Programmatic Advertising: An Exegesis of Consumer Concerns

Programmatic Advertising is a nascent and rapidly growing information technology phenomenon that reacts to, and impacts upon, consumers and their behaviour. Despite its popularity and widespread use, research in the area remains scant and our current knowledge is based upon a preponderance of practitioner-generated literature. This study contributes to our understanding of this technology by unpacking the means by which it functions and interacts with consumers.

The study draws upon Paradox Theory to deconstruct Programmatic Advertising's inherent tensions as dilemmas and dialectics. Adopting organizations are faced with the dilemma of pursuing the acquisition of increasingly detailed information in order to provide more personalized offerings, yet doing so increases the likelihood of creating a sense of fear and distrust among consumers. The automation of personalized advertising appears attractive yet presents the dilemma that adverts may be inappropriately placed. Finally, the true cost/benefit of PA is unclear, and adopters, platform providers and developers need to engage in dialectic in order to fully understand and communicate its financial implications. Through identifying these fundamental constraints, the study affords pathways for programmatic system actors to ameliorate their, and their customers' concerns.

Keywords: Programmatic Advertising, Paradox, Dilemma, Dialectic

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1.0 INTRODUCTION

Advances in technologies frequently offer exciting new ways of conducting business that promise to deliver greater efficiencies and effectiveness. These can fundamentally change the ways that business is conducted and those that have been brought about through the internet

revolution have had considerable effect upon all aspects of commerce and even the very fabric of society (Zinkhan 2005; Carlo, Gaskin, Lyytinen & Rose, 2014). 'Blockchain' for instance, is a nascent 'internet technology' that underpins cryptocurrency operation, and is thought to have the potential to revolutionise many aspects of contemporary business models (White, 2018), and 'geocaching' is a mobile technology-enabled sport that has been explored as a means of extending the reach and engagement of tourism business (Skinner, Sarpong & White, 2017). However, many of these technologies ultimately fail to meet expectations (Adner, 2002; Schmidt & Druehl, 2008) and present their own practical and methodological issues (Sriram, et al., 2015) that serve to warn those that are considering their use to take a critical stance in order to avoid what Porter (2001, p3) termed "rampant experimentation".

Additive Manufacturing, which is now more commonly termed 3D Printing, was developed in the 1980's from rapid prototyping technologies (Macdonald et al., 2014). This was expected to revolutionise the ways in which manufacturing and its supply chains operated (Mishra, 2013; Huang et al., 2012). However, while its use has grown steadily, it has not yet been the disruptive technology that it was envisaged (Thierer, 2013; Hutmacher, 2014), and concerns over its performance and capabilities remain (Ratto & Ree, 2012; Thomas and Gilbert, 2014). Fifty years from its conception in the mid twentieth century (Sabanovic, Milojevic & Kaur, 2012), Artificial Intelligence (AI) now promises human-like capabilities across a range of applications including healthcare, learning, finance and security (Gartner, 2019; Jarrahi, 2018). However, whether AI is truly capably of producing human-like systems remains moot (Gartner, 2019; Hengstler, Enkel & Duelli, 2016). Driverless cars are often used as an exemplar of AI capabilities, yet their ability to recognise and avoid road traffic and obstacles is enabled by the utilisation of vast numbers of human observers that continually populate the image recognition systems (BBC, 2019). Human call-handlers are also frequently employed to support automated 'chatbots' (Friedman, 2019). It is therefore not clear whether AI will result in the loss of jobs

or merely the displacement of the type of jobs that humans will perform (Choudhury, 2019; Rees, 2019; Stahl, Timmermans & Flick, 2017).

Zuboff (2019: 8-10) recognises that human computer interaction (HCI) is generating vast amounts of free surplus raw material that can be translated and exploited into sophisticated granular behavioural data. This so called 'behavioural surplus' that humans leave behind when interacting with technologies is at the forefront of the development of 'machine intelligence' and HCI prediction products that can anticipate what consumers will do and purchase in the near and distant future. The trading of these prediction products has created a new 'behavioural futures market', and at its vanguard is Programmatic Advertising.

Programmatic Advertising (PA) is a contemporary, yet poorly understood technology-enabled data-driven system that enables the cost-effective, real-time dissemination of select marketing materials to target audiences via the internet. It has quickly emerged as a vital communication tool for a significant number of consumer-facing organizations, most notably in retailing (Benady, 2015),

> "*…of the many buzzwords and trends that float around the industry, Programmatic Advertising may be the most prevalent and one of the most disruptive developments to media buying in the last 10 years*" (Stevens, Rau and McIntyre, 2016, p193)

Its use of data from web users' "*digital footprint (cookies) to find audiences, and then deliver ads to them*" has attracted a spend of £960 million in the UK alone (Benady, 2015, p15) and an estimated $14.88 billion worldwide (eMarketer, 2015). In 2015, nearly half of all digital adverts were traded programmatically with predictions that this will soon grow to over 80% (Benady 2015). New medias and industries are also entering the programmatic arena with loyalty schemes, apps, gaming, film, television (Guitart, Hervet and Gelper, 2020; Malthouse, Maslowska & Franks, 2018; Deng & Mela, 2018) and the internet of things, that includes products such as Amazon's Alexa, all opening novel spaces to take advantage of this growing practice (Benady, 2015; Gertz & McGlashan, 2016; Seitz and Zorn, 2016).

Even though the growth of PA has been rapid, the knowledge, skills and understanding of practitioners to use it effectively has lagged behind considerably (Benady, 2015). The speed of its development and functionality, combined with its technical complexity, is proving to be 'unnerving and off-putting' for many to try to comprehend it (Benady, 2015; Seitz & Zorn, 2016; Gertz & McGlashan, 2016) and it remains something of a 'black box' of technologies (White & Samuel, 2019; Molina, 1999).

In order to further understand this rising phenomenon, the authors undertook a structured literature review in 2019. Methods of conducting structured literature reviews are well known, but still vary depending upon the scope of the enquiry and the maturity of the subject area (Tranfield et al., 2003; Thorpe et al., 2005). The keywords 'programmatic' and 'programmatic advertising' were used to search the academic databases 'Business Source Complete', 'Emerald' and 'Science Direct'. While numerous practitioner articles were found the search returned very few scholarly publications (see Table 1). The literature search was repeated in 2020 in order to maintain contemporaneity and to monitor any increased academic interest in this nascent technology. This also returned few scholarly publications indicating that the subject area is still in need of concerted attention.

This was not unexpected given the general lack of understanding of PA (Gangadharbatla, et al., 2017; Benady, 2015), and is commonly encountered when exploring nascent technologies (for example White, 2018). The limited literature did not necessitate the further filtering of the results through the refinement or addition of search terms, or through the categorization of journal quality.

Academic Literature 2019	Academic Literature 2020

Malthouse, Maslowska & Franks (2018) Deng & Mela (2018) Gangadharbatla, Govinda, Ligon & Paramithiotti (2017) AlSabeeh & Moghrabi (2017) Li, Yan, Zaho, & Wang (2017) Alaimo, Kallinkos, & Sessa-Sforza (2017) Busch (2016) Fulgoni (2016)	Zhang, Wakefield, Huang and Li (2020) Guitart, Hervet and Gelper (2020) Perrin (2020) Malthouse, Hessary, Vakeel, Burke and Fuduric (2019) Mills, Pitt and Ferguson (2019) Geradin and Katsifis (2019)

Table 1, Structured Literature Review Summary

The preponderance of practitioner type articles found in the literature review reflects the rapid uptake and widespread utilization of PA. The paucity of academic publications indicates a significant lag in our understanding of this paradigm-changing development (Brosche & Kumar, 2016) and thus far, little attempt has been made to theorize this emerging, complex practice. Gangadharbatla et al., (2017, p158) concur and suggest that "*it is imperative that advertising educators (and professionals) start a conversation on what programmatic advertising is, the challenges and opportunities it presents, and what the future holds*". Emergent practices are often observed from within the confines of existing theoretical boundaries and while this may return interesting insight it can in fact be constraining and prevent more profound discoveries and theoretical development (Schwarz & Stensaker, 2014). We argue that the area is in need of academic research that moves PA research beyond mere examinations of consumer responses to 'personalized' advertisements (Aguirre, Mahr, Grewal, Ruyter & Wetzel, 2015; Lambrecht & Tucker, 2013) towards one that explores it in its entirety.

