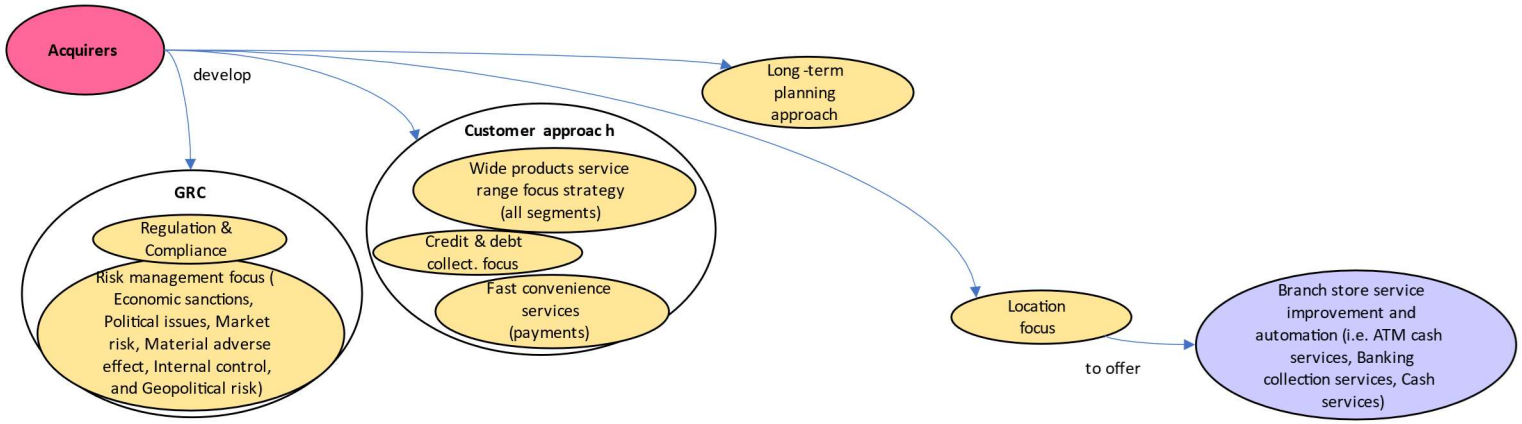


FIGURE 9.26.A ACQUIRERS' SYSTEMIGRAM STORYBOARD

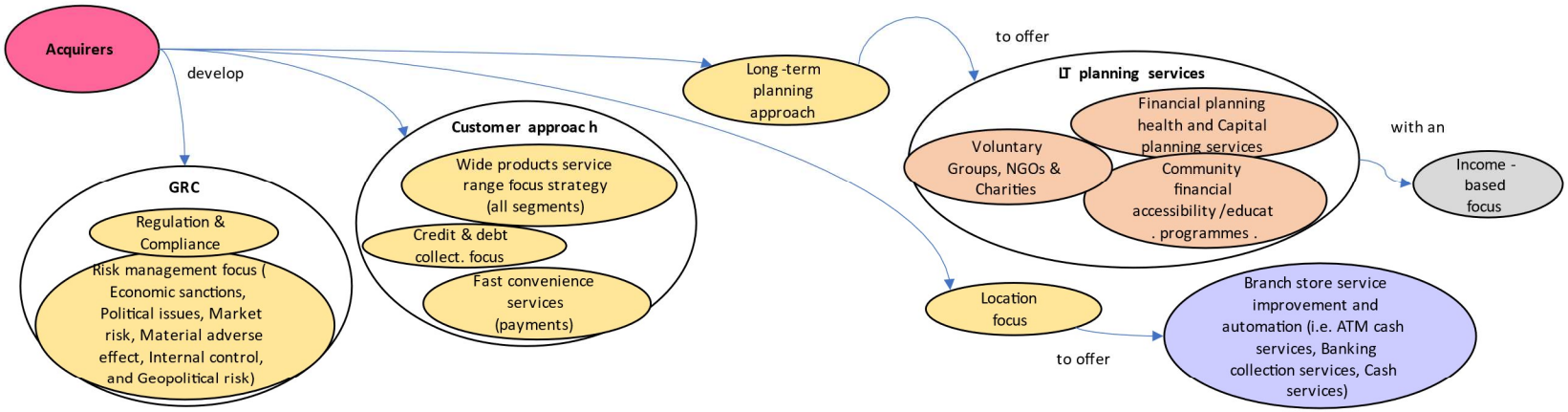


FIGURE 9.30.B ACQUIRERS' SYSTEMIGRAM STORYBOARD

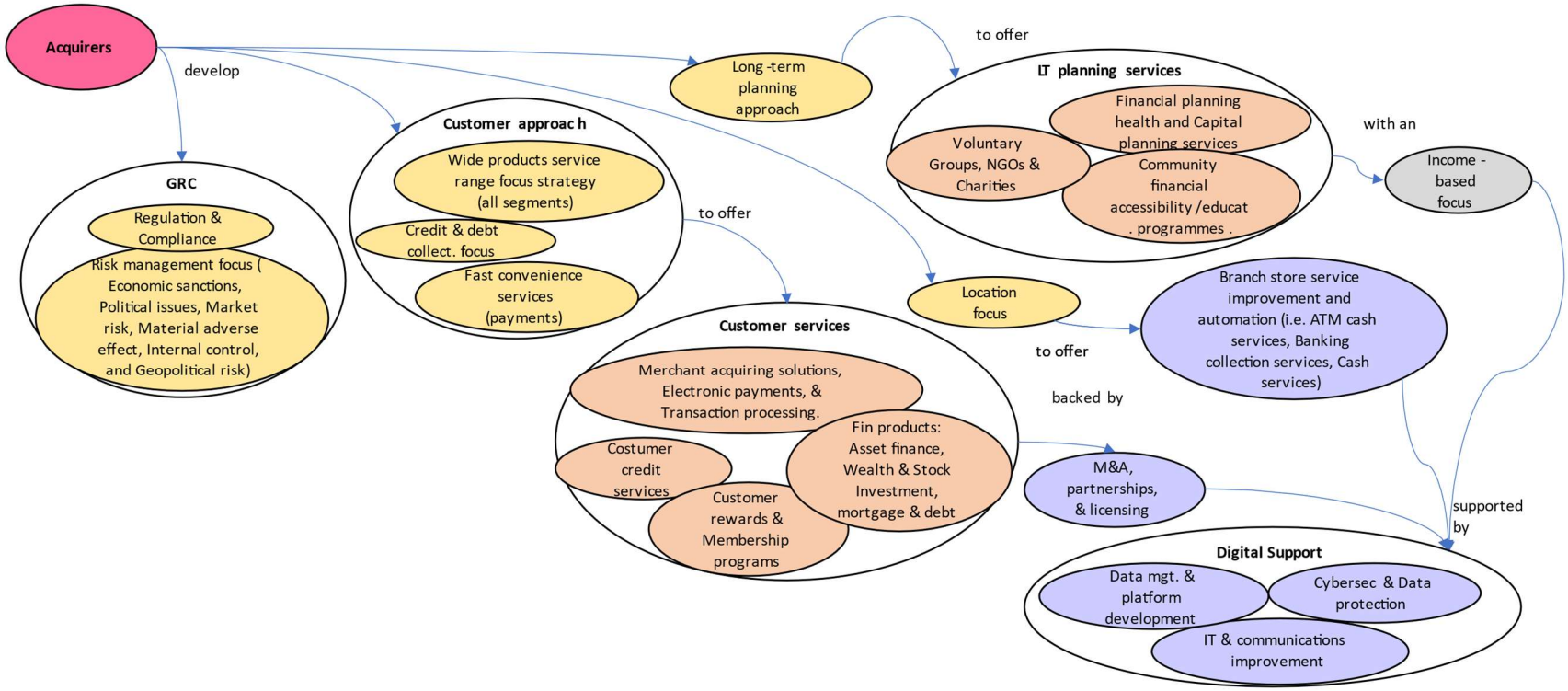


FIGURE 9.30.C ACQUIRERS' SYSTEMIGRAM STORYBOARD

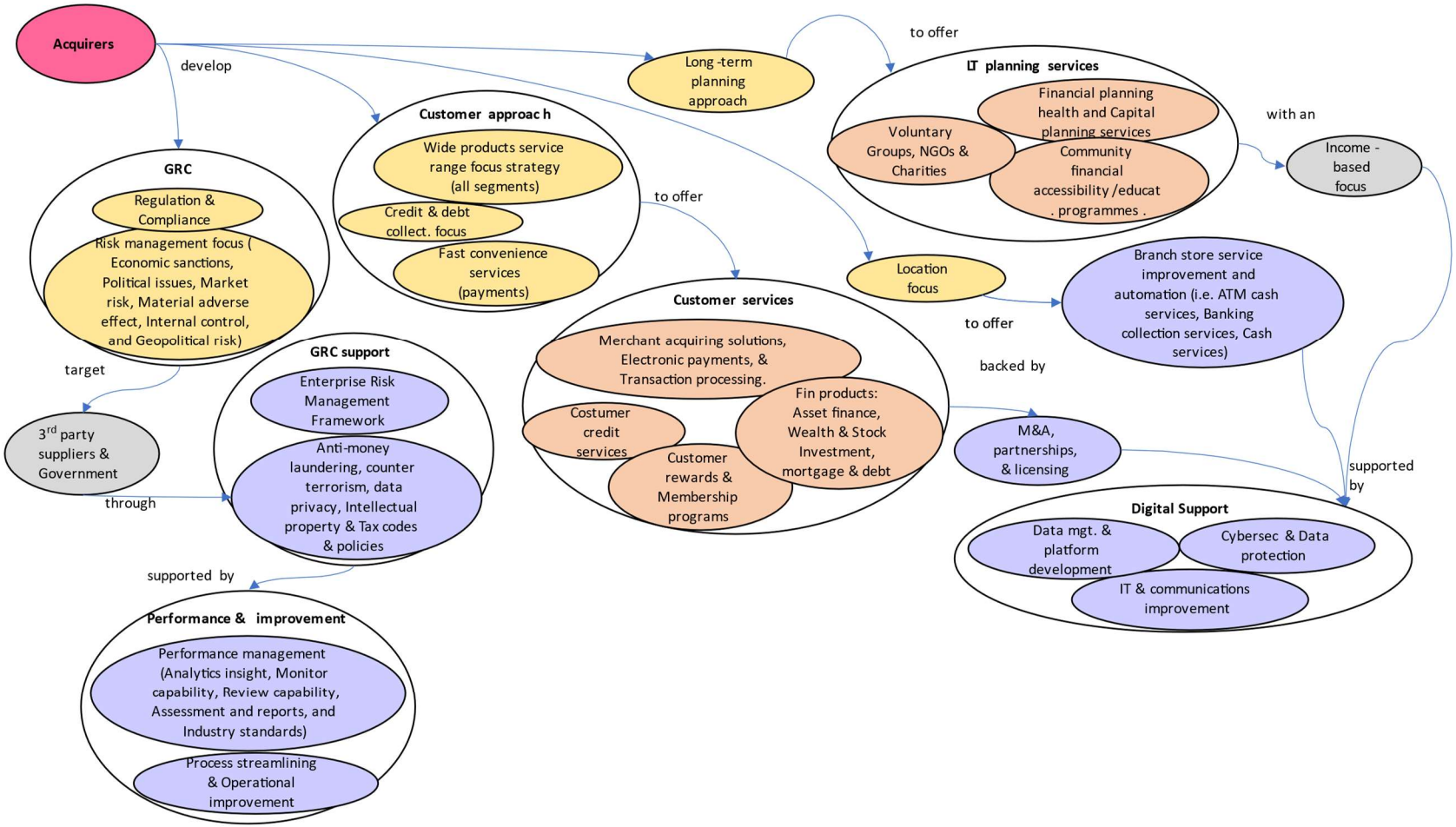


FIGURE 9.30.D ACQUIRERS' SYSTEMIGRAM STORYBOARD

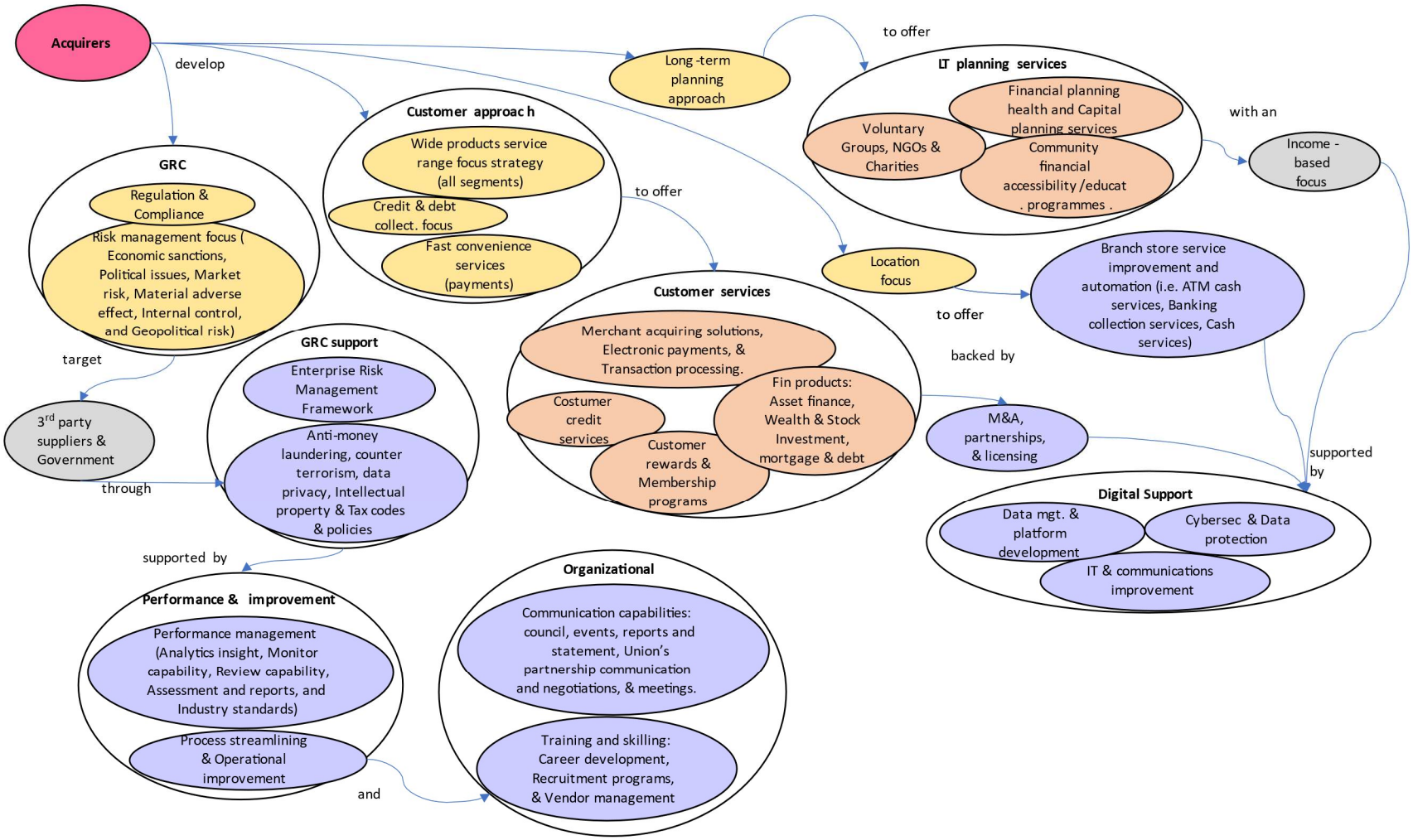


FIGURE 9.30.E ACQUIRERS' SYSTEMIGRAM STORYBOARD

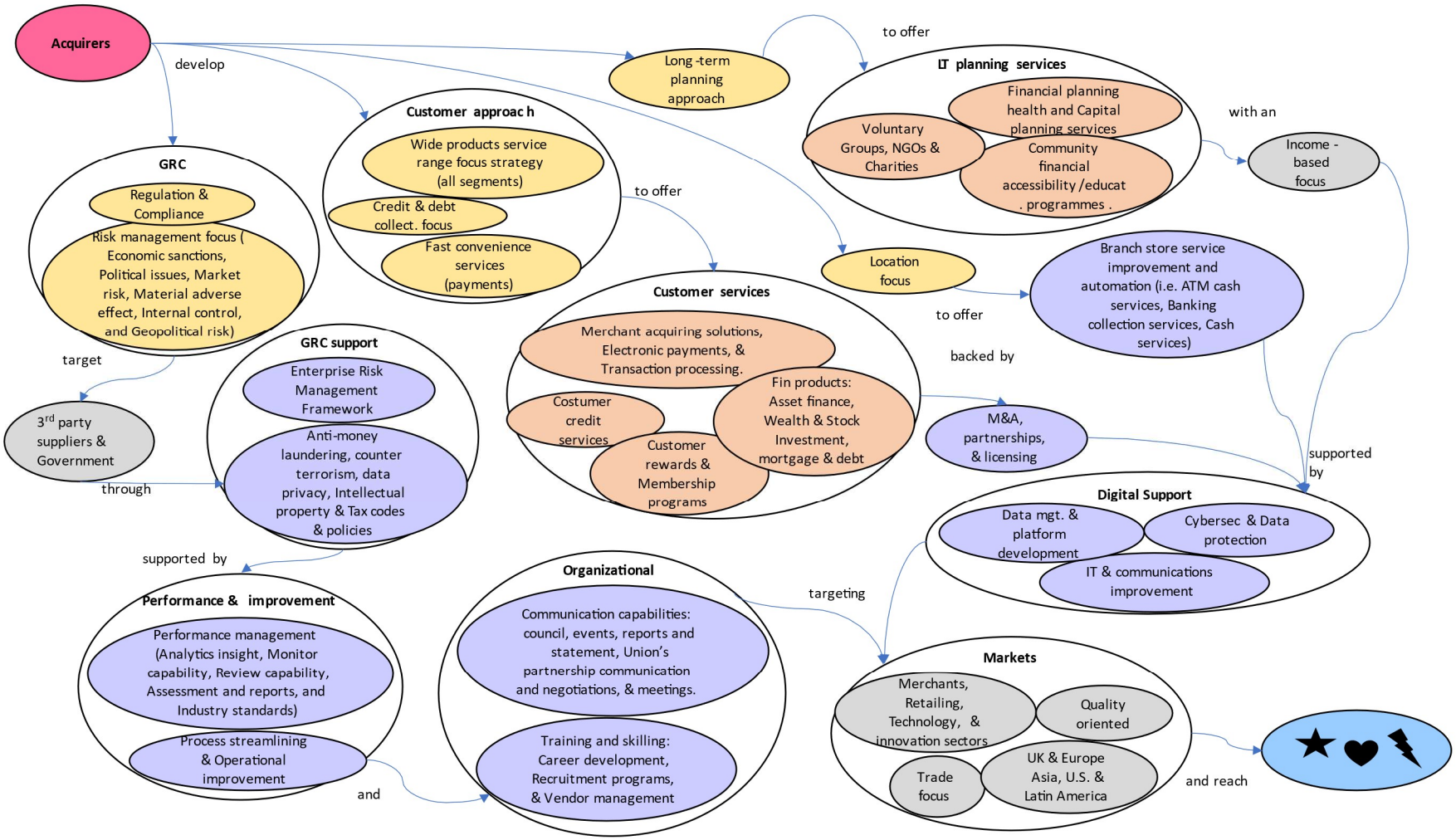


FIGURE 9.30.F ACQUIRERS' SYSTEMIGRAM STORYBOARD

C.3.4 Acquirers' degree of operational resilience alignment

In the following figures, the different strategic factors identified in the acquirers' strategic reports and analyst reports are classified based on the CERT ® operational resilience framework areas and sub areas, based as well on the common, shared, and specific clustering.

