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## **Reverse Exchange: Classifications for Public Service SCM**

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### **Abstract**

*Purpose:* To identify reverse flows and exchanges that support public service provision. Reverse flow literature has focused on manufacturing based supply chains utilising the lens of exchange (Recovery, Reuse, Repair, Recycle) to gain performance improvement in product flows. Limited research is available to support an understanding of customer derived reverse exchange (RE) service processes. We contribute to the service literature through the development of RE antecedents; derive new and revised definitions and the supporting constructs of RE service processes.

*Design/Methodology/Approach:* This paper synthesises literature creating a framework of antecedents for RE. Antecedents reflect differences of service flow (level of service inseparability and 'acting upon'). These antecedents are empirically tested within an illustrative pre-existing UK healthcare case study against the synthesised antecedents and existing RE definitions. Two teams of researchers reviewed the data generated from public service supply chain processes. Definitions of RE were either revised or derived from the empirical data by each team.

*Findings:* The service concept of 'acting upon' for inseparable public service supply chain flows provides a basis for examining the existence of reverse flows and exchanges. Revised and new classifications to the RE model are proposed to stimulate contextual performance improvement and innovation in public service provision. Psychological utility is an additional feature to economic, environmental and social utility in public service RE. RE offers practitioners and academics a strategic operational competence to achieve improvement and innovation in public services and further advance this concept.

*Originality/Value:* Extending the literature beyond the manufacturing derived RE concept to develop an understanding of the customer's role in preserving and co-creating value in RE and flows in public service. New RE antecedents for public services, including the potential of psychological utility, are presented.

**Keywords:** Reverse Flow; Reverse Exchange; Public Service; Healthcare; 'Acting upon', Service Value.

**Article Classification:** Research paper.

## Reverse Exchange: Classifications for Public Service SCM

### Introduction

The role of the consumer in co-creating value is one of the principal differences between service and manufacturing based supply chains (Maull et al, 2012). The significance of the consumer in the exchange challenges the application of production-based supply chain models to improve performance particularly for professional services (Schmenner, 2012; Ellram et al, 2004; Giannakis, 2011). Similarly the transfer of best practice manufacturing concepts into healthcare services has found to be troublesome as well as wasteful (Towill, 2006). The difficulty of conceptualising service exchanges through production-based lenses has left healthcare supply chain management (SCM) practices some ten years behind manufacturing (Chen et al, 2013). These disappointing forward flow experiences are replicated in reverse exchanges (REs) for public services as the participation and requirement of the consumer is poorly understood in prior literature (Xie and Breen, 2012; Bernon et al, 2011).

We develop the RE literature by addressing three distinct gaps. Firstly we build an understanding of reverse flows and exchanges which could aid public services that are under intense coercive pressure to increase the quality and range of services offered while reducing expenditure (Bakhoo and Choi, 2013; Radnor and Osbourne, 2013). We are not aware of any literature that provides guidance to public service managers to deploy and manage REs. RE management is a strategic operational competence that is untested in public services (Jayaraman and Luo, 2007). Institutional theory offers investigators the potential to develop RE research as an extension to SCM research and concepts (Ketchen and Hult, 2007). Through this theoretical lens this paper develops a framework that can support practitioners in managing REs which capture and create value for the consumer and provider. The theory has been used to study SCM developments across economic, environmental and social dimensions (Nair and Prajogo, 2009; Moxham and Kauppi, 2014). Supporting an analysis of the isomorphic pressures bearing on organisations, the theory provides insights into the approaches being adopted to improve exchanges (Prajogo, 2011).

Secondly we empirically examine the ideas of exchange and flow before clarifying how and why the perspective of 'reverse' provides a platform for evaluating, exploiting and improving existing service supply chains. From our literature review (see section 1 and 2) we define RE as: -

*“the preservation of previous met service expectations and inherent value in conjunction with ‘acting upon’ (Lovelock, 1996;) to deliver utility through the interaction of the public service provider and its’ customer.”*

Consequently reverse flow is defined as: -

*“the singular (or combined) action(s) of “acting upon” consumer, physical product or information required to enact a RE within a closed-loop supply chain.”*

This research utilises these definitions to investigate what RE approaches are currently being used by the healthcare sector and how and why REs arise. Through an institutional theory lens and a review of the literature on RE and flow in supply chains, we present in figure 1 (see literature section) a conceptualisation of the antecedents that support RE.

Thirdly our investigation informs the development of additional constructs for managing RE. We advance the research by providing a new definition, classification and constructs of RE and flow in public services context. The new classification may aid clinicians and managers in the healthcare environment to improve service provision and quality of care by having a

better understanding of RE and flow. Our research surfaces the need to utilise other factors in forming an understanding of service REs.

The remainder of the paper is structured as follows; a literature review synthesised from three streams - exchange and flow, service supply chains and institutional theory to derive a RE theoretical framework. This is followed by the methodology which utilises a pre-existing illustrative case study purposefully selected to represent 'professional services' and healthcare in particular within the UK. The case study results are then discussed in the context of the literature. The final section of the paper presents the emergent conclusions, managerial implications and limitations of the study.

## **Literature Review**

As we note above RE in a public service environment has not been well served in the academic literature. As a result we draw upon three themes in the literature to establish a RE theoretical framework.

### *1. Exchange as an antecedent to RE*

The intangible nature of exchange between the service user and service provider has potentially hidden reverse flows in service SCM (and any integrated recovery of service). It is necessary to understand the characteristics of forward exchanges in service SCM (Sampson, 2012) to build a framework of RE antecedents. Forward exchanges occur when co-produced services sufficiently satisfy customer value to warrant an exchange (often financial) e.g. a qualification resulting in the award of a certificate, the utility of which is a career path opportunity. RE also requires these attributes but additionally seeks the retention of inherent positive utility/value previously co-produced with the customer/consumer in the forward exchange.

