

Understanding the Value of Business Process Configuration

Noel Carroll¹, Eoin Whelan², Ita Richardson¹

¹Lero - the Irish Software Engineering Research Centre, Department of Computer Science & Information Systems, University of Limerick, Limerick, Ireland
Noel.Carroll@lero.ie; Ita.Richardson@lero.ie

²Department of Management and Marketing, Kemmy Business School, University of Limerick, Limerick, Ireland
Eoin.Whelan@ul.ie

Abstract. In order to deliver effective services, providers are being advised to ‘innovate’ their service delivery systems. Innovation in this context often refers to technology, technique or restructuring improvements. However, the difficulty is that in the modern organisation, service delivery is dispersed across a complex network of numerous departments and units. There are greater pressures on organisational service systems to deliver a higher quality and more efficient service. Management must attempt to develop a greater understanding of organisational process and where improvements may be made using business process management (BPM). The network approach ultimately makes service innovations more difficult to implement. Thus, the purpose of this study is to investigate how service innovation is managed across a service network. Specifically, we examine the effectiveness of a technique called ‘social network analysis’ (SNA) in extending business process management to enhance the manageability of network based services. This paper sets out to provide a state of the art literature review on the short fallings of our ability to understand what triggers business value. It examines the effects of our inability to understand the influence of business process behaviour on service innovation. It also provides a conceptual account of how SNA can be a powerful tool for managers to understand organisational network performance and service interaction (e.g. behavioural, functional, and structural).

1 Introduction

The growth in service science as a discipline has underscored the need to investigate the contributory value of business processes and its influence on how a service system (including people, technology, and organisations) affects the delivery of organisational performance. Within organisational and technological management theory, understanding and measuring value (i.e. application of competences) of service networks is considered one of the key problems which prevent the sustainability of organisational growth. We refer to value as “the adaptability and survivability of the beneficiary system” [VMA08] (p. 148). Understanding the value of this infrastructure after investing often proves to be an even greater challenge [WSB02]. Therefore, assessing the value of the service processes is of critical importance. Service science explores the value co-creation of interactions between service systems (for example, [SM08], [VMA08]). As service networks continue to grow, understanding the dynamic exchange of resources which creates “value”, determined through specific relationships and interactivity between service systems is of significant importance. This paper sets out to provide a state of the art literature review on the short fallings of our ability to understand what triggers business value. It examines the effects of our inability to understand the influence of business process behaviour on service innovation.

It also provides a conceptual account of how social network analysis (SNA) can be a powerful tool for managers to understand organisational network performance and service interaction (behavioural, functional, and structural).

2 Background to the Research

Our traditional understandings of the ‘*organisation*’, with solid boundaries and internally focused on operations, time, and individuality are becoming less apparent today. As competitive advantages of single organisational strategies continue to erode over recent years, organisations are experiencing greater demands to operate with increased innovation, collaboration, scalability, efficiency, agility, and virtuality (for example, [Z97], [MSB99], [RK02], [BH03], [AC05], [BM06], [F06], [K07], [VWVV07], [SMBG07], [C07], [G09], [H09]). In fact, services are now the dominant contributor to the developed economies. The business landscape has significantly changed, i.e. a shift from a goods-dominant logic towards a service-dominant logic ([N01], [VMA08]). It is evident that a scientific understanding of modern services is undeveloped and may even be described as an unexplored topic. This has sought the introduction of “*service science*” which attempts to address this problem. Service science is an attempt to “study the application of the resources of one or more systems for the benefit of another system in economic exchange” (p. 2) [SMBG07]. One of the fundamental objectives of service science is to understand the mechanics of service networks and define how and why they generate value.

[SMBG07] summarises one of the core problems in understanding the dynamics and complexity of service science: “*powerful dynamics are in play around the world when it comes to applying resources effectively to solve problems and create value*” (p. 10). Value (for example, economic, social, and interaction exchange) is the core of organisational sustainability. Over the past few years business practices have changed dramatically for several reasons including; globalisation, world financial crisis, accessibility of a global educated and mobile workforce, technological advances (*‘death of distance’*), and global outsourcing. Understanding how these influences have distorted our understanding of business plays a significant part on how we interpret service networks. Many of these changes require that we view business with a new mindset to understand the interactions of global and electronic infrastructure which supports service operations. Transparency within service operations is envisioned as a critical factor within service innovation [CS06]. Organisations are under increased pressure to adapt their business processes at a much faster pace than they have ever experienced before [PBLDKL08]. Understanding the value of service network infrastructure after heavy investments often proves to be an even greater challenge. In addition, organisations must monitor what is often described as the ‘paper-based system’ which is only too common through many organisational service systems. There is little evidence to suggest the organisations understand whether their service networks are operating at an optimum level and how can they demonstrate how value is created and measured.

