Service Capabilities within Open Innovation – Revisiting the Applicability of Capability Maturity Models

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Service capabilities within open innovation: Revisiting the applicability of capability maturity models

Noel Carroll Markus Helfert

Service capabilities within open innovation

Revisiting the applicability of capability maturity models

Noel Carroll
Department of Management and Marketing, University of Limerick, Limerick, Ireland, and
Markus Helfert
Dublin City University, Dublin, Ireland

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Abstract

Purpose – Open innovation is an emerging paradigm which exposes organisations to networked capabilities and competencies though collaboration relationships. The traditional view of the organisational environment raises concerns regarding the mismatch in the methods used to assess business value and understanding service process maturity. The purpose of this paper is to address this gap.

Design/methodology/approach – This paper employs a systematic literature review to present a state-of-the-art literature review with particular focus on the applicability of capability maturity models (CMM) within an open innovation context.

Findings – The authors present a conceptual account of our research developments and build on the state-of-the-art which bridges open innovation and CMM. The authors provide a comprehensive discussion on the literature and challenge the applicability of individual organisations evolving through maturity stages. The authors identify a significant gap in the emergence of open innovation and CMM and present a service capability sourcing model (SCSM) to bridge these two research areas.

Practical implications – Unpacking the nature of service capabilities allows us to understand the primary components of value co-creation and their contribution towards service maturity within an open service innovation environment. The authors verify the explanation model using a cloud computing scenario within an open service innovation environment.

Originality/value – The contribution of this paper is an explanation model of an open service innovation environment through our SCSM. Though an open innovation perspective, the authors examine the nature of service capabilities and the suitability of traditional CMM in a modern service context.

Keywords Open innovation, Value creation, Capability maturity models, Service capabilities, Service capability sourcing model

Paper type Research paper

1. Introduction

In today's service-dominant business environment, harnessing innovative applications of technology is considered one of the critical factors towards organisational sustainability (Carroll *et al.*, 2013). In recent years there have been two major trends across the service world towards "servitization" (Vandermerwe and Rada, 1989; Neely, 2007, 2008) and "openness" (Chesbrough, 2003, 2011) of service components. There have been several attempts to define servitization. For example, Neely (2008) defines servitization as "a business model innovation whereby existing product offerings are extended through the provision of related services". In addition, Baines *et al.* (2008) defines servitization as "the process of innovation of an organization's capabilities and processes to shift from selling products to selling integrated products and services that deliver value in use". What these definitions have in common is the shift in focus from selling products/services

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to availing of service capabilities to deliver value in use from integrated products/services. Thus, service capabilities have become a central construct in management research and have played a prominent role in competitive heterogeneity (Felin *et al.*, 2012). The service industry continues to play a critical and dominant role within the global economy (Normann, 2001; Fitzsimmons and Fitzsimmons, 2004; Spohrer *et al.*, 2007; Chesbrough, 2011). A service may be defined as "a means of delivering value to customers by facilitating outcomes customers want to achieve, without the ownership of specific costs and risks" (Orand, 2010, p. 39). This is often enabled through the use of information technology (IT). Service orientation has emerged at multiple organisational levels in business to support the leveraging of technology capabilities in response to the need for greater business integration, flexibility, and agility (Saleh and Alshawi, 2005; Boh and Yellin, 2007; Demirkan *et al.*, 2009). Nowadays, services are wrapped up in a complex business and IT environments (Carroll, 2012). For example, the internet offers a distributed platform to port services across the world and has become one of the most significant industrial drivers in recent years. The internet supports networking and connectivity of business objects though complex IT infrastructures. This captures the importance of internet tools and technologies to support computing utility. Moreover, it has also led to the realisation of new boundary-free service models such as cloud computing (e.g. Davenport and Brooks, 2004).

1.1 Research background

The concept of "open innovation" also captures the boundary-free view of the modern global service environment which contributes towards organisations ability to harness innovation for competitive advantage (Chesbrough, 2003). In essence, organisations can now take advantage of existing innovations to propel technologies. This suggests that innovation is no longer an internal asset but rather an exchangeable entity which can be altered through service networks and customised to generate business value (e.g. crowdsourcing). However, it is a concern that much of the debate on open innovation is orchestrated by IT companies who focus on technical aspects which supposedly differentiates service delivery. While much of the effort still lies in understanding the benefits of its technical infrastructure, the fundamental concern comes down to whether it can add business value from open innovation. More importantly, one of the biggest challenges facing organisations (e.g. IT vendors) is developing a mechanism to assess the business value of harnessing open innovation to avail of newfound capabilities.

Considering that organisations can now avail of globally distributed knowledge, the service ecosystem is considered to be a "flattened" (Friedman, 2006) global stage of innovation. This is what we describe as the combination of servitization and open innovation. Organisations can therefore benefit from proven ("tried and tested") research, for example, through the form of software licences. While we accept that the concept of open innovation has gathered increasing momentum across many research domains, we have identified a correlation between the ability to engage in an open innovation environment and the ability to in-source service capabilities. Now that the service ecosystem is considered to be a "level playing field" (Friedman, 2006), the questions of how do organisations perform differently and how does an organisation compete by availing of widely available service capabilities remains unclear (Carr, 2004). These broad questions have stimulated our interests to delve into understanding service capability maturity within a modern context, i.e. an open service innovation environment. By disaggregating service capabilities into process components we set

out to explain how service maturity is no longer an evolving process but rather an ad hoc (almost knee jerk reaction) capability sourcing and matching process.

1.2 Research focus

The objective of this conceptual paper is to examine an open service innovation environment from a capability perspective (see Figure 1). Revisiting the discussion on capability maturity, we propose an explanation model that differentiates significantly from the traditional stage approach. We argue that, driven by service orientation and openness, the traditional staged capability maturity model (CMM) view needs revision.