Exchange and expected customer services utility (Webber, 1978) is closely connected with the unique service feature of 'acting upon' (people's minds; bodies; belongings; information) (Lovelock, 1996). 'Acting upon' is the flow of tasks leading to the co-creation of value, made inseparable through the interaction of the public service provider and its customer. 'Acting upon' people's belongings and bodies are considered tangible actions whereas 'acting upon' people's information/assets and minds are intangible actions (Lovelock and Wirtz, 2002). Highly customised professional service arenas such as hospitals exhibit inseparable interaction with patients as operational activity to satisfy expected service utility. Without exchange it is proposed that utility is not achieved (Bititci et al., 2012; Ng and Nudurupati, 2010). We consider utility to be interchangeable with the notion of value in the SCM context. Drucker (2011) states, "*what the customer buys and considers value is never just a product. It is always a utility, that is, what a product or service does for him*" (p 57).

Social exchange theory, although criticised for presuming linear and rational actions in exchange, postulates the possibility of having value without financial exchange (e.g. self-satisfaction). Exchange encompasses social aspects (e.g. feel good factor from helping others) and environmental aspects (e.g. using less resource to achieve the same or better outcome) (Elstad et al., 2011; Lavelle et al., 2007) – see Figure 1).

### *2. Service Reverse Flow as an antecedent to RE*

The term flow is increasingly used in professional services such as healthcare to engender more than just an image of movement (Institute of Healthcare Improvement, 2003). The acquisition of other meanings to the word flow was a feature popular in academic literature in the 1980s and 1990s (Rockerfella, 2011). Achieving a state of forward flow for patients becomes a potential framework for process improvement (Radnor et al., 2012). Through understanding forward patient flow as the mechanism for improving performance, managers

can drive positive outcomes (Devaraj et al., 2013) and it is proposed the same is true for reverse flow.

Flow in this professional services context is in addition to the clinical needs of patients and represents the process of service delivery as a set of activities with the corresponding customer expectations. Traditional flows of materials and information, which are typically exchanged in product SCM, may be necessary to enable 'acted on' flow. Utilising the notion that product/manufacturing and pure service are two end points of a continuum of product/service combinations (Ellram et al, 2004; Davis and Heineke, 2003) we propose service flow design may draw on acted upon, product and information in any combination.

Reverse SCM is depicted as products battling against the upstream flow of objects implying product return/reuse is considered small in volume and/or low in complexity. Reverse supply itself may be perceived as starting with poor quality or poor value (returns/repair/reuse) or end of product life by customers (resale/reuse/refurbishment/ remanufacture). Due to their design, existing SCM structures, often cannot deal with reverse flows (Jayaraman et al. 2003). An alternative is offered through separated reverse direction SCM processes implying returns are higher in volume and/or complexity. Effective reverse flow designs can provide service-related benefits to customers and suppliers (Rogers and Tibben-Lembke, 1999). The common objective of reverse processes is to limit any potential for diminishing customer inherent tangible or intangible value previously exchanged through 'acting upon' co-creation. Therefore, as with forward SCM, there is a need to understand value as a means of determining variety and demand patterns (Radnor et al., 2012; Esain and Rich, 2005). Volume and variety therefore become a service design choice when managing RE.

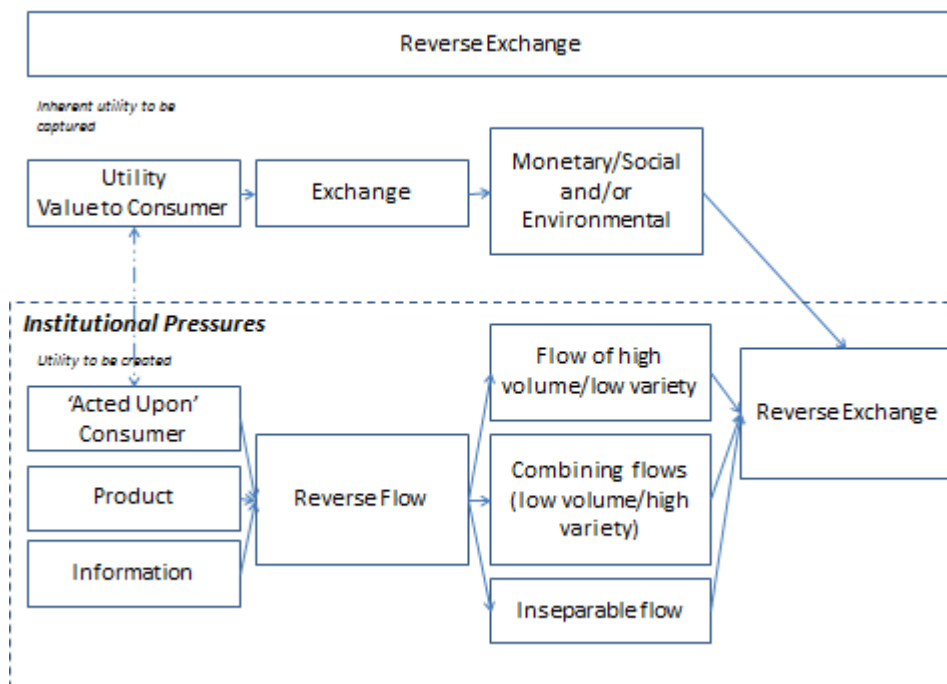


Figure 1: Proposed Antecedents of Simple RE

To further explain this under-researched area of reverse flows and exchanges in public services we draw on institutional theory.

### 3. Reverse flow in response to Institutional Pressures

The theoretical lens of institutional theory enables researchers to identify the factors that promote the survival and legitimacy of organisational practices. Such factors include culture,

social, environment, regulation, tradition, resources and economic incentives (Hirsch, 1975, Lai et al., 2006). Specifically, institutional theory has been employed to explain how changes in social values, technological advancements and regulations affect organizational decisions.