3 Business Processes Defined

The overall objective of implementing a business process is an attempt to improve business. Thus, we must understand the dimensions (for example, structural, behavioural, and functional) of the business process and its contribution towards organisational performance.

The term ‘*business process*’ has been well documented across literature in the hope to shape and reshape a more universally accepted meaning of the term. For example, [D93], (p.5) defines a business process as “...*a structured, measured set of activities designed to produce a specific output for a particular customer of market*”. In addition, [HC93], (p.35) defines a business process as a: “...*collection of activities that takes one or more kinds of input and creates an output that is of value to the customer*”. In more recent years, [SF03] define a business process as, “...*the complete, end-to-end, dynamically coordinated set of collaborative and transactional activities that deliver value to customers.*” [SF03] dissect their definition, and extract the key characteristics of business processes. They specify eight characteristics of business process as follows:

1. ***Large and complex:*** involving the end-to-end flow of materials, information and business commitments.
2. ***Dynamic:*** responding to demands from customers and to changing market conditions.
3. ***Widely distributed and customised across boundaries:*** within and between organisations, often spanning multiple applications on disparate technology platforms.

4. **Long-running:** a single instance of a process such as “order to cash” or “develop product” may run for months or even years.
5. **Automated:** at least in part. Routine or mundane activities are performed by computers whenever possible, for the sake of speed and reliability.
6. **Both “business” and “technical” in nature:** IT processes are a subset of business processes and provide support to larger processes involving both people and machines.
7. **Dependent on and supportive of the intelligence and judgment of humans:** the tasks that are too unstructured for a computer or require personal interaction with customers are performed by people. The information flowing through the automated systems can support people in solving problems and creating strategies to take advantage of market opportunities.
8. **Difficult to make visible:** these processes are often undocumented and embedded in the organization. Even if they are documented the definition is maintained independently of the systems that support them.

The last characteristic is an interesting flaw within business process management (‘difficult to make visible’). If we can understand the behaviour of business processes, surely we can offer a method to management to visualise the business processes behaviour and what influence (enables or inhibits) process innovation. After all, [P03], defines a business process as “*a set of logically related tasks performed to achieve a well defined business outcome*” (p. 49). In addition, [P07] explains that a business process comprises of a set of logically related tasks performed to achieve a well-defined business outcome that determines the results to be achieved, the context of the activities, the relationships between the activities, and the interactions with other processes and resources. Therefore, the behaviour exhibited within business process management, can provide us with a critical insight as to what influences organisational/service performance. Understanding this, relates back to how [CKO92] uses the term ‘business process reengineering’, and defines it as ‘*the redesign of an organisation's business processes to make them more efficient*’.

4 Business Process Management

As the current business practices are carried out, we know that taking a reactive stance in today’s business environment is no longer sustainable. In addition, we must also look beyond the

tangible assets within business processes. [A03], cautions that managers find it difficult to understand many of the critical intangible metrics of organisational networks (p.5):

“Companies and economists struggle to develop new scorecards, metrics, and analytics that will provide leading indicators for how well a company or country is building capability for the future”.

Although Business Process Reengineering (BPR) was quickly embraced, organisations failed to reap its potential promise [H97]. One of our latest organisational theoretical developments is Business Process Management (BPM). BPM has adopted many definitions, however [DM97], report that no single solution exists to meet organisational performance needs. The value driven metrics of BPM therefore requires further attention. [LD98] (p. 217), offers a definition for BPM as:

“...a customer-focused approach to the systematic management, measurement and improvement of all company processes.”

BPM is the latest development in extending our understanding of organisational management. BPM has emerged as one of the major new developments within organisations to support our understanding of the evolution and interaction of process-oriented business applications and information systems. BPM has encapsulated many definitions over time, which identified the need to enhance a specific process or a number of processes, to allow an organisation to operate more efficiently. For example, [EHLB95], state that BPM consists of “...systematic, structured approaches to analyse, improve, control, and manage processes with the aim of improving the quality of products and services.” The ‘value’ of BPM was captured in the [LD98], case study as a method of “*measuring the core processes, analysing what works and what doesn’t and improving them*” (p. 219). They also identify three critical factors which contribute to the success of BPM: (1) process discipline (correct and consistent application of business processes), (2) process improvement, and (3) cross-process integration. The concept of value-driven processes often refers to services within a business network that executes a business process to produce economic value while monitoring cost, quality and time parameters within business processes.