In order to address this gap and stimulate research into this growing phenomenon, and similarly to other works that have recognised the complex interplay of information technologies and the wider social contexts within which they operate and which they impact upon (Grewal, Bart, Spann & Zubcsek, 2016). It presents one of the first holistic examination of PA and recognizes

that it is fraught with tensions that collectively conspire to imbue the system with a degree of innate complexity that precludes its understanding by practitioners and which has impeded contemporary research. This paper proffers several areas that require concerted academic research to address the current gap in knowledge, and highlights areas where practitioner skills and abilities need development in order that a shared phronesis between academics and practitioners can be achieved (Ngwenyama, Klein, Hassan, Mingers & Stahl, 2018).

2.0 PROGRAMMATIC ADVERTISING OVERVIEW

There is no 'official consensus' on a definition of PA (Alaimo, Kallinkos & Sessa-Sforza, 2017, p.1) and it is 'clouded by misconceptions' (Whitmer, 2018). Fundamentally, it is an automated big data system that allows organisations (predominantly retailers) to bid for the privilege to publish personalized online advertising in the right place, to the right people, at the right time (Benady, 2015; Funk & Nabout, 2016; Li, Yuan, Zaho & Wang, 2017; Bush, 2016b; Li, et al., 2017; Waesch, Rotberg & Renz, 2016; Gertz & McGlashan, 2016; Kosorin, 2016). PA has disrupted the advertising ecosystem (Li, Yuan, Zaho, Wang, 2017; Seitz & Zorn, 2016) through sparing the expense and risk of mass communication advertising that is often criticized for its wastefulness (Benady, 2015; Bleier & Eisenbeiss, 2015; Aguirre et al., 2015). It is lauded as a cost-effective instrument that delivers more 'bang per buck' (Benady, 2015; AlSabeeh & Moghrabi, 2017) and may be a distinct competitive advantage for organizations that understand its technical ecosystem (Benady, 2015; Hachen & Bardega, 2016).

While the intricate technicalities of the system are beyond the needs of this study a brief overview of its functionality is worth noting. From the supply side, web publishers invite organizations (buyers) to participate in auction-style bidding to buy on-line space to display advertising that is 'personalized' to the webpage visitor (Aguirre, et al., 2015). Bidding is carried out on behalf of buyers by demand-side platforms (DSP), while data-management-platforms (DMPs) collect web user data, and supply-side-platforms (SSPs) manage the

webspace that is available for purchase and collate the viewing metrics. DSPs utilize digital information from the DMPs to assess their potential customer fit. Based upon this data the DSP automatically calculates (in milliseconds) if the space is worth having, how much it is worth bidding and what style of communication should be used (Benady, 2015; Bush, 2016; Kosorin, 2016; Schafer & Weiss, 2016). The winning bidder's adverts are then placed in the available webspace.

PA utilises website visitor data that may comprise their GPS coordinates and their current activities as well as more traditional data such as cookies and product preferences. Contextual data may also be used that comprises local time zones, weather and news. For example, Hilton Hotels used a customer-centric approach to PA (Gertz & McGlashan, 2016) to target passengers (via their mobile phone) at airports whose flights have been delayed for a long period (Benady, 2015). Mapping consumer journeys is now a given practice for many organisations and is likely to become more and more sophisticated (Seitz & Zorn, 2016). The proper integration of PA can lead to more effective and proactive use of often underutilised CRM systems (Yang & Li, 2015) and organisations can exploit this to develop a marketing communication strategy that embraces 'dynamic retargeting' and offers a greater return on investment (Lambrecht & Tucker, 2013).

2.1 PA Advertising Benefits and Challenges

The rapidly emerging PA literature is awash with practical advice to help practitioners understand what it is (Benady, 2015; Busch, 2016), how it functions and how to navigate its digital complexity (Kosorin, 2016). It is both celebratory of its capabilities (Benady, 2015; Busch, 2016) and optimistic of its sustained growth (Schafer & Weiss, 2016; Seitz & Zorn, 2016).

2.1.1 PA Effectiveness

The infancy and rapid acceptance of PA has led some to question the measurements of its effectiveness (Funk & Nabout, 2016) and whether its rapid uncontested 'hype cycle' of growth will result in the next .com crash (White & Samuel, 2019; Seitz & Zorn, 2016). The PA literature is also punctuated with cautionary tales of costly mistakes (Hackley & Hackley, 2018; Benady, 2015; The Guardian, 2017; The Telegraph, 2017), breaches of competition law (Geradin and Katsifis, 2019), malpractice (Innovation in Magazine Media, 2016), risks (Seitz & Zorn, 2016), creative challenges (Weisbrich & Owens, 2016), confusion (Krefetz, 2016), complexity (Benady, 2015; Anderl, Schumannand & Kunz, 2015), mistrust (Bleier & Eisenbeiss, 2015) and contradiction (Benady, 2015; Aguirre, et al., 2015).

PA is not transparent in terms of its cost or consumer viewable effectiveness (Funk & Nabout, 2016). Web surfers are generally averse to viewing banner-type adverts (Dreze & Hussherr, 2003) and issues such as click fraud via bots that make fake page impression often result in firms paying for advertising placements that are never seen by the human eye (Fulgoni, 2016; Innovation in Magazine Media, 2016). The RTB Trend Report (2015) indicated that only 55% of programmatic adverts are seen by web users, while Innovation in Magazine Media (2016 p.124) reported that 25% of all video advert impressions are viewed by machines and that US companies are losing over $4.5 million an hour through fraudulent PA. Other technologies such as adblockers may be used to block PA-generated adverts and this can have a significant deleterious effect upon web traffic and revenue for advertisers (Shiller, Waldfogel & Ryan, 2018; Turner, Shah & Jain, 2018). Some organisations have exploited system vulnerabilities in order to bypass the adblockers and force adverts upon end users (Bashir, Arshad, Kirda, Robertson & Wilson, 2018).

2.1.2 PA Advert Placement

By taking human judgment out of the process of advertising placement the automated system also has the potential to place advertisements on inappropriate sites that may misrepresent or,

worse still, irreparably damage the brand identity through negative and unsuitable association (Mills, Pitt and Ferguson, 2019; Benady, 2015; Campaign Live, 2018). For example, in 2017 the Guardian newspaper was forced to withdraw from Google's PA platform after discovering that its adverts were appearing on websites supporting extremist views (The Guardian, 2017). Marks and Spencer's also found its adverts had been displayed next to extremist views on Google's YouTube platform (The Telegraph, 2017). There is considerable room for improvement in the suitability of a PA banner advert based not only upon its content (dynamic) but also within its context (brand affinity) among other paratext (Hackley & Hackley, 2018; Benady, 2015). Marketers should therefore pay more attention to ensuring that the PA they engaged with is 'brand safe' (Schafer & Weiss, 2016).

2.1.3 PA Serendipity

De Gemmis, Lops, Semeraro & Musto (2015) make a quantitative examination of 'recommender systems' that are similar to PA systems in that they attempt to provide serendipitous experiences through exposing the user to interesting new information, based upon their historical interests and preferences (Malthouse, Hessary, Vakeel, Burke and Fuduric, 2019; Jain & Gupta, 2018). Recommender systems have gradually moved away from the pursuit of accuracy and, recognising its importance, have become more focussed upon providing serendipity (Kotkov, Zhao, Konstan & Veijalainen, 2018). McCay-Peet and Toms (2015) note the difficulty in providing an exacting definition of serendipity but confirm that serendipitous moments are always associated with the unexpected and the positive. Their review of the models and studies of serendipity indicate that it is a complex phenomenon, influenced by many factors that include psychological and environmental factors as well as the presence of new information or experience.