DiMaggio and Powell (1983), via institutional theory, explained the striking homogeneity of organisational forms and practices, particularly those associated with established organisations. Homogenisation is best explained by the concept of isomorphism. Hawley (1968) describes isomorphism as a process forcing an organisation to resemble others facing the same environmental conditions. The concept of institutional isomorphism is shown to be a useful tool for understanding SCM (Moxham and Kauppli, 2014; Bakhoo and Choi, 2013) and typically presents in three forms of institutional isomorphism pressures: coercive, mimetic and normative (DiMaggio and Powell, 1983).

Coercive isomorphism occurs when formal and informal pressures are exerted by those in powerful positions for example where an organisation has dependencies on others or where cultural expectations exist in the society within which organisations function. Such (political) pressures may be experienced as force, persuasion, or invitations to join in collusion. This paper views the coercive pressures of governments to reduce costs/increase services in the healthcare sector as a potential lever to implement closed-loop reverse flows and improve the efficacy of RE between actors in the system. However, it is noted that such pressures can be destructive, creating dysfunctional exchanges if not supported by appropriate resources (Bakhoo and Choi, 2013).

Mimetic isomorphic drivers occur when organisations imitate the actions of successful competitors or other stakeholders in an attempt to replicate the path to success and hence legitimacy (;Sarkis et al., 2011). Uncertainty is a powerful force encouraging imitation. When organisation technologies are poorly understood (March and Olsen, 1976), goals are ambiguous, or the environment creates symbolic uncertainty, organisations may model themselves on other, more successful, organisations. Copying the activities and processes of other service organisations is proposed to reduce uncertainty quickly and with less cost. Borrowing improvement frameworks to establish and govern RE and flows has been shown to be an option for product systems through acquisition of knowledge and operating standards from the market place (Xie and Breen, 2012; DiMaggio and Powell, 1983).

The final source of isomorphic change is termed as normative, referring to the legitimisation and professionalization of management. Normative drivers can exert influence due to the social obligation to comply (March and Olsen, 1976). Normative pressures can force organisations to implement reverse flows in order to be perceived as being more legitimate (Huang and Yang, 2013) and socially responsible. Improving reverse flows and exchanges provides public service managers with the opportunity to enhance the standing of their organisation within their peer/ stakeholder groups and wider society (Ellram et al., 2004).

Of course there can be negative consequences to such normative pressures and coercive and mimetic behaviour, which may well fuel the fads and fashions discussion often associated with managerialism. Institutional theory purports that organisations sharing the same environment will tend to employ similar practices (DiMaggio and Powell, 1983). Others suggest this might lead to a social bandwagon where the interest is in who has adopted the innovation rather than innovation itself (Abrahamson and Rosenkopf, 1997).

Despite these criticisms institutional theory provides a useful lens to understand the external pressures that organisations need to consider in relation to managing reverse flows. SCM research across the different tiers of healthcare has exposed the opportunity to unlock the 'iron cage' of institutionalism often associated with this type of public service (Bakhoo and Choi, 2013). For public service organisations, managing and structuring reverse flows are



more challenging and problematic due the diverse nature of exchanges and the principle role of the customer as co-creator of the service value to be delivered. In addition there is currently no dominant model in health for reverse flows for organisations to emulate hence the conceptual nature of this study.

### **Research Framework and Methodology**

It is evident from the above discussion that the RE antecedents (see figure 1) and the three isomorphic pressures exerted on organisations and their leaders create a challenging environment for managing and structuring REs in public services. Coercive governmental pressures to improve service utility for each and every “acted upon” contact with the public whilst driving down costs through improvement pressurise management of process flows. Cost avoidance strategies are critical to governments where public services represent more than a third of GDP in the UK and closer to fifty percent in the USA (Radnor et al, 2015).

Mimicking good practices from other organisations in structuring product returns and information flows supporting reverse flows could provide an alternative but in the absence of a best practice model (Towill, 2006) this is problematic. The combined complications of ‘acting upon’, inseparable interaction, heterogeneous consumer utility and not-for-profit context make the replication of other models from outside public services troublesome. High levels of uncertainty and process complexity make the manager’s role difficult and challenging (Baltacioglu et al., 2007).

Envisaging reverse flow as “intricate multi-layered steps” (Norek, 2002) or exchanges linking to tangible and intangible benefits delivered through ‘acting upon’ (people’s minds; bodies, belongings, information) highlights the complexity involved in creating new and securing previously provided inherent service value. In the context of this research, “REs” have to deliver both physical attributes and expected service utility through matched values between provider and consumer.

Thus, this early public services research (Meredith 1993) with scant theoretical development (Eisenhardt, 1989) requires a case study design for depth of understanding. Existing conceptual and theoretical developments have been demonstrated to be limited for the combined understanding of public service SCM and for RE and flow. Our case study design seeks to form conceptual definitions without which theory building risks unclear measurement, definitional overlap and loss of causality (Wacker, 2004). The literature review provides limited sources against which preliminary conceptual definitions have been assembled for empirical testing. Necessitating the existing theoretical grounding for RE and flow drawn predominantly from product SCM, focusing on market, environmental and informational value (Koppius et al., 2014).

The underlying proposition being that SCM can exploit reverse flows to improve organisational productivity and stakeholder satisfaction. This perspective primarily focuses on the transactional nature of exchange. Incorporating the relational aspects to reverse flows and exchanges, to align with the values of consumers, is poorly developed in the literature. In this scenario, the process of reverse flow and phenomenon of REs are not sufficiently developed to meet stakeholder needs (Alvarez et al., 2007). Empirical evaluation within a public services case study frame offers insights and evidence of RE.