Organisational change is one of the driving forces to sustain competitive advantage, particularly through the exploitation of IT capabilities (Henderson and Venkatraman, 1993; Tapscott, 1999; McFarlan and Nolan, 2003; Teece, 2009). Over the past few years, there have been continued economic pressures exerted on organisations to perform at an optimum level (Demirkan *et al.*, 2009). Managers continue to seek alternative ways to meet the demands of the service world while exploiting service provision opportunities (Demirkan *et al.*, 2009). This is evident with the popular uptake of cloud computing initiatives (Sharif, 2010; Carroll *et al.*, 2013, 2014). Thus, the nature of "service" has transformed over the past two decades, shifting from an individualistic organisational offering to a network offering. Greater emphasis is placed on the affordance of technology to sustain competitiveness and continual improvement. Investing in IT is now central to service management strategy. However, identifying where to invest IT in the service infrastructure (strategically) and how much to invest in IT (financially) remain the two main concerns for businesses and across academia, hence the emergence of "Service Science". While this paper does not focus on Service Science, it is worth noting that Service Science acts as an interdisciplinary umbrella which incorporates widely diverse disciplines to construct, manage, analyse and evolve service systems (Carroll, 2012). The explosive growth in Service Science is motivated by the need to develop more systematic, analytical, and overarching approaches to understanding the complexity of services (Spohrer *et al.*, 2007; Carroll, 2012). We identify the need to understand the mechanics of service networks

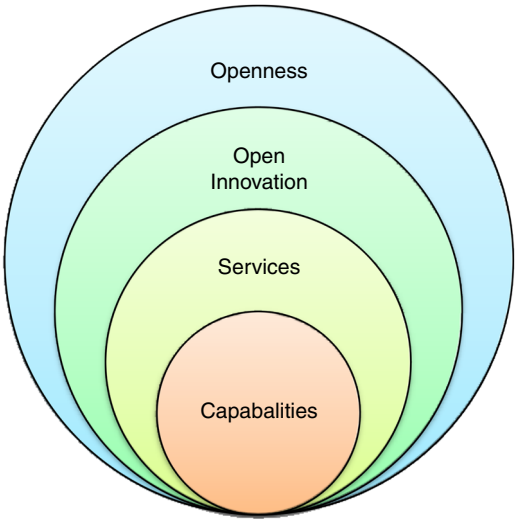

Figure 1.
Research overview: an open service innovation environment

and "explain" (Gregor, 2006) the organisational capabilities and maturity of modern service systems.

Section 2 outlines the research methodology which was employed in this paper. Section 3 provides a discussion on the state-of-the-art literature while Section 4 begins to develop new insights on capabilities within a modern service environment. Section 5 focuses on the concept of value and value co-creation within the service environment. Section 6 introduces the service capability sourcing model (SCSM) while Section 7 offers a discussion on the theoretical developments in this paper and the research implications of this work. Section 8 concludes the paper and offers some insights on our future research agenda.

2. Methodology

We present a conceptual account of our research developments (Creswell, 2013) and build on the state-of-the-art on open innovation and CMM. Considering the exploratory nature of this research, we adopted a conceptual study to build on the current body of knowledge and we discuss the need to extend our conventional understanding of service maturity. This enabled us to survey the state-of-the-art body of knowledge from published research on this specific domain. In order to broaden the scope of this research, a systematic literature review was carried out. A systematic literature search (see Figure 2) was employed which focuses on "service capabilities", "open innovation", "CMM" and "methods of assessing the value of IT". To provide a unique contribution of this research, an exploratory search was also conducted to identify weaknesses in CMMs, assessing value in service technology and outsourcing technologies, for example, cloud computing. The research question was formulated by the research problem outlined in Section 1.1 and became the starting point for our literature review and allowed us to identify the scope of this work. Our research question is:

RQ1. How does the conventional logic of capability maturity models cater for service capabilities within an open service innovation environment?

Figure 2 illustrates the various processes which were carried out with regards to the systematic mapping process and analysis phases. Each of the individual processes contributed towards the refinement and quality of the research undertaken. Thus, the literature review became an essential factor to explore the research question and examine the relationship between open innovation and CMM. We also adopt the

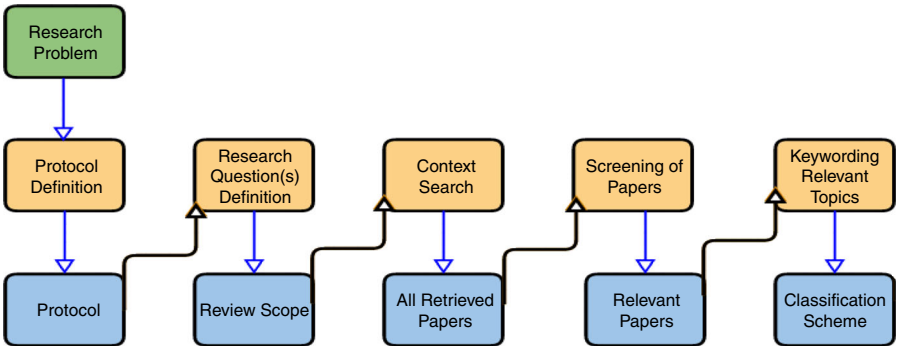

Figure 2.
Literature review methodology

principles of design science (Peffers *et al.*, 2007; Hevner, 2007) based on the cycle of identifying the problem, developing an artifact from the research developments, problem solving and contributing towards the knowledgebase in this field.

3. Literature review: state-of-the-art

We carried out an extensive review of the literature to support our conceptual argument and address the research question. We discuss the theoretical basis for this paper and examine service and innovation capabilities. We also explore the nature of open innovation environments and the concepts of capability maturity.

3.1 Theoretical basis

Despite the theoretical developments to identify questions on "how do we assess the value of the IT investment?" across strategic management literature, a satisfactory understanding appears to elude open innovation theorists. Organisations are now looking at ways to tap into innovation beyond their formal boundaries (Birkinshaw *et al.*, 2011) to improve service offerings. We explore the literature to derive key characteristic of an open service innovation environment within the following sections:

(1) service and innovation capabilities: these are critical building blocks which sustain a service environment;

(2) open innovation environments: allows us to examine the co-creation of value through the diffusion of innovation from external resources; and

(3) traditional capability maturity view: allows us to examine the suitability of current practices to assess of business value from IT investment.

