Innovation in healthcare services – creating a Combined Contingency Theory and Ecosystems Approach

IOP Conf. Series: Materials Science and Engineering **337** (2018) 012022 doi:10.1088/1757-899X/337/1/012022

Innovation in healthcare services – creating a Combined Contingency Theory and Ecosystems Approach

Per Engelseth[1] and Duangpun Kritchanchai[2*]
[1]Department of Logistics, Molde University College, Specialized University in Logistics, Molde, Norway
[2]Department of Industrial Engineering, Faculty of Engineering, Mahidol University, Nakhonpathom, Thailand

*duangpun.skr@mahidol.ac.th

Abstract. The purpose of this conceptual paper is to develop an analytical framework used for process development in healthcare services. Healthcare services imply a form of operations management demanding an adapted research approach. This study therefore highlights first in the introduction challenges of healthcare services as a reasoning of this study. It is a type of service that has high societal and therefore ethical concern, but at the same time needs to be carried out efficiently to economise service production resource use. Combined business and ethics concerns need to be balanced in this service supply system. In the literature review that is the bulk of this paper, first, particularities of the service industry processes are considered. This is followed by considering literature on contingency theory to consider the nature of the supply chain context of the healthcare service processes highlighting interdependencies and appropriate technology use. This developed view is then expanded to consider an ecosystems approach to encompass the environment expanding analyses to considering in balanced manner features of business, society and nature. A research model for directing both further researches on the healthcare service industry an innovation of such services in practice is introduced.

1. Introduction

This conceptual paper aims to develop a research model that can provide guidance in the development of healthcare services as well as foundation for further research within this industrial sector. This choice of research topic is founded on research of healthcare services that points to how this form of operations management (OM), is poorly developed and thus inefficient [1][2]. Hospitals face obstacles, related to e.g. inventory management and transportation costs. A study by Butt and Run [3] revealed that the information management infrastructure of hospitals in Malaysia is poorly developed, showing how patients in Malaysian hospitals rarely receive the right service at the right time. In healthcare services of Singapore, one of leading countries in medical tourism, Leng [4] revealed that the government to a greater degree has prioritised healthcare services compared with its neighbouring countries. Still, hospitals in Singapore continue to cope with weak operational performance statistics. Patients in Singapore exhibit a long treatment cycle time despite expressing satisfaction with waiting between 15-30 minutes [5]. Empirical findings also suggest that in Thailand hospitals also suffer from inefficient healthcare service system development. This is especially related to inventory management [6]. Through a case study, Kritchanchai [7] revealed that in Thailand medicine product standardization

in the information systems used by healthcare services is weak impeding supply chain integration. The agents in the studied Thai healthcare supply chains tend to use different codes for the same drugs obstructing a seamless flow of information and thus affecting information exchange efficiency within Thai hospitals.

How to improve healthcare services? Parker [8] states that: "Measuring performance is something that all organizations do". Measuring operations performance in healthcare service organizations enables them to evaluate, control, budget, motivate, promote, celebrate, learn, and improve these operations [9]. Performance measurement has been applied used in various industries and in the public sector [10][11][12]. Introducing an effective performance measurement system in healthcare entails that quality shortfalls can be detected on a daily and continuous basis more supporting efficiency in quality shortfalls detection and thereby also efficient process improvement [13]. The ultimate objective of performance measurement in healthcare services is to increase service performance [14]. Healthcare process effectiveness is associated with quality operations practices that provide the appropriate service for its recipients. Both effectiveness and efficiency objectives are vital in healthcare and these aims are interdependent. The further development of a healthcare information system (HIS) is therefore a priority in many countries [15].