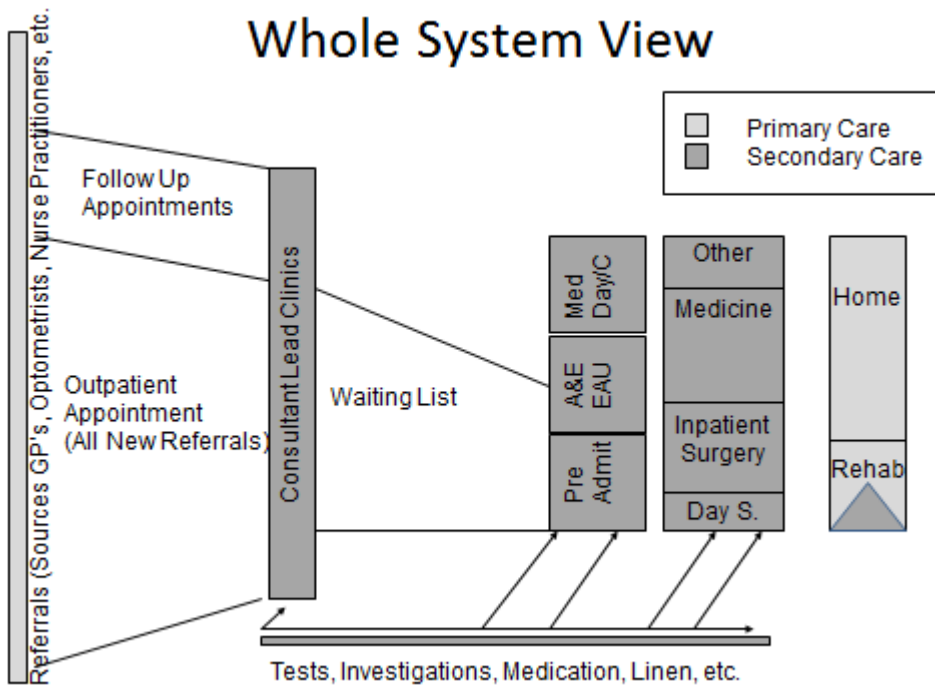


Figure 2: Idealised Healthcare Supply Chain Forward Flow (left to right direction) (Esain, 2011 as amended)

In the absence of a best practice model of RE for public services the research framework draws on an idealised forward flow representing UK public healthcare system (Esain, 2011) context (see figure 2). We further develop this idealised view of forward flow recognising co-creation and the 'acted upon' attributes of the UK healthcare system from primary care through to secondary care and then returning to primary care (see figure 2). This idealised form of forward flow is intended to calibrate and codify forward process flows and in turn surface those process flows that do not fit the forward flow idealised form.

The case organisation selection was by predetermined variables relevant to the objectives of the research (Miles and Huberman, 1994). The case study selected delivers secondary care and is one of the largest Integrated Healthcare Trusts (IHT) in the UK. The IHT delivers services within both urban and rural settings which are representative of the region in terms of activity and length of stay. The IHT has however lower than average consultant numbers. The integrated nature of the IHT means that multiple sites are managed by one management system, with a large budget (millions) and employee numbers in the thousands. Services are supplied across multiple nodes (upstream/downstream organisations) to deliver healthcare.

The unit of analysis for this study is the existing service supply chain processes in an integrated healthcare system, i.e. a set of steps within and across organisations that deliver a service type (e.g. general medicine/general surgery). Within these processes 'episodes of care' are performed, representing the interface of the patient with the process as "... a time-sequence of health" events (Lillrank et al., 2011 p.195) to which the patient is subject and is thus classified as inseparable.

Three pre-existing SCM processes were selected within the case study, enabling case comparison for validity of results. The position of the SCM process with regard to patient flow is considered a relevant selection criteria given the antecedents are hypothesised from literature to relate to the 'acted upon'. The degree of closeness to patient flow is signified as:

- 1<sup>st</sup> degree of closeness relates to mainly inseparable activity;



- 2<sup>nd</sup> degree of closeness is activity which can be undertaken as either separate (e.g. fulfilling prescriptions) or inseparably (e.g. conducting a test/investigation such as barium enema but not on the critical path for delivery of the service);

Service Supply Chain Process	Degree of closeness to patient flow (level of inseparability)	Crossed functional/departmental boundaries with Integrated Healthcare Trust	Cross external organisational boundaries	No. of people in Multidisciplinary team	Staff Involved
1 General Surgery (for A&E see 2)	1 <sup>st</sup>	Yes	Yes	25	Pre Assessment Nurse, Ward nurses, theatre nurses, porters, a union representative, IT, pharmacy, occupational therapy, physiotherapy, anaesthetists, chief of staff for surgery, Managers.
2 General Medicine (A&E and District Nursing)	1 <sup>st</sup>	Yes	Yes	27	S R, Nursing, Managers, Porters, Ward Clerks, IT, Maintenance, Bed Mangers, Community labs, Medical Records.
3 Radiology – Barium Enema	2 <sup>nd</sup>	Yes	No	22	Patients, Referring Consultants, Consultant Radiologists, Radiographers, Clerical Staff, Nurses, HRM, Managers.

Table 1: Attributes of Service Supply Chain Processes

The typology (Table 1) focuses on REs to test against flow within a healthcare context, thus a single case study was deemed appropriate (Jankowicz, 2005). Triangulation of data was sought through the collection of data produced from cross functional groups, the Patient Administration System (PAS) and other secondary data e.g. management performance reports, complaint/compliment data.

The case study management team purposefully selected a representative sample of people involved in the day-to-day activity of each of the service SCM process (Table 1). These groups were asked for their perception of what represented value (utility) from the 'customer's perspective' for the service SCM process under evaluation (output in Table 3). This entailed predetermining the main recipient/co-producer of the service and thus who were the 'customer (s)' of the selected service SCM process.