From a traditional organisational viewpoint, explanations were offered using a resource-based view (RVB). The RBV suggests that although organisations may operate in the same industry, the nature of the resources used differ and therefore has the potential to offer different performance contributions (e.g. Penrose, 1959; Wernerfelt, 2006). However, this offers a very disconnected or individualistic interpretation of a service operating internally to produce a specific outcome. More recently, there has been considerable focus on the promise of technology to drive the differentiation factor between organisations (e.g. Normann, 2001; Weill *et al.*, 2002; Spohrer *et al.*, 2007). However, while armed with similar technological resources, many organisations have similar tools and began offering similar services (Clemons and Row, 1991; Carr, 2004). In more recent years, strategists began to explore methods to justify the cost in IT investments (Clemons, 1991; Dos Santos, 1991; Devaraj and Kohli, 2002; Alshawi *et al.*, 2003; Ettlie, 2012). One of the most notable developments included CMM which acknowledges the evolutionary nature of organisational environments which is supported through IT investments (e.g. Curtis *et al.*, 1997; Helfat and Peteraf, 2003; Curley, 2009). More specifically, there has been considerable research directed at the relationship between IT investment and capability maturity and its contribution towards organisational performance (e.g. Paulk *et al.*, 1993; Team, 2002; Curley, 2009; Donnellan *et al.*, 2011). Thus, the literature suggests that IT investment can be reconfigured to leverage organisations growth. The CMM has become one of the main approaches to examine the impact of IT investment across management studies (e.g. Curley, 2009). Yet, while much of the attention is placed upon the impact of IT investment on capability maturity, there are few efforts to challenge the relevance of CMM within a modern service environment supported through open innovation. In this paper, we address this gap within capability maturity literature. First, we offer a discussion on

the shortcomings in the CMM conventional logic within a modern service context. Second, we expand on the need to extend theoretical developments on capability maturity towards an open service innovation environment viewpoint. The basic premise of our paper is that CMM is no longer an internal issue but rather a networked contribution of a wider service eco-system which exchanges service capabilities to sustain competitive advantage through the unique deployment of service capability components. Melville *et al.* (2004, p. 297) do consider the need to look at "linking multiple firms via electronic networks and software applications and melding their business processes […] [since] trading partners increasingly impact the generation of IT business value for the focal firm". We propose that internal IT investment is no longer a direct link to service performance. We explain how outsourcing IT capabilities now plays a dominant role to support short, spontaneous and proactive maturity lifecycles (previously described as "knee-jerk" reactions) which extends service capabilities and competencies.

3.2 Service and innovation capabilities

Service environments become increasingly complex when technology is implemented to execute specific processes to deliver a service. This ultimately adds to the complexity of a service environment, making it one of the most difficult environments to examine and manage service capabilities. Capabilities are complex, structured, and multi-dimensional (Winter, 2000). They may be described as fundamental determinants resource utilisation to support and sustain organisational performance (Teece, 2009). Managing process maturity has been well documented throughout the business and IT literature. In IT management, maturity models play an important and influential role in organisational change (Becker *et al.*, 2009; Curley, 2009). The availability of service and innovation capabilities has motivated us to review how we conceptualise the service environment. For example, Normann (2001, p. 114) describes a service from an alternative or unconventional viewpoint (emphasis added):

> Services are activities (including the use of hard products) that make new relationships and new configurations of elements possible […]. Viewing the economy as a web of activities and actors linked in co-productive value creation gives us another […] more creative view of the nature of "offerings". Offerings are artifacts designed to more effectively enable and organize value co-production.

The success of innovation often relies on a number of contributing factors. For example, according to Birkinshaw *et al.* (2011, p. 3) the following "conditions" contribute towards sustained innovation:

(1) shared understanding: cultural understanding of organisational behaviour;

(2) alignment: aligning systems and processes to achieve desired performance metrics;

(3) tools: training, concepts, and techniques to innovate;

(4) diversity: optimising external influences and insights to offer solutions within a particular domain;

(5) interaction: establishing platforms to exchange ideas and build networks; and

(6) slack: providing opportunities to access additional resources to develop ideas.

These conditions contribute towards organisations overall competencies and capabilities. Organisational capabilities may be considered to be the core stability factor of a service

operation since they focus on internal processes, functions, and systems to meet customer needs. Thus, organisational capabilities foster unique service-specific routines (Felin *et al.*, 2012) which enable competencies to harness competitive advantage and are typically directed towards achieving defined goals and strategies (Winter, 2000). More specifically, an organisational capability may be described as "a high level routine (or collection of routines) that, together with its implementing input flows, confers upon an organisation's management a set of decision options for producing significant outputs of a particular type" (Winter, 2000). It is interesting that Winter identifies "routine" as the contributing factor of capabilities since it conjures a notion of learned behaviour which follows a specific execution pattern that is repetitive in nature. Routines are relatively fixed, static objects which reflect an agreement of how things are done, i.e. imposing a control mechanism through repetitive patterns (Feldman and Pentland, 2003). Thus, routines encode organisational capabilities and knowledge in a learning cycle (see Figure 3). However, this suggests that services may be predictable and relatively static in nature – but we know that this is not necessarily the case. For example, consider the concept of "dynamic capabilities". Collis (1994) suggests that dynamic capabilities govern the rate of change of ordinary capabilities. Dynamic capabilities are traditionally believed to involve patterned activities which originate from service objectives. However, we argue that through a complex service network of value co-creation, dynamic capabilities are influenced by external market forces which request capabilities on-demand as we will describe in a cloud computing context (see Section 6.2). By "value co-creation" we imply that the interaction or relationship acts as the locus of mutual value creation between service actors (further discussed in Section 5).

Creating a value IT strategy suggests that organisational objectives have been realised through the effective deployment of service capabilities. The service capabilities must compete with the external environment to generate some form of uniqueness, differentiation, or even rarity from other competitors (Barney, 1991, 2003; Carr, 2004). In addition, the external environment must place some form of value on the packaged