Therefore, BPM should be considered as a tool with huge potential and not a fad of managerial toolsets [DM97]. However, according to [A03], one of the main problems of successfully managing organisations today is that it has become more complex due to the changing nature, structure and identity of organisations. One of the major emphases realised today in achieving a competitive advantage is in business intelligence (BI), through communicative and collaborative networks and knowledge management (KM) across the wider organisational spectrum ([D88], [D06], [EL05]. [WDLBNVP09], explore the use of Business Activity Monitoring (BAM) to map service choreography and monitoring agreements. To assist business analysts and managers to extract knowledge, there are often a number of BI tools available (e.g. IBM Cognos 8 is a single service-oriented architecture). However, these are limited in their functionality (i.e. ability to extract unstructured data and limited to focus on a single organisation rather than an entire network). While the current limited view is sufficient to address specific problems, a complete and holistic view of the BPM modelling space is required in order to avoid isolated solutions by providing an overall view over the whole organisational network [PBLDKL08]. This is more evident in the service-dominant logic business environment.

4.1 Business Process Management – The Problems

Organisational change, more specifically business process change is a critical activity across service networks to accommodate the reoccurring trends across the business landscape.

However, change can take place on many dimensions, i.e. through continuous process improvements, or through radical rethinking a renewal of the business model and how business activity reflects this change. To look at BPM through a much broader lens, we revisit what [A04] suggests that BPM supports:

“...business processes using methods, techniques, and software to design, enact, control, and analyse operational processes involving humans, organisations, applications, documents and other sources of information”.

Therefore, the governance, choreography and management of human and technological interaction are of critical importance to understand the competency of a service network. However, the literature indicates that there are several issues with our current understanding of BPM. For example, [PBLDKL08], state that BPM suffers from a lack of automation which ‘could’ support the transition between the business domain and the information technology domain.

We should also re-examine the goal of BPM as highlighted by [BCGMT05], the goal towards achieving business process automation, is motivated by numerous reasons, including; creating opportunities in relation to cost savings and higher quality, more reliable executions, which has consequently generated the need for integrating the different enterprise applications involved in such processes. Within the [S08], BPM has received much attention. An extensive account of BPM describes a number of problems which are listed as follows:

1. Existing generation BPM technologies do not address quickly emerging requirements of complex, service enabled applications, involving several organisations.
2. BPM deployments are narrow in scope
3. Existing BPM adopt an organisation-centric view
4. Only provide improvements to business functions of a single organisation
5. Becomes a problem if managers are trying to apply existing methods to encompass agility to span service networks across organisational boundaries.

In addition, existing methodologies or concepts (for example, BPEL) used within service engineering fail to capture and represent human aspects and other data including, the user goals, tasks, motivations and characteristics, and lacks information about the actors ability, actions, motivations. We wish to take this a step further and explain the need for more dynamic and explorative methodologies to understand the underlying behavioural patterns of service networks.

5 The Emergence of Service Science

Information and communication technology (ICT) has been charged as one of the main contributors for organisational flattening [F06] and the evolvement of service science [CS06]. The wealth of information available on people and their roles, technology and processes, and organisations and activity has never been greater, nor has the prospect to (re)configure them into service relationships to create new value. The information revolution has given birth to new economies structured around processes and flows of data, information, knowledge, and more recently, people ([H89], [K89], [SG89], and [REMCV02]). Thus, information technology plays a significant role in the enabling or inhibiting of business process behaviour across service networks [WSB02]. To exasperate this, organisational boundaries have been redefined, creating larger ‘change’ patterns [A03]. Despite all the attention however, the contributory value of services to organisations is still poorly understood. Considering the promise of BPM, understanding the value of service systems is prominent across several sectors of our economy.

The concept of service science has become very popular throughout organisational and information systems literature. Service science is often referred to as a discipline which scientifically explores the theory and mechanisms required for the distribution of interoperable services. [SM08], state that “*service science aims to explain and improve interactions in which multiple entities work together to achieve a win-win outcome or mutual benefits....[as] value co-creation as a change or set of related changes that people prefer and realise a result of their communication, planning, or other purposeful and knowledge-intensive interactions*”. This theoretical development is considered important to support today’s dynamic and networked business world. However, considering that service science is a relatively new field, much of the literature attempts to understand the importance of service science and attempts to define what service science constitutes rather than prescribe precise methods to improve business practice. BPM could provide a significant contribution here with the emergence of a modern theoretical view of the business world (i.e. service science) and the application of business process technology (i.e. BPM). There has been a significant shift on the focus of a technological-centric view of business to a more holistic encompassment of business processes, human behaviour, and technology.