Serendipitous moments are an important part of human activity but there is some debate over the ability of internet technologies to deliver such unexpected and potentially most valuable

experiences (Andre, Teevan & Dumais, 2009; Makri, et al., 2014; Erdelez & Jahnke, 2018). Consequently, there have been continued calls for human intervention in order to induce novelty into technology-based information searches (Cooksey, 2004). Methods for generating serendipitous recommendations from web searches have been proffered (see for example U.S. Patent US6334127B1) but these tend to rely upon some aggregation of large populations of data and that user's existing preferences (Eirinaki, Gao, Varlarmis & Tserpes, 2018), or the equivalent method of creating multiple avatars of the user (see for example US patent US7319998B2). Makri, Blandford, Woods, Sharples and Maxwell (2014) maintain that while digital environments can be useful for enabling serendipitous experiences, the design of such environments must be thought of as merely being capable of influencing such moments.

While dynamic retargeting is cited as a potential upside of PA (Lambrecht & Tucker, 2013) organizations should be mindful of the dangers that this may bring in the form of the loss of serendipitous experiences and locking the consumer in an 'echo chamber' of product offerings. De Gemmis et al. (2015) recognise the problem with systems that "*threaten to deprive us from serendipitous encounters that spark creativity, innovation and the democratic exchange of ideas*" (p695) and review the novel approaches that have been devised for inducing serendipity. Many of these techniques rely upon two-way information exchange for the assessment of the affective state of the user, for example, facial expression recognition. The search for serendipity requires increasingly sophisticated analysis of increasingly large, and even more personal, data sets.

The personalization of adverts, often celebrated by PA as its unique proposition, has been found to be concerning for some consumers (Zhang, Wakefield, Huang and Li, 2020; Li & Unger, 2017). Questions about how their data is being stored and used shows that consumers that are exposed to aggressive PA often feel vulnerable and the approach is sensed to be intrusive (Aguirre, et al., 2015; Van Doorn & Hoekstra, 2013). Recent revelations surrounding the

potential of Russian interference in the 2016 USA elections (Forbes, 2017) and Cambridge Analytics' acquisition and unscrupulous use of aggregated datasets of 57 billion Facebook friendships and the harvesting and sharing the data of more than 50 million American Facebook users (The Guardian, 2018) exemplify these heightened concerns. Legislation exists in most countries to protect the user and their data from unlawful use but they are not consistent nor universally applied (Chaffey & White, 2011). The application of individually targeted real-time (data-driven) news and promotions is being questioned from moral and legal standpoints (Krafft, Arden & Verhoef, 2017; Grewal, Bart, Spann & Zubcsek, 2016; BBC, 2018).

2.1.4 Consumer Reactions

Historically, (See Nelson, 1970, 1974) and indeed more recently, consumers have a predilection (Xie, et al., 2015) to 'search' for products themselves. Individuals express values when engaging with advertising and don't always respond to actions derived from real time bidding and access (Wang, Zhang & Yuan, 2016) particularly when there has been no prior relationship with a brand or product (Hayes, Golan, Britt and Applequist 2020). The advertising literature clearly indicates that "*judgements of questionable marketing practices*" (Boush, Madrigal and Xie 2015, p281) are critically important and can be often overlooked. However, the potential for negative downstream effects are likely to impact if such issues are not addressed.

'Blatant exposure' (Wan, Ansons, Chattopadhyay & Leboe, 2013) can cause self-defence processing and negative evaluations of a given product with an immediate impact on trust (Bleier & Eisenbeiss, 2015). Therefore, the notion of personalisation through computation doesn't immediately correlate with impact or acceptance (Yang, Yang, Jansen & Lalmas, 2017), and this is the case with both mass and personalised advertising approaches (Malthouse, Maslowska & Franks, 2018).

There are calls to ban direct advertising given its breach of human rights (Wellington, 2010). This 'forced exposure' results in both cognitive and even physical avoidance (Jeon, Park, Lee, Kim & Han, 2009). Opinion dynamics are therefore critical given the impact on elements like appreciation (De Pelsmacker, Geuens & Anckaert, 2002) and there is empirical evidence to suggest that privacy is a primary concern (Ham, 2017)

Perceptions of advertising have been described as 'evolutionary' and interval perception will impact on external action (Luo, Liu, Zeng, Diao & Xiong, 2014). Advertising practice has to be ethical, as advertising will be judged by internal 'moral ideologies' to see if it violates ethical norms (Treise, Weigold, Conna & Garrison, 1994). This is the case with traditional media (Fulgoni & Lipsman, 2017) and with the growth of non-traditional, complex media (Drumwright & Murphy, 2009; Voorveld, van Noort, Muntinga & Bronner, 2018). Consequently, the use of 'big data' isn't without its pitfalls (Malthouse & Li, 2017; Chen & Zhou, 2018; Liu-Thompkins, 2019) and the notion of effectiveness and behavioural targeting (Bennett, 2011) is still very much being learned (Boerman, Kruikemeier & Zuiderveen Borgesius, 2017). Consequently, we don't know how even the 'most interested' customers will respond (Malthouse, et al., 2018).

2.2 PA System Tensions

Despite there being limited extant literature it does provide some valuable insight into the operationalization of PA and indicates the challenges that require closer attention: summarised in Table 2.

Table 2, Programmatic Advertising Tensions

Tension	PA Challenges
Personalization	Pursuit of serendipity. Perceptions of intrusiveness.
Mechanisation	Automation of marketing activity. Lack of human judgement.
Efficacy	Supposed benefits of adopting PA.

	Lack of understanding of true consumer impact.

The tension of ‘Personalization’ comprises the integrated analysis of user-specific and contextual big data sets. In order to deliver more deeply personalized adverts that retain a sense of serendipitous experience, ever larger, more recent and potentially more sensitive data sets are required. However, this has the potential to alarm users about the degree to which their personal behaviours and preferences are known by faceless organisations and how those data are stored and otherwise utilised. It also raises concern over the governance of these large data sets and the legality of their use.

‘Mechanization’ recognises the speed and efficiency benefits that are provided by PA’s automated system that enables the real-time exposure of visitors to personally and contextually relevant materials. However, the loss of human judgement from the process has been found to result in improper advert placement.

The ‘Efficacy’ consists of organisations’ drive to adopt PA, in order to take advantage of its many proposed benefits, that is juxtaposed by the lack of understanding of its true impact upon consumer behaviours. Adopters may therefore be caught between the decision to engage with this seemingly invaluable but ‘dark art’ approach to advertising or risk losing presence in an increasingly digitally enabled world.

These interwoven factors conspire to imbue PA with a degree of complexity that makes its academic study challenging, as indicated by the lack of contemporary research, and makes it a daunting subject for practitioners to assess critically (Figure 1): the PA system spans the technical, economic and social domains of providers, adopters and consumers. Furthermore, each of the tensions can be seen to comprise antagonistic factors, that is, they present as inherent contradictions within the PA system.