These same groups created the detail flow of the SCM process based on their perception and their involvement in the process. Each SCM process was then mapped through structured observation (Hines and Rich, 1997). For validity, those working in a specific part of the process were matched with those who were unfamiliar with that part of the process. Where formal quantity data existed, these were compared with activity to obtain a measure of volume. Episode of Care data were obtained from PAS and also used to understand the

volume of activity. All data collected were finally presented by the cross disciplinary/functional group to the managing team, professional leaders and those working with the service SCM process for validation purposes.

The research team, reflecting on the existing classification of reverse flows for products such as returns/reuse/repair/recycle (van Wassenhove and Zikopoulos, 2011), developed an instrument against which the data generated from the cross functional groups were assessed.

Typology for Reverse Flow in Product Supply Chain	Product Supply Chain Definition of Reverse Flow/Exchange Activities	Public Sector Supply Chain Protocol to define Reverse Flow ('acting upon' 'minds, bodies, information, belongs')	
		Including	Excluding
Recover/Return	Recompense/remedy because the product fails to meet needs and/or fails to perform (could be resold).	Readmission - remedy because service ('episode of care') fails to meet needs/perform	Complaint process – seen as separate (but could result in complaint process actioned)
Reuse	Using a product again for the purpose it was originally designed		
Reuse/Repair - Segmented to recognise the degree of deconstruction and reconstruction (product)	<u>Recondition</u> - Cleaned and repaired to a 'like new' state.		Simple Treatment Type both physical and psychological (short in time scale) - determined as forward flow in healthcare
	<u>Refurbishment</u> - As above but more work required to repair.		Treatment both physical and psychological (requiring an inpatient stay) - determined as forward flow in healthcare
	<u>Remanufacture</u> - As above but more extensive to the point of complete disassembly		Complex Treatment Type both physical and psychological (requiring a long inpatient stay) - determined as forward flow in healthcare
Recycle	Reduced to basic parts for alternative uses		

Table 2: Initial typology to evaluate case study flow data

Each service SCM process was grouped by the research team to reflect what aspect of 'acting upon' was appropriate and then compared for validity. Similarly, an assessment of the SCM flows was undertaken by two of the researchers independently. The results of this exercise were reviewed by the whole team to ensure rigor and reliability of the findings.

## Findings

The findings detailed below are in the order of service SCM processes (as shown in Table 1). A preamble of each service SCM process is provided. A summary of value/utility from the patients' perspective as determined by each cross functional group is shown in Table 4.

Reverse flows were identified as any aspect of the service supply chain not complying with idealised flows across the UK health system, see Figure 2. Where appropriate the reverse

flow was evaluated in terms of volume or variety (shown in brackets). These reverse flows are shown in groups to reflect what aspect of 'acting upon' was deemed appropriate. Each reverse flow identified has the emerging RE classification listed against it in capitals, similar to that presented for reverse flow in product supply chain (see Table 2). Operational definitions of new and revised classifications of RE which emerged are shown in table5. The institutional pressures impacting or influencing the flows are also identified.

*FLOW 1 General Surgery (A&E to discharge)*

The surgical flow mapped at the IHT was for patients with hernias.

*Institutional pressures:* Hernia operation waiting-times are published online and national comparisons can be made, exerting coercive pressures on management and mimetic pressures on hospital staff to adopt a perceived better and improved process.

The service SCM *processes* included Episode of Care for both planned and unplanned procedures.

The proposed *REs* identified by the research team are shown in capitals:

1. ITEM 1: Those reverse flows 'acting upon' *Information* and (because a negative experience) *minds*.
  - a. No bed/Out of Time for surgery – patient sent home on day of surgery without operation (volume of patients involved in reverse flow 6.86%/annum – low variety).  
Classification- REVISIT
  - b. Inappropriate admissions for planned surgery (e.g. patient unfit) – patient sent home on day of surgery without operation.  
(volume of patients involved in reverse flow 5.65%/annum – low variety).  
Classification - RECONDITION
  - c. Beds on the High Dependency Unit/ITU are always needed on a Wednesday PM for up to 7 days. These are complex cases with 1 operation per week being cancelled – always longer staying patients.  
(volume and variety difficult to evaluate due to multiple use).  
Classification - REVISIT
2. ITEM 2: Those 'acting upon' *information*
  - a. Operating trays not being correct or available (often because these are unnecessarily specific to each patient – as determined by consultant preference) results in 8% of operating time being lost.  
Classified – RETURNS
3. ITEM3: Those 'acting upon' *information and belongings*
  - a. To Take Out prescriptions not being available on time causes problems with discharge (while this was witnessed and confirmed it was noted that the discharge process was more complex than providing prescriptions and the lack of urgency may be related to the institutionalised notion that administration to complete scripts by doctors is not as urgent as seeing other patients). Some patients returned home without their prescribed medication which was then delivered to them, in some cases through the use of taxis/specialist transport.  
Classified - REVISIT

*FLOW 2: General Medicine (A&E to discharge)*

IHT A&E patient flow was determined from those registering at A&E. For the rural hospital 54% of admissions were classified as Minor episodes. Twenty were classified as Major

episodes not resulting in admission to hospital (includes not waiting to be seen) and the remaining 26% were medical (17%) and surgical (9%) admissions to a hospital bed.

IHT Medical flows were assessed from the point at which the patient was admitted to hospital. The sample was a cohort of patients, identified as medical patients as part of the medical coding process. This sample enabled the use of anonymised medical data to be assessed. Hospital A was in a rural location with 30% of patients admitted via GPs and 62% admitted via A&E, the remaining 8% consisted of booked elective treatments and the transfer of patients from other hospitals. Hospital B was an urban hospital with 43% of patients being admitted via GP, 50% via A&E and the remainder represented planned treatment and transfer of patients.

The IHT district nursing team was situated in a rural GP surgery. There was a problem with space for treatment at the practice.