To strengthen national HISs, a global partnership, the Health Metrics Network (HMN), was established in 2005. Its goal is to increase the availability, accessibility, quality and use of healthcare information in healthcare service organizations so support professional decision making at both a national and global level. This implies considering healthcare services also as an inter-organizational phenomenon. HMN is predominately applied to assess healthcare service performance at the national level. Research-based literature on operational performance measurement for healthcare services as type of industry is still limited. This study accordingly focuses on developing healthcare services as an intra-organisational process integration problem. The supply chain is this considered as the immediate context of these service processes and national and global healthcare control mechanism as environmental characteristics. Healthcare service *processes* represent the unit of analysis in this approach. A process focus implies focus on resource use and transformation; the dynamics. "Context" implies direct interaction between hospitals and other actors in a supply chain system. "Environment" implies forces not necessarily interacting, but still impacting on healthcare services in a more one-way manner. Figure 1 below expresses this approach:

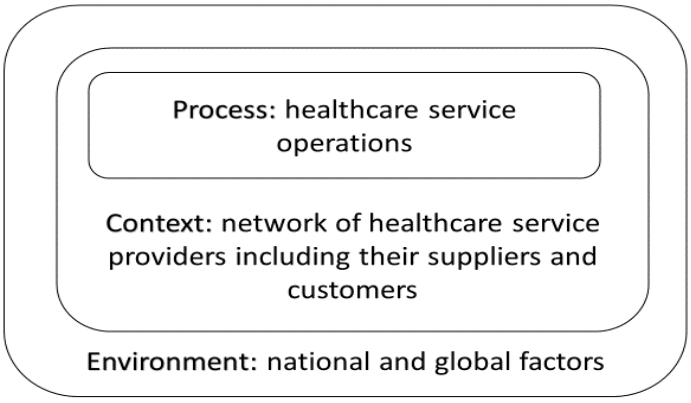

Figure 1. The healthcare service process as embedded unit of analysis

To improve healthcare services an approach is needed to elaborate on industrial particularities. Being a service, research needs to be founded on research that elaborates on service industry particularities. To enable this, we start by considering features of the service industry in general and strengthen this approach focusing on particularities by analysing interdependencies. Within contingency theory Thompson [16] later, Stabell and Fjeldstad [17], have developed an approach

focusing on the role of power relations in the supply chain that enhances service industry particularities enabling process development schemes better adapted to service. Furthermore, the embedded nature of healthcare in society call for ecosystems thinking [18] to integrate a wider array of environmental concerns into studying healthcare services. Literature concerning these two lines of research are first discussed and then integrated to create a research model concerning process development in healthcare services.

2. Services particularities

This section concerns the process layer embedded in its industrial particularities. Particularities reflect features of process in their immediate manageable context and wider less manageable environment (see fig. 1). Healthcare is a services type of industry. The physical distribution of goods represents the dominant industrial interest within operations management. Only recently has there been development to consider services likewise as goods supply from an operations management perspective. To include services in supply chain management (SCM), Ellram et al. [19] integrate the concept of "service" in their SCM definition: "Supply chain management is the management of information, processes, capacity, service performance and funds from the earliest supplier to the ultimate customer". They also present a service supply chain model, where they identify six managerial processes; 1) capacity management, 2) demand management, 3) customer relationship management, 4) supplier relationship management, 5) service delivery management, and 6) cash flow management. Services are commonly classified as intangible, heterogenic, inseparable, and perishable [20]. However, this static classification provides, according to Spring and Araujo [20], provides limited value when analysing services.

Fundamental to this critical view of using a static classification of services in academia is that service production demands a different form of organising of the resource structure and processes within this structure [21][22]. The "people" resource and human interaction is fundamental to services [23][24], and is highlighted in the more recent service-dominant logic that highlights the importance of customer value in supply [25]. Given the importance of interaction, service supply chains are therefore bidirectional in nature [26], as opposed to physical distribution, where outbound flows are the dominant mode of producing value. Sampson and Froehle [26] state in their effort to conceptualise service process that: "With service processes, the customer provides significant inputs into the production process". Sampson and Froehle [26] also point out that from a supplier's perspective, they may experience that the quality of customer inputs in the service process interactions can vary.