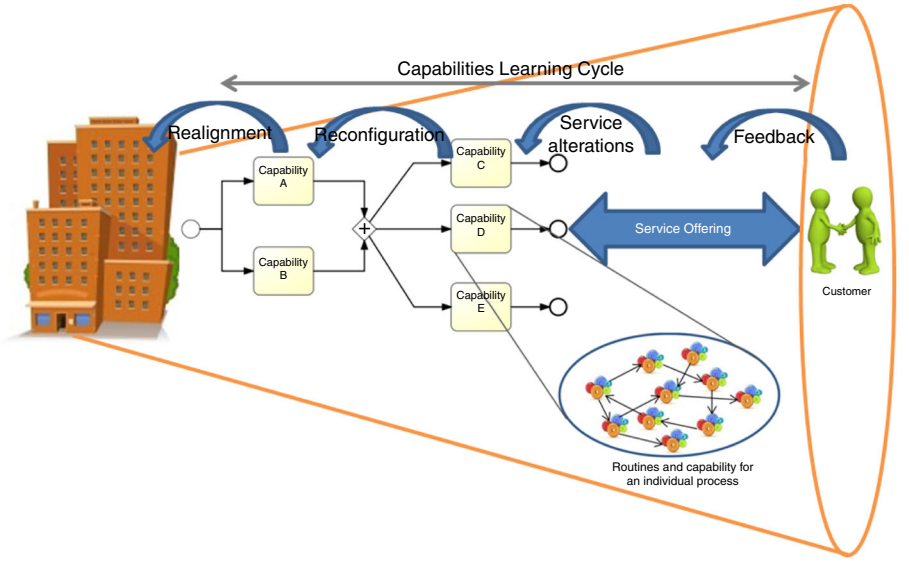

Figure 3.
Basic overview of service capabilities supporting service provision

outcome from a service, for example, IT support. There have been some efforts to understand the role of IT in value creation. For example transaction cost theory (TCT) (Clemons and Row, 1991; Gurbaxani and Whang, 1991) is one approach to examine how technology reduces transaction costs. Thus, resources are central to the sustainability of competitive advantage. This is true for a RBV of IT business value. Melville *et al.* (2004) propose that "IT and non-IT resources and the business processes of electronically connected trading partners shape the focal firm's ability to generate and capture organisational performance" (Melville *et al.*, 2004, p. 307). IT business value research examines how organisational performance results from IT investment and to what extent the application of IT leads to improved performance (Melville *et al.*, 2004). By performance, scholars have referred to productivity enhancement, profitability improvement, cost reduction, competitive advantage, inventory reduction, and other measures of performance (e.g. Hitt and Brynjolfsson, 1996). Nowadays, the focus is often on optimising internal routines and capabilities though individual processes. In most cases, managers opt for CMM and IT service management (ITSM) as traditional approaches to evaluate the utilisation and alignment of IT resources in service optimisation.

3.3 Open innovation environments

Open innovation is considered to be a relatively new concept which examines the creation of value through the diffusion of innovation from external resources (Chesbrough, 2003). The funnelled approach of the open innovation model (Chesbrough, 2004) combines external technologies with internal capabilities to realign service provision for a targeted market opportunity.

Open innovation assumes that organisations ought to avail of external ideas and merge them with internal plans to advance specific technologies and service offerings. In many cases, organisations will enter into a business relationship to combine specific competencies and capabilities in order to reach a certain goal and share a risk in doing so. This removes what was once considered to be boundary barriers and frees up the flow of innovation transferability between organisations to distribute knowledge. One of the key drivers of open innovation is the obvious cost savings required in an internally dedicated research team to develop new technologies. Nowadays, organisations often opt for licence agreements or joint ventures. Thus, open innovation has altered the concept of service capabilities from what was traditionally considered to an internal resource is now an external opportunity within the modern service environment. We will explain how the concepts of the open innovation model share similar characteristics to what we describe as the open service innovation environment.

3.4 Traditional capability maturity view

There has been much debate as to methods to achieve organisational efficiency across business and IS literature with the implicit aim of achieving the highest operational level. One of the most prominent research developments stems from the CMM created by IBM's Watts Humphrey (Humphrey, 1989) at the Software Engineering Institute (SEI). The theoretical bases for the CMM are centred on the need to evaluate and strategies process improvement though a defined number of maturity stages which represent organisational growth. The CMM is an investigative tool to support users in understanding and improving software processes to reach a specific growth/performance goal. In essence, the goal of the CMM is to optimise processes and practices within an organisation to generate a greater return on investments such as IT (Brodman and Johnson, 1994; Sward, 2006). CMM guides organisations to define and qualitatively

assess several organisational levels, to identify areas of gradual improvement. During our extensive research on CMM approaches, we examined their applicability within the modern service environment, particularly an open innovation context. In so doing, we identified a significant finding which challenges the suitability and applicability of CMM within open innovation.

4. Capabilities within the modern service environment

This section builds on the literature review and examines capabilities within a modern service environment and the process of value creation. Capabilities are enabled through the utilisation of resources. One of the most widely accepted definitions of resources stems from Capron and Hulland (1999, p. 42) where they define resources as "stocks of knowledge, physical assets, human capital, and other tangible and intangible factors that a business owns or controls, which enable a firm to produce, efficiently and/or effectively, market offerings that have value for some market segments". Additionally, Teece *et al.* (1997, p. 516) offer a more general definition of resources as "the firm specific assets that are difficult, if not impossible to imitate". These views suggest that competitive advantage and performance are a direct consequence of how organisational resources and capabilities are uniquely created, owned and/or controlled internally. Since IT resources can now be viewed as a commodity and is relatively standardised across organisations, moving away from differentiation or competitive advantage, we argue that this resource view is not necessarily accurate (Porter, 1980; Carr, 2004). Chandler (1990) defines organisational capabilities as an organisations collective physical facilities and skills of employees and the expertise of top management layers. Thus, capabilities provide a building block towards organisational core competencies (Coulter, 2002), for example, research and development. As highlighted by O'Regan and Ghobadian (2004) organisational capabilities include the organisations "capacity for undertaking, through its employees, a particular productive activity". This is also extended by Helfat's (2003, p. 1) descriptions as he explains that "an organisational capability refers to an organisational ability to perform a co-ordinated task, utilising organisational resources, for the purpose of achieving a particular end result". This suggests that there is a clear relationship between capability and performance. However, we examine this in terms of the capability being externally sourced, as in the case of open innovation. We argue that capability is no longer an internal issue as the literature might suggest (Stuart and Podolny, 1996; Teece *et al.*, 1997; Schoenecker and Cooper, 1998; Fiol, 2001; Winter, 2003; Melville *et al.*, 2004; Curley, 2009) to generate change and ultimately business value. Services have become more complex and dynamic which introduces the notion of dynamic capabilities. According to Winter (2003, p. 2) dynamic capabilities "are those that operate to extend, modify or create ordinary capabilities […] [and] involves a pattering of activity" which is interesting when we examine the extension, modification, and co-creation of service value. We refer to value co-creation as the combining of organisational resources and capabilities between two or more organisations to create mutual value through a unified service strategy (Vargo *et al.*, 2008; Carroll, 2012).