*Institutional pressures:* Normative and coercive pressures are likely to exist as GPs from the locality refer patients to hospital. Similarly, to flow 1 (general surgery) the publication of performance data such as waiting times, patient length of stay is likely to provide normative pressures to meet designated targets.

REs identified:

1. ITEM 1: Those 'acting upon' Minds, Bodies and Information
  - a. Potential admission avoidance by redirecting flow to primary care  
Classification-REDIRECTION
  - b. Lack of senior clinicians in A&E/Medical Assessment Unit to ensure right first time decisions and safely admit or discharge (including risk scoring from evidence based medicine for common conditions).  
Classification - REDIRECTION
2. ITEM 2: Those 'acting upon' Minds and Information
  - a. Readmission to A&E within 30 days of the first Episode of Care with the same or complimentary condition (medically coded).  
Classification - READMISSION
  - b. Multiple ward changes resulting in patients being admitted to wards that were not supported by specialists for their specific condition before being transferred to the specialist ward.  
Classification - REDIRECTION
3. ITEM 3: Those 'acting upon' Information
  - a. Create virtual wards. Service level agreements to complete tests/investigations are shorter for those patients admitted to hospital than for outpatients. Patients admitted via A&E require speedy tests and investigations but their conditions can mean they only require regular 'vital sign' checks that can be provided by district nursing at home. Creating a ward for patients to be virtually admitted enables the necessary tests/investigations promptly without the patient/carer discomfort of having to stay in hospital (avoiding the cost/occupancy of a fully serviced bed). This also allows for deterioration of the patient symptoms through a fast process of physical admission direct to a real bed if/when necessary.  
Classification - REVISIONING
  - b. Perceived avoidance of admission of difficult/high workload patients to ward. Examples of patients delayed on trolleys, which resulted from delayed discharge of patients from ward.  
Classification REBUFF
4. ITEM 4: Those 'acting upon' belongings
  - a. Laundry management of clothing while in hospital.  
Classification – RETURN/REUSE

b. The presence of stock held for patients at the GP surgery store. The volume of some stock items was greater than a lifetime caseload. Some stock rarely, if ever, used in healthcare today.

Classification – RETURN/REUSE

c. Many items in the store were duplicated in the vehicle of each district nurse.

Classification – RETURN/REUSE

Items detailed in ‘a’ and ‘b’ above were prescribed by clinicians. Stock was often a consequence of returns from patients. Legislation currently does not permit these items to be reused (Xie and Breen, 2012).

### FLOW 3: Radiology

The radiology department offered a planned barium enema service for tests/investigations needed for outpatient clinics. Clinics were offered in five locations across the IHT, with patients preferring to use their local clinic. The annual volume for each clinic varied from 240 to 800. Clinics were on specified days with consultants undertaking final assessments. The combined waiting list for the service was 12 weeks, which is monitored by government and seen by peers.

*Institutional pressures:* As noted above the performance data (both internal and external) are likely to exert pressure on the department. Similarly, when peers require urgent investigations normative pressures are likely to be present as individuals rely on seniority or good working relations to help shorten wait times.

REs identified:

1. ITEM 1: Those ‘acting upon’ Information

a. Rearranging inconvenient appointments (37% of all appointments).

Classification – REARRANGE

No evidence of an RE related to ‘acting upon’ bodies for this flow, although it is possible that misdiagnosis might necessitate an RE.

Table 3 codifies the findings above and proposes a typology for reverse flow/exchange. An emergent finding was although supply chain processes 1, 2 and 3 were intended to act upon the body, it was difficult not to consider ‘acting upon’ the mind as an inseparable element of coproduction. Planning instability and capacity losses due to uncertainty about quality and time was evidenced in resubmissions, revisits, redirections and reconditioning (Nuss et al, 2014)

	Evidence of Product Return	Evidence of ‘acting upon’ minds, bodies, information, belongs’	Revised & Proposed Definition of Reverse Flow/Exchange.
Reuse/Return	Evidence of product/specialist equipment/ belongings return in the support process -Flow 1, item 2a; Flow 2, items 4a, b&c.	<b>Readmission</b> – Flow 2, Item 2a.	<b>Readmission</b> – expected service fails to meet needs (no opportunity to exploit)
		Failure to proceed with planned service necessitating <b>Revisit</b> Flow 1 items 1a&c & 3a.	<b>Revisit</b> -service fails to meet planned performance at the agreed time.
		<b>Redirection</b> where patients have chosen or directed to an inferior service route. Flow 2, items 1a&b and 2b.	<b>Redirection</b> – sub-optimal route for service selected by service user (or directed to by service provider).

Reuse - Using a product for which it was originally designed.	Potential for reuse (constrained by legislations) Flow 2, items 4b&c	n/a	n/a
Reuse/Repair - Segmented to recognise the degree of de/re construction	Recondition -_Cleaned and repaired to a 'like new' state	Evidence of <b>Recondition</b> where service user not technically 'fit' to receive service Flow 1 item 1b.	<b>Recondition</b> –critical entry parameters to service not met (service user) or suitably identified (service provider)
Not discussed in product literature for reverse flow.	n/a	Evidence redesign to exploit reverse flow for service improvement and development <b>Re-visioning</b> – Flow 2 item 3a.	<b>Re-visioning</b> – developing new flows for improvement, link to Redirection via service proliferation (example formal coercive pressure).
Not discussed in product literature for reverse flow.	n/a	Evidence of <b>Rebuffing</b> selective forward flow. Flow 2 item 3b.	<b>Rebuff</b> – Obstructing forward flow through the service (example informal coercive pressure)

Table 3: Emergent definitions from case study data analysis and data coding

(Note: In terms of “acting upon” the recycling of parts was not evidenced in the processes therefore is not listed).