Producing a service cannot start before the customer provides the supplier with some form of resource input. According to Sampson and Froehle [26], three types of customer inputs can be found in services. They are (1) the customer person, (2) physical resources such as customer belongings, tools and other tangible objects, and (3) information. These resources are pooled and used in combination to produce a service. Another distinct feature of service supply is that these supply chains can be characterised as having a hub configuration. They are, according to Sampson and Froehle [26], also short since more than two levels are rarely found. Regarding the service process itself, Sampson and Froehle [26] site empirical evidence of quality issues predominant in the service supply chains including (1) random arrivals, (2) inconsistent specification, and (3) varying input quality that influence service processes as capacity and demand management and quality management. From a Lean perspective Bicheno and Holweg [27] point to typical forms of waste (muda) found in services are represented by (1) delay, (2) duplication, (3) unnecessary movement, (4) unclear communication, (5) incorrect inventory, (6) poor customer service, and (7) transaction and production errors. To support quality service provision tools such as reservation systems, price incentives and promotion of off-peak demand, and customer self-service are may be used. In addition, capacity management involves a mix of resources such as people, tools and goods. Following up service quality is often organized to be carried out through a specialized customer service department that needs to network both internally with the company's different own functions as well as other service providers and customers [28].

Important sub-conclusions regarding service process particularities are (1) that regarding *structure*, services are carried out by combining various interlinked resources in an integrated network structure, (2) regarding the *dynamics*, that manging these services demands interaction, and (3) regarding *learning and development*, that experiences form the services industry indicate that service quality is poor much due to the complex nature of services process coupled with weak understanding of manging services as emergent phenomena.

3. Contingency theory

This section concerns the context of healthcare processes, the supply chain structure. This focus on context is in line with contingency theory that is founded on the presumption that processes are environmentally contingent [16]. This section elaborates on this immediate context, in management literature commonly termed as a "supply chain" or alternatively as a "distribution channel". The first encompasses focus on resource transformation through processes (goods and service flow) while the latter encompasses focus on the transaction flow. A key feature of the supply chain is that it is a network consisting of multiple interconnected actors [29]. When approaching how to understand the nature of healthcare process contingency in relation to the supply chain context, analysis is dependent on revealing and the analyst thus understanding the nature of this context.

One of the key features of any network is the strength of coupling between the network entities. Following Weick [30], network interactions take place through business relationships where this coupling varies on a continuum ranging from weak to strong. The nature of coupling impacts importantly on the loyalty of actors in the network, which then again may be viewed as expression of degree of power and trust; the "network atmosphere" [31]. One of the fundamental reasons for networking is associated with interdependencies [16]. Since resources are scarce and investments have made production resources specialized to a single firm, these actors need to interact to produce. Emerson [32] points accordingly to that power is fundamental characteristic of this interaction. In a network, relationships can be characterised as degrees of being imbalanced or balanced.

Change in power imbalance is associated with corporate strategy change. In supply chains power is associated with efficient and effective resource control; vital in securing production. Following Pfeffer and Salancik [33], this form of control is based on a mix of resource ownership, access, use and ability to make the rules regarding resource use. Power is often associated with coercion. Based on the writings of the process-focused sociologist Elias, Stacey [34] argues how power both enables and constrains in production processes in industry. According to Pfeffer and Salancik [33] and Leonardi [35], interdependencies can be managed, be increased, reduced, or the dominant interdependency in a dyadic relationship changed. Managing interdependency of the network context is, following contingency theory, the core feature of strategic corporate management.

Integrating at a strategic level to coordinate resource use involves, following Thompson [16], taking into consideration whether interdependency is mainly *pooled*, *sequential* or *reciprocal*. Interdependency describes fundamentally how economies of complementarity are reaped through interaction in a business relationship. Thompson [36] states that pp.101-102), "…human action emerges from interaction of (1) the individual, who brings aspirations, standards, and knowledge or beliefs about causation; and (2) the situation, which presents opportunities and constraints". In line with Parsons [37], the management of technical production activities is embedded in an institutional layer. This is important since, decision-making is embedded in discourse, a developed business culture. Perceptions of interdependencies accordingly impact on how processes are managed.