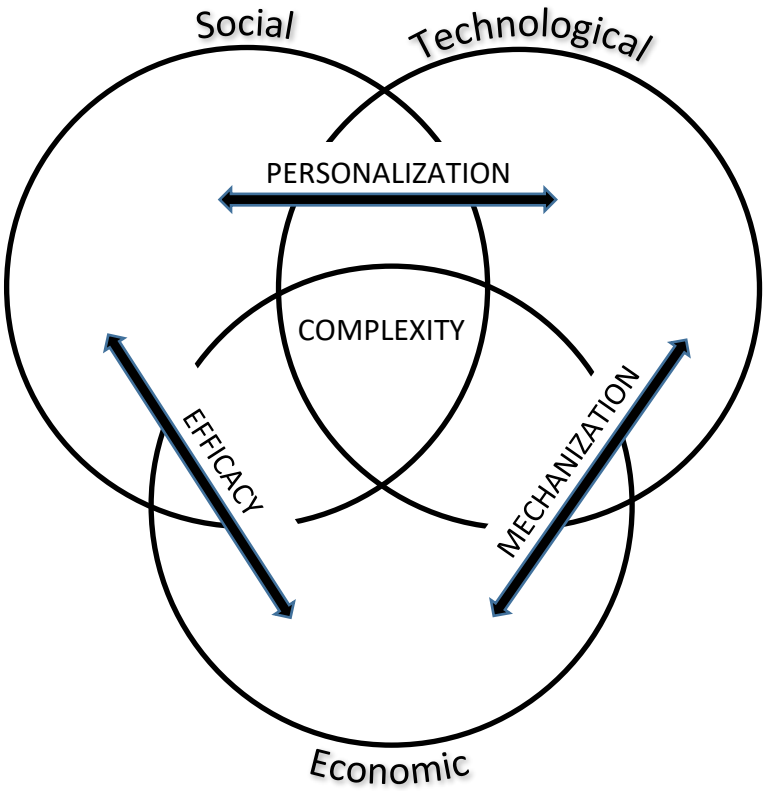

Figure 1, Programmatic Advertising Systemic Complexity

3.0 PARADOX THEORY

The value of adopting Paradox Theory (PT) as a theoretical lens is evidenced in its ability to direct the practical solutions to prevailing problems. These have included unpacking the internal and external organizational tensions that surround the pursuit of the 'Triple Bottom Line' (Ozanne, et al, 2016), resolution of the inherent paradoxes of Social Enterprise (Luscher & Lewis, 2008), and balancing the competing demands that are put upon leaders (Lewis, Andriopoulos & Smith, 2014). Adopting a paradox perspective affords researchers new insight into organizational form, function and challenges, while managers may benefit from its ability to enable seemingly irreconcilable tensions to be overcome and generate ingenious solutions (Smith & Lewis, 2011; Smith & Tracey, 2016).

Paradoxes are encountered in many aspects of daily life including organizations (Lewis, 2000). The term describes some persistent problem that is seemingly insoluble because the options

are perceived to be antagonistic (Smith & Lewis, 2011). PT comprises approaches to depolarizing paradoxes so that non-binary decisions can be made and their paralyzing effects can be abjured (Bednarek, et al., 2017; Calabretta, Gemser & Wijnberg, 2017; Smith & Tracey, 2016).

PT has been utilized in the study of numerous management problems since its earliest conception (Cameron & Quinn, 1988), including non-profit organisations (Lloyd & Woodside, 2015), haute cuisine (Leone, 2018), social enterprises (Mason & Doherty, 2015), digital innovation (Ciriello, Richter & Schwabe, 2019), green human resource management (Guerci & Carollo, 2016), corporate social responsibility (Bondy, 2008), consumer fanaticism (Chung, Farrelly, Beverland & Karpen, 2018), nursing (Kan & Parry, 2004), leadership (Denison, et al., 1995), university hospital (Jansson, 2015), public sector organisations (Matthews & Shulman, 2005), mobile phones, (Reyes, Dholakia & Bonoff ,2018), family-owned businesses (Braun & Uhlaner, 2012), strategic agility and decision-making (Calbretta, et al., 2017; Lewis, et al., 2014) and even the role of fun in the workplace (Plester & Cooper-Thomas, 2015).

Typologies of paradoxes have been produced (Luscher & Lewis, 2008; Smith & Lewis, 2011) and methods of dismantling paradoxical problems have been proffered. For example, through the temporal and spatial separation of juxtaposed organizational activities (Smith, Gonin & Besharov, 2013), or the ‘exploration’ and ‘exploitation’ of new and existing opportunities (Papachroni, Heracleous & Paroutis, 2015), through cycles of ‘splitting’ and ‘synthesizing’ activities (Ozanne, et al., 2016) or through ‘assimilation’ and ‘adjustment’ (Poole & van de Ven, 1989).

Adopting PT as a research lens is thereby a means of examining systemic tensions in a manner that transcends their mere description and affords an avenue for their deconstruction and resolution. PA is a nascent, influential, but comparatively poorly understood technology that is beset by a range of inherent tensions. PT is adopted as the conceptual lens for this study in

order to gain understanding of those tensions and thereby provide useful guidance for practitioners as well as forge a pathway for its academic study.

3.1 Paradoxes, Dilemmas and Dialectics

Smith and Lewis (2011) differentiate between antagonistic organizational tensions and term them as either paradoxes, dilemmas or dialectics. Each may then be approached in an appropriate manner in order to reach resolution. Smith and Lewis (2011, p382) consider a dilemma to be *"a tension such that each competing alternative poses clear advantages and disadvantages".* It therefore follows that if either option is economically and technically feasible then a dilemma is effectively a decision-making problem (Tongur & Engwall, 2014; Kotarba, Wooten, Freeman & Brasier, 2013; Dubetz, Turley & Erickson, 1997). However, such decisions should not necessarily be considered to be 'either-or' in nature, but they may occasionally comprise some way of accepting both propositions to some degree *ambidexterity* (Ozanne, et al., 2016; Papachroni, et al., 2015). In these situations, it is inevitable that the disadvantages of the choices will also be suffered to some degree (Dubetz, Turley & Erickson, 1997). Dialectics are "[ongoing processes]…*of resolving tensions through integration"* (Smith & Lewis, 2011, p386) that aim to uncover *'the truth' through argument and dialogue* (Hargrave & Van den Ven, 2017; Kodama, 2007; Calton & Payne, 2003; Russell, 1945). Temporary resolution may be gained by adopting some stance that attempts to take the advantages of both in a way whereby they outweigh the inherent disadvantages. While dilemmas and dialectics exhibit some similarities, they are differentiated by noting that dilemmas (decisions) occur at specific points in time whereas dialectics (discussions) extend over time. Those tensions that are conceptualized as dilemmas are effectively subject markers for the various actors to open dialogue and discussion in order to address the foundational problems.

4.0 DISCUSSION

4.1 Personalization

The PA tension of 'Personalization' comprises the competing goals of achieving serendipitous experiences for consumers without infringing their perceived data privacy. Drawing upon Smith and Lewis' (2011) conceptualizations we identify the pursuit of serendipitous consumer experiences as a dilemma, that is, it can be conceived of as a decision that the PA platform provider may choose to pursue. The platform provider would effectively be committing to acquiring and utilizing ever-larger and more personal data sets: we are adopting the position that information systems are currently unable to deliver truly serendipitous experiences by any other means. Consequently, the PA platform provider would be committing its participating organisation to potentially heightening concerns over data privacy among its consumer base.

PA is presented as a technology that can facilitate the inexorable quest for engagement and the development of microfoundations that lead to meaningful relationships and the much-vaunted loyalty (Chung, et al., 2018; Oliver, 1999). However, the indiscriminate implementation of techno-social forms of marketing to the detriment of traditional forms risk exclusion that impacts upon 'relational cohesion' (Wang & Ding, 2017). This decreases the sense of belonging (Mzoughi, Ahmed & Ayed, 2010), which is the essence of marketing practice. PA must instead be considered as part of the advertising paratextual schema (Hackley & Hackley, 2018).

One may also consider whether PA is capable of capturing the rich complexity of the circular paradigm of consumer behavior. When individuals, groups and organizations act and interact, their actions encompass a broad realm of possibilities. The capacity for social systems to self-develop means that the array of consumer reactions and behaviors is impossible to predict. The literature clearly indicates that consumers exhibit goal-contrast behaviors in response to attempts to control (Chartrand, Dalton & Fitzsimons, 2007). Such actions are said to result in reduced purchase intention and purposeful contrariance leading to resentment and activism. It would be erroneous to suggest that this isn't a distinct possibility and therefore, for those

positing PA as a functional panacea, customer *elenchus* or refutation also needs to be considered.

Consumer perceptions of data privacy may be identified as a dialectic, that is, they may be conceived of as a process of ongoing dialogue. PA platform providers and the participating organisations should be mindful of the concerns that may be raised by consumers over their data privacy and engage in open dialogue over the means by which data is acquired, utilised and, importantly, later destroyed or deleted, for the purposes of PA. The recent introduction of legislation, such as the General Data Protection Regulation (GDPR) or the California Consumer Privacy Act (Perrin, 2020) go some way toward protecting the right of individuals, however their usage is limited to specific regions.