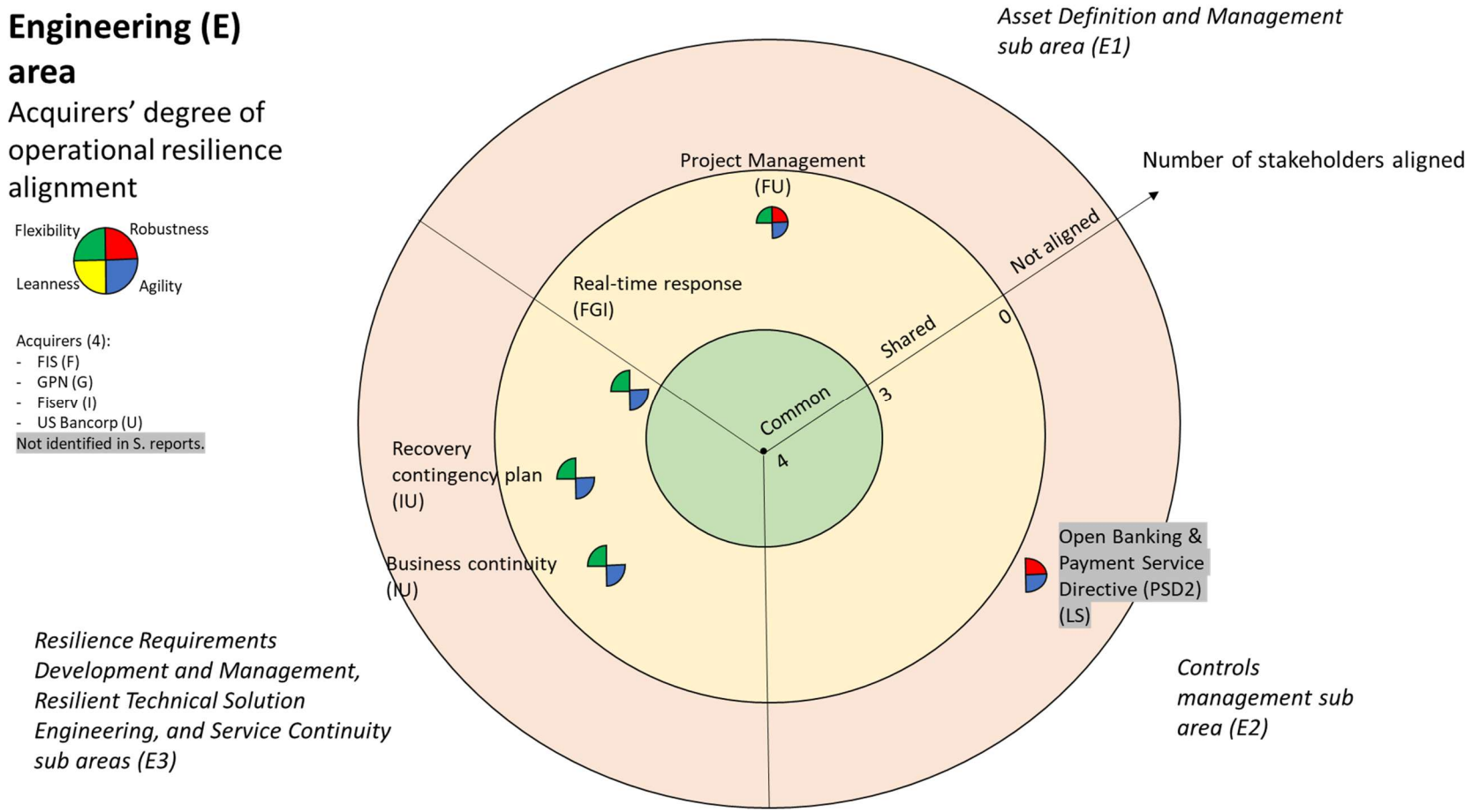


FIGURE 9.27 ENGINEERING AREA ACQUIRERS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

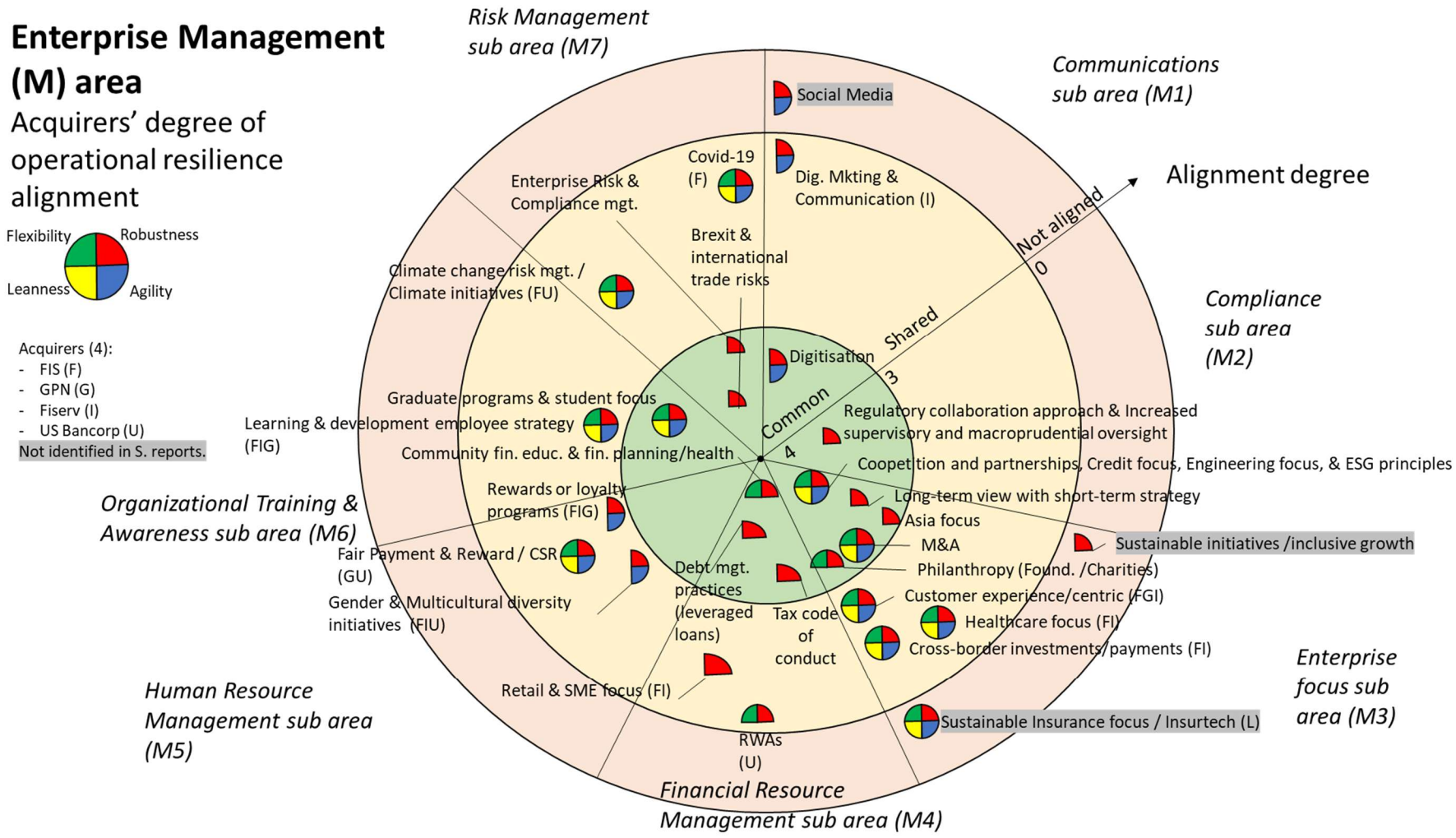


FIGURE 9.28 ENTERPRISE MGT. AREA ACQUIRERS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

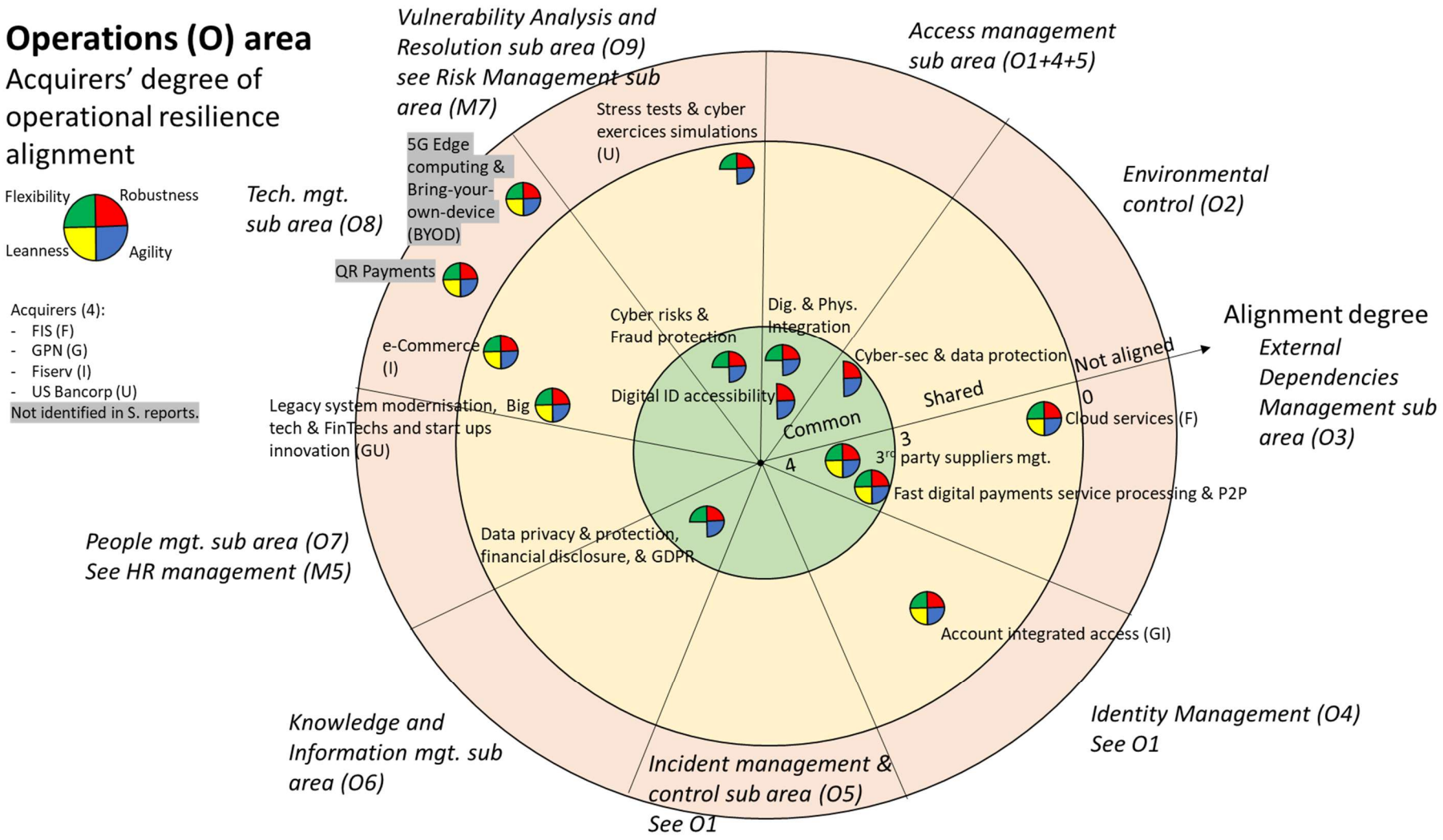


FIGURE 9.29 OPERATIONS AREA ACQUIRERS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

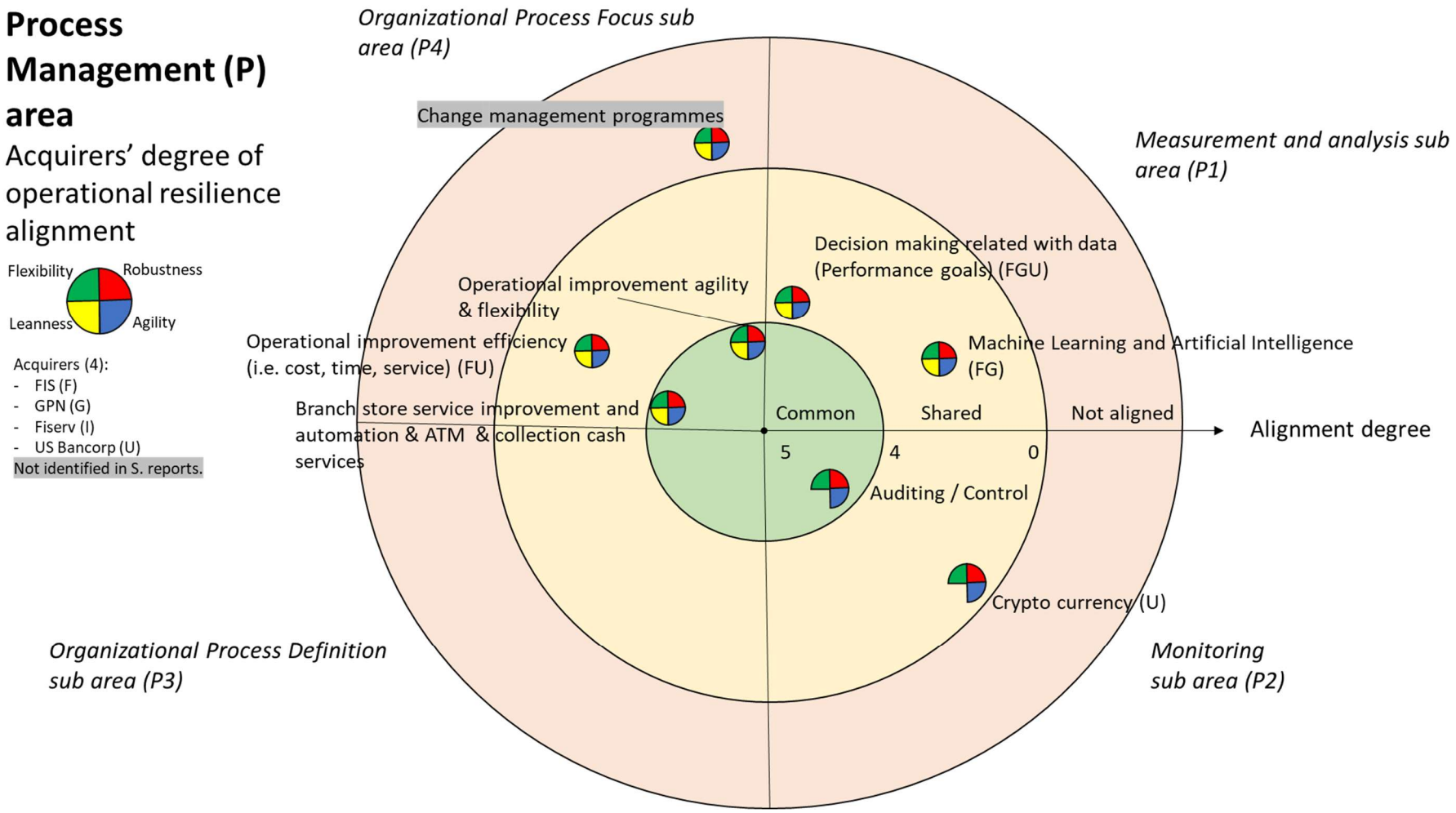


FIGURE 9.30 PROCESS MGT. AREA ACQUIRERS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

C.4 Regulators

C.4.1 Regulators' dictionary-based factor clustering results

Regulators level analysis

PESTEL categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Political_Organizational	119	91	18.02%
Economic_Financial	57	31	6.14%
Socio-Cultural_Demographic	60	32	6.34%
Technological_Methodological	168	95	18.81%
Environmental_Societal	65	41	8.12%
Legal_Ethical	46	29	5.74%
Retailers' identified factors		319	63.17%
Grand Total	515	505	98.06%

TABLE 9.28 NUMBER OF FACTORS PER PESTEL CATEGORY AT A REGULATORS' LEVEL ANALYSIS

Note: Percentages are related to the Factors Identified (505)

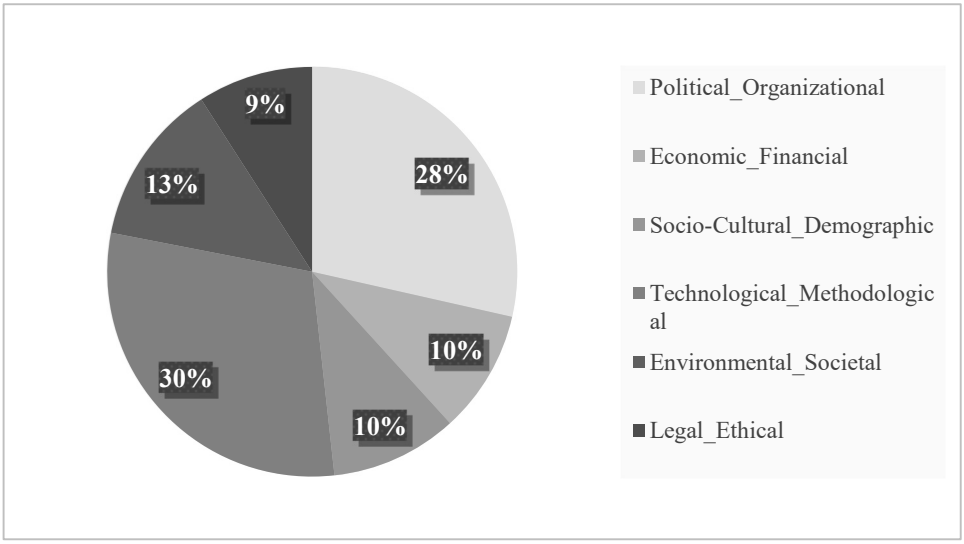


FIGURE 9.31 PERCENTAGE OF FACTORS PER PESTEL CATEGORY

PESTEL categories	BOE (B)	FCA (F)	HM Treasury (H)	PRA (P)	UK Finance (U)
Political_Organizational	60	23	14	17	14
Economic_Financial	21	35	20	16	26
Socio-Cultural_Demographic	24	22	10	14	14
Technological_Methodological	69	67	43	54	53
Environmental_Societal	36	16	13	14	12
Legal_Ethical	15	74	41	49	43
Grand Total	225	237	141	164	162

PESTEL categories	BOE (B)	FCA (F)	HM Treasury (H)	PRA (P)	UK Finance (U)
Political_ Organizational	26.67%	9.70%	9.93%	10.37%	8.64%
Economic_Financial	9.33%	14.77%	14.18%	9.76%	16.05%
Socio-Cultural_ Demographic	10.67%	9.28%	7.09%	8.54%	8.64%
Technological_ Methodological	30.67%	28.27%	30.50%	32.93%	32.72%
Environmental_ Societal	16.00%	6.75%	9.22%	8.54%	7.41%
Legal_Ethical	6.67%	31.22%	29.08%	29.88%	26.54%
Grand Total	44.55%	46.93%	27.92%	32.48%	32.08%

TABLES 9.29 & 9.30 NUMBER OF FACTORS PER PESTEL CATEGORY PER REGULATOR

Stakeholders' categories	Factors coded (FC)	Factors identified (FI)	Percentage FI (%)
Colleagues	66	54	10.69%
Customers	176	89	17.62%
Investors and Board	103	67	13.27%
Regulators, Governments, and Policy Makers	104	65	12.87%
Society/Communities/Environment	48	35	6.93%
Suppliers and Strategic partners	18	9	1.78%
Banks' identified factors		319	63.17%
Grand Total	515	505	98.06%