Interdependencies are impacted by uncertainty which is defined by Burns and Stalker [38] as "…the ignorance of the person who is confronted with a choice about the future in general, and in particular about the outcomes of which may follow any of his possible lines of action". Interaction helps soothe uncertainty through exchange mechanisms; fundamentally involving information sharing [33]. *Mutual adjustment* is typical of reciprocal interdependency using exchange mechanisms founded on intensive technology to coordinate production processes. This is a costly form of organisation in developed economies since it is predominately manual. Alternatively, services may be increasingly

pooled using mediating technology. This implies increasing standardization in the network. Since services are predominately characterized by reciprocal or pooled interdependence [17], automating service processes entail increasing strategically pooled interdependence by reducing reciprocal interdependence in individual or sets of business relationships. Managing interdependency provides a pathway to increased service process efficiency.

4. Ecosystems theory

Considering ecosystems involves accounting for the environmental level presented in figure 1. One of the fundamental characteristics of Thompson's [16] interdependency theory is that it is associated with systems theory. Ecosystems also represent system thinking, meaning function and interconnectedness within defined boundaries are characteristic of such a system. Thompson's [16] discussion, is however, limited to use of closed as well as open systems, and for his purpose, seeking understanding on what determines how and when organizations act. More precisely, he states that "...we will conceive of organizations as open systems, hence indeterminate and faced with uncertainty, but at the same time as subject to criteria of rationality and hence needing determinateness and certainty" [39]. Management understanding the nature of interdependencies is associated with increasing rationality in decision-making in the network. However, interactions in supply chain networks account for only a part of these influences. Following Leonardi [35], interdependency change is viewed as subject to incremental and iterative adaptations; a process view that implies interaction both within the supply chain and a wider social and natural environment. While business systems tend to conceptually be governed by management, ecosystems places weight ion how both nature and society together interplay making the system more self-governed; more out of reach to the manger.

Expanding supply chain management to regard it as an ecosystem involves taking account of not only interaction in the supply chain network to manage production flows, but to expand management discourse to encompass also societal and nature concerns. A direct impact of this expansion is not only widening the scope of systemic description and investigation, but also expanding the researched time frame. Since ecosystems are associated with sustainability, this means that the time frame of analytical scrutiny is expanded to considering interests of future generations. Furthermore, an ecosystem will be form the perspective of the manger be perceived as uncertain and inherently complex. Ecology has its own logic of organising that may be different from that of mangers, e.g. in a hospital.

Finally, some key concepts related ecosystems thinking. Ecology was termed by Haeckel in 1866 as the science of relations between organism and the surrounding outer world [40]. "Ecosystems" indicate accordingly considering nature, society and business as integrated from a system's perspective. Systems thinking finds its roots in the natural sciences, based on observations of how biological organisms function. As Capra and Luisi [41] state based on recent studies in many fields of natural sciences that "...nature does not show us any isolated building blocks, but rather appears as a complex web of relationships between the various parts of a unified whole". Systems are found in nature regardless of the glasses the researcher wears. In sum, an ecosystem understanding of healthcare processes implies using systems thinking encompassing economic, societal and nature concerns; an expansion of systems border that entails increased complexity.

5. Concluding with a research model

Ecosystems are considered as objective entities. A fundamental view is that they do function this way as micro-purposeful interaction that also can be reflected upon from a holistic perspective. This is an understanding that can change how we understand and thereby use SCM principles focusing on integration to better collaborate and coordinate processes as a managerial imperative. SCM thus should not be limited to organizational, economic and technological considerations. Nature and society envelopes production and is a part of it. Developing SCM as an ecosystem represents an integrated view that considers the economy as an environmentally contingent network and thus also faces a wider range of challenges than normally conceived of when using this managerial philosophy. Therefore, in

this study we choose to remain simple in our modelling effort and leave many questions and considerations unwrapped. Engelseth [42] has proposed that causality in the influence of society and nature on management is filtered through economic considerations. This view is followed in figure 2:

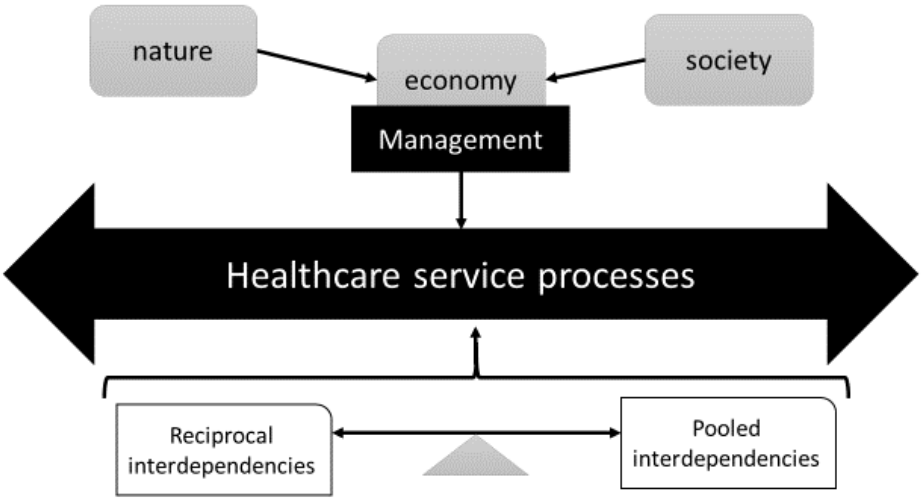

Figure 2. An ecosystem view of interdependency in healthcare service processes

Figure 2 characterises healthcare service processes as involving varying degrees of reciprocal and pooled interdependency; they are usually more or less imbalanced. This implies that sequential interdependency, dominant in manufacturing, is reduced merely to a role of describing healthcare service processes as flows. Timing is accordingly understood as strategically managing reciprocal and pooled interdependency found in healthcare service processes. Management, associated with operational as well as strategic level decision-making, is primarily influenced by economic concerns. These concerns are, following the developed ecosystems view (figure 2), considered as impacting on, and thereby intertwined with economic considerations. This view is substantiated by a view that managerial cognition is human perception and therefore limited. Management's inherent prime concern is survival in the volatile market place; normally considered a purely economic concern. Adding societal and nature concerns to this commonplace view implies therefor heightening of ethical as well as long-term thinking on the behalf of management. This is rooted in a continuous learning process. It also implies sustainability as a key factor when designing and implementing change in healthcare services. This view is high in the level of abstraction and needs therefore to be further substantiated with empirical evidence to increase the detail in the model, lowering abstraction, and moving towards the operational level. This needs to be done, due to the complexity of the model, through two potentially parallel research stages. First, what are the factors considered as "society" and "nature" considered as impacting on healthcare service? Also, studies may study the detailed nature of pooled and reciprocal interdependencies in health care; evaluate more closely the role of sequential interdependency, to create more detailed roadmaps for healthcare service development; creating support for automating healthcare service processes.

This developed analytical framework will also be administered to existing data from in-depth site visit in twenty hospitals. This research focuses are on the resource transformation through processes (goods and service flow) and the transaction flow. Six dimensions are included. These are logistics information management; forecasting and inventory management, purchasing processes, warehouse management, transportation management and organisation function for logistics. Initially it has been

revealed through this research that the hospitals with good inventory visibility have a good performance in safety stock level and purchasing processes. Data standards in hospitals significantly influence the information flow within the hospitals and logistics information system. Furthermore, the hospitals which have an organisation structure for logistics function obviously has a good performance in inventory and transportation management.