As demonstrated above, there are numerous definitions throughout management literature which examines the multidimensional nature of organisational capabilities. Collis (1994) classifies many of the definitions into three broad categories:

(1) Performance: capabilities are those that reflect the ability to perform the basic functional activities of the organisation. This suggests that capabilities are developed functional areas which comprise of defined business processes.

(2) Repeated processes: capabilities are repeated processes which are responsive to market trends and short lifecycles. This suggests that an organisation must be agile to adapt to customer needs by refocusing organisational capability deployment.

(3) Strategize value creation: realising the value of resource allocation to execute and enable novel strategies by deploying organisational resources.

The relationship between capabilities and performance has been well documented throughout organisational strategy literature from a number of different perspectives (De Carolis, 2003; Barney, 2003; O'Regan and Ghobadian, 2004). For example, the literature examines capabilities from a RBV (Teece *et al.*, 1997), organisational learning theories (Davies and Brady, 2000), knowledge-based view (Grant, 1996), and dynamic capabilities (Helfat *et al.*, 2007). We define capabilities as a partial representation of the collective ability to carry out specific business processes across a network in a cyclical, efficient, and relatively predictable manner to contribute towards organisational performance. Thus, from a technological viewpoint, we can view capabilities as being socially embedded routines which may be captured through technological means, i.e. automated processes. They support the transformation of inputs into outputs which are the product of each individual process that are networked together to contribute to the entire service system. More recently, scholars have begun to examine organisational capabilities from a microfoundations view. Microfoundation literature is largely concerned with economic entities, i.e. the microeconomic analysis of individual agent behaviour which may influence supply and demand (e.g. Felin *et al.*, 2012). We acknowledge the need to examine service capabilities in greater detail and examine the notion of reconfiguring resources to meet on-demand requirements is a precursor for dynamic service capabilities. Thus, the interconnectedness of the service ecosystem attributes to the value realisation of service capabilities and potentially influences the maturity and ultimately the value of service processes.

4.1 Capabilities attributes

The ultimate goal of an organisational capability is to contribute towards some form of business value. There are a very large number of variables which are dependent on the context and industry which determine the important role capabilities play in value creation. Based on the definitions and descriptions discussed throughout the literature, at an abstract level we may identify the attributes of a capability to include:

- objective achievement;
- hierarchical structure;
- resource utilisation;
- component interaction;
- performance orientated;
- cyclical or repeated processes;
- end-to-end events;
- process enabling;
- value creation;
- outcome focused;

- measurable; and
- maturity driven process.

The concept of capability maturity is not novel as it may be traced back to scientific applications of management practices to improve business processes (e.g. Taylorism). However, the concept of CMM has received interest across other fields. For example, it has been applied in software engineering and IT management within a business context. As described above, the primary objective of CMM is to examine the linkage between IT investment and organisational performance maturity. Our quest is to explore CMM shortcomings in terms of a networked value co-creation service environment. We develop an understanding of their phenomena in terms of the networked service entities and their interaction to offer additional external service capabilities at a macro-level. Micro-level phenomena, specifically, individuals, processes, and structures, play a central role in the origins of management theory (Felin *et al.*, 2012, p. 1352). These are important causes of the emergence, function, and dynamics of service capabilities. Thus, capabilities comprise of constituent components which may be temporally prior to others whose interactions with other components contribute to the aggregation and emergence of collective constructs. Herein, we refer to this a value co-creation. The exchanges are idiosyncratic in nature which act as representative agents of service capabilities but who collectively stabilise a service network (Carroll, 2012). From a CMM perspective, the argument for such upward progression through the maturity stages is missing appropriate assumptions which restrict its application within a modern service environment. Maturity is not an internal issue since service providers often rely on sourcing external capabilities to support internal operations as demonstrated through open innovation.

4.2 Dynamic capabilities

Dynamic capabilities are considered the source of competitive advantage (Teece and Pisano, 1994). Teece and Pisano (1994) identify two key aspects in harnessing competitive advantage through dynamic capabilities which may apply to an open service innovation environment:

(1) the shifting character of the environment; and

(2) the importance of strategic management in agility, adaptability and reconfiguring internal resources to meet external demands.

Thus, dynamic capabilities are considered to have a long-term or strategic relevance in service provision (O'Regan and Ghobadian, 2004). For example, Winter (2003, pp. 4-5) suggests that "dynamic capabilities typically involve long-term commitments to specialised resources […] [and] […] there must be an ecological demand for the costs of the capability and the use that is actually made for it". However, within a modern service ecosystem this conventional logic regarding organisational capabilities should be updated. For example, drawing on traditional strategy literature, Collis (1994, p. 143) explains that "the strategy field will never find the ultimate source of sustainable competitive advantage" does not apply to a modern service environment (e.g., cloud computing). While much of the literature focuses on intrinsic organisational heterogeneity to examine how capability differences contributed to market competitiveness and profits (e.g. Zahra and Nielsen, 2002; Stockdale and Standing, 2004), we examine the extrinsic nature of the networked service environment. This can be argued through the progressive field of open innovation and its current advocacy for on-demand access to additional

service capabilities. Collis (1994, p. 144) argues that capabilities "are not always sources of sustainable competitive advantage, and […] are certainly not the 'ultimate' source". Consider the force of competitiveness which ignites the need to innovate new services through improved or invented capabilities. Capabilities therefore are the result of tacit knowledge which has the collective power to stabilise and evolve a service ecosystem. In addition, Collis' (1994, p. 146) argument that "all profits are returns to factors in fixed supply" is no longer valid today since service demand is unpredictable in nature (Ng *et al.*, 2010). In fact, according to Ng *et al.* (2010, p. 14), in most cases, the value co-creation relationship of the customer within the system "introduces a high degree of variety and exhibits autonomous behaviour". Thus, the volatile nature of capability availability and exchanges erodes much of the competitiveness of service provision in a digital marketplace. This raises an apparent paradox between a service network openness or connectedness and competitive sustainability. Sustaining a service capability is therefore likely to be of a limited duration due to technological advances and mass customisation of services, similar to the concept of "creative destruction" from Schumpeterian theory (Schumpeter, 1934). Due to the availability of alternative services to deliver similar service competencies, efficiency differences are no longer the differentiating factor in distinguishing service capabilities which is becoming more apparent through open innovation.