TABLE 9.31 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY AT A REGULATORS' LEVEL ANALYSIS

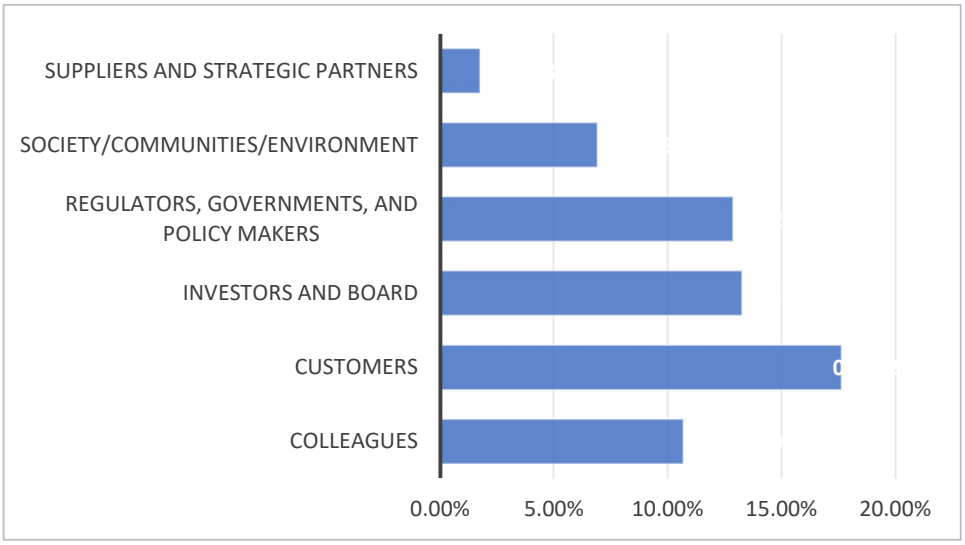


FIGURE 9.32 PERCENTAGE OF FACTORS PER STAKEHOLDERS' CATEGORIES

Stakeholders' categories	BOE (B)	FCA (F)	HM Treasury (H)	PRA (P)	UK Finance (U)
Colleagues	45	36	25	22	21
Customers	55	75	36	42	44
Investors and Board	50	48	33	39	38
Regulators, Governments, and Policy Makers	38	41	26	41	36
Society/Communities/Environment	30	28	16	14	20
Suppliers and Strategic partners	7	9	5	6	3
Grand Total	225	237	141	164	162

Stakeholders' categories	BOE (B)	FCA (F)	HM Treasury (H)	PRA (P)	UK Finance (U)
Colleagues	20.00%	15.19%	17.73%	13.41%	12.96%
Customers	24.44%	31.65%	25.53%	25.61%	27.16%
Investors and Board	22.22%	20.25%	23.40%	23.78%	23.46%
Regulators, Governments, and Policy Makers	16.89%	17.30%	18.44%	25.00%	22.22%
Society/Communities/ Environment	13.33%	11.81%	11.35%	8.54%	12.35%
Suppliers and Strategic partners	3.11%	3.80%	3.55%	3.66%	1.85%
Grand Total	100.00 %	100.00 %	100.00%	100.00 %	100.00%

TABLES 9.32 & 9.33 NUMBER OF FACTORS PER STAKEHOLDERS' CATEGORY PER REGULATOR

Number of sharing organizations	Sharing factors count	Percentage	Organizational cluster	Sharing factors count	Percentage
5	62	12.28%	BFHPU	62	12.28%
4	64	12.67%	BFHP	22	4.36%
			BFHU	15	2.97%
			BFPU	22	4.36%
			BHPU	2	0.40%
			FHPU	3	0.59%
3	52	10.30%	BFH	6	1.19%
			BFP	20	3.96%
			BFU	12	2.38%
			BHP	2	0.40%
			BHU	2	0.40%
			BPU	3	0.59%
			FHP	2	0.40%
			FHU	1	0.20%
			FPU	4	0.79%
2	66	13.07%	BF	21	4.16%
			BH	7	1.39%
			BP	4	0.79%
			BU	6	1.19%
			FH	6	1.19%
			FP	2	0.40%
			FU	15	2.97%
			HP	4	0.79%
			PU	1	0.20%
1	75	14.85%	B	19	3.76%
			F	24	4.75%
			H	7	1.39%
			P	11	2.18%
			U	14	2.77%
Total	319	63.17%		319	63.17%

TABLE 9.34 SHARED FACTORS BY NUMBER OF REGULATORS CLUSTERED AND ORGANIZATIONAL CLUSTERS

	UK Finance	PRA	HM Treasury	FCA	BOE
U		97	85	134	124
P			97	137	137
H				117	118
F					180
B					

	UK Finance	PRA	HM Treasury	FCA	BOE
U		19%	17%	26%	24%
P			19%	27%	27%
H				23%	23%
F					35%
B					

TABLE 9.35 SHARED FACTORS BETWEEN ANY TWO REGULATOR

C.4.2 Regulators' strategic reports' categorization and clustering

In this section, we first summarise some relevant categorization and clustering statistics, detailed in the tables and figures in previous sub section. Then a brief description of the relevant factor findings is given. The strategic factors categorization and clustering results can be graphically seen in Figures 9.37 to 9.39. The organization clusters are referred by their initial letter: BOE (B), FCA (F), HM Treasury (H), PRA (P)), UK Finance (U). From the total 505 factors identified, only 319 factors were detected (63.19%).

In the *PESTEL categorization*, Technological and Methodological (18.81%) is the most frequent, followed by Political and Organizational (18.02%) and Environmental and Societal (8.12%). FCA, HM Treasury, and UK finance have as second most frequent the Legal and Ethical category followed by the Economic and Financial category, and then followed by Political and Organizational factors. While PRA has Legal and Ethical factors in second place after Technological and Methodological, and then follows the same general distribution. In terms of *stakeholder's categorization*, 17.62% of the factors are focused on Customers, 13.27% on Investors and Board, and 12.87% on Regulators, Governments, and Policy Makers. Only PRA has in second place the Regulators, Governments, and Policy Makers category, and then Investors and Board.

The strategic factors' *organizational clustering* shows 12.28% shared by all banks, 12.68% shared by four banks, 10.30% by three banks, 13.07% by three banks and 14.85% bank specific. In the shared by regulators tier, the largest clusters are BOE/FCA/HM Treasury/PRA (BFHP), and BOE/FCA/PRA/UK Finance (BFPU) with 4.36%, and BOE/FCA (BF) with 4.16% and BOE/FCA/PRA (BFP) with 3.96% then all are under 3%, most of the shared factors in the *Technological and Methodological* category.

By comparing all the shared factors, without tiering them, the three most similar are FCA and BOE with 35% of the identified factors, while HM Treasury and UK Finance the least with 17%. Most of these factors are in the *Technological and Methodological* category, followed by the *Political and Organizational*, and then the *Environmental and Societal*.

The next paragraphs detail Figures 9.37 to 9.39 PESTEL categorization and clustering analysis of all shared initiatives. For the PESTEL tiering analysis, please refer to the figures 5.1- 5.6.

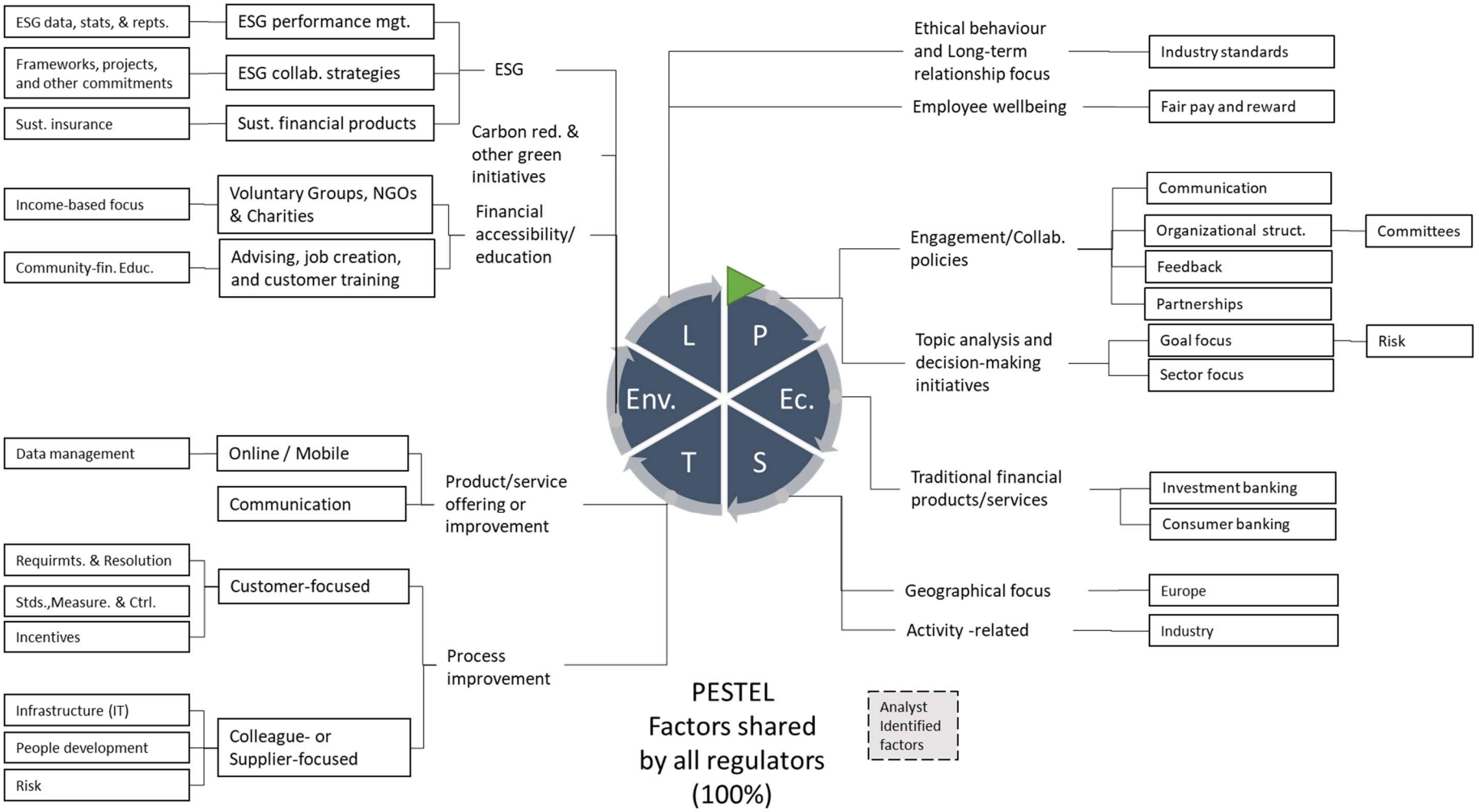


FIGURE 9.33 STRATEGIC FACTORS SHARED BY ALL REGULATORS

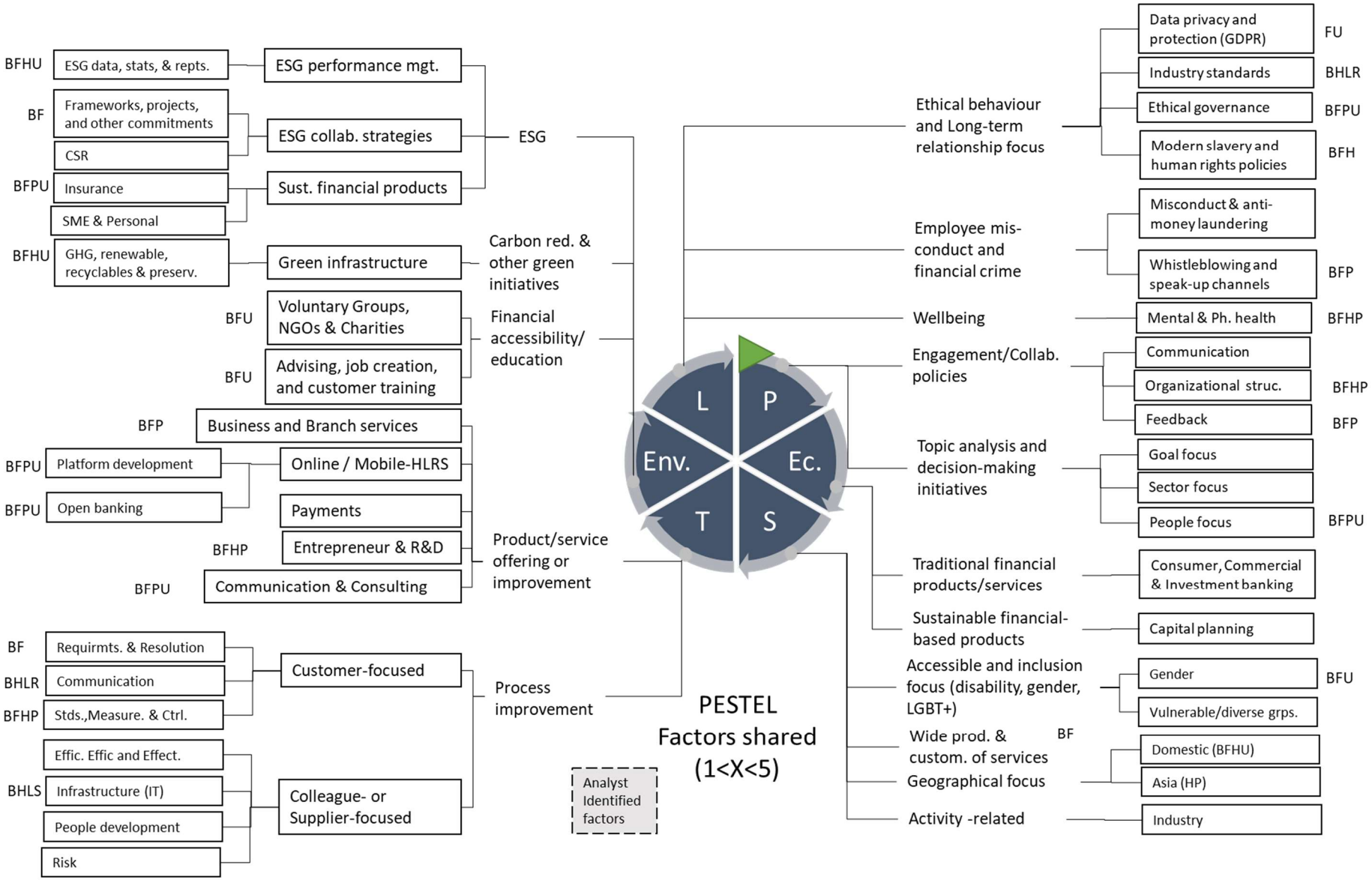


FIGURE 9.34 STRATEGIC FACTORS SHARED BY 4, 3, AND 2 REGULATORS

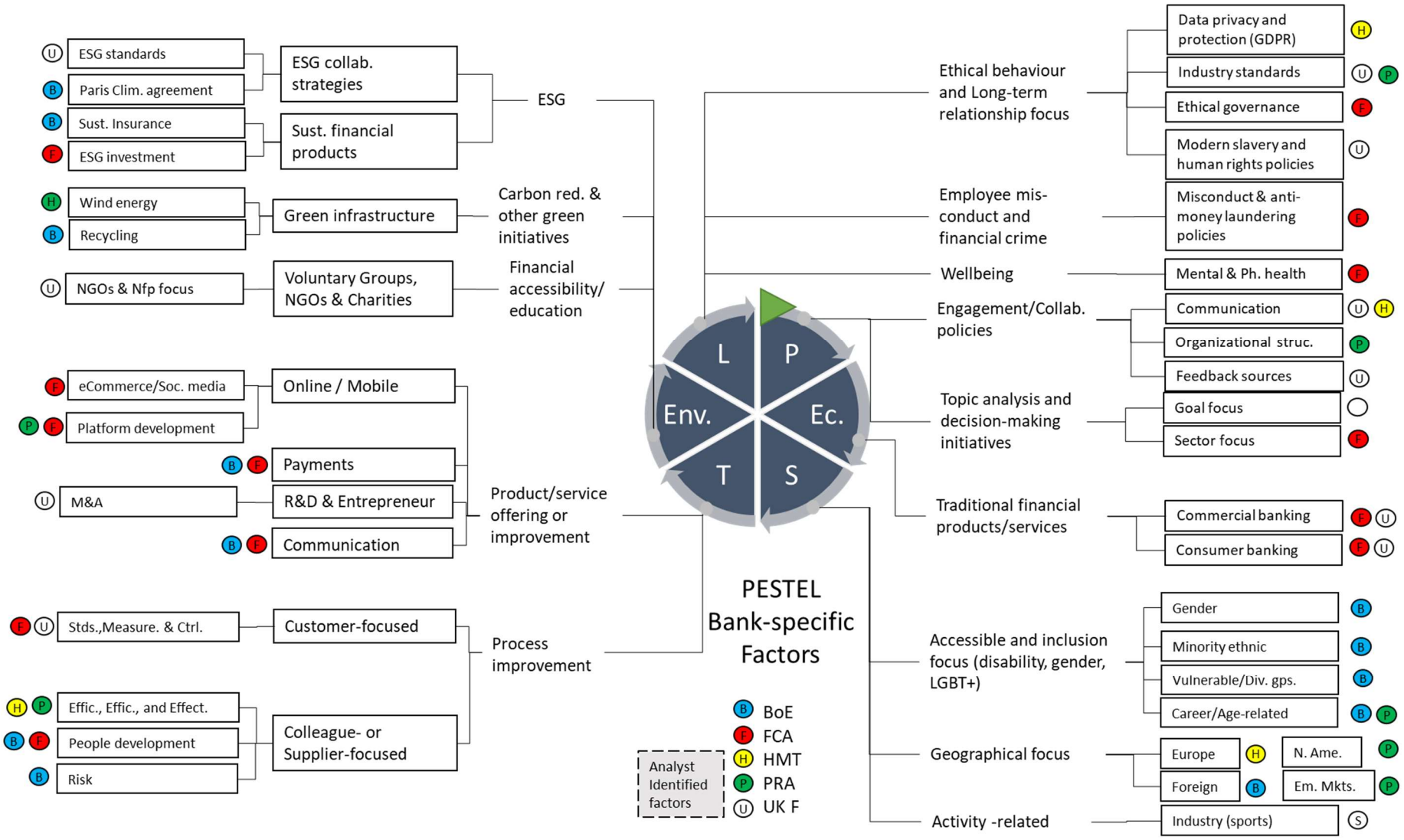


FIGURE 9.35 STRATEGIC FACTORS SPECIFIC BY REGULATOR

For the ***Technological and Methodological (T&M)*** factors, in relation to product or service offering or improvement, all regulators focus on *Mobile and Online* initiatives, such as Data management and Online banking capabilities.

Regarding shared initiatives by 2, 3, and 4 regulators, in relation to *Branch services*, they focus Branch store service improvement and automation (BFP); in *Business services*, on Business travel mobility (BF); in *Communication*, on Digital communication (BFU), Printed communication (FPU) and Virtual reality (BU); on *Consulting and Entrepreneurship*, on Innovation programs (FHP) and Consulting customer capabilities (BFP); on *Mobile and Online*, on Biometric authentication (FU), Digital bank company (BFHU), Fintech (BFHP), Mobile banking capabilities (FU), Open banking (FU), Personal data app management capabilities (BFP), and Platform portal development (BFHP); on *Payments*, such as Banking collection services (BFP), Cash services (FU), Credit cards (FH), Cross border payment solutions (BFPU), Fast digital payments service process (BF), PSD2 (FU), Payment integration capabilities (FU), and Switching capabilities (BF)

In terms of specific initiatives, related with *Communication*, they highlight a Customer networking platform (F); on *Entrepreneurship*, Mergers and acquisitions (U); on *Online & Mobile capabilities*, eCommerce (F), Integrated access capabilities (P), and Social media and web chat bots customer communication (F); and on *Payments*, ATM cash services (F), Crypto digital currency (B), Electronic payments (B), Buy now pay later (F), and Check services (F).