5.1 The Change in Business Landscape

Technological advances are the main driving forces of service science especially across end-to-end electronic communication channels and service-oriented business models. This has afforded organisations the opportunity to break-up or to ‘unbundle’ and the ability to put together or ‘rebundle’ specific processes [N01]. Most notably, IKEA have become world class in their ability to unbundle their system of value creation or reallocate different economic actors, i.e. the customer now plays a significant role in

identifying, transporting, and assembling IKEA furniture. Witnessing the dramatic change in business, it raises two core questions within service science and one in which this within BPM: what is the contributory value of business processes across a service network, and how do these contributions influence service innovation? As [F05] reports, “*services have little value if others cannot discover, access, and make use of them*” (p. 814). Thus, service science explores how an organisation conducts business and how we can optimise process influence on the delivery of a service. To gain a better understanding of how we might address these questions, we must first ask what constitutes as a service. Within the IS discipline, little research exists towards the exploration into the influence of ICT in service design and delivery, which suggest the need to revisit the modern concept of the ‘service’. In 1977, [H77] defines a service as: “*a change in the condition of a person, or a good belonging to some economic entity, brought about as a result the activity of some other economic entity, with the approval of the first person or economic entity.*” Economics typically attributes transactional value or market value to assets, good or service which is difficult to set by an individual economic actor [N01]. A market handles these complexities and establishes the market value which is determined by the buyer and seller. Within a service environment, a service may be viewed as the networked behaviour to offer a specific capability from one party to another through a predefined protocol or service compositions.

Defined by [FF04], a service is a “*...time-perishable, intangible experiences performed for a customer acting in the role of a co-producer.*” Services are a fundamental factor in every organisation, for example, health care, education, retail, and finance. Services extend business processes and business functionality within (cross-departmental) and outside (cross-organisational) of an organisation. The behaviour in which it does so indicates the value of process within the service network.

A service is often referred to as “*protocols plus behaviour*” [SMBG07]. Service activities include co-generated exchanges of largely intangible assets, collective coordination, and integration of knowledge under negotiated conditions between the provider and the supplier. According to [F05] “creating a service involves describing, in some conventional manner, the operations that the service supports; defining the protocol used to invoke those operations over the Internet; and operating a server to process information requests” (p. 814). The complexity of the service system or on-demand business architecture is often misunderstood which requires the introduction of new theoretical developments. Therefore, managers must begin to view services through a scientific lens to construct reusable and standardised modelling methods to evaluate and govern service networks and manage dynamic business process.

5.2 Service Configuration

Through this new lens, we propose that service configuration is the core logic which should support service process management. Service configuration presents us with the ability to (re)construct reusable methods and process patterns or blueprints to support service networks through the visualisation of dynamic business process. The concept of service configurability has been well documented throughout business and information systems literature. For example, [N01] (p. 59) reports “*a technological breakthrough in itself may be enough to trigger reconfiguration*”, ... [and] “*creates cases of reconfiguration which seems to stem from a new design vision of the ‘industry’ or broader system of value creation*” (p. 61), e.g. IKEA, Apple, and Microsoft. Technology often serves to reconfigure business practice and processes albeit often without a strategic plan to reframe *business practice to align with emerging business patterns*. In addition, [N01] illustrates the dramatic shift in business logic from an assets dominant perspective to a reconfiguration of value-creating system as depicted in figure 1 below. Figure 1 above illustrates that significant towards a new strategic logic of the ‘economy of reconfiguration’. The main emphasis here is the competence to organise value creation extending beyond the traditional boundaries. This is largely due to the affordance of information technology and the virtual organisational infrastructures. Thus the “*reconfiguration of value-creating systems*” shifts our focus on the customer from being that of a recipient to being the co-producer and co-designer of value creation. These relationships between the service provider and client open up new possibilities on the generation of service innovation. Across academia and industry we are beginning to recognise the significance of service innovation and service systems within the global economy. One of the fundamental objectives of mapping these relationships is to understand the underlying mechanics of service networks and define how and why they generate value.