4.2 Mechanization

The PA tension of 'Mechanization' comprises the competing characteristics of the benefits of automating the marketing process with the difficulties that are presented by the absence of human judgement. The continued development of the automated PA system is considered to be a dilemma, that is, an organization effectively chooses to adopt PA in order to take advantage of its efficiency. The organisation must be mindful of the fact that it would also be incurring the risk of inappropriate advert placement. This may seem to be of greater concern to some organisations than others, however, we would maintain that adverts for any product or service could be positioned in such a way that they may be harmful to the organisation's desired image. Incorporating human judgement into the PA process would not be practicable since without undermining the purpose of PA that is to provide real-time advert placement. It is therefore a dilemma that is inextricably linked with the decision to adopt PA: there is an inherent risk that adverts may be inappropriately placed.

It would appear as though the tension of ‘Mechanization’ remains paradoxical, however, this is true only from the perspective of PA adopters. From the perspective of PA developers then this tension may be conceived of as a dilemma, that is, it becomes a technical issue to solve. It is beyond the scope of this paper to consider the technical measures by which the proper placement of adverts could be assured but we may proffer one solution. PA platform providers, particularly SSPs, may be capable of owning the entire webspace upon which adverts are to be placed. This may alleviate many of the risks of improper ad placement since all adverts that are displayed could be sourced from reputable SSPs only. While this may afford some degree of assurance for participating organisations it must be noted that this approach would require a restructuring of the PA ecosystem and is likely to have a concomitant effect upon the costs of using PA.

4.3 Efficacy

Finally, the tension of ‘Efficacy’ consists of the lure of the promised benefits of PA, tempered by a current lack of understanding of the true impact that it has upon the consumer base. The benefits of adopting PA would appear to be a dialectic, that is, it is a problem that requires ongoing dialogue in order to resolve. This, we maintain, requires objective analysis of the true costs of PA to participating organisations along with much greater understanding of its impact upon those consumers that are exposed to it but do not become customers. This issue is inextricably linked with the provision of metrics by PA platform providers. Thus, they must also engage in an ongoing dialogue in order to resolve the issues of a lack of reliable performance metrics, not least of which is clouded by fake page impression technologies. Some progress has been made in preventing these technologies from functioning (Bashir, Arshed, Kirda, Robertson & Wilson, 2018) but the rapid development of web technologies suggests that this is likely to result in an escalating ‘arms race’ with an attendant rise in the costs of using PA.

CONCLUSION

This examination responds to Gangadharbatla, et al.'s (2017) call for the investigation of PA because it remains largely unheeded: the limited extant literature is dominated by practitioner materials. We suggest that this is largely due to the overriding complexity of the entire system and reassert the need to undertake detailed examination of this evolving phenomenon. At this point in time, PA may be considered to be a phenomenon that has radically changed consumer engagement with advertising and seemingly delivered considerable benefits and drawbacks for those that are involved. However, many of these assertions are built upon rhetoric and this poses the danger of PA continuing to be implemented ineffectively, and having widespread deleterious effects upon target audiences.

Much of the reason why PA remains misunderstood appears to be due to its inherent complexity and a lack of concerted academic investigation. This we observe to be generated through the complex interplay of competing systemic tensions that comprise the continued quest for deep personalization of the offering, the mechanistic placement of adverts, and a lack of clarity of the true cost/benefit of PA. These manifest as a metaphorical Gordian Knot that seemingly defy disentanglement.

Through viewing these tensions as their constituent dilemmas and dialectics we endeavor to provide some potentially profitable avenues for future research and attention that may lead to a shared understanding of the PA paradigm. Theoretically, the adoption of Paradox Theory has afforded a means of interrogating a system that comprises information technology, advertising and human behavioral elements. This approach has enabled the study of the diverse dimensions of PA and consequently afforded insight into the system in its entirety. By embracing the complexity of PA the study has identified three fundamental and interconnected tensions, comprising 'personalization', 'mechanization' and 'efficacy', which conspire to constrain its ultimate value.

PA has the potential to utilise data from any conceivable source and from any conceivable location. It would therefore seem unwise for organisations that use or intend to adopt PA to rely upon legislation alone to provide consumers with sufficient feelings of trust. Proactive description of data management principles and practices, along with disclosure of actual performance and incidents may be effective ways for organisations that engage with PA to increase consumer trust.

We propose that a set of 'good habits', or perhaps more candidly, a series of virtues be applied to PA practise. PA should not only replicate the ethical behaviors embedded within the marketing paradigm but also be motivated to establish new practice. In a complex system, driven by bidding and bidding wars, we need to ask if trust, commitment and diligence are enough to proceed. Within this framework, where there is a fiscal altercation to reach a given audience, can empathy exist? Can we expect empathy between the DSP and SSP platforms? When does an agreed price for an opportunity descend into opportunism? Consequently, it is posited that the use of PA poses ethical dilemmas. This is an important point to consider since even a cursory review of the advertising literature indicates that it is beset with moral/ethical issues: Covert Advertising (CA) for instance is defined as "*...a firm's marketing actions whereby consumers believe that the activities are not those of the firm*" (Sprott, 2008, p4). Such surreptitious information-gathering and communication practices are linked to advertisement avoidance, irritation and privacy concerns. Can PA claim to be significantly distanced from such practices?

REFERENCES

Adner, R. (2002). When are Technologies Disruptive? A Demand-Based View of the Emergence of Competition. *Strategic Management Journal,* 23, 667–688.

Aguirre, E., Mahr, D., Grewal, D., Ruyter, K-D., & Wetzels, M. (2015). Unraveling the personalization paradox: The effect of information collection and trust building strategies on online advertising effectiveness. *Journal of Retailing*, 91(1), 34-49.

Alaimo, C., Kallinkos, J., & Sessa-Sforza, C. (2017). Infrastructures of automation: Objects, metrics and practices in the programmatic advertising ecosystem. V Innovation in Information Infrastructures (III) Workshop. 7-9 November 2017, LUISS Guido Carli, Rome.

ALSabeeh, D. A., & Moghrabi, I. A. R. (2017). Programmatic Advertising and Real Time Bidding Utilization. *International Federation for Information Processing*, 289-297.

Anderl, E., Schumann, J. H., & Kunz, W. H. (2015). Helping Firms Reduce Complexity in Multichannel Online Data: A New Taxonomy-Based Approach for Customer Journeys. *Journal of Retailing*, 92(2), 185-203.

Andre, P., Teevan, J., & Dumais, S. T. (2009). From X-Rays to Silly Putty via Uranus: serendipity and its role in web search. CHI 2009, Boston.

Bashir, M. A., Arshad, S., Kirda, E., Robertson, W., & Wilson, C. (2018). https://www.ieee-security.org/TC/SPW2018/ConPro/papers/bashir-conpro18.pdf Accessed 28 April 2020.

BBC (2018). http://www.bbc.co.uk/news/technology-43501184 Accessed 28 April 2020.

BBC (2019). https://www.bbc.co.uk/news/technology-46055595 Accessed 27 February 2019.

Bednarek, R., Paroutis, S., & Sillince, J. (2017). Transcendence through rhetorical practices: Responding to paradox in the science sector. *Organization Studies*, 38(1), 77-101.

Benady, D. (2015). Programmatic: Packed with potential and peril. *Catalyst*, Charted Institute of Marketing, 13-19.

Bennett, S. C. (2011). Regulating Online Behavioral Advertising. John Marshall Law Review, 44, 899–62.

Bleier, A., & Eisenbeiss, N. (2015). The Importance of Trust for Personalized Online Advertising. *Journal of Retailing*, 91(3), 390-409.

Boerman, S. C., Kruikemeier, S., Zuiderveen, F. J., & Borgesius, F. J. (2017). Online Behavioral Advertising: A Literature Review and Research Agenda. *Journal of Advertising*, 46(3), 363-376.

Bondy, K. (2008). The Paradox of Power in CSR: a case study on implementation. *Journal of Business Ethics*, 83, 307-323.