Related with process improvement, all regulators focus on *Efficient, effective, efficacious capabilities*, like Customer feedback; on *Incentives*, such as Customer reward programs; on *IT infrastructure*, like Cyber security and data protection; on *People development*, which consist of Colleague support and Training and skilling, and a Customers' Requirements focus; on *Risk management*, in an Enterprise Risk Management Framework and a Resilience focus; and on *Standards, measurement, and control*, on Performance management, Surveys, a Project and programme management approach, Performance goals measurement, a Monitor capability, a Reviewing capability, Assessment and reports, and an Auditing capability.

In terms of shared initiatives by 3 and 2 payment networks, they focus on *Efficient, effective, efficacious capabilities,* like Process streamlining (BFPU), Collaboration improvement (BFP), Operational improvement with an efficiency focus (BFHP), Operational improvement related with simplification (BFHP), Operational improvement focused on faster times (BFP), Operations improvement focused on agile (BU), Process improvement in general (BU), a Real-time response (BH), and Fast convenience services (BFHP); on *IT Infrastructure,* in a Cloud based digital environment and IT and communications improvement; on *People development,* in Apprenticeship (BH), Coaching and mentoring (BF), Colleague benefits (FHU), People digital capabilities development (BHU), Colleague engagement policies (BFU), Colleague survey (BFH), Employee leadership development program (BH), Expert leadership development (BFHP), Recruitment programs (BFH), and Vendor management (BP); on *Research and development*, in Research science (BH); on *Resolution*, in a Resolving capability (BF); on *Risk management capabilities,* on Model risk (BP), Risk Impact mitigation (BFPU), Accountability (BFHP), Fraud capabilities (BFHU), a Mitigation approach (BFPU), Recovery contingency plans (BFHP), Stress tests (BFP), and Business continuity (BFPU); and finally, on *Standards, measurement, and control,* in Analytics insights (BFP), Scorecards (BH), Machine learning and artificial intelligence (BFPU), and a Measurement capability (BFHP).

In terms of bank-specific initiatives, in *Efficient, effective, efficacious capabilities*, they highlight Interviews and focus groups (B), Effective communication (F), and Operational improvement cost (H); on *People development*, Career development (B) and Workshops and bootcamp (*F*); on *Research and Development,* in Research science (F); and in *Standards, measurement, and control,* on Banking standards (P), Customer satisfaction and trust scores (U), CRM (U), Industry standards (F), and Tracking (F) performance.

On the ***Environmental and Societal*** factors category, all regulators focus on *Carbon reduction & other green initiatives*, related with Climate initiatives. In terms of *ESG collaboration strategies*, they focus on an *ESG approach*, on specific *Frameworks, projects, and other commitments*; like, Sustainable Initiatives, ESG partnerships and trusts, and ESG Principles. On *ESG performance management*, *they have ESG data,*

stats, and reports related to Climate change risk management. In terms of *Financial accessibility & education*, they focus on *Advising, job creation, and customer training*; in respect of Community financial education, Business advising, and Strategy commitments. In terms of *Voluntary Groups, NGOs & Charities*, they mention Foundation and fundraising programs and an Income-based focus.

In terms of shared initiatives, there are some related with *Carbon reduction & other green initiatives*; like Carbon red initiatives (BFU), and GHG emissions (BFH). Others related with *Green infrastructure*; like Green Infrastructure (BFH) and Preservation and safeguarding (BFHU). Related with *ESG collaboration strategies*, in respect of *Frameworks, projects, and other commitments*, they mention ESG groups and committees (BF). There are several factors regarding *CSR*; for example, a Corporate responsible culture interest (FU), Supplier accountability initiatives (BFHP), a Supply chain suppliers focus (BFPU), and Volunteering programmes (BF). On *ESG performance management*, they focus on *ESG data, stats, and reports*; alike, ESG recognitions (BFHU), the Coronavirus pandemic (BFH), and any case of Pandemic (BFHU). In the case of *Sustainable financial products*, there are ESG business financing products and services (BFPU), ESG personal financing products (BF), ESG SME-oriented financing services and support (BFHP), and Sustainable housing initiatives (BFHU). In terms of *Financial accessibility & education*, we can find *Advising, job creation, and customer training*; like, Community financial accessibility programmes (BFU), Academy or school education workshops (BF), and Financial educational tools (BFU). And in terms of *Voluntary Groups, NGOs & Charities,* they highlight Charities (BFU), Donations (BFU), Financial inclusion (BFU), and Volunteering (BF).

In terms of specific initiatives, related with *Carbon reduction & other green initiatives*, they mention *Green infrastructure*, in terms of Wind energy initiatives (P) and Recycling (B). In the case of *ESG collaboration strategies*, linked with *Frameworks, projects, and other commitments*, they include ESG standards (U) and the Paris climate agreement (B). On *CSR*, they highlight Supplier accountability (F) and Corruption laws (F). In terms of *Sustainable financial products*, they offer Sustainable insurance services (B) and

Sustainable investments (F). Related with *Financial accessibility & education*, specifically in *Voluntary Groups, NGOs & Charities*, they just mention NGOs (U).

In the ***Socio-cultural and Demographic*** classification, all regulators focus on a *Geographical focus* specifically related with a Europe focus, an International focus, and a United Kingdom focus. In relation with *Activity and Industry-related initiatives,* they offer, both, a Trade and Quality focus.

In terms of shared initiatives, they mention an *Accessibility and inclusion focus (disability, gender, LGBT+)* related with *Vulnerable or diverse groups*, such as Abuse-related initiatives (FH), Accessible services (BFHP), Disability-related initiatives (BF), an Inclusion focus (BFHU), and Multicultural diversity initiatives (BFHP). In terms of *Gender*, they include Gender diversity (BFU) and Gender balance initiatives (BU). In respect of *Activity-related/Industry*, they focus on the Service industry (FHPU), a Wholesale focus (BFPU), and a Trading focus (BFP). Related with *Geographical focus*, they include an Asia focus (HP) and a Domestic market focus (BFHU). Finally, in terms of *Wide product & customisation of services*, they talk about a Wide products service range focus strategy (BF).

In terms of specific initiatives, there is an *Accessibility and inclusion focus (disability, gender, LGBT+)* related with *Vulnerable or diverse groups*, including initiatives such as a general Pay gap (B) analysis; and specifically, a BAME pay gap (B), and a BAME taskforce (B). In terms of *Gender*, there are Gender pay gap initiatives (B), and *Career or Age -related initiatives*; related with, Age group diversity initiatives (B), Career break or change (B), Graduate programs (B), Parental programs (P), and a Student focus (B). In terms of *Geographical focus*, they include the following areas: Germany (H), Emerging markets (P), Canada (P), and Foreign (B). Also, in respect of *Wide product & customization of services*, they mention Branded products (U).

For the ***Political and Organization*** category, all regulators focus on *Engagement and collaboration policies*, and specific *Communication capabilities*, like Events, and Reports and Statements. In terms of *Feedback sources*, they mention a Regulatory approach and Regulator collaboration. In *Organizational structure*, they talk about Committees, a Membership capability, Teams, Unions' partnership communication and negotiations,

Groups, forums and centres, and Meetings. In relation with *Partnerships*, they focus on Partnership Alliances. On *Topic analysis and decision-making*, in respect of *Goal focus*, there is a *General* approach related with a Collaborative focus, a Credit focus, a Regulation and compliance focus, a Learning and training employee strategy, a Lending focus and Strategic business planning capabilities. Related with *Risk*, there is Market risk mentioned. In terms of *Sector focus*, they mention Technology and innovation, Third party suppliers, and a Government focus.

In terms of shared initiatives by 2, 3 and 4 regulators, there are *Engagement and collaboration policies* related with *Communication capabilities*, such as Councils (BFHP), a Cultural focus (BFHU), Feedback (BFHP), Executives remuneration reports (BFPU), Letters and briefs (BFPU), and Financial statements (FU). In *Feedback sources*, they talk about Benchmarking (BFP). On *Organizational structure*, they mention Change management programmes (FH), Panels (BF), Roundtables (BFP), the Basel committee (BP), and Credit unions (BFHP). In terms of *Partnerships*, there are Sponsorships (BF). Related with *Topic analysis and decision-making*, there is a *General Goals' focus* in terms of Employment job creation (BH), Customers or consumers (FU), Corporate governance (FU), Office location (BFH), Profitability (FU), Topic analysis decision making (BP), Payments (BFU), Long-term initiatives (FH), Monetary policies (BHP), Political issues (BFU), Positive views (BFPU), Competitiveness (BFHU), Effective competition (BFP) and Productivity (BFHU. Related with *Risk* factors, they identify Financial risks (BFPU), Risk management (BFHP), Operational risk (BFPU), Libor transition (FPU), Credit Risk (PU), Economic sanctions (FHP), Brexit (BFU), Legal risk (BFPU), Liquidity risk (BHPU), a Material adverse effect (BU), Resolution planning critical functions (BPU), Strategic risk (BHU), Financial crisis (BFHP), Internal control (BFPU), and Operational resilience (BFPU). In terms of *People's focus*, they mention a CEO focus (FPU), an Executive directors' focus (BF), and a Senior managers' focus (BFPU). Related with *Sector focus,* there is a focus on the Consultative employee capacity (BFP), Retailing industry (FPU), Shareholders (FHPU) and Major banks (HP).

In respect of specific initiatives, related with *Engagement and collaboration policies*, there are *Feedback sources*; like, Board engagement (F) and Accounting policies (U). On

Organizational structure, they include Organizational model simplification initiatives (P) and Licensing (H). In terms of *Topic analysis and decision-making*, the *Goals' focus*, in *General*, is on Colleagues' share and pension plans (F), a Complaint focus (F), Entrepreneurial initiatives (F), Financial indicators (H), a Short term focus (F), a Cancer focus (B), and Negative views (U). Related with *Risk*, they identify Non-financial risk (B), Ringfencing (P), Foreign exchange risk (F), Geopolitical risk (H), Principal risk (U), Emerging risks (B), Systemic risk (P) and Tier banking (U). On the *Sector focus*, they mention a Merchant focus (F) and Farming industry (H) capabilities.

In the ***Ethical and Legal*** categories, all regulators focus on an *Ethical behaviour and Long-term relationship focus,* related with *Industry standards*, such as Treasury policy and Policy making. In terms of *Wellbeing*, they talk about a Fair payment and reward policy.

In terms of shared initiatives, on an *Ethical behaviour and Long-term relationship focus*, there are *Data privacy and protection (GDPR)* initiatives, related with Data privacy and protection (FU). On *Ethical governance*, they talk about a Code of conduct (BF), Ethical values' governance (BFPU), a Long-term approach (BFHU), and Financial disclosures (BF). Also, in terms of *Industry standards*, they include Prudential standards (BPU), Industry certifications (BFPU), the Companies' act (FU), and Financial reporting (BFPU). Related with *Modern slavery and human rights policies*, they highlight Counter terrorism (FH) and Employees' human rights and rights to work policies (BF). And in terms of *Tax policies*, they talk about a Tax code of conduct (HP). In relation with *Employee misconduct and financial crime*, in specific on *Misconduct & anti-money laundering policies*, they develop policies on Anti money laundering (BFHU), Financial crime (FHPU), and Misconduct (BFP). There are *Whistleblowing and speak-up channels'* initiatives, such as an Employees' whistleblowing and speak up channels policy (BFP). As well, in *Wellbeing*, related to *Mental & Physical Health*, they include Employee mental and physical health and safety (BFHP) initiatives.

In terms of specific initiatives, there are *Employee misconduct and financial crime initiatives*, related with *Misconduct & anti-money laundering policies*; like, Anti bribery (F) and Corruption (F). In terms of *Ethical behaviour and Long-term relationship focus*, there

is a focal point on *Data privacy and protection (GDPR),* as well as Intellectual property (H). On *Ethical governance*, they are mentioning Unfair trade (F). Related with *Industry standards*, they include Strategic reports (U), Competition reports (P), and Risk buffers compliance (P). As well, in terms of *Modern slavery and human rights policies*, they highlight the Modern slavery policy (U). Finally, in relation to *Wellbeing,* they talk about Health-focused products (F).

On the ***Economic and Financial*** category, all regulators focus on *Traditional financial products/services*, with a *General* approach, in terms of an Economic and Financial focus. Related with *Consumer banking*, they talk about Mortgage process improvement and automation; and *Investment banking,* they mention Asset finance.

In the case of shared initiatives, related with *Traditional financial products and services*, and in respect of *Commercial banking*, they mention Transaction fees (BFP), a Commercial banking focus (BU), Reimbursements (FU) and Balance sheet analysis (BPU). Also, in *Consumer banking*, they talk about Pension products (BFHP), a Debt focus (BFHU), Pricing practices (BF) and Interest rates (BFP). Related with *Investment banking*, they focus on the Common Equity Tier 1 (HP), Investment products and services (BFHP), Wealth investment (FH), an Investment banking focus (FP), Stock markets (FP), a Libor focus (BFPU), SWAPs (BF), Financial instruments (FU), Bonds (BF), the Financial market (BFP), and a GDP focus (BH).

In terms of bank-specific initiatives, related with *Traditional financial products/services,* and in respect of *Commercial banking*, they mention the Merchant discount rate (F), a Cash flow focus (U). And related with *Consumer banking*, they talk about Leasing (U) and Travel insurance (F).

C.4.3 Regulators' strategic reports' systemigram

For the Systemigram development, first, a categorisation of the different factors was used with the "Playing to win" framework, as seen in Table 9.36.

	Systems (Infrastructure)	Capabilities (Process)	How we will win?	Where we will play?	Winning aspirations
Definition	Support systems structures, and measures	Set of reinforcing activities and specific configuration	Value proposition and competitive advantage	Geographies , product categories , costumer segments , channels, vertical stages of production	Purpose or guiding aspirations
Factors	-Data management and Online banking capabilities. -Cyber security and data protection -Colleague support, learning, training & skilling cap. -Enterprise Risk Management Framework (Climate change risk focus) - Performance management (Data, Stats, Surveys, Performance goals measurement, Monitor, Reviewing, Assessment, Reports, and Auditing capability) -Project and programme management approach -Strategic business planning -Communication (Events, Statements, Committees, Membership, Teams, Unions partnership communication and negotiations, Groups forums centre, and Meetings -Partnerships & alliances	-Sustainable Initiatives (ESG partnerships and trusts, and Principles) -Community financial education, -Business advising, -Foundation and fundraising programs -Regulator collaboration and compliance -Policy making -Customer feedback and membership rewards	-ESG initiatives (Climate-focused) -Credit and Market Risk focus -Learning and training employee strategy -Technology and innovation strategy -Fair payment and reward approach	-Geographical focus (UK, Europe, and International) -Activity/Industry focus (Trade and Quality focus) -Stakeholders (3rd party supplier & Government focus, treasury) -Mortgages & asset finance	-Resilience focus -ESG focus (Climate initiatives and Income -based initiatives) -Employee wellbeing -Economic/financial sustainability

TABLE 9.36 REGULATORS' "PLAYING TO WIN" DECISION-BASED FRAMEWORK CATEGORIZATION

Then, the Systemigram prose was developed, as seen in the next paragraphs, alongside, the Systemigram graphic and complete storyboard, as seen in Figures 9.40.A to G.

Regulators are developing their strategies on four main areas: **ESG**, **Regulation and Compliance**, *Colleagues' Learning and training*, and *Technology and innovation*.

First in **ESG**, there are several *ESG initiatives*, mainly *Climate-focused*, and a *Fair payment and reward* approach, with and *Income-based focus*, developing **Sustainable Initiatives**, such as *ESG partnerships, trusts*, *and principles*, as well as *Community financial education* services, and *Foundation and fundraising programs*.

In the **Regulation and Compliance** strategy, there are *Regulator collaboration and compliance* initiatives, there is a *Credit and Market Risk focus*, concentrated on *Policy making* capabilities, highlighting a focus on **Customer services** as *Mortgages & asset finance*, and *Customer feedback and membership reward*. The main **Policy areas** are *Anti-money laundering, Counter terrorism, Data privacy, Intellectual property & Tax codes policies*, as well as *Cybersecurity & Data protection*. In terms of *Business advising*, they focus on a *Strategic business advising approach*.

The Regulators also mention a *Learning and training employee strategy*, mainly supported by **Organizational support** capabilities as *Colleague support, learning, training & skilling* resources, and *Communication and Working* capabilities, such as *Events, Statements, Committees, Membership, Teams, Union's partnership and communication, Negotiations, Groups, Forums, Centres,* and *Meetings*.

They highlight a *Technology and innovation strategy*, supported by **Digital strategies** as *Data management & online platform development* and *Partnerships & alliances.*

To support the above-mentioned strategies, they have been focusing on several common **Governance support** capabilities such as *Performance management*, with the help of *Data, Stats, Surveys, Performance goals measurement, Monitor, Reviewing, Assessment, Reports, and Auditing.* Also, *Project and programme management*, and an *Enterprise Risk Management Framework*, highlighting *Climate change risk.*

Mainly Regulators are targeting the *Trade* sector with a *Quality* dimension focus, related with *3rd party supplier & Government focus*, mentioning especially treasury services, and geographically looking after the *UK, and Europe*, mainly, but also showing an *International* focus.

The common goals highlighted are in terms of Social & Environmental sustainability, specifically mentioning *Gender & cultural balance and diversity inclusion,* Environmental and Social consciousness, and *Employee & supplier wellbeing*, including *fair payment, health, and safety*. In terms of *Economic profitability*, they continue to focus on *Economic and Financial competitive performance*, and of course maintain Operational resilience.