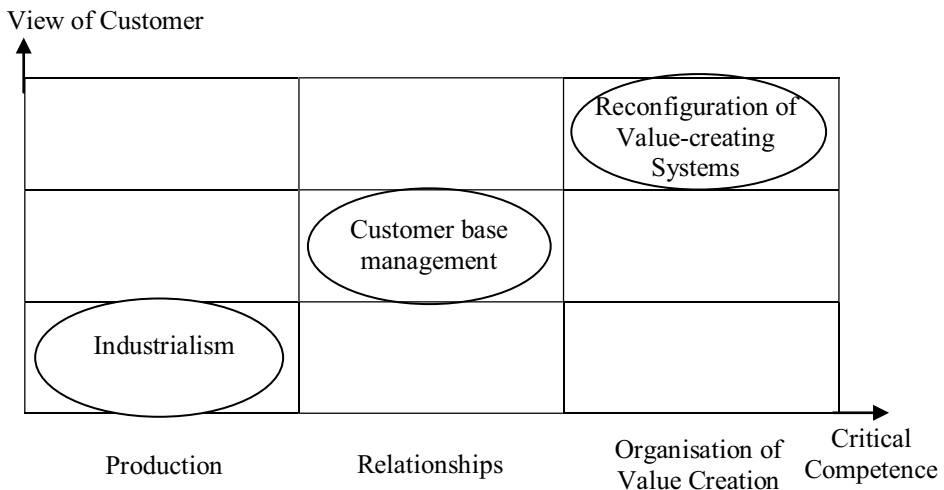


Figure. 1 - Evolution of Strategic Paradigms (extracted from Normann 2001)

5.3 Service Science and Organisation

The introduction of service science indicates the need to theoretically and empirically explore the concept of services in today's global and digital economy. Organisations are beginning to move away from the traditional corporate hub of business practice towards a more diffused and distributed web of relationships and agile alliances. [N01] introduces the *'principle of density'*, which is mainly driven by technology and the shift in managers mindsets in restructuring or reconfiguration of new 'opportunities' This refers to the best combination of resources which are mobilised from a particular situation in a given time and place, independent of location, to create the optimum value/cost result, for example, the mobile phone [N01]. However, we fail to understand the contributory value of service networks and the influence of service relationships. For example, [A05] reports that within the U.S., *"10-50% of general service business contracts do not meet client expectations"* (p. 9). This may have a greater affect on service networks. For example, [SMBG07], report that *"service systems are connected to other service systems via value propositions"* (p. 4). Understanding the mechanisms and theory of managing service business models and processes adopted across many organisations require that we approach service networks with a scientific lens. It is clear throughout literature that manager's continue to face serious issues in managing a completely invisible asset (i.e. service network) which inhibits their ability to monitor and exploit the value of service networks. In addition, managers fail to determine the influence of both human interaction and technology on service networks.

Service systems continuously evolve and are (re)designed in response to change but one of the fundamental problems is their inability identify shortfalls and fail to optimise the return on investment across entity interactions with unpredictable outcomes [SMBG07]. In addition, we propose the need to work towards the introduction of agility within service networks to identify changes and respond proactively to this information. The value of service transactions often go unknown, although managers perceive that they understand the possible investment of executing an effective service, for example, distributing software or distributing valuable information [N01]. This shifts the focus from the tangible good to viewing the *"transaction as an investment in a future revenue-generating relationship"* [N01] (p. 38). This suggests that this phenomenon is a strong indicator of the shift from the industrial strategic logic towards higher logic of customer-base management.

The introduction of service science challenges our traditional understandings of service management. The unprecedented growth in service-based business processes over a short period of time has underscored the need for understanding the mechanisms and theorising the business models and business process management adopted across many organisations today. Understanding the functionality of these networks and the challenge of managing and co-coordinating their relationships is becoming more complex. As SSME theory is at a relatively early stage, it cannot adequately prescribe methods to manage complex service processes and their relationships. Thus, the questions emerge: how do we manage service networks and how can we enhance their capabilities and business value? This question will be further explored in section seven.

Understanding the value of service network relationships, especially from a human and technological perspective can prove to be extremely problematic. In addition, the literature indicates that the tools to create, track, and manage outsourcing business process opportunities are incompatible, slow, and difficult to use. To exasperate this, it is also reported throughout literature that critical business data is incorrectly collected, shared, standardised, or analysed to provide business intelligence.

6 Business Process Management in Service Science

BPM across service networks should be also concerned with improving manager's ability to predict risk, estimate their effects, and reduce uncertainty through modelling the value-exchange which results from provider and client interaction (intellectual, behavioural, economic, and/or social activities). [CS06], identify several key foundations within service science, including understanding the level of interaction, the nature of knowledge, and the exploitation of ICT and transparency in service networks. The nature of knowledge refers to both codified (information) and tacit (experience) which are often difficult to model and understand the transfer, partition, and reuse of knowledge which are considered fundamental building blocks within the economies of service science [CS06]. One of the critical characteristic within these services is 'differentiation' or 'uniqueness' in order to allow a service to remain sustainable. Across large service networks, reorganising, consulting, and exchanging on business processes is becoming more important within service science. Understanding the complexity of network structures, process patterns, and methods to improve network performance is critical to the success of service system, for both the service provider and client.