Bousch, D. M., Madrigal, R., & Xie, G. (2015). Disentangling the Effects of Perceived Deception and Anticipated Harm on Consumer Responses to Deceptive Advertising. *Journal of Business Ethics*, 129(2), 281-293.

Braun, M. M., & Uhlaner, L. M. (2012). Family Governance Practices and Teambuilding: paradox of the enterprising family. *Small Business Economics*, 38: 103-119.

Brosche, K., & Kumar, A. (2016). Realtime Data Accelerates Online Marketing. In: Bush O (Eds) Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, Switzerland, Springer, 221-232

Busch, O. (2016). The Programmatic Advertising Principle. In Bush, O (Eds) Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, Switzerland, Springer, 3-16.

Calabretta, G., Gemser, G., & Wijinber, N. M. (2017). The interplay between institution and rationality in strategic decision making; a paradox perspective. *Organization Studies*, 38(3-4), 365-401.

Calton, J. M., & Payne, S. L. (2003). Coping With Paradox. *Business & Society*, 42(1): 7-42.

Cameron, K., & Quinn, R. (1988). Organizational paradox and transformation. In R. Quinn & K. Cameron (Eds.), Paradox and transformation: Toward a theory of change in organization and management, 1-18. Cambridge, MA.

Campaign Live (2018). https://www.campaignlive.co.uk/article/keeping-brands-safe-programmatic-world/1439273 Accessed 28 April 2020.

Carlo, J. L., Gaskin, J., Lyytinnen, K., & Rose, G. M. (2014). Early vs Late Adoption of Radical Information Technology Innovations Across Software Development Organizations: an extension of the disruptive information technology innovation model. *Information Systems Journal,* 24, 537-569.

Chaffey, D., & White, G. R. T. (2011). Business Information Management 2nd Ed. Prentice Hall: UK.

Chartrand, T. L., Dalton, A. N., & Fitzsimons, G. (2007). Nonconscious relationship reactance: when significant others prime opposing goals. *Journal of Experimental Social Psychology*, 43(5), 719-726.

Chen. H., & Zhou, L. (2018). The myth of big data: Chinese advertising practitioners' perspective. *International Journal of Advertising*, 37(4), 633-649.

Choudhury, S. R. (2019). https://www.cnbc.com/2019/02/20/microsoft-idc-study-skills-shortages-stopping-companies-from-using-ai.html Accessed 28 April 2020.

Chung, E., Farrelly, F., Beverland, M. B., & Karpen, I. O. (2018). Loyalty or Liability: resolving the consumer fanaticism paradox. *Marketing Theory*, 18(1), 3-30.

Ciriello, R. F., Richter, A., & Schwabe G. (2019). The Paradoxical Effects of Digital Artefacts on Innovation Practices. *European Journal of Information Systems*, 28(2), 149-172.

Cooksey, E. B. (2004). Too Important to be Left to Chance – serendipity and the digital library. *Science and Technology Libraries*, 25(1-2), 23-32.

De Gemmis, M., Lops, P., Semeraro, G., & Musto, C. (2015). An Investigation on the Serendipity Problem in Recommender Systems. *Information Processing and Management*, 51, 695-717.

De Pelsmacker, P. M. Geuens, M., & Anckaert, P. (2002). Media context and advertising effectiveness: The role of context appreciation and context/ad similarity. *Journal of Advertising*, 31(2), 49–61.

Deng, Y., & Mela, C. F. (2018). TV Viewing and Advertising Targeting. *Journal of Marketing Research,* 50(5), 99-118.

Denison, D. R., Hooiberg, R., & Quinn, R. E. (1995). Paradox and Performance: toward a theory of behavioural complexity in managerial leadership. *Organization Science*, 6(5), 524-540.

Dreze, X., & Hussherr, F. (2013). Internet Advertising: is anybody watching? *Journal of Interactive Marketing*, 17(4), 8-23.

Drumwright, M. E., & Murphy, P. (2009). The Current State of Advertising Ethics: Industry and Academic Perspectives, *Journal of Advertising*, 38(1), 83-108.

Dubetz, N., Turley, S., & Erickson, M. (1997). Dilemmas of Assessment and Evaluation in Preservice Teacher Education. In A.L. Goodwin (Ed), Assessment for Equity Inclusion: embracing all our children (197-210), Routledge, New York.

Eirinaki, M., Gao, J., Varlamis, I., & Tserpes, K. (2018). Recommender Systems for Large-Scale Social Networks: a review of challenges and solutions. *Future Generation Computer Systems,* 78(1), 413-418.

eMarketer (2015). http.//bit/1BMJWIa. Accessed 28 April 2020.

Erdelez, S., & Jahnke, I. (2018). Personalized Systems and Illusion of Serendipity: a sociotechnical lens. ACM, New Brunswick.

Forbes (2017). https://www.forbes.com/sites/dougbandow/2017/08/01/interfering-in-democratic-elections-russia-against-the-u-s-but-u-s-against-the-world/#45f93cd76644 Accessed 28 April 2020.

Friedman, T. L. (2019). https://www.nytimes.com/2019/02/26/opinion/artificial-intelligence.html Accessed 28 April 2020.

Fulgoni, G. M. (2016). Fraud in Digital Advertising: A multibillion Dollar black hole: How marketers can minimise losses caused by bogus web traffic. *Journal of Advertising Research,* 56(2), 122-125.

Fulgoni, G. M., & Lipsman, A. (2017). Measuring television in the programmatic age. *Journal of Advertising Research*, 57(1), 10–4.

Funk, B., & Nabout, N. A. (2016). Cross-Channel Real-Time Response Analysis. In Bush, O (Eds), Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, Springer, 141-152

Gangadharbatla, H., Govinda, S., Ligon, D., & Paramithiotti, A. (2017). Programmatic Everything: Is this the future of advertising? *American Academy of Advertising,* 158-160.

Gartner (2019). https://www.gartner.com/doc/3890363/laying-foundation-artificial-intelligence-machine Accessed 28 April 2020.

Geradin, D., & Katsifis, D. (2019). An EU Competition Law Analysis of Online Display Advertising in the Programmatic Age. *European Competition Journal*, 15(1), 55-96.

Gertz, O., & McGlashan, D. (2016). Consumer-Centric Programmatic Advertising. In Bush, O (Eds), Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, Springer, 55-74.

Grewal, D., Bart, Y., Spann, M., & Zubcsek, P. P. (2016). Mobile Advertising: a framework and research agenda. *Journal of Interactive Marketing*, 34, 3-14.

Guerci, M. & Carollo, L. 2016. A paradox view on green human resource management; insights from the Italian context. *International Journal of Human Resource Management*. 27(2), 212-238.

Guitart, I. A., Hervert, G., & Gelper, S. (2020). Competitive Advertising Strategies for Programmatic Television. *Journal of the Academy of Marketing Science*, 48, 753-775.

Hachen, N., & Bardega, S. (2016). Evolution of Digital Campaign Design and Management. In Bush, O (Eds), Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, Springer, 211-220

Hackley, C., & Hackley, A. R. (2018). Advertising at the Threshold: paratextual promotion in the era of media convergence. *Marketing Theory*, 19(2), 195-215.

Ham, C. D. (2017). Exploring how consumers cope with online behavioral advertising. *International Journal of Advertising*, 36(4), 632-658.

Hargrave, T. J., & Van den Ven, A. H. (2017). Integrating Dialectical and Paradox Perspectives on Managing Contradictions in Organizations. *Organization Studies*, 38(3-4), 319-339.

Hayes, J. L., Golan, G., Britt, B., & Applequist, J. (2020). How advertising relevance and consumer–Brand relationship strength limit disclosure effects of native ads on Twitter. *International Journal of Advertising*, 39(1), 131-165.

Hengstler, M., Enkel, E., & Duelli, S. (2016). Applied artificial intelligence and trust—The case of autonomous vehicles and medical assistance devices. *Technological Forecasting and Social Change*, 105, 105-120.

Huang, S., Liu, P., Mokasdar, A., & Hou, L. (2012). Additive manufacturing and its societal impact: a literature review. *International Journal of Advanced Manufacturing Technologies*, 67(5-8), 1191-1203.