5. Value creation within the modern service environment

This section argues the need to re-evaluate how we conceptualise value creation within a modern service environment. The concept of value co-creation implies that the customer plays a significant role in creating value within service systems (Carroll, 2012). Thus, understanding the complexity of network structures, process patterns, and methods to improve network performance is critical to the success of service eco-systems, for both the service provider and client, especially within a smart service network (Spohrer *et al.*, 2007; Carroll, 2012). Thus, the process of value creation changes within modern service environment as we move away from a chain approach to a service network. We can explore alternative ways to view and understand service operations and fundamentally the capabilities which sustain a service environment. In addition, Chesbrough (2011) provides an interesting argument in the need to move from a product-based view of service (such as Porters value chain) to a service value web. We can identify how this may be applied to examine the cyclical nature of service maturity within an open service innovation environment. Within the service value web, Chesbrough (2011) explains that there is no simple linear process of material inputs being transformed into outputs, but rather comprises of an iterative process that involves the customer in the whole process experience. While the service value web undergoes a number of key phases, its relationships also creates value through external interactions with customers. Therefore, the implementation of technological innovation is often concerned with improving internal value. However the realisation of service maturity and value is a co-creation process which involves the exchange of internal and external resources. This is important in open innovation for a number of reasons. Understanding the nature of service capabilities of open innovation become increasingly important as part of organisational strategic planning.

5.1 From an individualistic business model to a network service model

Considering the extensive literature review on open innovation and capabilities, our immediate objective is to ground a definition of capabilities in a modern service context.

We appreciate the inherent interchange between the concept of "routine" and "capability". For example, both include the notion of repetitiveness, performatative, recognises patterns of actions, explicitly collective though multiple actors (e.g. Feldman and Pentland, 2003; Felin *et al.*, 2012). Thus, the core focus is on service interaction and capability exchange process within the whole eco-system of inquiry. Winter (2000, 2003) suggests that an "organisational capability is a high level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type". Organisational resources contribute to contribute towards service capabilities and putting resources into action to extend performance and competencies.

There has also been some excellent work on developing a lifecycle analytical framework on managing outsourcing. For example, Cullen *et al.* (2005) presents a four-phase outsourcing life-cycle model with 54 key activities. Their work is motivated by over a decade of experience and findings which suggest that there are a number of factors which support outsourcing success including "retaining core IS capabilities, optimizing sourcing options, sourcing selectively, having an intent that supports enterprise strategy (such as cost reduction or business transformation), signing the appropriate type of contract, managing across the lifecycle, managing the relationship, and motivating the supplier by knowing its behaviours and capabilities" (Cullen *et al.*, 2005, p. 230). Ultimately, the nature of service has transformed from an individualistic internal service maturity effort to a networked value co-creation service network where maturity can be sourced through external capabilities.

Managers require some form of guidance to support their ability to assess and optimise business processes. Processes and capabilities are considered to be central constructs in the field of management research (Felin *et al.*, 2012). Their orchestration and optimisation play a critical role in linking knowledge with operations to support organisational heterogeneity. Thus, the performance of capabilities often evolves through interactions and hierarchy of action execution. While capabilities and performance are theoretically linked we may examine the constructs which co-create value which contributes towards performance (Figure 4).

Figure 4 illustrates the main building blocks which contribute towards the stabilisation of a service ecosystem in the creation of value. We recognise that within these building blocks there are complex constituent components which influence service processes, behavioural, functional, and structural factors (Carroll *et al.*, 2010). Upon further inspection, capabilities may be viewed from a number of conceptually different processes, for example (Felin *et al.*, 2012):

(1) emergence;

(2) maintenance/reproduction;

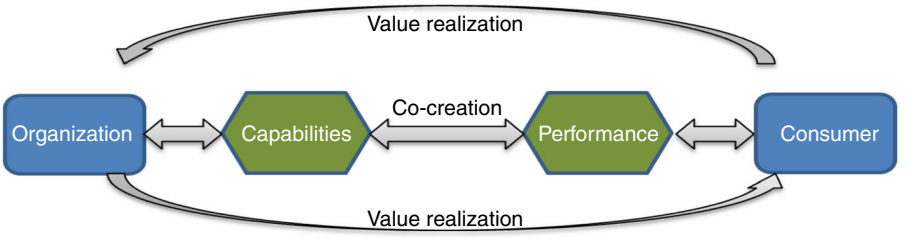

Figure 4.
Service capabilities overview

(3) change; and

(4) displacement.

While we identify the difference in the various viewpoints in capabilities, we stress that there is an overarching process of maturity which impacts on all aspects of capabilities. Maturity implies a state of development and therefore requires an entity to change and grow and introduces a new layer of complexity (Carroll *et al.*, 2013). Nevertheless, it must be recognised that no solution is deemed adequate in today's service-dominant environment. Becker *et al.* (2010) examines IS research and explains that the literature is "rarely endeavoured into reflecting and developing theoretically sound maturity models". In addition, they provide a comprehensive discussion on the developments on CMMs (summarised in Table I). As demonstrated in Table I, although there have been many developments on CMM, few efforts are adequate for an open innovation environment. We propose the need for an ad hoc sourcing service capability model since the service environment is not highly patterned and is responsive in nature albeit comprising of micro-patterns of practiced performance (i.e. rules and principles). Thus, this forms part of our motivation towards the development of a SCSM.

6. A fluid SCSM

This section supports our argument and the conceptual contribution of this research. As discussed throughout this paper, service relationships play a critical role in outsourcing newfound capabilities and the need to examine the exchange process across three macro-levels; strategy, sourcing, and governance (see Figure 5). This forms the basis of our SCSM. The data which will be gathered from this model will support open innovation and service capability decision making. The data will address four main factors within the decision-making process: volume, velocity, variety and value of the service lifecycle. For example, devising an open service innovation environment strategy in order to source external service capabilities within an agile service environment requires service analytics. This will govern the optimisation of business value within a structured environments illustrated in the SCSM. Figure 5 illustrates the structured macro levels which describes how we are interested in examining strategy, sourcing, and governing capabilities of a service environment. This forms the basis for our revised capability maturity framework to assess service environments. The structure of the model examines how behaviours, practices, and processes of a service environment are reliable and sustainable to produce specific outcomes. The organisation controls the process maturity through its internal capabilities and capabilities sourced from external parties. Similar to CMM, we incorporate the notion of maturity levels (i.e. business value and performance) but we highlight the unsuitability of "maturity stages", for example, moving from level one to five, where five is the ideal maturity state.