7 Applying Social Network Analysis to Business Process Management

In recent years there has been significant interest in our ability to effectively and efficiently manage and (re)engineer services. It is clear throughout literature that manager's continue to face serious issues in managing '*a completely invisible asset*' (i.e. service network) which inhibits their ability to monitor and exploit the value of innovation. Social network analysis (SNA) is an approach and set of techniques which studies the exchange of resources (for example, information) among actors. SNA focuses on patterns of relations among nodes such as people, groups, organisations, or information systems ([B82], [WB88], [S91], and [WF94]). SNA demonstrates the value of ties and relationships between each node to provide a visual and mathematical representation of interaction and exchanges which influence behaviour. Managers realise that the key to continued success is within their understanding of how workflows and business processes can be optimised (e.g. [P02]). [BK06], reports that SNA may allow organisations, in financial trouble, to gain vital insights and discover survival prospects. In 2009, [H09] demonstrates that by studying IT-enabled processes, we can identify the contribution of IT to business process success, or improved performance. One of the main benefits of SNA is its ability to provide a methodology to gain deeper insight of how structural regularities influence behaviour [OR02].

Therefore, SNA is a very fitting methodology to deploy within this research to uncover more ‘truths’ as to the activities and their business process patterns. Thus, organisations can gain continuous and insightful feedback on how business processes are actually being executed, and where ‘gaps’ or ‘pain-points’ may exist. This enables BPM to overcome three major problems:

1. The need to isolate and measure the impact of IT in order to plan and design how the technology should support the business process across a service network.
2. The need to measure the success of IT-enabled BPM efforts as they are being implemented.
3. Determine how service-orientated process patterns influence the value configurability of service system networks.

In addition, [CP04] summarise the common social network applications including, supporting partnership and alliances, assessing strategy execution, improving strategic decision in top leadership networks, integrating networks across core processes, promote innovation, ensuring integration post-merger or large scale change, and developing communities of practice. Thus, BPM can benefit from the application of SNA. More notable, SNA can support BPM to discover business process dynamic behaviour while identifying where strengths, weaknesses, opportunities, and/or threats lie across a service network using SNA metrics. Measuring business networks can provide valuable insight on the operating status of a service network and determine whether change may be required, or provide knowledge where change may cause further problems through SNA simulation. Business process modelling and the evaluation of various scenarios for improvement are the main driving factors of renovating business processes. SNA allows us to graphically capture organisational interaction, and can provide us with an insight into how people’s understandings of business process are transferred onto their interactions. Thus, SNA provides an excellent methodology to offer managers a more simplified, practical, and reusable framework.

8 Conclusion

This paper provides a state of the art literature review and identifies some of the significant problems which emerge within BPM. In addition, the paper presents the need for BPM methodologies and techniques to adopt and simulate change within service-dominant logic. The justification for this is to understand how business processes influence service value and generates service innovation. The motivation is to propose the need to incorporate SNA techniques with BPM which presents managers with the ability to manage service network through the visualisation and simulation through the support of SNA and BPM combined to deliver a more robust and adaptive approach to managing complex service networks. This requires the development of a coherent framework to capture the value of service process behaviour. Through the affordance of SNA, this will allow us to define the characteristic of linkages to interpret key behavioural indicators. This will determine the structure and pattern of service process

relationships and identify the influence (cause and consequence) of relationships embedded in the service network

Acknowledgements

The research leading to these results has received funding from the European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement 215483 (S-Cube). For further information please visit: <http://www.s-cube-network.eu/>. This work was supported, in part, by Science Foundation Ireland grant 03/CE2/I303_1 to Lero - the Irish Software Engineering Research Centre (www.lero.ie).