Hutmacher, D. (2014). The 'new' direction of manufacturing: 3D printing. *Australasian Biotechnology*, 24(2), 25.

Innovation in Magazine Media (2016). Advertising: Digital Advertising Fraud, 122-138.

Jain, A., &, Gupta, C. (2018). Fuzzy Logic in Recommender Systems. In: Kacprzyk C (Ed) Studies in Computational Intelligence, Springer.

Jansson, N. (2015). Permanent Tensions in Organization: an obstacle or an opportunity for the change discourse? *Journal of Health Organization and Management*, 29(6), 654-669.

Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business Horizons,* 61(4), 577-586.

Jeon, J., Park, H. H., Lee, J. H. Kim, Y. H., & Han, H. E. (2009). The Effects of Negative Feelings Caused By Forced Exposure to Banner Ads on Advertising Responses. *Advances in Consumer Research*, 36, 872-872..

Kan, M. M., & Parry, K. W. (2004). Identifying Paradox: a grounded theory of leadership in overcoming resistance to change. *The Leadership Quarterly*, 15(4), 467-491.

Kodama, M. (2007). Innovation and Knowledge Creation Through Leadership-Based Strategic Community: case study on high-tech company in Japan. *Technovation*, 27, 115-132.

Kosorin, D. (2016). Introduction to Programmatic Advertising. Kosorin: Czechoslovakia.

Kotarba, J. A., Wooten, K., Freeman, J., & Brasier, A. R. (2013). The Culture of Translational Science Research. *International Review of Qualitative Research*, 6(1), 127-142.

Kotkov, D., Zhao, Q., Konstan, J. A., & Veijalainen, J. (2018). Investigating Serendipity in Recommender Systems Based on Real User Feedback. SAC, France.

Krafft, M., Arden, C. M., & Verhoef, P. C. (2017). Permission Marketing and Privacy Concerns – Why Do Customers (Not) Grant Permissions? *Journal of Interactive Marketing*, 39, 39-54.

Krefetz, N. (2016). http://www.onlinevideo.net/2016/06/programmatic-buying-means-changing-advertising/ Accessed 18 June 2018.

Lambrecht, A., & Tucker, C. (2013). When Does Retargeting Work? Information Specificity in Online Advertising. *Journal of Marketing Research,* 50, 561-576.

Leone, L. (2018). The Ratatouille Paradox: an inductive study of creativity in haute cuisine. *Technovation*, 92-93.

Lewis, M. W. (2000). Exploring paradox: Toward a more comprehensive guide. *Academy of Management Review*, 25(4), 760–776.

Lewis, M. W., Andriopoulos, C., & Smith, W. K. (2014). Paradoxical Leadership to Enable Strategic Ability. *California Management Review*, 56(3), 58-77.

Li, J., Yan, Y., Zhao, X., & Wang, F. Y. (2017). Research on Information Structure of Programmatic Advertising Markets. *International Federation of Automatic Control,* 13587-13592.

Li, T., & Unger, T. (2017). Willing to Pay for Quality Personalization? Trade-off between quality and privacy. *European Journal of Information Systems*, 21(6), 621-642.

Liu-Thompkins, Y. (2019). A Decade of Online Advertising Research: What We Learned and What We Need to Know. *Journal of Advertising*, 48(1), 1-13.

Lloyd, S., & Woodside, A. G. (2015). Advancing paradox resolution theory for interpreting non-profit, commercial entrepreneurial strategies. *Journal of Strategic Management*, 23(1), 3-18.

Luo, G. X., Liu, Y., Zeng, Q. A., Diao, S. M., & Xiong, F. (2014). A dynamic evolution model of human opinion as affected by advertising. *Physica A: Statistical Mechanics and its Applications*, 414, 254-262

Luscher, L. S., & Lewis, M. W. (2008). Organizational Change and Managerial Sensemaking: working through paradox. *Academy of Management Journal*, 51(2), 221-240.

Macdonald, E., Salas, R., Espalin, D., Perez, M., Aguilera, E., Muse, D., & Wicker, R. (2014). 3D Printing for the Rapid Prototyping of Structural Electronics. *IEEE Access*, 2, 234-242.

Makri, S., Blandford, A., Woods, M., Sharples, S., & Maxwell, D. (2014). Making My Own Luck: serendipity strategies and how to support them in digital information environment. *Journal of the Association for Information Science and Technology,* 65(11), 2179-2194.

Malthouse, E. C. & Li. H. (2017). Opportunities for and Pitfalls of Using Big Data in Advertising Research. *Journal of Advertising*, 46(2), 227-235

Malthouse, E. C., Maslowska, E., & Franks, J. U. (2018). Understanding programmatic TV advertising. *International Journal of Advertising*, 37(5), 769-784.

Malthouse, E. C., Hessary, Y. K., Vakeel, K. A., Burke, R., & Fuduric, M. (2019). An Algorithm for Allocating Sponsored Recommendations and Content: unifying Programmatic Advertising and recommender systems. *Journal of Advertising*, 48, 366-379.

Matthews, J. H., & Shulman, A. D. (2005). Competitive advantage in public sector organizations: Explaining the public good/sustainable competitive advantage paradox. *Journal of Business Research*, 58(2), 232-240.

McCay-Peet, L., & Toms, E. G. (2015). Investigating Serendipity: how it unfolds and what may influence it. *Journal of the Association for Information Science and Technology,* 66(7), 1463-1476.

Mills, A. J., Pitt, C., & Ferguson, S. L. (2019). The Relationship Between Fake News and Advertising: brand management in the era of Programmatic Advertising and prolific falsehood. *Journal of Advertising Research*, 3-8.

Mishra, S. (2013). Helping additive manufacturing. *Metal Powder Report,* 68(4), 38-39.

Molina, A. H. (1999). Understanding the Role of the Technical in the Build-Up of Sociotechnical Constituencies. *Technovation*, 19, 1-29.

Mzoughi, N., Ahmed, R. B., & Ayed, H. (2010). Explaining the Participation in a Small Group Brand Community: an extended TRA. *Journal of Business & Economics Research*, 8(8), 17-25.

Nelson, P. (1970). Information and consumer behavior. Journal of Political Economy, 78(2), 311–329.

Nelson, P. (1974). Advertising as information. Journal of Political Economy, 82(4), 729–754.

Ngwenyama, O., Klein, S., Hassan, N. R., Mingers, J., & Stahl, B. (2018). Phronesis, Argumentation and Puzzle Solving in IS Research: illustrating an approach to phronetic IS research practice. *European Journal of Information Systems*, 27(3), 347-366.

Oliver, R. L. (1999). Fundamental Issues and Direction for Marketing. *Journal of Marketing,* 63, 33-44.

Ozanne, L. K., Phipps, M., Weaver, T., Carrington, M., Luchs, M., Catlin, J., Gupta, S., Santos, N., Scott, K., & Williams, J. (2016). Managing the tensions at the intersection of the triple bottom line: A paradox theory approach to sustainability management. *Journal of Public Policy & Marketing*, 35(2), 249-261.

Papachroni, A., Heraclecus, L., & Parouti, S. (2015). Organizational ambidexterity through the lens of paradox theory: Building a novel research agenda. *The Journal of Applied Behavioural Science,* 51(1), 71-93.

Perrin A. (2020). Data Governance in the Age of Programmatic Advertising. *EContent*, 35.

Plester, B., & Cooper-Thomas, H. (2015). The Fun Paradox. *Employee Relations*, 37(3), 380-398.

Poole, M. S., & Van De Ven, A. H. (1989). Using Paradox to Build Management and Organization Theories. *Academy of Management Review*, 14, 562-578.

Porter, M. E. (2001). Strategy and the Internet. *Harvard Business Review,* March, 1–20.

Ratto, M, & Ree, R. (2012). Materializing information: 3D printing and social change. *First Monday*, 17(7).

Rees, B. (2019). https://singularityhub.com/2019/02/13/ai-wont-create-a-skills-gap-heres-what-will-happen-instead/#sm.0001pxn1c0d08de2qwq26fv5gvt1w Accessed 28 April 2020.