6.1 Theoretical basis for a SCSM

In Section 3, we provide a discussion on the nature of open innovation from a service management viewpoint. We describe how the improvement in business processes is no longer an internal operation but rather an external consideration for example, cloud service provision. In fact, we argue that the nature and survivability of new service models such as cloud computing relies on the lack of process maturity to source service capabilities from service providers. We examine the shortcomings of existing CMMs and we propose a more inclusive model which encapsulates externally sourced

Source	Contribution/research question	Reference to model
Ashrafi (2003)	Investigation of the impact of process improvement methodologies on software quality	CMM
Becker and Gibson (1997)	Presentation of an Information Abstraction Model and an integrated CASE toolset for its practical use	CMM
Crawford (2006)	Development of a project management maturity model	CMM
Dekleva and Drehmer (1997)	Examines whether actual software engineering practices follow the SEI software process maturity model	Software Process Maturity Framework (SPMF)
Drinka and Yen (2008)	Explored experiences in implementing a curriculum redesign using the CMM	CMM
Holland and Light (2001)	Determination of ERP system maturity for 24 organisations, illustration of one organisation for each stage	Nolan's Stage Theory
Huang and Han (2006)	Development of a decision model to help CMMI adopters choose a suitable improvement path for their SPI efforts	CMMI
Iversen *et al.* (1999)	Development and application of an alternative technique to CMM and Bootstrap	CMM
Jiang *et al.* (2004)	Examines the relationship between the implementation of the CMM activities and software project performance	CMM
Khaiata and Zualkernan (2009)	Development and application of a survey instrument for measuring IT/business alignment based on Luftman's SAMM	Software Assurance Maturity Model (SAMM)
Luftman (2003)	Presentation of a maturity model for IT/business alignment (SAMM)	CMM
Magdaleno *et al.* (2008)	Application of the CollabMM in an explanatory study in oil production processes	Collaboration Maturity Model (CollabMM)
Mathiassen and Sørensen (1996)	Explication of the strengths and limits of the CMM for CASE introduction	CMM
Phan (2001)	Review of software development practices at IBM and Microsoft	CMM
Purvis *et al.* (1998)	Examines what IS functions are excluded by the CMM	CMM
Ramasubbu *et al.* (2008)	Development of a learning-mediated model of offshore software project productivity and quality	CMM
Saulnier *et al.* (2008)	Proposal of an approach consistent with CMMI for learner-centred assessments	Capability Maturity Model Integration (CMMI)
Scott (2007)	Propositions for the IS organisation of the future, amongst others and the use of maturity models as a trend that requires new capabilities	N/A
Urwiler and Frolick (2008)	Presentation of a hierarchy of progressing IT maturity	Maslow's Hierarchy of Needs
Vitharana and Mone (2008)	Development and validation of an instrument to measure critical factors of software quality management	CMM

Source: Adapted from Becker *et al.*, (2010)

Table I. Summary of capability maturity models

capabilities to deliver a service. We examine the state-of-the-art on capability maturity with particular emphasis on the complexity of service maturity. We also examine the applicability of traditional CMM and approaches and offer a discussion on extending the conventional logic of service maturity. To support our argument that CMM is no

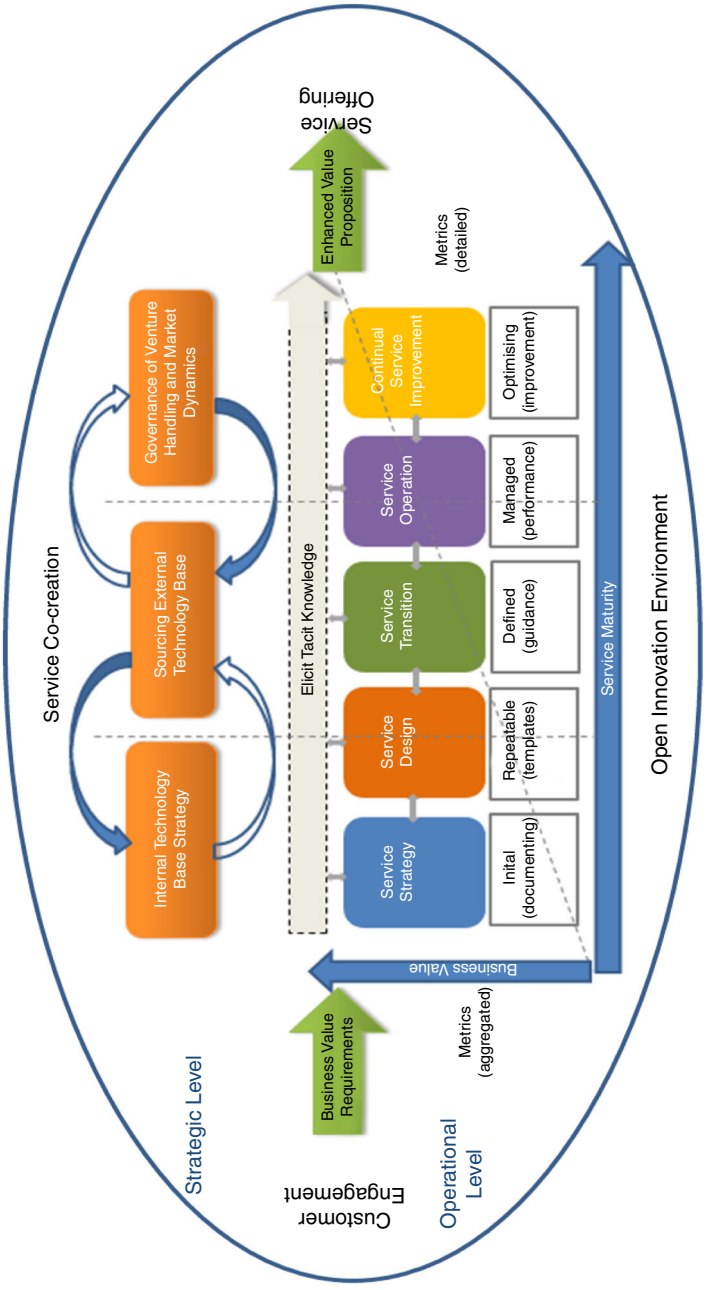

Figure 5.
Service capability sourcing model (SCSM)

longer a valid analytical lens to examine the business value of IT we expand our discussion in light of TCT (Robins, 1987). TCT tries to explain the existence of organisations and how they expand by outsourcing key business functions and the costs that are associated with sourcing and maintaining business relationships to deliver a service. In essence, TCT suggests that organisations strive to reduce costs of exchanging resources and weigh up the costs of performing activities in-house versus outsourcing activities. According to Dahlman (1979, pp. 147-148), transaction costs may be divided into three main categories:

(1) search and information costs: incurred to examine whether the required service is available and at the lowest price;

(2) bargaining costs: contractually agreeing on the cost between external parties; and

(3) policy and enforcement costs: governing the terms and conditions of a contract and taking appropriate action if necessary.