Bibliography

- [A04] Aalst, W.M.P. van der (2004). Business Process Management - A Personal View. *Business Process Management Journal*, Volume 10, Number 2, pp.248-253.
- [A05] Abe, T. (2005). "The development of service science", *The Japanese Economy*, Volume 33, Number 3, pp. 55-74.
- [AC05] Afsarmanesh, H., Camarinha-Matos, L., M., (2005). A Framework for Management of Virtual Organization Breeding Environments, in *Proceedings of PRO-VE'05 – Collaborative Networks and their Breeding Environments*, Springer, Valencia, Spain, 26-28 September, pp. 35-48.
- [A03] Allee, V. (2003). *The Future of Knowledge – Increasing Prosperity through Value Networks*. Butterworth-Heineann.
- [BK06] Balkundi, P. and Kilduff, M., (2006). The ties that lead: A social network approach to leadership, *The Leadership Quarterly*, Volume17, pp. 419–439.
- [BCGMT05] Benatallah. B., Casati, F., Grigori, D., Motahari Nezhad, H. R., and Toumani, F. (2005), Developing Adapters for Web Services Integration, *Proc. of CAiSE*, retrieved on 18/02/2009 from website: <http://www.prism.uvsq.fr/~grig/These/adapters.pdf>
- [BM06] Bender-deMoll, S. and McFarland, D. A. (2006). The Art and Science of Dynamic Network Visualization, *Journal of Social Structure*, Volume 7, Number 2.
- [B82] Berkowitz, S. D. (1982). *An introduction to structural analysis: The network approach to social research*. Toronto: Butterworth.
- [BH03] Brynjolfsson, E. and Hitt, L. M., (2003). *Beyond Computation: Information Technology, Organisational Transformation, and Business Performance*, Edited by Scott Morton, M.S and Laubacher, R., *Inventing the Organizations of the 21st Century*, MIT Press.
- [C07] Chen, C., (2007). Social networks at Sempra Energy's IT division are key to building strategic capabilities, *Journal of Organizational Excellence*, Volume 26, Issue 2, Pages 16-24, January.
- [CS06] Chesbrough, H., and Spohrer, J. (2006). "A research manifesto for services science", *Communications of the ACM*, July, Volume 49, Number. 7, pp. 35-40.
- [CP04] Cross, R. L. and Parker, A. (2004), *The Hidden Power of Social Networks: Understanding how Work Really Gets Done in Organizations*, Harvard Business Press.
- [CKO92] Curtis, B., Kellner, M. I., and Over, J. (1992). Process Modeling. *Communications of the ACM*, Volume 35, Number 9, pp. 75-90, September
- [D93] Davenport, T.H. (1993). *Process Innovation*, Harvard Business School Press, Boston, MA.
- [D06] Davenport, T.H., (2006). "Competing on analytics", *Harvard Business Review*, January.

- [DM97] DeToro, I. and McCabe, T. (1997). "How to stay flexible and elude fads", *Quality Progress*, Volume 30, Number 3, pp. 55-60.
- [D88] Drucker, P. F. (1988). "Management and The World's Work". *Harvard Business Review*, Sept-Oct.
- [EHLB95] Elzinga D.J., Horak, T., Lee, C.H. and Bruner, C., (1995). *Business Process Management: Survey and Methodology*, IEEE Transactions on Engineering Management, Volume 42, Number 2, pp. 119-128, May.
- [EL05] Ernest-Jones, T. and Lofthouse G. (2005). *Managing Knowledge for Competitive Advantage*, the Economist Intelligence Unit. Retrieved from website: http://graphics.eiu.com/files/ad_pdfs/Tata_KnowHow_WP.pdf
- [FF04] Fitzsimmons, J. A. and Fitzsimmons, M. J. (2004). *Service Management: Operations, Strategy, Information Technology*, 5th ed. McGraw-Hill Irwin, New York.
- [F05] Foster, I., (2005). *Service-Oriented Science*. *Science*, Volume 308, pp. 814-817.
- [F06] Friedman, T. L., (2006). *The world is flat*. New York, Penguin Books.
- [G09] Glenn, M., (2009). "Organisational agility: How business can survive and thrive in turbulent times". A report from the Economist Intelligence Unit, *The Economist*, March 2009. Retrieved from Website [accessed on 1st September 2009]: <http://www.emc.com/collateral/leadership/organisational-agility-230309.pdf>
- [HC93] Hammer, M. and Champy, J. (1993). *Reengineering the Corporation: A Manifesto for Business Revolution*. New York, NY: HarperCollins Publishers.
- [H89] Handy, C. (1989), *Age of Unreason*. London, Arrow Books.
- [H09] Hassan, N. R., (2009). 'Using Social Network Analysis to Measure IT-Enabled Business Process Performance', *Information Systems Management*, Volume 26, Issue 1, pp 61-76
- [H97] Huffman, J.L. (1997). "The four Re's of total improvement", *Quality Progress*, Volume 30, Number 1, pp. 83-88.
- [H77] Hill, T.P. (1977). "On Goods and Services," *Review of Income and Wealth*, Volume 23 (December), pp. 315-338.
- [H09] Hsu, C., (2009). *Service Science and Network Science*, *Service Science and Network Science - Service Science*, Volume 1, Number 2, pp. i-ii.
- [H97] Huffman, J.L. (1997). "The four Re's of total improvement", *Quality Progress*, Volume 30, Number 1, pp. 83-88.
- [K89] Kanter, R. M. (1989). *The new managerial work*, *Harvard Business Review*, November-December, pp. 85-92.
- [K07] Krebs, V., (2007). *Managing the 21st Century Organization*, *IHRIM Journal*, Volume 9, Number 4.
- [LD98] Lee, R.G. and Dale, B.G., (1998). *Business process management: a review and evaluation*, *Business Process Management Journal*, Volume 4, Number 3, pp. 214-25.
- [MSB99] Morabito, J., Sack, I., Bhate, A., (1999). *Organization Modeling, Innovative Architectures of the 21st Century*, Prentice-Hall Publishers.
- [N01] Normann, Richard (2001). *Reframing business: when the map changes the landscape*. Chichester, New Sussex: Wiley
- [OR02] Otte, E. and Rousseau, R. (2002). *Social network analysis: a powerful strategy, also for the information sciences*, *Journal of Information Science*, Volume 28, Number 6, pp. 441-453.
- [P02] Papazoglou, M.P. (2002). *The World of e-Business: Web-Services, Workflows, and Business Transactions*. In *Lecture Notes In Computer Science, CAiSE '02/ WES '02: Revised Papers from the International Workshop on Web Services, E-Business, and the Semantic Web*, Volume 2512, pp, 153-173. London, UK. Springer-Verlag.
- [P03] Papazoglou, M., P., (2003). *Web Services and Business Transactions*. *World Wide Web: Internet and Web Information Systems*, Volume 6, pp. 49-91. Kluwer Academic Publishers.
- [P07] Papazoglou, M. P. (2007), *Web Services: Principles and Technology*, Prentice Hall.