When reviewing value/utility from the patient’s perspective (Table 3) two clusters were identified. The first cluster relates to values applicable to all types of service SCM processes. These relate to time, information and choice, and patient/carer assurance and reflecting that value, utility and quality are closely aligned (van Wassenhove and Zikopoulos, 2011). The second cluster is the value/utility that predominantly links to patient flow, suggesting the desire for co-creation of service. This is also signalled by the literature on service dominant logics (Radnor and Osborne, 2013) and is an area requiring further exploration.

Classification	Utility	Service Processes & Location				
		1	2	3	Rural	Urban
Applicable to all Public Service Supply Chains (General)	Short waits (e.g. treatment, results, equipment)	Y	Y	Y	Y	Y
	Convenient appointment (planned activity)	Y		Y	Y	Y
	Know if anything is (or what’s) wrong	Y	Y	Y	Y	Y
	Know what is happening	Y	Y		Y	Y
	Request appropriate info. – min duplication	Y	Y		Y	Y
	Confidentiality and Confidence in Staff	Y	Y		Y	Y
	Treated kindly by friendly staff	Y	Y		Y	Y
	Directions/access to site/dept/parking	Y	Y	Y	Y	Y
	Clean environment	Y	Y	Y	Y	Y
	Given appropriate info. throughout process	Y	Y		Y	Y
Applicable to Patient Flow (Context Specific)	Dignity preserved/privacy	Y			Y	Y
	Not to have planned treatment cancelled	Y			Y	Y
	To be free from pain/infection	Y			Y	Y
	Induction to ward routine	Y	Y		Y	Y
	Peaceful at night	Y	Y		Y	Y
	Not to catch an infection while in hospital	Y	Y		Y	Y
	Ability to find the A&E entrance easily	Y	Y			Y
	Be Safe	Y	Y		Y	Y
	No trolley waits	Y	Y		Y	Y
	Private changing and examining facilities	Y	Y	Y	Y	Y
Provision of transport on treatment completion		Y		Y	Y	



	Feel Safe	Y	Y		Y	Y
	Involved in Treatment		Y		Y	Y
	Medication Timely and Explained	Y	Y		Y	Y
	Safe and Timely discharge home		Y		Y	Y

Table 4: Value/utility from the patient’s perspective

The implication of these findings is discussed in more detail in the following section.

**Discussion**

For the proposed RE antecedents, the literature suggested, the higher the volume and variety involved in the exchange, the greater the need for the supply chain process to be segmented. In our case study, the volume and variety of reverse flows were not found to be impactful and thus it is argued that volume and variety are not antecedents for RE. However, the output of the value/utility exercise clearly shows two separate clusters (Table 4) which relate to service exchanges and segments the specifics of the context (healthcare) with aspects which may be more generally relevant to public sector contexts (Figure 3).

From our analysis it is additionally proposed that utility should also include the potential to affect the psychology (being scared/angry), as an area for improvement, in the co-production of public services. While only tested in healthcare, the nature of other public services could also generate distress and unintended consequences for RE. This echoes the need to develop customisation capabilities, flexibility and cross-functional integration for service SCM process flows to increase utility (Huang and Yang, 2013; Chen et al., 2013).

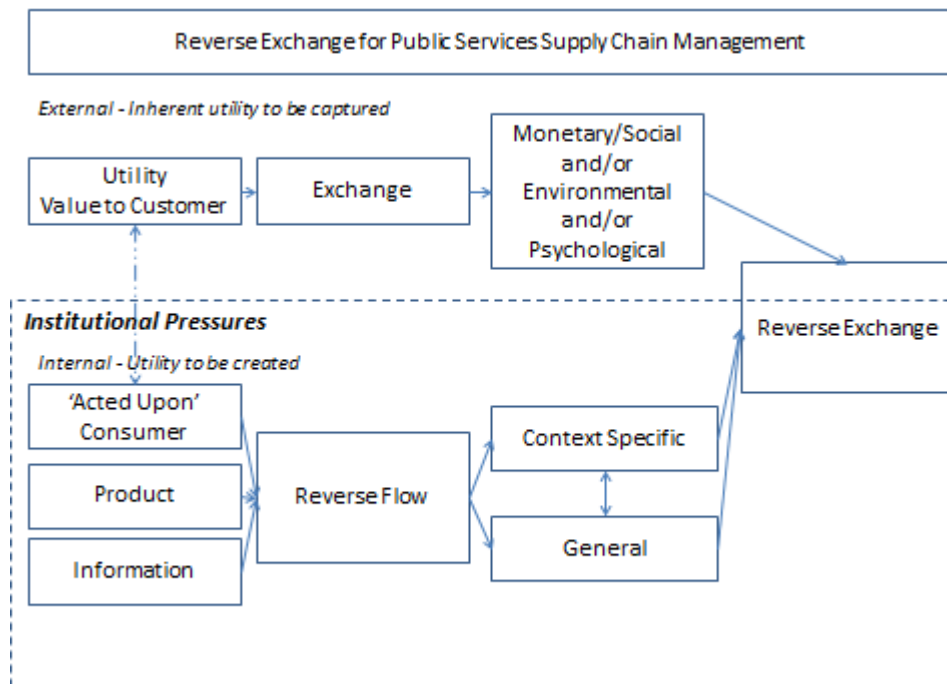


Figure 3: Antecedents of Professional/Public Services SCM

The more involved the patient and the greater the degree of closeness to the RE, the harder the challenge to mimic best practice and legitimise the reverse flow. Xie and Breen (2012) also found that patient involvement was problematic in reverse flow. This was particularly true where RE is developed in response to coercive pressure and, even for exchanges based on physical products. Within Flow 1, the role of the patient arriving at surgery unfit for the operation led to reverse flow. Inappropriate admission for planned surgery, driven by

coercive government targets, reflects the failure of a functional approach to engaging with patients.