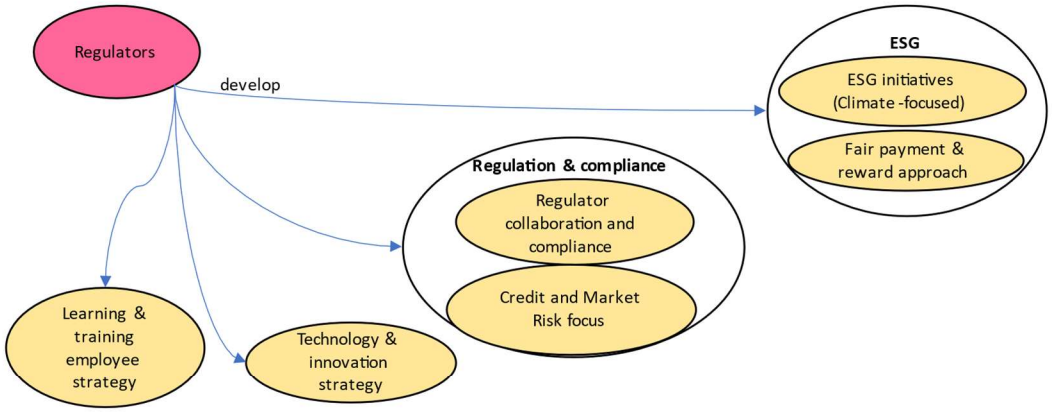


FIGURE 9.36.A REGULATORS' SYSTEMIGRAM STORYBOARD

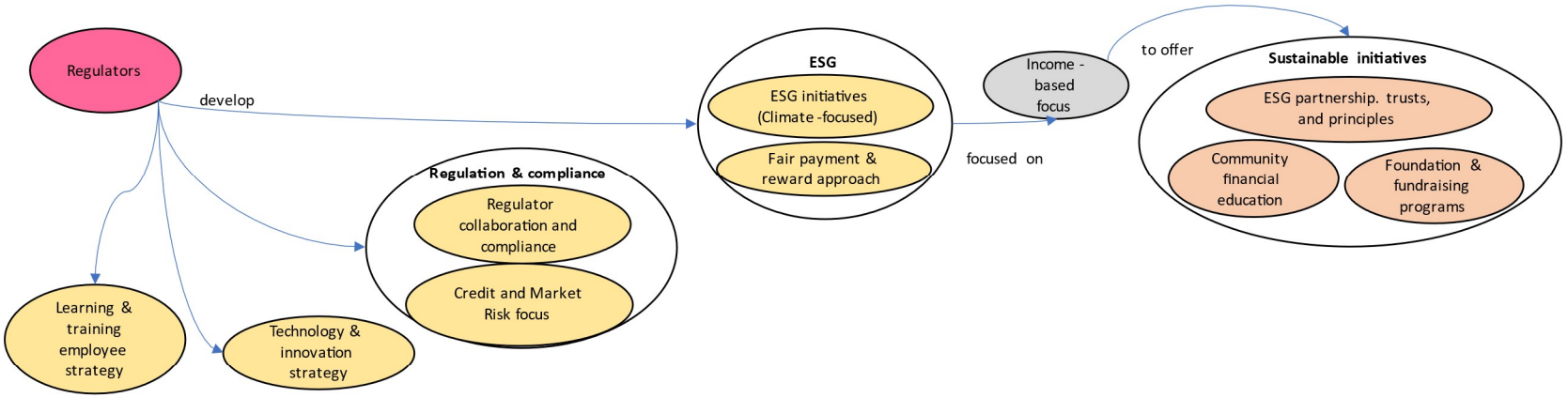


FIGURE 9.40.B REGULATORS' SYSTEMIGRAM STORYBOARD

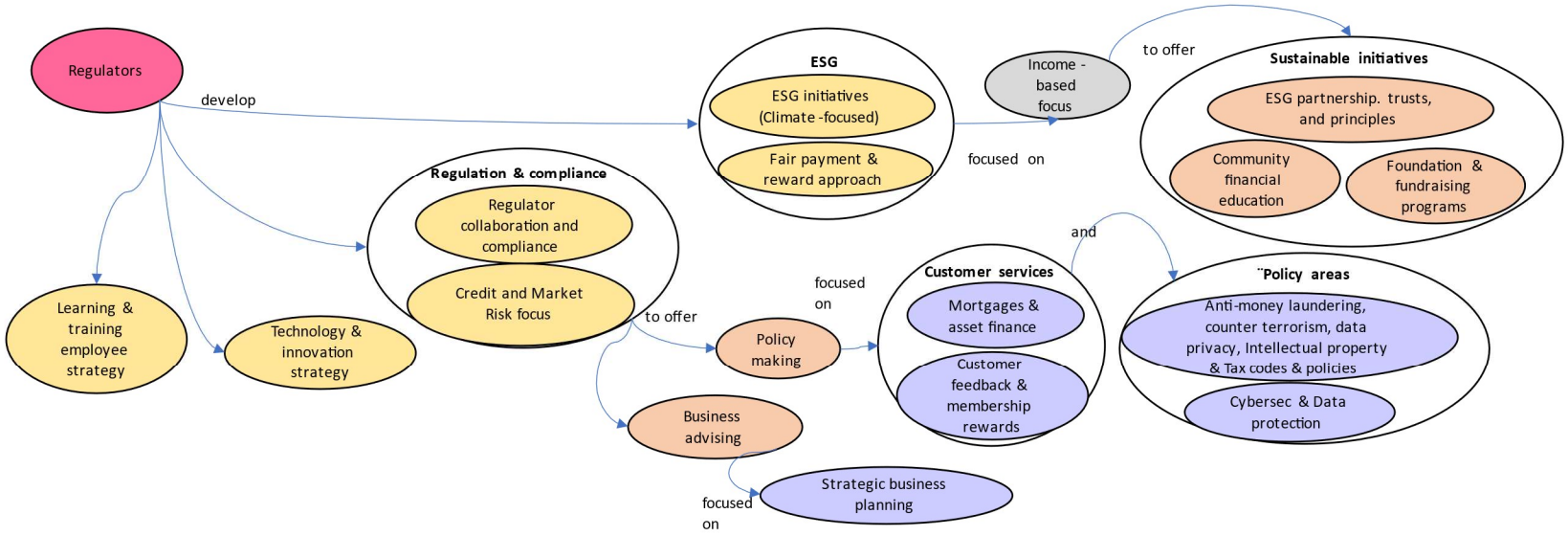


FIGURE 9.40.C. REGULATORS' SYSTEMIGRAM STORYBOARD

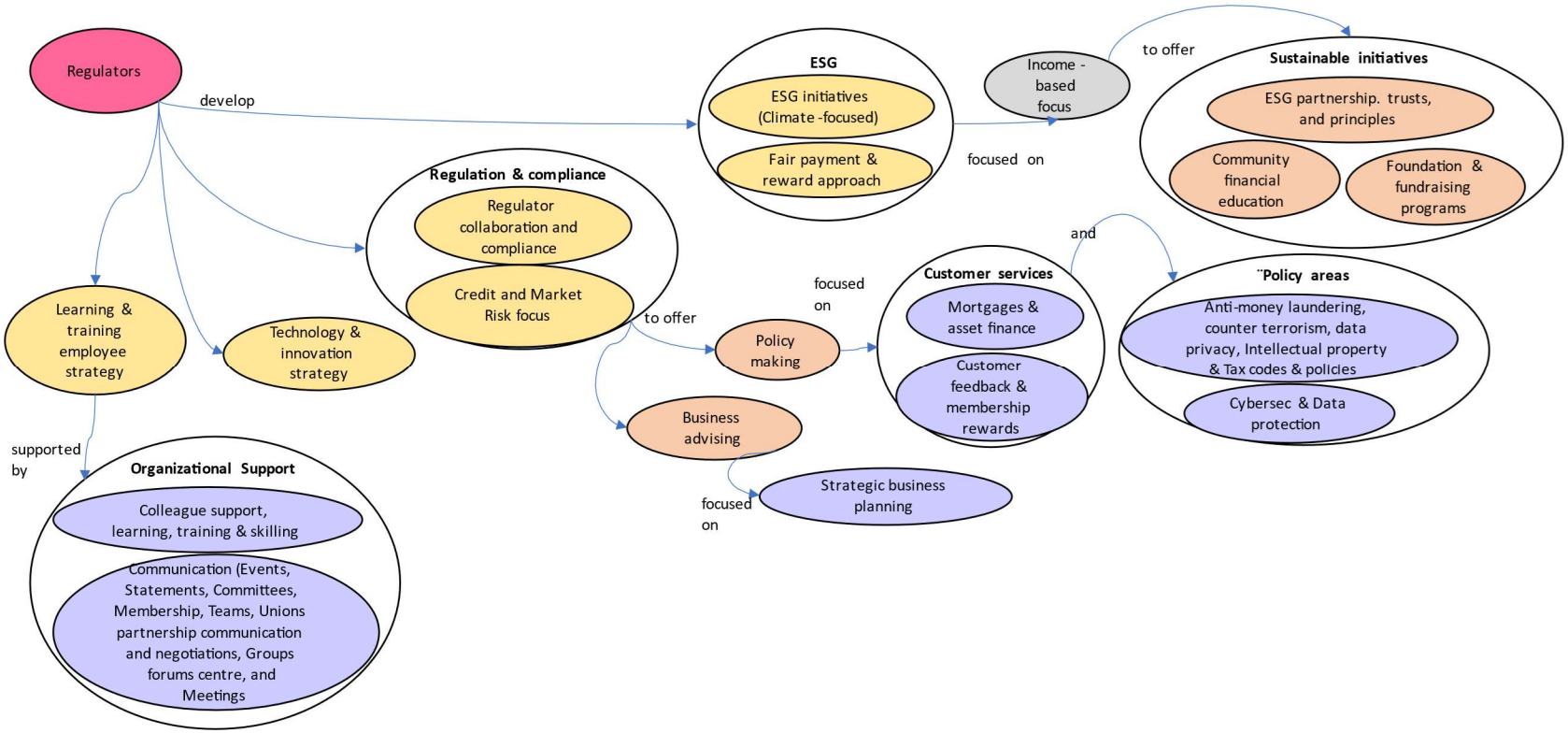


FIGURE 9.40.D REGULATORS' SYSTEMIGRAM STORYBOARD

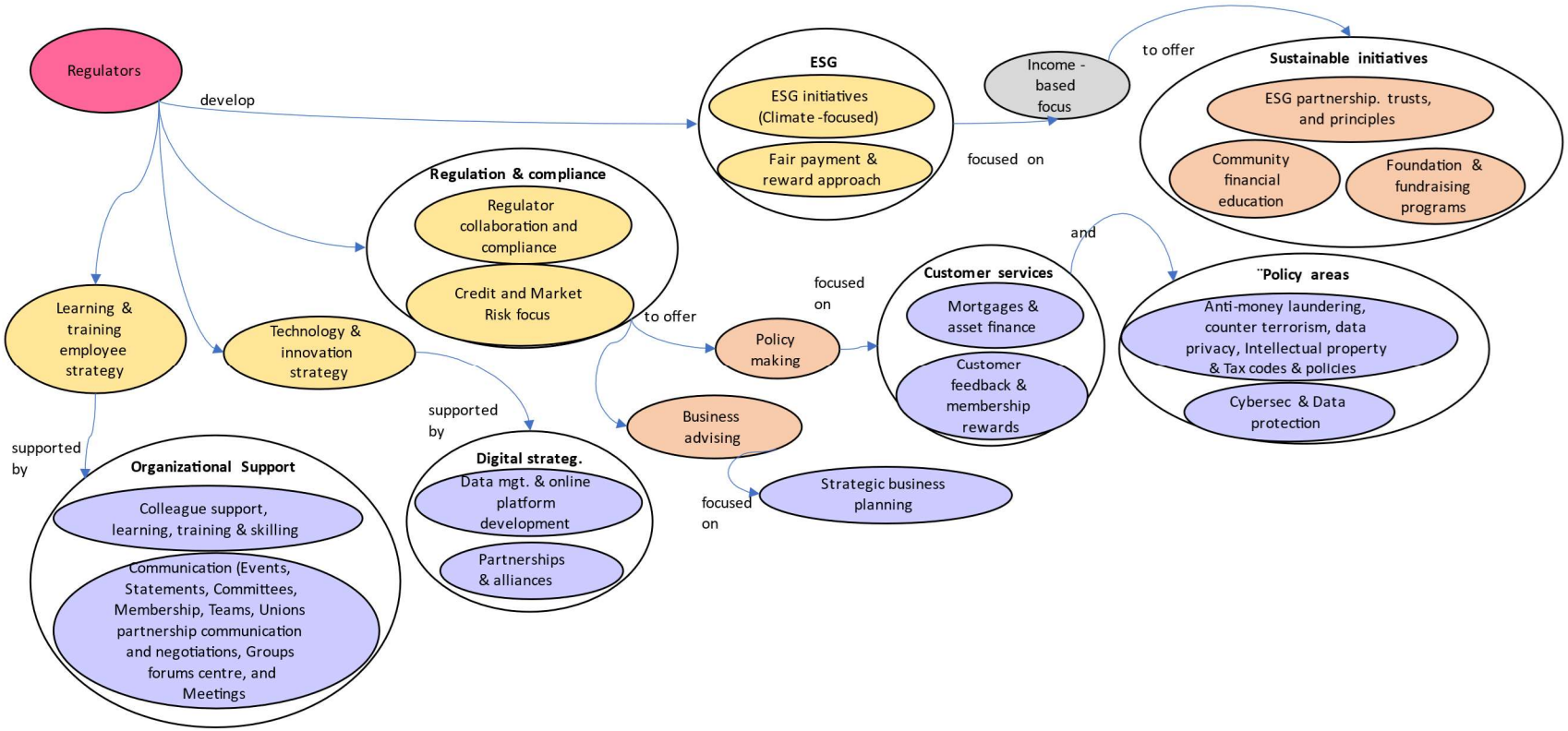


FIGURE 9.40.E REGULATORS' SYSTEMIGRAM STORYBOARD

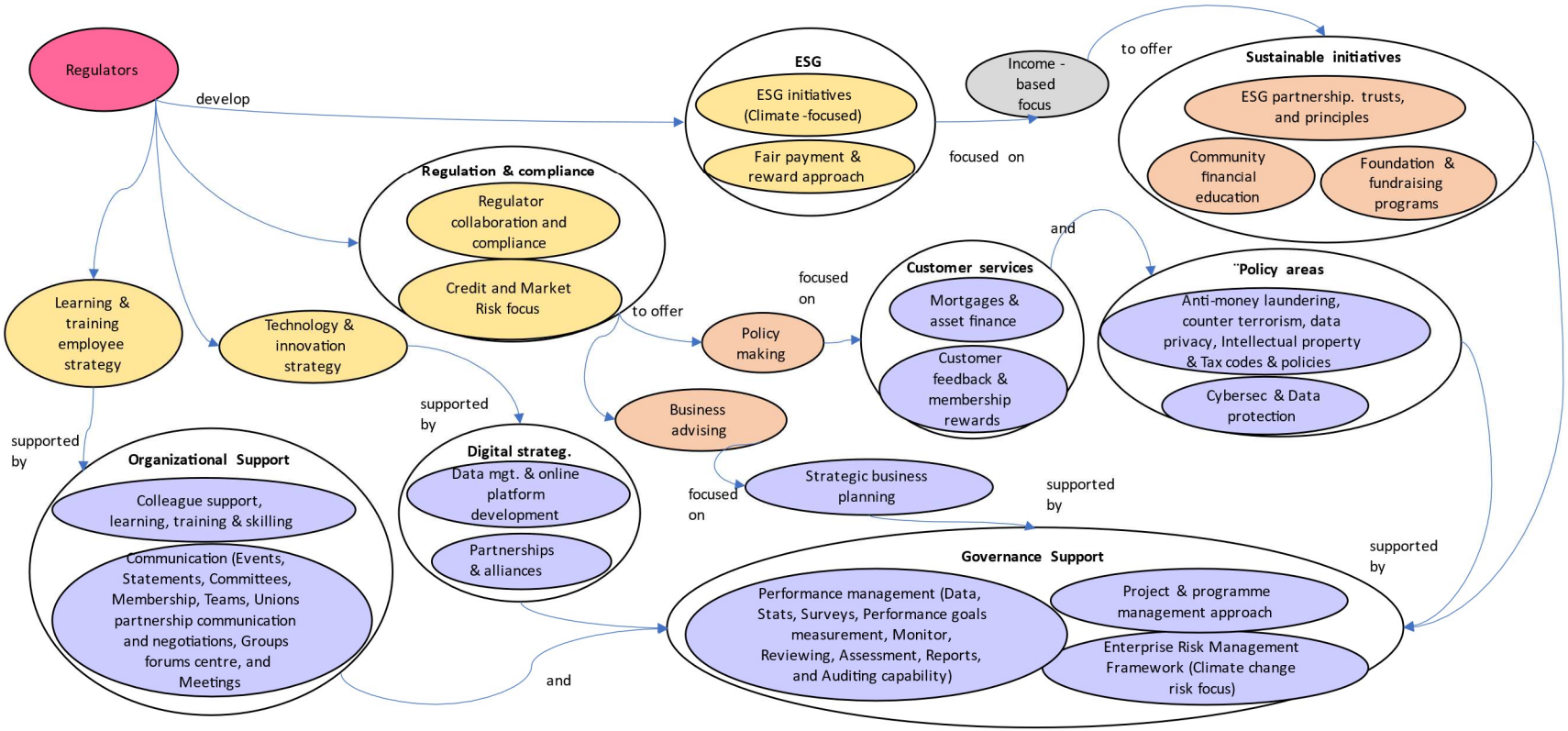


FIGURE 9.40.F REGULATORS' SYSTEMIGRAM STORYBOARD

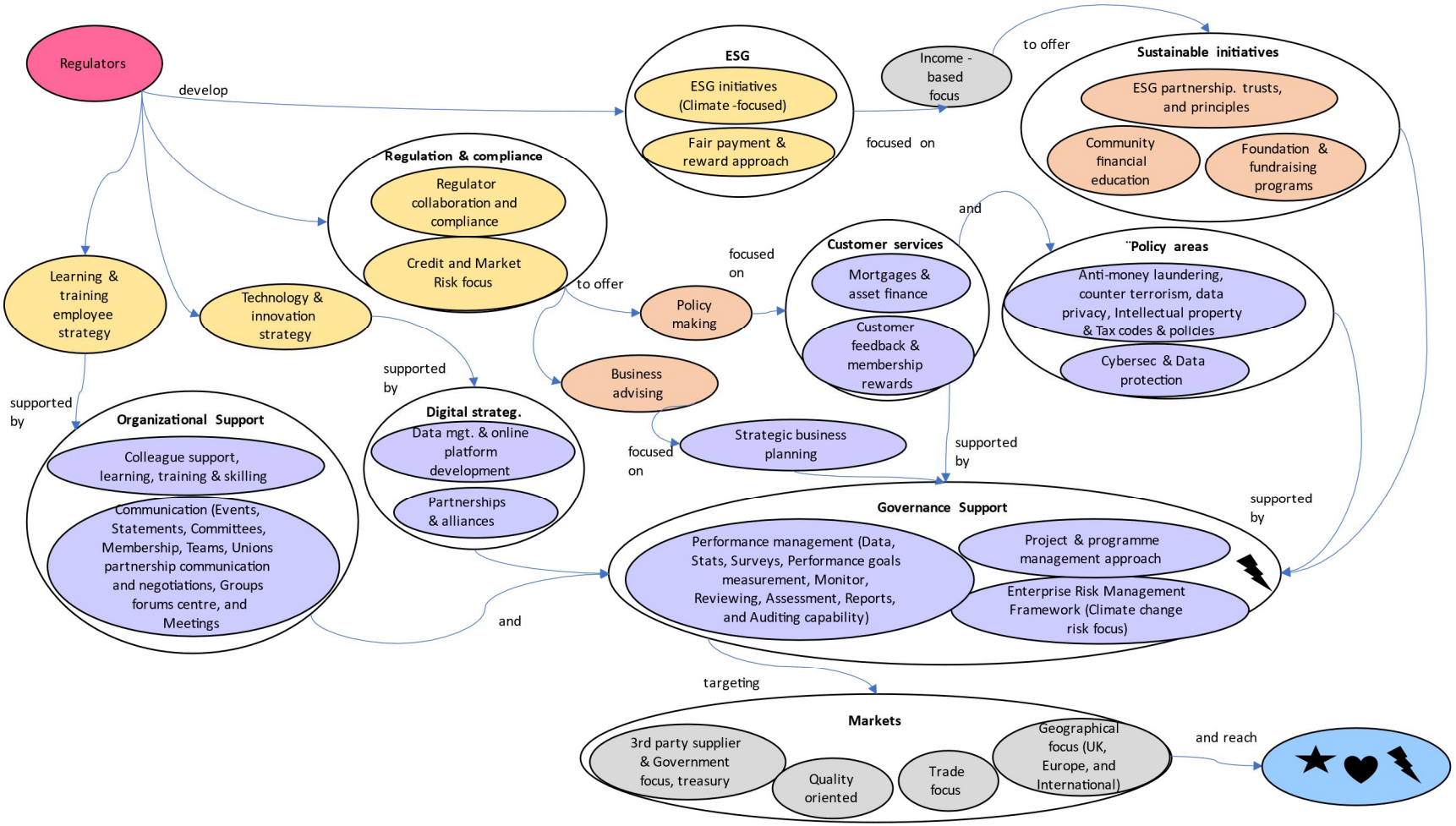


FIGURE 9.40.G REGULATORS' SYSTEMIGRAM STORYBOARD

C.4.4 Regulators' degree of operational resilience alignment

In the following figures, the different strategic factors identified in the regulators' strategic reports and analyst reports are classified based on the CERT ® operational resilience framework areas and sub areas, based as well on the common, shared, and specific clustering.