Reyes, I., Dholakia, N., & Bonoff, J. K. (2018). Disconnected/Connected: on the 'look' and the 'gaze' of cell phones. *Marketing Theory*, 15(1), 113-127.

RTB Trend Report (2015). https://www.iabuk.com/sites/default/files/public_files/Adform_RTB_Trend_Report_Europe_Q1_2015.pdf Accessed 28 April 2020.

Russell, B. (1945). A History of Western Philosophy. New York: Simon and Schuster.

Sabanovic, S., Milojevic, S., & Kaur, J. (2012). John McCarthy [History]. *Robotics & Automation Magazine, IEEE,* 19(4), 99-106.

Schafer, A., & Weiss, O. (2016). Understanding Demand-Side-Platforms. In Bush, O (Eds), Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, 75-86. Switzerland, Springer.

Schmidt, G. M., & Druehl, C. T. (2008). When Is a Disruptive Innovation Disruptive? *Product Innovation Management*, 25, 347-369.

Seitz, J., & Zorn, S. (2016). Perspectives of programmatic Advertising. In Bush, O (Eds), Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, 37-54. Switzerland, Springer.

Schwarz, G., & Stensaker, I. (2014). Time to Take Off the Theoretical Straightjacket and (Re-) Introduce Phenomenon-Driven Research. *The Journal of Applied Behavioral Science*, 50(4), 478-501.

Shiller, B., Waldfogel, J., & Ryan, J. (2018). The Effect of Ad Blocking on Website Traffic and Quality. *The RAND Journal of Economics*, 49(1), 43-63.

Skinner, H., Sarpong, D., & White, G. R. T. (2017). Meeting the Needs of the Millennials and Generation Z: Gamification in Tourism through Geocaching. *Journal of Tourism Futures*, 4(1), 93-104.

Smith, W. K., & Lewis, M. W. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of Management Review*, 36(2), 381-403.

Smith, W. K., Gonin, M., & Besharov, M. L. (2013). Managing social-business tensions: A review and research agenda for social enterprise. *Business Ethics Quarterly*, 23(3), 407-442.

Smith, W. K., & Tracey, P. (2016). Institutional complexity and paradox theory: Complementarities of competing demands. *Strategic Organizations*, 14(4), 455-466.

Sprott, D. E. (2008). The policy, consumer, and ethical dimensions of covert marketing: an introduction to the special section. *Journal of Public Policy & Marketing*, 27(1), 4-6.

Sriram, S., Manchanda, P., Bravo, M. E., Chu, J., Ma, L., Song, M., Shriver, S., & Subramanian, U. (2015). Platforms: a multiplicity of research opportunities. *Marketing Letters*, 26(2), 141-152.

Stahl, B. C., Timmermans, J., & Flick, C. (2017). Ethics of Emerging Information and Communication Technologies. *Science and Public Policy,* 44(3), 369-381.

Stevens, A., Rau, A., & McIntyre, M. (2016). Integrated Campaign Planning in a Programmatic World. In Bush, O (Eds), Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, 193-210. Switzerland, Springer.

The Guardian (2017). https://www.theguardian.com/media/2017/mar/16/guardian-pulls-ads-google-placed-extremist-material Accessed 8 April 2020.

The Guardian (2018). https://www.theguardian.com/commentisfree/2018/mar/21/cambridge-analytica-facebook-data-users-profit Accessed 28 April 2020.

The Telegraph (2017). https://www.telegraph.co.uk/business/2017/03/20/marks-spencer-pulls-adverts-google-extremist-video-fears/ Accessed 28 April 2020.

Thierer, A. (2013). Permissionless Innovation. Mercatus Center at George Mason University: USA.

Thomas, D., & Gilbert, S. (2014). https://www.nist.gov/publications/costs-and-cost-effectiveness-additive-manufacturing Accessed 28 April 2020.

Thorpe, R., Holt, R., Pittaway, L., & Macpherson, A. (2005). Knowledge within small and medium sized firms: A systematic review of the evidence. *International Journal of Management Reviews,* 7(4), 257-281.

Tongur, S., & Engwall, M. (2014). The Business Model Dilemma of Technology Shifts. *Technovation*, 34, 525-535.

Tranfield, D. R., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management,* 14, 207-222.

Treise, D., Weigold, M. F., Conna, J., & Garrison, H. (1994). Ethics in Advertising: Ideological Correlates of Consumer Perceptions. *Journal of Advertising*, 23(3), 59-69.

Turner, J., Shah, R., & Jain, V. (2018). How Brands are Using Nonlinear Marketing to Address Consumer Resistance to Traditional Marketing Strategies. *Journal of Brand Strategy*, 6(4), 397-408.

Van Doorn, J., & Hoekstra, J. C. (2013). Customization of Online Advertising: the role of intrusiveness. *Marketing Letters*, 24(4), 339-351.

Voorveld, H. A. M., van Noort, G., Muntinga, D. G., & Bronner, F. (2018). Engagement with Social Media and Social Media Advertising: The Differentiating Role of Platform Type. *Journal of Advertising*, 47(1), 38-54.

Waesche, N. W., Rotberg, T., & Renz, F. (2016). The Contribution of Measurement in a Cross-Device, Data-Driven, Real-Time Marketing World. In Bush, O (Eds), Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, pp.153-164. Switzerland, Springer.

Wan, F., Ansons, T. L., Chattopadhyay, A., & Leboe, J. P. (2013). Defensive Reactions to Slim Female Images in Advertising: the moderating role of mode of exposure. *Organizational Behavior and Human Decision Processes,* 120(1), 37-46.

Wang, L., & Ding, Y. (2017). An exemption for strong brands: the influence of Brand community rejection on Brand evaluation. *European Journal of Marketing*, 51(5/6), 1029-1048.

Wang, J., Zhang, W., & Yuan, S. (2016). Display advertising with real-time bidding (RTB) and behavioural targeting. *Foundations and Trends in Information Retrieval*, 11(4–5), 297–435.

Wellington, A. (2010). To Ban Or Not To Ban: direct-to-consumer advertising and human rights analysis. *Australasian Medical Journal*, 3(12), 749-766.

Weisbrich, S., & Owens, C. (2016). The Creative Challenge. In Bush, O (Eds), Programmatic Advertising The Successful Transformation to Automated, Data-Driven Marketing in Real-Time, 123-131. Switzerland, Springer.

White, G. R. T. (2018). Future Applications of Blockchain in Business and Management: a Delphi study. *Strategic Change: briefings in entrepreneurial finance*, 26(5), 439-451.

White, G. R. T., & Samuel, A. (2019). Programmatic Advertising: forewarning and avoiding hype-cycle failure. *Technological Forecasting & Social Change*, 144, 157-168.

Whitmer, C. (2018). https://www.ama.org/publications/eNewsletters/B2BMarketing/Pages/5-Programmatic-Mistakes-You're-Probably-Making.aspx Accessed 28 April 2020.

Xie, K. L., Chen, C., & Wu, S. (2015). Online Consumer Review Factors Affecting Offline Hotel Popularity: evidence from Tripadvisor. *Journal of Travel & Tourism Marketing,* 33(2), 211-223.

Yang, S., & Li, J. (2015). Research of CRM System Structure Based on Cloud Computing. The 5th International Conference on IS Management and Evaluation, ICIME, 2015, Shaanxi, China.

Yang, Y., Yang, Y. C., Jansen, B. J., & Lalmas, M. (2017). Computational advertising: A paradigm shift for advertising and marketing? *IEEE Intelligent Systems*, 32(3), 3–6.

Zhang, S, Wakefield, R., Huang, J., & Li, X. (2020). Exploring Determinants of Consumers' Attitudes Toward Real-Time Bidding (RTB) Advertising. *Information Technology & People*, in-press.

Zinkhan, M. Z. (2005). The Marketplace, Emerging Technology and Marketing Theory. *Marketing Theory*, 5(1), 105-115.

Zuboff, S. (2019). The Age of Surveillance Capitalism, Profile Books: London, UK.