- [PBLDKL08] Pedrinaci, C., Brelage, C., van Lessen, T., Domingue, J., Karastoyanova, D., and Leymann, F., (2008). Semantic Business Process Management: Scaling up the Management of Business Processes, 2nd IEEE International Conference on Semantic Computing (ICSC) 2008, IEEE Computer Society.
- [REMCV02] Rubery, J., Earnshaw, J., Marchington, M., Cooke, F. and Vincent, S. (2002). Changing organisational forms and the employment relationships, *Journal of Management Studies*, Volume 39, Number 5, (July), pp. 645-672.
- [RK02] Rust, R.T. and Kannan, P.T., (2002). "The Era of e-Service" in *E-Service: New Directions in Theory and Practice*, R. Rust and P. Kannan, (eds.), Armonk, NY: M.E. Sharpe, pp. 3-24.
- [S08] S-Cube (2008). European Community's Seventh Framework Programme FP7/2007-2013. <http://www.s-cube-network.eu/>
- [SG89] Scase, R. and Goffee, R. (1989). *Reluctant Managers*, London, Routledge.
- [S91] Scott, J. (1991). *Social Network Analysis: A Handbook*. London. Sage
- [SF03] Smith, H. and Fingar, P., (2003). *Business Process Management: The Third Wave*, Meghan-Kffer Press, Tampa, FL
- [SMBG07] Spohrer, J., Maglio, P. P., Bailey, J., and Gruhl, D., (2007). "Steps Toward a Science of Service Systems," *IEEE Computer*, Volume 40, Number 1, pp. 71-77.
- [SM08] Spohrer, J., and Magilo, P.P. (2008). The emergence of service science: toward systematic service innovations to accelerate co-creation of value. *Production and Operations Management*, 2008 – POMS
- [SAPAG08] Spohrer, J., Anderson, L., Pass, N., Ager, T., Gruhl, D. (2008). *Service Science. Journal of Grid Computing, Special Issue on Grid Economics and Business Models*.
- [VWVV07] Van Oosterhout, M., Waarts, E., van Heck, E., and van Hillegersberg, J., (2007), *Business Agility: Need, Readiness and Alignment with IT Strategies*, Chapter 5, *Agile Information Systems: Conceptualization, Construction, and Management*, Elsevier Inc
- [VMA08] Vargo, S. L., Maglio, P. P. and Akaka, M. A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal*, Volume 26, pp. 145-152.
- [WF94] Wasserman, S. and Faust, K., (1994). *Social network analysis: Methods and applications*. Cambridge, NY: Cambridge University Press.
- [WSB02] Weill, P., Subramani, M., and Broadbent, M., (2002). Building IT infrastructure for strategic agility. *Sloan Management Review*, Volume 44, Number 1, pp. 57-65.
- [WB88] Wellman, B. & Berkowitz, S. D. (1988). *Social Structures: A Network Approach*. Greenwich, CT: JAI Press
- [WDLBNVP09] Wetzstein, B., Danylevych, O., Leymann, F., Bitsaki, M., Nikolaou, C., van den Heuvel, W-J., and Papazoglou, M., (2009). Towards Monitoring of Key Performance Indicators Across Partners in Service Networks, *Proceedings of the Fifth International Conference on Networking and Services (ICNS 2009)*, Valencia, Spain, April 20-25. Springer Berlin Heidelberg.
- [Z97] Zairi, M., (1997). Business process management: a boundaryless approach to modern competitiveness, *Business Process Management*, Volume 3, Number 1, pp. 64-80.