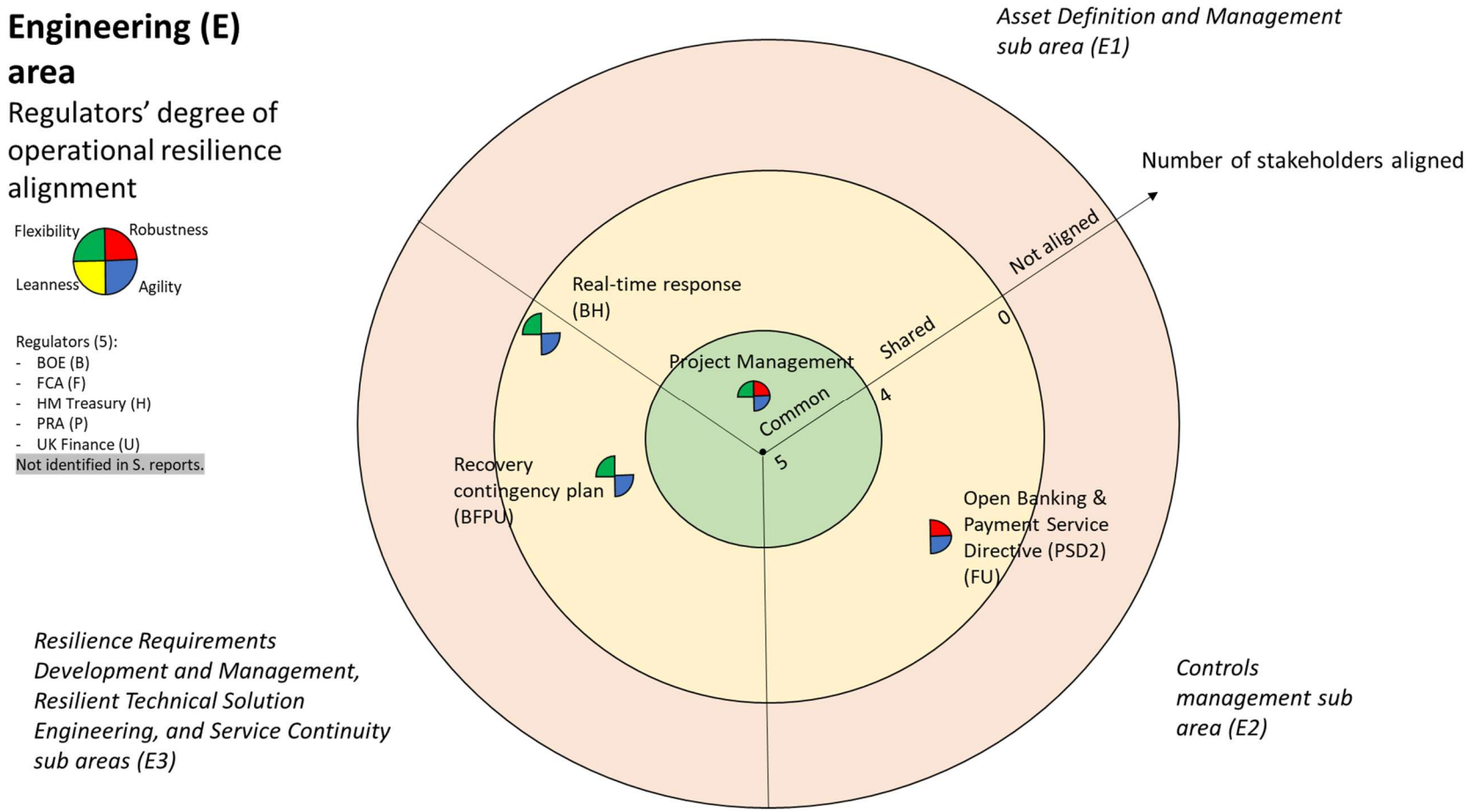


FIGURE 9.37ENGINEERING AREA REGULATORS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

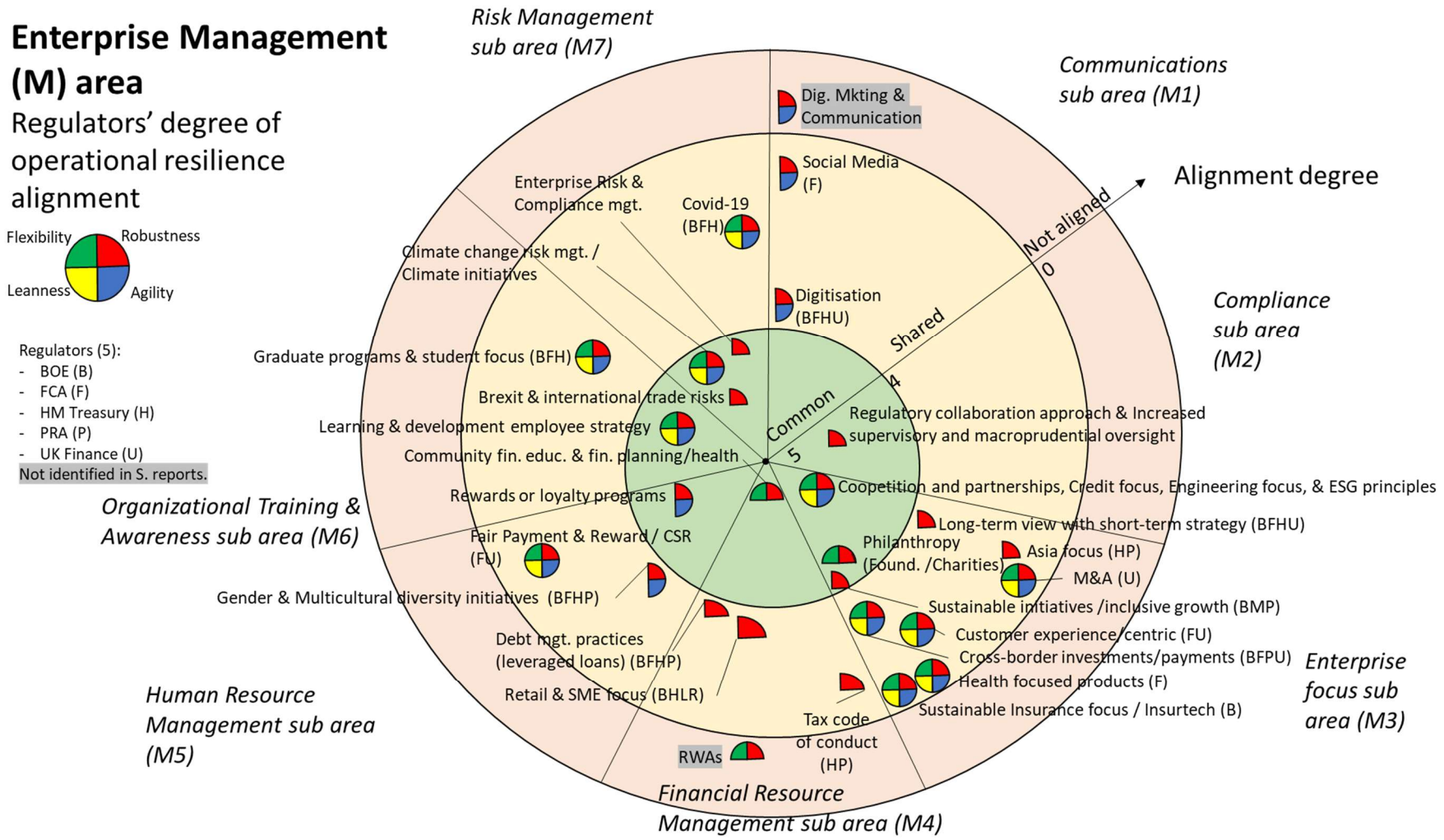


FIGURE 9.38 ENTERPRISE MGT. AREA REGULATORS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

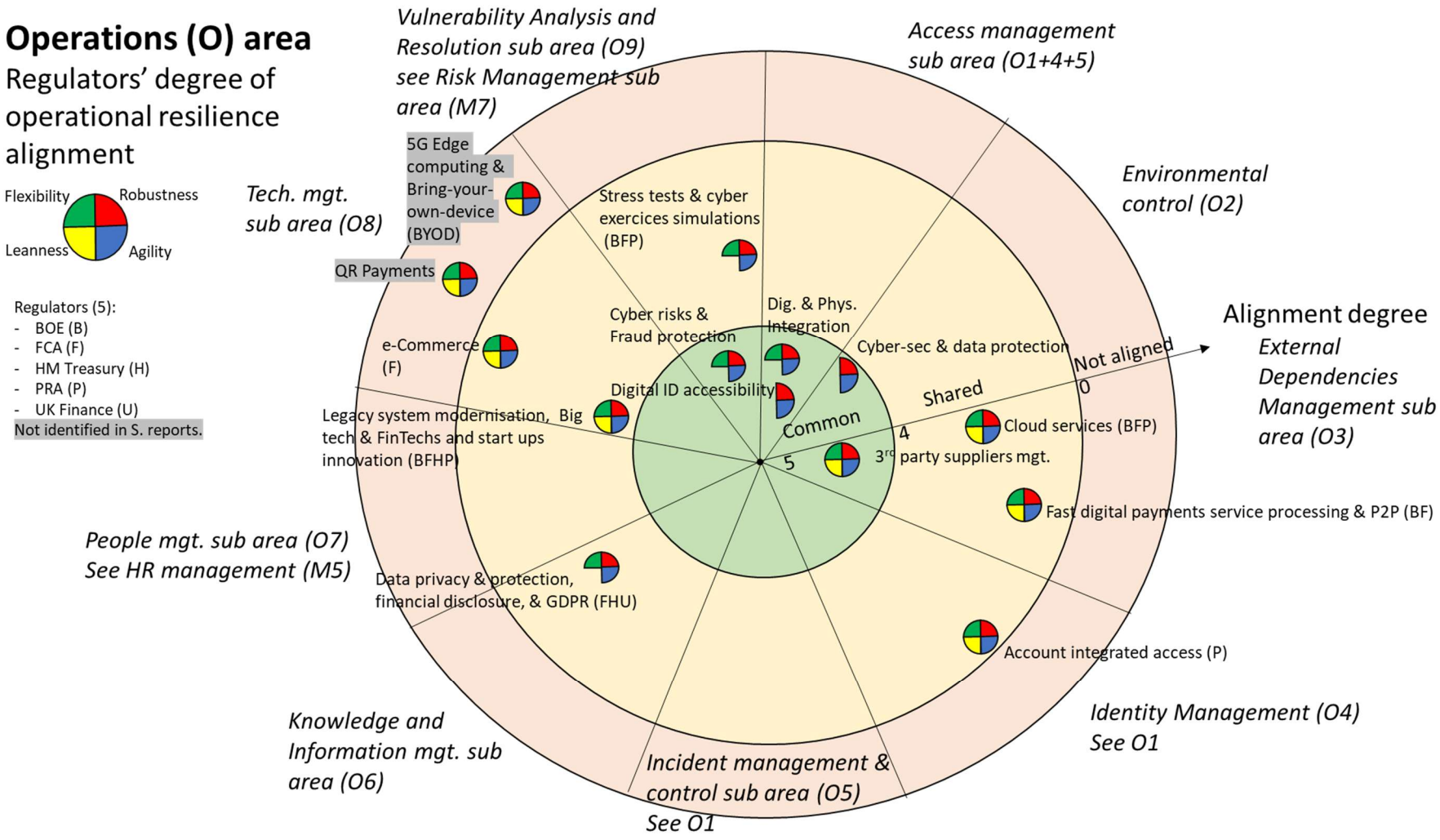


FIGURE 9.39 OPERATIONS AREA REGULATORS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

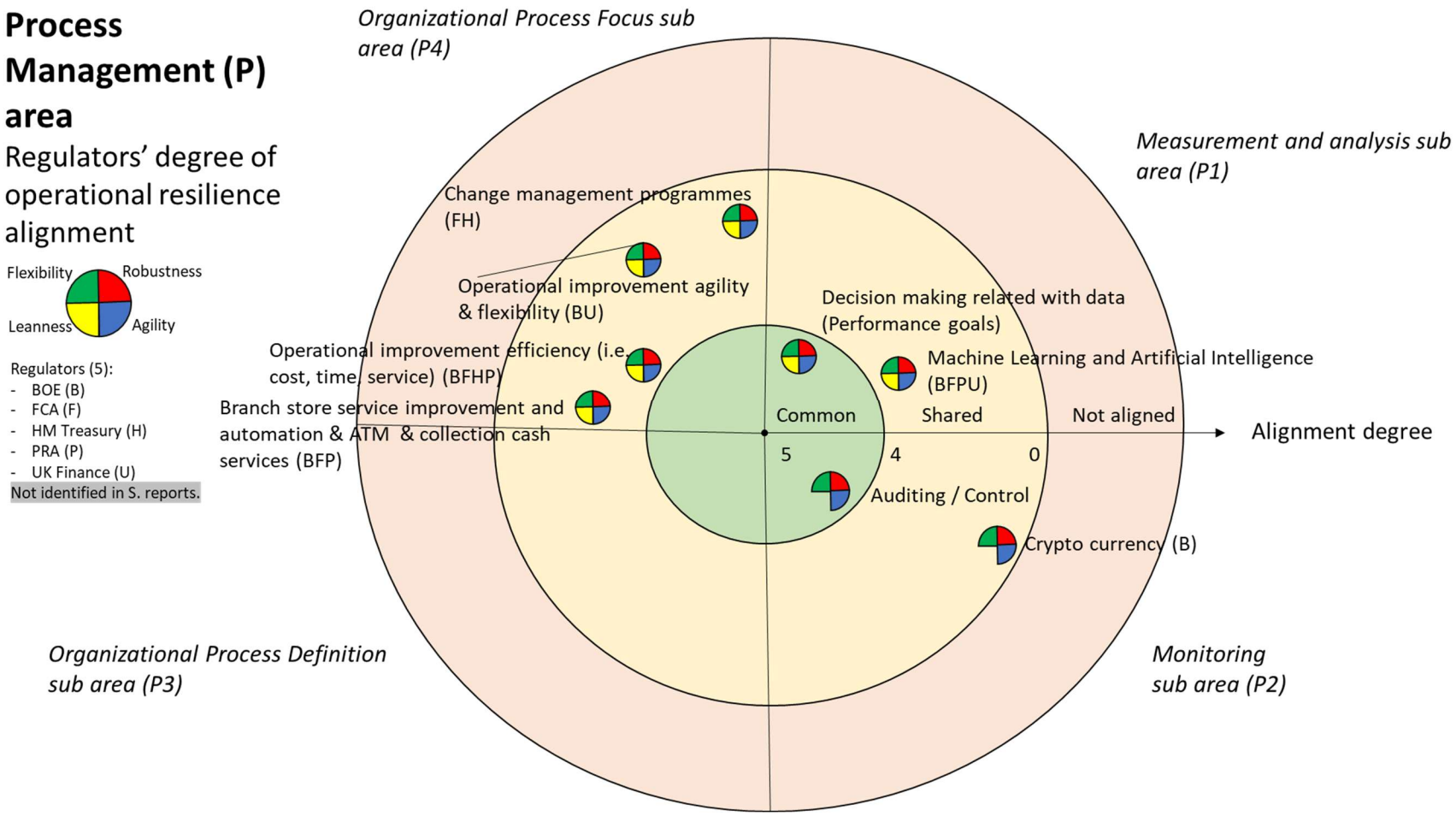


FIGURE 9.40 PROCESS MGT. AREA REGULATORS' STRATEGIC FACTORS DEGREE OF OPERATIONAL RESILIENCE ALIGNMENT

Appendix D Systemigram Guidelines Comparison Table

Analysis						
Guidelines	Blair, C.D., Boardman, J.T. and Sauser, B.J. 2007. Communicating strategic intent with systemigrams: Application to the network-enabled challenge. Systems Engineering.	Sivadasan S and Sauser B 2009. UNDERSTANDING PLAGIARISM USING BOARDMAN'S SOFT-SYSTEMS METHODOLOGY. In proceedings of the 2009 American Society for Engineering Education (ASEE) Annual Conference and Exposition, Austin TX, June 14-17	Boardman, J. and Sauser, B.J. 2008. Systems Thinking: Coping with 21St Century Problems.	Squires, A., Pyster, A., Sauser, B., Olwell, D., Gelosh, D., Enck, S. and Anthony, J. 2010. Applying systems thinking via SystemigramsTM for defining the body of knowledge and curriculum to advance systems engineering (BKCASE) project. 20th Annual International Symposium of the International Council on Systems Engineering, INCOSE 2010 1(July)	McDermott, T., Nadolski, M. and Sheppard, L. 2015. Use of systemigrams to identify emergence in complex adaptive systems. 9th Annual IEEE International Systems Conference, SysCon 2015 – Proceedings	Integrated guidelines

Purpose & motivation	1. Understand complex sociotechnical capabilities and Dynamic complexity (Senge 1990) 2. Provide a synergy of prose and pictures, based on scientific basis in neuropsychology. 3. Facilitate the efficient capture and communication of strategic intent to project teams, establishing a framework for comprehensive NEC requirements definition and understanding. 4. Transforming the positivistic ontology of words and pictures into a phenomenologist ontology to provide meaningful dialogue. 5. Iterative refinement process, until a		1. The problems addressed by systemigrams are complex with an heterogenous team, searching for a common culture and requiring vision to be articulated and translated in between vision and tactics (going though mission). (Issues with determining the detail level)	1. Systemigrams focusing on INCOSE System Engineer third principle to provide and understanding of the system context within the larger enterprise and technological contexts. 6. focused on project management and concurrent engineering	1. Partial understanding of a complex engineering system within a wider socio technical and socio economical complex adaptive system (Social, technological and economic factors). What are the policies needed to promote/enforce the future system´s sustainability?#MeToo) Given that today the policy and existing models are not sufficient to estimate change in complex environments. 8. Multi levelling modelling, representing subsystems, with a systemic intent(environmental sustainability, social responsibility, equity and resilience) and dynamic temporal view (past present and future (forecasts)) 9. Qualitative soft systems models to provide insight for further research and	1. Partial understanding of a complex engineering system within a wider socio technical and socio economical complex adaptive system (Social, technological and economic factors). What are the policies needed to promote/enforce the future system´s sustainability?#MeToo) Given that today the policy and existing models are not sufficient to estimate change in complex environments. 2. Provide a synergy of prose and pictures, based on scientific basis in neuropsychology. 3. Facilitate the efficient capture and communication of strategic intent to project teams, Iterative refinement process, until a comprehensive and coherent understandable strategy emerges. 7. Benchmark for demonstrating enterprise's competence maturity Human skills, knowledge, and aptitudes aligned with tasks. 8. Multi levelling modelling, representing subsystems, with a systemic intent(environmental sustainability, social responsibility, equity and resilience) and dynamic temporal view (past present and future (forecasts)) 9. Wider systems views with traditional structure and behavioural representations + contextual, temporal, and perspective views. Managerial or governance view also added.

	comprehensive and coherent understandable strategy emerges. 6. Serves as a baseline to launch development projects. 7. Benchmark for demonstrating enterprise's competence maturity Human skills, knowledge, and aptitudes aligned with tasks.				development of quantitative models. 10. Specific conditions: Cost-effective distribution is a regional supply/consumption market. Future worldwide development distribution. Current policy is not sufficient to estimate change in the current environment. 11. Wider systems views with traditional structure and behavioural representations + contextual, temporal, and perspective views. Managerial or governance view also added.	