References

[1] Haszlinna M N and Potter A 2009 *Supply Chain Management: An International Journal*, **14** p 234
[2] Hall R 2014 *Patient flow* AMC **10** p 12
[3] Butt M M and Run E C 2010 *International Journal of Health Care Quality Assurance* **23** p 658
[4] Leng C H 2010 *Global Social Policy* **10** p 336
[5] Lim P C and Tang N K H 2000 *International Journal of Health Care Quality Assurance* **13** p 290
[6] Kritchanchai D 2012 *Operations and Supply Chain Management: An International Journal* **5** p 103
[7] Kritchanchai D and Suwandechochai R 2010 *International Journal of Services, Economics and Management*, **2** p 211
[8] Parker C 2000 *Work Study* **49** p 63
[9] Behn R D 2003 *Public administration review* **63** p 586
[10] Schmitz J and Platts K W 2004 *International Journal of Production Economics* **89** p 231
[11] Kald M and Nilsson F 2000 *European Management Journal* **18** p 113
[12] Palmer A J 1993 *Public Money & Management* **13** p 31
[13] Purbey S, Mukherjee K and Bhar C 2007 *International Journal of Productivity and Performance Management* **56** p 241
[14] Baker G R, Brooks N, Anderson G, Brown A, McKillop I, Murray M and Pink G 1998 *Hospital Quarterly* **2** p 22
[15] Haux R 2006 *International Journal of Medical Informatics* **75** p 268
[16] Thompson J D 1967 *Organizations in Action* (New York: McGraw Hill)
[17] Stabell C B and Fjeldstad Ø D 1998 *Strategic Management Journal* **19** p 413
[18] Capra F and Luisi P L 2014 *The Systems View of Life. A Unifying Vision* (Cambridge UK: Cambridge University Press)
[19] Ellram L M, Tate W L and Billington C 2004 Journal of Supply Chain Management **40** p 17
[20] Spring M and Araujo L 2009 *International Journal of Operations & Production Management* **29** p 444
[21] Chase R & Garvin D 1989 *Harvard Business Review* **67** p 61
[22] Oliva R and Kallenberg R 2003 *International Journal of Service Industry Management* **14** p 160
[23] Grönroos C 1990 *Service management and marketing: managing the moments of truth in service competition* (Lexington, MA - Lexington Books)
[24] Normann R 2001 *Reframing business: When the map changes the landscape* (West Sussex UK: Johan Wiley & Sons Ltd)
[25] Lusch R F and Vargo S 2014 *Service-Dominant Logic, Premises, Perspectives, Possibilities* (Cambridge UK: Cambridge University Press)
[26] Sampson S E and Froehle C M 2006 *Production and Operations Management* **15** p 329
[27] Bicheno J and Holweg M 2009 *The Lean Toolbox: The Essential Guide to Lean Transformation* (Buckingham UK - PICSIE Books)
[28] Engelseth P, Wagner A and Farrukh A 2014, Developing Lean customer service in a Lean manufacturing firm *Proceedings of the 21st international EurOMA conference*
[29] Christopher M 2016 *Logistics and Supply Chain Management (5 ed.)* (London - Financial Times Press)
[30] Weick K E 1976 *Administrative Science Quarterly* **21** p 1

[31] Gadde L E, Håkansson H and Persson G 2010 *Supply Network Strategies* (Chichester UK: John Wiley & Sons)
[32] Emerson R 1962 *American Sociological Review* **27** p 31
[33] Pfeffer J and Salancik G R 1978 *The External Control of Organizations* (Stanford CA: Stanford Business Books)
[34] Stacey R D 2003 *Complexity and Group Processes* (Milton Park UK: Routledge)
[35] Leonardi P M 2013 Nicolini, D, Langley, A & Tsoukas, H *How Matter Matters. Objects, Artefacts, and Materiality in Organization Studies* (Oxford UK: Oxford University Press) 142
[36] Thompson J D 1967 *Organizations in Action* pp 101-102 (New York: McGraw Hill)
[37] Parsons T 1960 *Structure and processes in modern societies* (New York: The Free Press of Glencoe)
[38] Burns T and Stalker G M 1961 *The Management of Innovation* (London: Tavistock Institute) p 112
[39] Thompson J D 1967 *Organizations in Action* p 10 (New York: McGraw Hill)
[40] Haeckel E 1866 *Generelle Morphologie der Organismen* (Berlin: Reimer)
[41] Capra F and Luisi P L *The Systems View of Life. A Unifying Vision* p 68 (Cambridge UK: Cambridge University Press)
[42] Engelseth P and Sandvik M 2017 *Proceedings in Food System Dynamics 2017* forthcoming