In Flow 2, senior consultants were pressurised to ensure right first time decisions in the context of a difficult ‘acting upon’ RE. Incorporating the ‘acting upon’ dimension to RE and the resultant consequential heterogeneous demand, highlights the complexity and challenge of developing and managing a reverse flow. For inseparable 1<sup>st</sup> degree of closeness activities, innovative solutions to preserve previous utility are required. This challenging environment consists of complex, context specific and difficult to codify exchanges for reverse flows (Aitken and Harrison, 2013). Generating knowledge to produce a reverse flow for ‘acting upon’ REs may require the movement towards reconstructive learning to establish new ways of working under increasing institutional pressures. Organisations may move in this direction to “effect change across the entire supply chain and redefine its identity” (Lambrechts et al., 2012:p628).

Coercive pressure in professional services and specifically complex public service settings, such as healthcare, are evident in this research but not simple to evaluate (see discussions on the 4 hour waiting target in A&E). RE in the context of quality performance can seemingly be quite obvious to resolve. However, the variation of states within a medical condition can mean that standard clinical pathways are applicable only to a proportion of patients. In certain clinical circumstances patient returns are both necessary and correct. Conversely, this research reveals issues with perceived dysfunctional gaming behaviour (for example, A&E process to admit to ward), which are more difficult to surface (Bakhoo and Choi, 2013). Classification of RE will provide a greater understanding of flows and help in relation to normative pressures and legitimise potential actions or improvements.

Classification of Constructs	Segment (Process)	‘Acting Upon’ input	Reverse Exchange	Utility
Reconditioning	Inseparable Flow (1)	Body (and Mind)	Enforced preparation of patient to achieve parameters of entry.	Economic, society, psychological
Revisit/ Readmission	Inseparable Flow (1&2)	Information (Body and Minds)	Enforced return to service (with related stress/dissatisfaction and anger). Implications for planning and capacity.	Economic, psychological
Re-visioning	Inseparable Flow (2)	Information	Innovative Design	Economic, Society, psychological
Rebuff	Inseparable Flow (2)	Mind (and Body)	Uncontrolled/ hidden exchange (Coercive institutional Isomorphism). Implications for HRM, planning and capacity	Economic, psychological
Redirection/ Rearrange	Inseparable Flow (2) and Support Services	Mind, Bodies and Information.	Enforce rerouting to the standard flow (tend towards patient/ information failure)	Economic, psychological

Table 5: The Operational Definitions of Reverse Flows in Service Supply Chain Processes

Table 5 provides the classifications and definitions of REs from this study. We would propose that REs are not understood in the same way as commercial SCM (Jayaraman and Luo, 2007). However the commonality of results across the different flows and contexts

suggests that it is possible to generalise the same utility/values across the healthcare sector, professional services and the public sector more generally.

When assessing the volume of RE within the context of healthcare processes, the data integrity is reliant on the information extracted from the PAS in terms of both input and accuracy. As this system is used to enable payment for activity, there is a belief in the systems accuracy. The level of input is less easy to evaluate so it is possible that the level of reverse activity is under reported.

## **Conclusions**

We have investigated the under-researched reverse flows and exchanges in the context of public services. We draw on institutional theory, specifically normative, coercive and mimetic pressures that often impact on or influence change. Normative and coercive pressures were clearly at play in all of the supply chain processes we present here. To some extent the political sensitive nature of healthcare may well heighten such pressures. The emotive nature of clinical flows (e.g. Flow 1 & 2) is again likely to display coercive pressures particularly in response to social and cultural norms and expectations. The mimetic pressures were less evident but this is not to say that examples of innovation and improvement are not being sought.

This research has surfaced the need to expand the frame of utility and value to reflect the specific nature of service SCM. We have proposed that psychological utility in professional and public services is a valid addition to the classic utility of economic, environmental and societal. Utility previously delivered by forward flow needs to be considered, captured and combined with the 'acted upon' value being created in the RE. The retention of previous (positive) experiences is complex and challenging as value perceived by the patient can be psychological as well as economic, environmental or social. We therefore argue that psychological utility has implications for public service managers in understanding and operating both forward and REs. The utility has a role in professional service SCM where the actions within the process flow can evoke emotional reactions related to personal safety for example.

The antecedents of RE developed and tested in this case study provide the basis of further theory building by providing clear parameters for measurement as called for by Wacker (2004). Our findings challenge the traditional manufacturing based perspective of reverse flow in terms of utility, segmentation and constructs. Segmentation of flow through only volume and variety was found to be inappropriate. Instead, the inclusion of an inseparable classification of service supply chains provides a better fit for this analysis. Similarly several constructs of reverse flow were identified providing a service orientated basis for managing REs instead of the traditional manufacturing 3Rs.

As REs are determined through a structured approach, managers will be able to evaluate their implications. The classifications of RE proffered here are anticipated to provide an opportunity for managers and researchers to test their usefulness to exploit or improve the reverse supply chain flow within the context of heterogeneous customer demand. The approach and processes deployed (or to be developed) by public servants to capture and concurrently co-create utility where process inseparability exists (degree of closeness) requires further research.

This paper offers a new lens of 'acted upon' to evaluate service SCM processes. We provide a platform from which a set of constructs for complex public services can be developed (Table 4). These constructs offer practitioners and researchers the means to scrutinise service SCM. RE provides a mechanism to reveal opportunities for immediate redress and more long term re-visioning of both the forward and reverse flows. We plan to further extend this research by integrating the operations concept of RE and flow with

marketing research on service recovery. Service recovery also emphasizes provision of better service (and thus improvement) and is limited in public service research. Through understanding the complaints or queries of customers, service recovery can generate process improvement, better knowledge for customers and employees to prevent those mistakes from occurring in near future. The combination of RE and service recovery is considered to have the potential to provide substantial work to more fully understand the value co-creation through the reverse flow process in closed loop supply chains.

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