Business Process Architecture (BPA) related attributes	1. Yields a Business Process Architecture (BPA), not capturing but comparing and aligning enterprise architectures.		2. Insight: Dependencies among the nodes could also have a direction starting with the architecture building blocks, on top, and then continue with the solution building blocks downwards. This could also reduce any overlaps.		2. Development of a generalized multilevel enterprise architecture model to identify components and interactions with help of expert workshops. Focusing on the levels: domains, structure, processes, people and resources. 3. Future scenario analysis with international policy scientists and systems engineers. Identified control mechanisms for the current and future environment.	1. Development of a generalized multilevel enterprise architecture model to identify components and interactions with help of expert workshops. Focusing on the levels: domains, structure, processes, people and resources. 2. Dependencies among the nodes could also have a direction starting with the architecture building blocks, on top, and then continue with the solution building blocks downwards. This could also reduce any overlaps.

Application	UK Ministry of Defence (MoD) – Network Enabled Capability (NEC) – producing agile military and non-military effects via a network of networks.		Atmoshphere (European IT project) and UK Rail system 1. Question which are the incentives in the market, any self-regulation mechanisms. 2. Describe the overall current situation and latest actions by stakeholders, look if there are any key initiatives, and validate with the stakeholders. 3. Capture the real processes, the extended enterprise architecture as a whole and, most of all, the money flow or resources flow. 4. Harmonize the Systemigram	Body of Knowledge and Curriculum to advance Systems Engineering (BKCASE) Systemigram project.	1. Application of a socio technical modelling framework (Systemigram) to capture the wider system impacts of the European shale gas boom in a context of larger global energy place to help policy and laws catch up with technological diffusion. 2. Systemigram for Socio economical landscape: Development of transit states and transit agreements with respect to natural gas distribution represent the dominant narrative thread with future route diversification. 3. Systemigram for Socio technical landscape: Describe the systems at work across the system structure, delivery operations, and work practice levels. Impact of technology on upstream processes cause the energy forecasts to diverge.	Payment technologies (Debit card, mobile and biometric)

			among the different companies.			

Process acknowledged	Systemigram's evolution process(Boardman 2005). 1. Development: As a form of visual language. 2. Adaptation: As a methodology for business architecture. 3. Refinement: As an appreciative learning system.	Step 1 – The Problem Situation: Unstructured : The problem situation is first experienced, as it is, by the researcher (or stakeholder). As this step can be based on many presumptions, every attempt is made not to extrapolate about the nature of the situation. Step 2 – The Problem Situation: Expressed: In this step, a description of the situation within which the problem occurs is formulated. Both logic and the culture of the situation are taken into account at this point. 4 JHSEM: Vol. 8 [2011], No. 1, Article 31 Brought to you by | Cardiff University AuthenticatedDownload Date | 3/18/20 12:09 PM Step 3 – Structured Text : Conceptualize the problem situation in structured text. The Structured Text identifies the key elements with attention to systems		1. *Create and initial diagram from established prose*. Provide a vision of the entire project based on the project charter. 2. *Compare the resulting diagram to the rules of Systemigram development and update accordingly.* 3. *Present the Systemigram to the core project team and reach consensus.* Reach consensus through several iterations and revise the rules, most important is level of accuracy and effectiveness. Systemigrams can become quite complex and overwhelming to absorb all at once. A project story is needed. Main outcome	Step 1. Central questions of interest: Visual modelling activities around central questions to investigate future changes Step 2. Define key phenomena under these questions. Step 3. Develop one or more qualitative visualizations vis current and future narratives. Step 4. Determine key trade-offs in discussions. Step 5 to 10. Model representation and design.	1. Define central questions of interest. 2. Create an established prose from sources. 3. Validate, if possible, the prose with industry stakeholders. 4. Create an initial diagram from the prose. Try to define each stream separately. 5. Compare the resulting diagram to the rules of the systemigram. 6. Reverse engineer the resulting diagram. 7. Create a story board to read the diagram. 8. Validate the diagram with industry stakeholders.

		thinking modeling and analysis requirements, i.e. systemigrams. Step 4 – Systemigram Design : Creation of a systemigram model as designed from the Structured Text to capture and represent the essence of the original conceptual thinking. Steps 5 – Dramatization and Dialogue: At this step the systemigram model is dramatized via storyboarding to the stakeholders. This is done so that the model and reality can be compared and contrasted. The differences become the basis for discussion: how things work, might work, and what are the implication? Step 6 – Feasible, Desirable Changes: At this step the identification of feasible and desirable changes are deciphered from the previous step, understanding that they are likely to vary. Desirable asks		show at the bottom right the products/services as the outcome and main purpose of your project. 4. *Create the project story.* A mature Systemigram should be read such that the nodes and the relationships tell a story. A rework required by going down the different streams and reverse engineering them. The story is better read if you can show each one of the streams incrementally. First stream(s) answer what and why and following streams answer the how.		

		if it is technically an improvement? Feasible asks if it fits the culture? Step 7 – Action to Improve the Problem Situation. Every individual or collective input that is deemed Desirable or Feasible is incorporated into the model. Only contributions that answer “no” to one of the two questions presented in Step 6 are dismissed. Steps 1-7 are then repeated until a successful outcome of a BSSM is achieved.				

Prose content attributes	1. High-level goals are broken down into specific objectives, each with an owner, who is responsible of delivering, in conjunction with other stakeholders, the outputs required to achieve these objectives. 2. “Ends, ways, means” approach 3. The strategic vision and user needs must be captured and accurately translated into requirements, establishing the operational context for system development. 4. The translation process entails all “social” elements from the stakeholders to be collected, analyzed, understood, and integrated into a set of coherent		1. The prose should capture the strategic essence of the system in words (mission, motivation, structure) 4. Establish top level requirements or objectives, stated in a mission, and determine how it will be accomplished.			1. High-level goals are broken down into specific objectives, each with an owner, who is responsible of delivering, in conjunction with other stakeholders, the outputs required to achieve these objectives. 2. “Ends, ways, means” approach 3. The strategic vision and user needs must be captured and accurately translated into requirements, establishing the operational context for system development. 4. The translation process entails all “social” elements from the stakeholders to be collected, analyzed, understood, and integrated into a set of coherent requirements faithful to the perceived intent of the original strategy.

	requirements faithful to the perceived intent of the original strategy.					
Prose format	1. 2000 words max		1. 2000 words max			1. 2000 words max
Word relationship/ Idea connection	1. Capture strategic intent, not procedural tactics. 2. Well-crafted, Include authors and readers perspective. 3. Facilitation and dialogue with all stakeholders		1. Analysis is based on the syntactic and semantic relationship that words and their relationships have. 2. Analysis is broken down into significant parts (nouns phrases) and relationships (prepositional	3. Provided general Systemigram creation guidelines (based on extensive research): Rules should provide value, not constraints. Rules should be based on proven research methods. Rules should support		1. Capture strategic intent, not procedural tactics. 2. Well-crafted, Include authors and readers perspective. 3. Facilitation and dialogue with all stakeholders 4. Analysis is broken down into significant parts (nouns phrases) and relationships (prepositional and verb phrases).

			and verb phrases).	intellectual flexibility of the modeler.		
Diagram format attributes	1. Entities Nodes and links (inputs and outputs) 2. Direction: Begin should start from top left and finish at bottom right. 3. Size: 1 single page 4. Ratio of nodes to links is 1.5. 5. No cross over of links. 6. Colours used to draw attention.(Nodes' families or transformation process).		6. Colour: Used with intention.	2. Upper left corner starts with diagram description and lower right hand node represents the system's purpose.		1. Entities Nodes and links (inputs and outputs) 2. Direction: Upper left corner starts with diagram description and lower right hand node represents the system's purpose. 3. Size: 1 single page 4. Ratio of nodes to links is 1.5. 5. No cross over of links. 6. Colours used to draw attention.(Nodes' families or transformation process).
Nodes attributes	1. Noun phrases which specify key concepts, noun phrases, specifying people, organisations, groups, artifacts, and conditions. 2. Nodes may		3. Unique nodes	2. Connection nodes or any nodes that has multiple nodes inside, is used to collect nodes that belong to a specific group. 3. Systems should only be shown in one		1. Noun phrases which specify key concepts, noun phrases, specifying people, organisations, groups, artifacts, and conditions. 2. Connection nodes or any nodes that has multiple nodes inside, is used to collect nodes that belong to a specific group. 3. Systems should only be shown in one place (no repeated nodes).

	contain other nodes.			place (no repeated nodes).		
Links attributes	1. Represent relationships and flow between nodes. 2. Storyboard concept: using carefully selected scenes as subnets. 3. Use of Gestalt's principles of perception. 4. Separate each strand of strategic intent.		5. The relationships between these nodes will be verb phrases (occasionally prepositional phrases) indicating transformation, belonging and being. Not always a cause-effect relationship. 6. Reverse engineer to verify the original text.	5. A relationship should not end at a node in the middle of the diagram. 6. Relationships can be phrases (relationship-node-relationship) ex. guides the development of. No specific need to create a node.	7. Main variation in Systemigram application is that there are multiple entry points and inputs to capture all components and behaviours of the system.	1. Represent relationships and flow between nodes. 2. Storyboard concept: using carefully selected scenes as subnets. 3. Relationships can be phrases (relationship-node-relationship) ex. guides the development of. No specific need to create a node. 4. Separate each strand of strategic intent. 5. The relationships between these nodes will be verb phrases (occasionally prepositional phrases) indicating transformation, belonging and being. Not always a cause-effect relationship. A relationship should not end at a node in the middle of the diagram. 6. Reverse engineer to verify the original text. 7. Main variation in Systemigram application is that there are multiple entry points and inputs to capture all components and behaviours of the system.
Software				Systemitool		Power point

Application insights				1. The main lesson learnt from this application is to understand all the rules upfront to make the right decision on the development.	2. There are some benchmarks in terms of the application process and outcomes that could be applied to the debit card environment.	

Appendix E Analyst reports identified factors comparison to stakeholders' factors

Comparable payment system stakeholders' strategic report factors	N	Analyst reports' identified factors	PESTEL classif.	Status	Resilience framework process area category	Resilience framework process area	Raconteur	World Bank	UKF.	IMF	PWC	Oliver W.	Accenture /Gartner	BIS	OECD	BoE	Deloitte	KPMG	EY
IT_and_communications_improvement =	1	Legacy systems or tied to obsolete practices, Legacy modernisation Application	T	Identified	Technology Management	Operations	X						X				X		X
Process_improvement =		Legacy systems or tied to obsolete practices, Legacy modernisation Application	T	Identified	Technology Management	Operations													
Process_streamlining =		Legacy systems or tied to obsolete practices, Legacy modernisation Application	T	Identified	Technology Management	Operations													
Operational_improvement_simplification =		Legacy systems or tied to obsolete practices, Legacy modernisation Application	T	Identified	Technology Management	Operations													

Operational_improvement_efficiency =		Legacy systems or tied to obsolete practices, Legacy modernisation Application	T	Identified	Technology Management	Operations													
Machine_learning_and_artificial_intelligence =	2	Artificial intelligence and technology, automated software solutions (Verbal AI) / automation, machine learning	T	Identified	Measurement and Analysis	Process Management	X				X		X		X	X	X		X
Trade_portal =	3	Trading systems or super efficient back office processes	T	Identified	Organizational Process Focus	Process Management	X										X		
Automated_clearing_house =		Trading systems or super efficient back office processes	T	Identified	Organizational Process Focus	Process Management													
Social_media_and_web_chat_bots_customer_communication =	4	Digitisation/Digital Marketing/Social media	T	Identified	Communications	Enterprise Management	X	X									X	X	X
Digital_communication =		Digitisation/Digital Marketing/Social media	T	Identified	Communications	Enterprise Management													
Digital_bank_company =		Digitisation/Digital Marketing/Social media	T	Identified	Communications	Enterprise Management													
Financial_indicators =	5	Business intelligence/analytics/ End-to-End/ Enterprise wide view or top-down / KPIs	T	Diff. wording	Measurement and Analysis	Process Management	X											X	X
Analytics_insight =	6	Business intelligence/analytics/ End-to-End/ Enterprise wide view or top-down / KPIs	T	Diff. wording	Measurement and Analysis	Process Management	X											X	X

Survey =	7	Business intelligence/analytics/ End-to-End/ Enterprise wide view or top-down / KPIs	T	Diff. wording	Measurement and Analysis	Process Management	X											X	X
Colleague_survey =	8	Business intelligence/analytics/ End-to-End/ Enterprise wide view or top-down / KPIs	T	Diff. wording	Measurement and Analysis	Process Management	X											X	X
Business_advising =	9	Business intelligence/analytics/ End-to-End/ Enterprise wide view or top-down / KPIs	T	Diff. wording	Measurement and Analysis	Process Management	X											X	X
Mobile_banking_capabilities =	6	Mobility/mobile applications , apps, smartphones, mobile banking, digital wallets, digital platforms	T	Identified	Access Management	Operations	X		X				X		X	X	X		X
Platform_portal_development =		Mobility/mobile applications , apps, smartphones, mobile banking, digital wallets, digital platforms	T	Identified	Access Management	Operations													
Online_banking_capabilities =		Mobility/mobile applications , apps, smartphones, mobile banking, digital wallets, digital platforms	T	Identified	Access Management	Operations													
Cloud_based_digital_environment =	7	Cloud services/solution technology and standards/Decentralised	T	Identified	External Dependencies Management	Operations	X				X	X	X			C	X		
Crypto_digital_currency =	8	Breaking digital asset exchange, powered by blockchain, digital token, block-chain	T	Diff. wording	Monitoring	Process Management	X				X				X	X			

		based tokens, digital currencies																	
ESG_personal_financing_products =	9	The cost of doing IPOs and issuing bonds will come down dra-matically	Ec	Identified	Financial Resource Management	Enterprise Management	X												
Fintech =	10	Fintechs and start ups, bigtechs	T	Identified	Technology Management	Operations	X				X	X	X						X
Innovation_program =		Fintechs and start ups, bigtechs	T	Identified	Technology Management	Operations													
Accelerator_and_incubators =		Fintechs and start ups, bigtechs		Identified	Technology Management	Operations													
Business_solutions_b2b =		Fintechs and start ups, bigtechs	T	Identified	Technology Management	Operations													
Technology_and_innovation_focus =		Fintechs and start ups, bigtechs	T	Identified	Technology Management	Operations													
Ventures =		Fintechs and start ups, bigtechs	T	Identified	Technology Management	Operations													
Joint_venture =		Fintechs and start ups, bigtechs	T	Identified	Technology Management	Operations													
IT_and_communications_improvement =	11	Big tech and big data	T	Diff. wording	Technology Management	Operations	X				X	X	X		X				X
Data_management =		Big tech and big data	T	Diff. wording	Technology Management	Operations													
Data_privacy_and_protection =		Big tech and big data	T	Diff. wording	Technology Management	Operations													
Fraud_capabilities =	12	Fraud protection and detection, financial crime	T	Identified	Vulnerability Analysis and Resolution	Operations	X									X			X
Anti_money_laundering =		Fraud protection and detection, financial crime	T	Identified	Vulnerability Analysis and Resolution	Operations	X									X			X

Financial_crime =		Fraud protection and detection, financial crime	T	Identified	Vulnerability Analysis and Resolution	Operations													
Corruption =		Fraud protection and detection, financial crime	T	Identified	Vulnerability Analysis and Resolution	Operations													
Counter_terrorism =		Fraud protection and detection, financial crime	T	Identified	Vulnerability Analysis and Resolution	Operations													
Corrupt_practices_act =		Fraud protection and detection, financial crime	T	Identified	Vulnerability Analysis and Resolution	Operations													
Cyber_security_and_data_protection =	13	Auditing / Control Rooms : Deal mgt, conflict checking, Wall crossing approvals, reporting and detailed audit tracking.	P	Diff. wording	Monitoring	Process Management	X										X		
Audit_capability =		Auditing / Control Rooms : Deal mgt, conflict checking, Wall crossing approvals, reporting and detailed audit tracking.	P	Diff. wording	Monitoring	Process Management													
Monitor_capability =		Auditing / Control Rooms : Deal mgt, conflict checking, Wall crossing approvals, reporting and detailed audit tracking.	P	Diff. wording	Monitoring	Process Management													
Internal_control =		Auditing / Control Rooms : Deal mgt, conflict	P	Diff. wording	Monitoring	Process Management													

		checking, Wall crossing approvals, reporting and detailed audit tracking.																	

Appendix F Strategic factors contribution to operational resilience areas

This appendix shows a table with the most relevant strategic factors and their specific contribution to each operational resilience area (i.e**., 1 Engineering**) and sub areas (i.e., **1.1 Asset Definition and Management**), showing either an increase or decrease of operational resilience based on the arguments from the relevant references that support the findings shown in section 5.4. The ***factors*** are identified in bold and italics, and below them are the specific arguments that justify the identified operational resilience attribute contribution (i.e., ***Project management*** contributes to an increase in Flexibility, Agility, Leanness, and Robustness). The references included here are only those of industry analyst reports and academic articles researched.

			Operational Resilience attributes			
N	CERT process areas	References	Flexibility	Agility	Leanness	Robustness
1	**Engineering**					
1.1	**Asset Definition and Management**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Project Management					
	Develop dynamic capabilities and adapt to market demands and changes, providing training	Coetzee et al. 2016; PWC 2019; Steemis 2019; BoE 2019; FIS 2019; Salunke et al. 2011;	Increases	Increase	Increase	Increase
	Sustainable projects are labour intensive	Urban and Wójcik 2019; PwC 2019; Pyka and Nocoń 2021			Decrease	
	Creates a matrix organisational structure which can create complexity	HM Treasury 2016; KPMG 2020		Decrease	Decrease	
1.2	**Controls Management**			**Agility**		**Robustness**
	Open Banking					
	Standards and internal controls allow for improved risk management and security, and boost innovation	Senge 1991; Porter 1996; Coetzee et al. 2016		Increase		Increase

	Boost innovation and change market dynamics	Shukla et al. 2011; Coetzee et al. 2016; EY 2020	Increase	Increase		Decrease
1.3	Resilience Requirements Development (See 1.6 Service Continuity)		**Flexibility**	**Agility**	**Leanness**	**Robustness**
1.4	Resilience Requirements Management (See 1.6 Service Continuity)		**Flexibility**	**Agility**	**Leanness**	**Robustness**
1.5	Resilient Technical Solution Engineering (See 1.6 Service Continuity)		**Flexibility**	**Agility**		
1.6	Service Continuity		**Flexibility**	**Agility**		
	Real-time response (24/7 availability)					
	Develop business continuity plans for certain risk scenarios allow for a quick, efficient, and adaptable response	Nutt 2000; Durach et al. 2015; KPMG 2020; Walker and Cooper 2011; Bank of England 2019a; Pettit et al. 2010; Purvis et al. 2016	Increase	Increase	Increase	Increase
2	**Enterprise Management**					
2.1	**Communications**		**Flexibility**	**Agility**		**Robustness**
	Digitisation, Digital Marketing and Social media					
	Higher targeted customer awareness (mainly digitally educated) as a result of digitisation and real-time transactions (i.e. BNPL, P2P, Big Tech)	Yousafzai and Yani-de-Soriano 2012; Arvidsson 2014; Oliveira et al. 2016a; Hedman et al. 2017; Alderman 2018; Nelms et al. 2018; Raconteur 2018; Urban and Wójcik 2019; Bank of England 2020; Vives 2020;	Increase	Increase		Increase
2.2	**Compliance**		**Flexibility**	**Agility**		**Robustness**

	Regulatory approach, Regulator collaboration, and Regulation and compliance focus					
	Need to collaborate with regulators and comply with the regulated practices to improve transparency, operational standardized practices, and avoid fines, in the worst-case scenario	Giocoli 2014; Puschmann 2017; Innovate Finance 2019				Increase
	Compliance or reporting cost/risk	Zhou et al. 2007; Japp and Kusche 2009; PwC 2019; Ernst & Young 2020;	Decrease	Decrease		
	Committees & Councils, Antitrust law and Policymaking					
	Respond to specific operating issues on a needs basis (i.e., compliance, ethical, HR, suppliers, etc.)	UK Finance 2019a; Álvarez Jaramillo et al. 2019		Increase		Increase
2.3	**Enterprise Focus**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Strategic commitments, Partnerships and Alliances					
	Develop new capabilities with other stakeholders in a cost-effective and timely manner with competitive constraints	Quelin et al. 2019; PWC 2019	Increase	Increase	Increase	Increase
	Credit focus					
	Increase profitability with the right risk governance	Maier 1998; The UK Cards Association 2017; UK Finance 2019b; Vives 2020	Increase	Increase	Decrease	Decrease
	ESG approach					

	Increase of ESG governance and accountability	Kleindorfer et al. 2005; Machado et al. 2017; Schoenmaker 2018; Hayes et al. 2019; IMF 2019a; Ernst & Young 2020;	Increase	Increase	Decrease	Increase
	Increase in ESG-aligned services (e.g., green mortgages)	Schoenmaker 2018; Hayes et al. 2019	Increase	Increase	Increase	Increase
	Asian Investment					
	Portfolio diversification improves financial performance	World Bank 2019a; Vives 2020; IMF 2019a				Increase
	Long-term approach					
	Sustainable long-term investment strategy and ESG performance tracking	Karapandza 2016; Accenture 2019; HSBC 2019; Oliver Wyman 2020; IIF and EY 2021				Increase
	Mergers & Acquisitions					
	new capabilities' development to adapt to changing market conditions	Johnson et al. 2007; Sluyts et al. 2011; Morgan et al. 2019; PwC 2019	Increase	Increase	Increase	Increase
	Philanthropy (Fundraising, Charities, Not-for-profit)					
	Market efficiency mechanism to encourage redistribution of capital	Amanatidou et al. 2012; Government and Division 2015; Nelms et al. 2018	Increase			Increase
	Sustainable, responsible, and inclusive growth (UN Sust. Develop goals and sustainability metrics					
	Ensure a sustainable growth, risks and appropriate business plans should be considered from various perspectives	Bank for International Settlements 2019; Sani et al. 2021; HM Treasury 2016; Ernst & Young 2020; Deloitte 2021				Increase
	Customer experience focus					

	High strategic priority that gives a competitive advantage through new customised capabilities, gaining a new market position, and winning customers based on simplicity, personalization and service excellence, agility & flex.	Yousafzai and Yani-de-Soriano 2012; Schuh and Stavins 2013; Koulayev et al. 2016; Rysman and Schuh 2017; Accenture 2019; Gartner 2019;	Increase	Increase	Increase	Increase
	Cross border payment solutions					
	Access to fast, safe, transparent, and cost-efficient financial services around different parts of the world is a top priority	Weiner and Wright 2009; Bolt and Schmiedel 2013; Batiz-Lazo and Del Angel 2018b; Deloitte 2019; Bank of International Settlements 2020	Increase	Increase	Increase	Increase
	Health-focused products					
	Financial health is relevant for incoming risks, and sustainable investments have to be done in this area, in a timely and adaptable way, according to the customers' needs	Schoenmaker 2018	Increase	Increase	Increase	Increase
	Sustainable insurance / Insurtech					
	Access data provide more tailored information about customers to help them face specific risks that they might be exposed to	PWC 2019; Steemis 2019; Conboy et al. 2020	Increase	Increase	Increase	Increase
2.4	**Financial Resource Management**		**Flexibility**	**Agility**		**Robustness**
	Financial health and education					

	Improve customers and colleagues' financial education from a community perspective	Klee 2006; Teoh et al. 2013; Bank for International Settlements 2019				Increase
	Improves customer adoption of new financial services	Klee 2006; Gray 2006; Bloxham 2011; Teoh et al. 2013; Bank for International Settlements 2019	Increase	Increase		
	Debt/Lending management practices					
	Debt is currently high among market participants to finance their activities and leveraged by risky sources, good mgt. practices increase robustness	Calomiris et al. 2004; HM Treasury 2016; Hasan et al. 2012; IMF 2019a				Increase
	Taxing / Tax management					
	Taxing helps governments to fund public policies and programmes, encourage certain behaviours among market participants, and avoid unnecessary risks	Naher and Aya 2013; IMF 2019a; Deloitte 2019; World Bank 2019b; Vives 2020				Increase
	RWAs standardization					
	Standardized approach to assess credit risk, recalibrating risk weights, and new or additional capital requirements	HM Treasury 2016; KPMG 2020	Increase			Increase
2.5	**Human Resource Management**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Customer rewards or loyalty programs					

	Customer behaviours are encouraged through loyalty programs to implement new strategies avoid risks in a fast and cost-effective way	Rysman 2007; Dahlstrom et al. 2014; Koulayev et al. 2016; Gilmore 2018; Deloitte 2019 Ernst & Young 2020	Increase	Increase		Increase
	Social Protection and Assistance and pay-roll based insurance models (Fair payment & reward)					
	Companies that have satisfied or motivated colleagues, tend to perform better in every task assigned. Focusing on long-term colleagues' employment benefits	Calomiris et al. 2004; Gray 2006; Ponomarov and Holcomb 2009; Sluyts et al. 2011; World Bank 2019b; Lagoarde-Segot 2019; Ernst & Young 2020	Increase	Increase	Increase	Increase
	Gender diversity initiatives (i.e., women and LGBT+)					
	Diversity focus can enrich the range of views or skills, building different capacities that can complement each other and provide everyone with equal opportunities, based on their capacities, to improve motivation	Carabine and Wilkinson 2016; Schoenmaker 2018; UK Finance 2019a; Visa 2019c; Hamish et al. 2018; Accenture 2019	Increase	Increase		Increase
2.6	**Organizational Training and Awareness**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Training and skilling, Digital skills, and an Engineering focus					
	Colleagues and customers to develop technological and digital skills	Carabine and Wilkinson 2016; PwC 2019; KPMG 2020; EY 2020; WB 2019	Increase	Increase	Increase	Increase

	Learning and development employee strategy					
	Highly trained employees, including third-party suppliers, help to implement any new strategies, especially those related with new digital technologies	PwC 2019	Increase	Increase	Increase	Increase
	Recruitment programs					
	Market, community, and organisational needs are changing, and people with different and emerging skills might contribute to the relevant technical fields of expertise	World Bank 2019b; Ernst & Young 2020	Increase	Increase	Increase	Increase
2.7	**Risk Management**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Brexit, Trade focus, UK focus, Europe focus, & International focus					
	Increase of a localised focus within an international environment	Wang et al. 2018; FCA 2019a; Soroka et al. 2020; Deloitte 2021; IIF and EY 2021				Increase
	Enterprise Risk Management Framework					
	Increase the organisational preparedness towards risk management	Scholz et al. 2012; Durach et al. 2015; Purvis et al. 2016; Deloitte 2021; IIF and EY 2021				Increase
	Climate change risk management or Climate initiatives					

	New ESG, and specifically, climate regulations are now requiring companies to reduce their emissions. Creating risks and opportunities	Bloxham 2011; Callahan et al. 2011; Vigneau et al. 2015; Álvarez Jaramillo et al. 2019; Lagoarde-Segot 2019; FCA 2019a; IMF 2019a; IIF and EY 2021; Azahara and González 2021; Popescu et al. 2021	Increase	Increase	Increase	Increase
	Covid 19 pandemic					
	Governments and organizations need to be prepared to face this kind of situations and offer relevant recovery mechanisms	Fair 2005; HM Treasury 2016; Pettit et al. 2010; Araz et al. 2020; KPMG 2020; Deloitte 2021; IIF and EY 2021	Increase	Increase	Increase	Increase
3	**Operations**					
3.1	**Access Management**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Digital identification (KYC, LEI, & biometric, among others)					
	Right data and methods for customers to access in a secure and timely manner helps to improve customer experience	Olaleye et al. 2017; Bech et al. 2018; Raconteur 2018; PWC 2019;	Increase	Increase		Increase
	Integration of physical and digital channels (incl. branch automation)					
	Offering different access methods to your services improves the customer experience, especially for those customers who are not as acquainted with digital and mobile technologies	Klee 2008; Yousafzai and Yani-de-Soriano 2012; Bech et al. 2018; Gartner 2019; Vives 2020	Increase	Increase		Increase
	Remote and hybrid working					

	Hybrid working offers flexible and fast responses, reducing operational costs but poses operational risks	Deloitte 2021; IIF and EY 2021;	Increase	Increase	Increase	
3.2	**Environmental Control**			**Agility**		**Robustness**
	Cyber security and data protection					
	Cyber security risks threats daily real-time payments, needing the right regulation and controls to safeguard daily operations and data	Gheorghe et al. 2018; PwC 2019; KPMG 2020; Deloitte 2021		Increase		Increase
3.3	**External Dependencies Management**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Fair payment and reward policy for third-party suppliers					
	With aligned supply chain policies and practices, companies can deliver better services and improve the overall customer experience	Purvis et al. 2016; Morozov 2018; Bancorp 2019; Oliver Wyman 2020; Vives 2020; IIF and EY 2021	Increase	Increase	Increase	Increase
	Fast digital payments service process (i.e., P2P and other Fintech services)					
	Allow organizations and customers more efficient, ease or convenient, flexible, and faster payment capabilities (for example, expense management tools, electronic payment methods and data capture and reporting)	Klee 2006; Wang and Wolman 2016; Bank for International Settlements 2020; Vives 2020	Increase	Increase	Increase	Increase

	Cloud-based digital environment					
	Software-as-a-Service (SaaS) makes faster, cheaper, scalable, flexible and of high-quality service levels, in terms of better insights and faster rates of products innovation, but cyber risks need to be managed	Han et al. 2017; Haimes 2018; Han et al. 2020; Homburg et al. 2020; IIF and EY 2021	Increase	Increase	Increase	Increase
3.4	**Identity Management**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Integrated access capabilities					
	Provides a digital identity that can be configured to access financial information, and integrated products and services in one platform through different channels and technologies (see also Access management subarea)	KPMG 2020; IIF and EY 2021	Increase	Increase	Increase	Increase
3.5	**Incident Management and Control (See Access Management sub area)**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
3.6	**Knowledge and Information Management (See Access Management sub area)**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Data management (incl. privacy and protection) & Financial disclosure (GDPR)					
	Customers' data allows companies to be responsive and tailor their services according to users' needs, but	Accenture 2019; KPMG 2020; Oliver Wyman 2020; Deloitte 2021; IIF and EY 2021	Increase	Increase		Increase

	requires data and information handling and reporting, to safely guard it					
3.7	**People Management (refer to the Human Resource Management sub area in the Enterprise Management Area)**		**Flexibility**	**Agility**		**Robustness**
3.8	**Technology Management (please also refer to the factors mentioned in the Access Mgt. subarea)**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Bank services digitisation (inc. e-commerce, branch improvement, digital banking, and robotization)					
	Organisations use digitisation to comply with ESG regulations and create a green infrastructure, and product/service offering.	Klee 2008; Yousafzai and Yani-de-Soriano 2012; Gartner 2019; Vives 2020	Increase	Increase	Increase	Increase
	Legacy systems modernisation, tech innovation (i.e., big data, B2B, Fintech), and operational improvement simplification					
	Identifying and addressing vulnerabilities in legacy systems and improving processes to provide a better payments infrastructure	Naim et al. 2002; PWC 2019; Vives 2020; Oliver Wyman 2020; Deloitte 2021; IIF and EY 2021	Increase	Increase	Increase	Increase
	5G edge computing, BYOD (Bring your own device) banking, and QR payments					

	Enhances digital capabilities (i.e., data availability, personalization, faster information exchange, and creating a more robust and efficient digital environment)	PWC 2019; World Bank 2019b	Increase	Increase	Increase	Increase
3.9	**Vulnerability Analysis and Resolution**		**Flexibility**	**Agility**		**Robustness**
	Enterprise Risk Management Framework (incl. risk impact, resilience, etc.)					
	This factor allows companies to manage risks and develop a strategy towards operational resilience	FCA 2019a; Innovate Finance 2019	Increase	Increase		Increase
	Cyber security and data protection and Fraud capabilities					
	Allows to develop the right regulations and controls in digital innovation; including data protection, cyber security & any fraud issues that could impact customer trust	UK Finance 2019a; BoE 2019; Paul and Zhang 2020; IIF and EY 2021	Increase	Increase		Increase
	Stress tests, cyber exercises, and simulations					
	Allow companies to evaluate different situations that might create different risks and vulnerabilities to their systems and possible continency plans	Bank for International Settlements 2019; Gandhi et al. 2019; Deloitte 2021; IIF and EY 2021	Increase	Increase		Increase
4	**Process Management**					

4.1	**Measurement and Analysis (See Access Mgt. for other relevant factors)**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Performance measurement and decision-making					
	Performance management systems are track down results from strategic initiatives or decisions made, including any kind of coordination and adaptation or responses to any business risks or hazards	Folke et al. 2010; Coetzee et al. 2016; Li et al. 2017; Snowden and Boone 2017; Jain et al. 2018; IMF 2019b; World Bank 2019b; IIF and EY 2021	Increase	Increase	Increase	Increase
	Machine learning and artificial intelligence					
	With a focus on flexibility agility, and leanness, process automation helps to improve services efficiency, a main industry business driver	World Bank 2019b; Shi et al. 2020	Increase	Increase	Increase	Increase
4.2	**Monitoring**		**Flexibility**	**Agility**		**Robustness**
	Auditing and controlling (incl. cybersec, monitoring, internal controls, cross-checks, among others)					
	Different resources and practices need to be verified according to the procedures and standards specified (i.e., ESG, CSR, and ethical issues)	BIS 2019; UK Finance 2019a; Deloitte 2021	Increase	Increase		Increase
	Crypto digital currency					

	Crypto currencies could create some market efficiencies, such as faster and more transparent cross-border payments, if the technology is secure.	Dodd 2018; Nelms et al. 2018; Deloitte 2019; PwC 2019	Increase	Increase		
	See Access Mgt. for other relevant factors					
4.3	**Organizational Process Definition (See Access Mgt. for relevant factors)**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
4.4	**Organizational Process Focus (See Access Mgt. for other relevant factors)**		**Flexibility**	**Agility**	**Leanness**	**Robustness**
	Physical payments service improvement and automation (incl. branches, logistics, and main office)					
	Physical payments services, incl. cash payments, need to be inclusive and provide excellent customer experience	Bech et al. 2018; Gartner 2019; IIF and EY 2021	Increase	Increase	Increase	Increase
	Operational improvement (efficiency, cost, services, standardization)					
	Efficient and effective resource use (material, financial, social, environmental, etc.) to provide customers with low costs, excellent service, and the best value, from all different perspectives to increase their profit returns and growth	Kleindorfer et al. 2005; Walker et al. 2014; Sani et al. 2021	Increase	Increase	Increase	Increase

	Operational improvement (agility and collaboration)					
	These capabilities and their improvements allow to provide fast, flexible, cost-effective, customer-oriented tailored services and operations, according to changing market circumstances and changing customer demand	Han et al. 2017; Parreiras et al. 2019; Deloitte 2021; IIF and EY 2021	Increase	Increase	Increase	Increase
	Change Management programmes					
	Companies need a coordinated response for changing market circumstances (i.e., human, technological, etc)	Han et al. 2017; Parreiras et al. 2019; Deloitte 2021; IIF and EY 2021	Increase	Increase	Increase	Increase

Appendix G Stakeholders' strategic reports identified risks

The risks are ordered in alphabetical order, if the risk was identified by any stakeholder an "X" appears on the cell. For example, Business risk appears on Barclays (B) Bank. At the Payment System integrated level, the sum of all the stakeholders appears, for example, the Business risk is common in 4 of 5 stakeholders, where Merchants do not have commonly identified it.

		Banks					Payment Networks				Acquirers					Retailers / Merchants				Regulators					Payment System Integrated				
	Risks	B	H	L	R	S	A	D	M	V	F	I	G	U	A	M	S	T	W	B	F	H	P	U	A	B	M	P	R
1	Business (Competition, Prices, fees)	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	5	4	4	4	4
2	Capital / Working capital (Pension)	X		X		X	X	X		X	X	X	X			X	X	X	X			X	X		3	3	3	4	2
3	Climate	X	X	X	X	X								X	X	X	X	X	X	X	X		X	X	5	0	1	5	4
4	Conduct / Accountability			X		X		X			X	X	X		X					X	X				2	1	3	1	2
5	Consumer habits/preferences			X		X			X	X	X	X	X		X	X	X		X					X	2	2	3	4	1
6	Credit (Interest rate, LIBOR)	X	X			X	X	X		X	X	X	X	X	X			X	X	X	X	X	X	X	3	3	4	3	5
7	Currency exchange (FX)		X					X	X		X		X		X	X		X	X						1	2	2	4	0
8	Cyber and data privacy	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	5	4	4	4	4
9	Environmental						X							X	X	X	X	X	X					X	0	1	1	5	1
10	ESG (Communities, Human Rights)		X	X	X	X											X			X	X				4	0	0	1	2
11	Financial/Economic	X						X	X	X		X		X	X		X	X	X		X	X	X		1	3	2	4	3
12	Fraud and financial crime	X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	X	X	X	X		5	3	4	3	4
13	Health and Safety			X												X		X	X						1	0	0	3	0
14	Investment (Joint V., Alliances)	X	X	X	X	X	X	X		X	X		X		X				X		X		X		5	3	2	2	2
15	Labour and compensation (Skills)			X			X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	1	4	4	5	2
16	Legal (Contracts, IP, litigation)		X				X	X	X	X	X	X	X	X	X		X	X	X	X		X		X	1	4	4	4	3
17	Liquidity	X	X				X	X	X	X	X	X	X	X		X	X	X	X	X	X		X		2	4	4	4	3
18	Market and Geopolitical (Brexit, Seasonality)	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		4	4	4	5	4
19	Model (Risk mgt)						X	X			X		X							X			X	X	0	2	2	0	3

20	Operational	X	X	X			X	X	X		X	X	X	X	X		X	X	X	X	X		X	X	3	3	4	4	4
21	Pandemic									X				X	X	X			X	X	X	X			0	1	1	3	3
22	Payments										X		X		X										0	0	2	1	0
23	Physical		X		X			X															X		2	1	0	0	1
24	Product/Service availability							X		X					X	X									0	2	0	2	0
25	Product safety/liability														X	X		X							0	0	0	3	0
26	Regulatory/Prudential/Compliance (Tax, Ring-fencing)	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X		5	4	4	4	3
27	Reputation and Brand						X		X	X	X		X	X	X		X	X	X	X				X	0	3	3	4	2
28	Strategic							X						X		X	X		X	X		X			0	1	1	3	2
29	Supply chain disruption (Inventory)														X	X	X	X							0	0	0	4	0
30	Systemic (Group)						X				X	X	X					X					X		0	1	3	1	1
31	Technology (IT, acceptance, availability)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X		5	4	4	5	2
32	Third-party and business partners			X	X	X	X	X	X	X	X	X	X	X	X			X	X				X		3	4	4	3	1
33	Trade											X				X									0	0	1	1	0
34	Transition		X								X		X										X		1	0	2	0	1
35	Mortgage													X											0	0	1	0	0