Dahlman (1979, p. 162) concludes his work on externalities by posing the following question: "how can the economic organisation be improved upon by endogenous institutional rearrangements?" Similar to the attraction of cloud computing, TCT was largely shaped by concepts borrowed from economics and organisational cost analysis to develop microeconomic logic. TCT provides a framework to evaluate whether specific service functions are more economically viable developed in-house or outsourced. While IT has reduced transaction costs, the complex nature of technology has incurred additional negotiation and regulation costs associated with transactions have increased (Pei *et al.*, 2008). For example, Liu *et al.* (2008) explains that transactions costs are determined by a number of key factors which influence outsourcing IT decisions:

(1) asset specify;

(2) uncertainty;

(3) frequency of occurrence; and

(4) internal IT capabilities.

As our scenario (discussed in Section 6.2) will demonstrate, this is evident in cloud computing. Cloud service users can reduce transaction costs through pay-as-you-go service models. The cloud service model reduces software installation and maintenance costs, removes associate risks, and removes the need to invest in hardware (Armbrust *et al.*, 2009) for example, Amazon Elastic Compute Cloud Amazon (EC2), Salesforce.com (cloud platform for business applications), Google App Engine (platform for web applications), and Windows Azure platform (environment for developers to create cloud applications and services). We posit that organisations can acquire high maturity instantly through servitization in an open environment. Within our SCSM there are key process areas which cluster specific activities to achieve a business objective. In the case of the SCSM, we are initially interested in the assessment process and it activities namely, documenting a strategy, developing templates to structure the service design, defining the transition process, monitor the service operations through predefined metrics, and optimise continual improvements. While these activities are high-level tasks, each activity comprises of specific goals which describes to what extend the activity is completed. There are several common features in our SCSM and CMM since the approach is centred on performance mechanisms but we incorporate the need to analyse the value co-creation factors which contribute towards organisational performance.

The SCSM provides a framework which defines a systematic structure to assess and implement best practice improvements in IT service capabilities and ultimately improve service capability investment decision making. The SCSM also supports the assessment of business value for service capability portfolio investment through the examination and optimisation of the return-on-investment. The SCSM also provides a platform to establish a common language to assess, measure, and value the sourcing of service capabilities which impacts on service performance. The concepts from Chesbrough's (2004) funnelled approach of the open innovation model are included in the SCSM (strategic level). This demonstrates how value is co-created between the internal technology base and the external technology base to enhance the value proposition of a service offering. We demonstrate this through a cloud computing case scenario.

6.2 Cloud computing service capabilities: an open service innovation environment case scenario

There are numerous definitions of cloud computing. One of the most widely accepted definitions comes from Mell and Grance (2009) at the National Institute of Standards and Technology (NIST). They define cloud computing as a "model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." There are significant benefits to cloud computing. For example, Foster *et al.* (2008) describe the benefits of cloud computing as providing a large-scale distributed computing paradigm which is massively scalable and can be encapsulated as an abstract entity. The literature suggests that cloud computing is driven by economies of scale where services can be dynamically configured and delivered on demand (Carroll *et al.*, 2014). According to Foster *et al.* (2008), this has largely become popular due to the decrease in hardware cost, increase in computing power, exponentially growing data size, and the wide-spread adoption of service computing (Ramdani *et al.*, 2009). With the emergence of cloud computing, service capability rearrangements are the very source of the economic organisation and their ability to sustain competitive pressures. Technological advances within the field of cloud computing have reduced costs associated with service provision. For example, Boss *et al.* (2007) report on IBM's On Demand Business and explains how cloud computing offers organisation the ability to "further reduce costs through improved utilisation, reduced administration and infrastructure costs, and faster deployment cycles." In addition, Han (2011) demonstrates how the major cloud computing providers, for example, Amazon Web Services (AWS), Microsoft Azure, and Google App Engine are explored and their implementation of infrastructure-as-a-service and platform-as-a-service using AWS, Linode and Google AppEngine are demonstrated. Han (2011) also provides a discussion which compares the costs and technology analysis of cloud computing with local managed storage and servers. For example, since Amazon offers lower storage pricing for huge amounts of data, the total costs of ownership (TCO) of an AWS are significantly lower. There has also been some excellent work on developing a lifecycle analytical framework on managing outsourcing. Ultimately, the service ecology has transformed from an individualistic internal service maturity effort to a networked value co-creation service network where maturity can be sourced through external capabilities, i.e. an open service innovation environment.

6.3 Case description

Prioritising which service capabilities require additional support often steers organisations towards open innovation possibilities. First, managers must identify the core capabilities which generate business value. When these are identified, customers are engaged in an exploration, communication and negotiation process with cloud service providers to detect a suitable match based on specific service requirements. In many cases, the matching process is influenced by cloud provider reputation, security profiles, service flexibility, pricing, and recovery or service capabilities. The service providers' competencies are aligned with the internal technology base strategy to identify a suitable match within an open service innovation environment. The service strategy is the initial documentation of service analytics which prescribes what an organisation wishes to achieve by sourcing external service capabilities. This commences the service value co-creation process by sourcing the external technology base (i.e. service capabilities). The combination of the service strategy and the availability of external service capabilities influence the design of service offerings and support the development of service templates to assess performance. The service transition phase is concerned with the readiness of an organisation to adopt newfound service capabilities and the transition of service components to a cloud-based solution. As part of the governance of venture handling and market dynamics cycle phase, continual service improvement plays a critical role in sustaining an open innovation environment and the generation of elicit tacit knowledge on cloud service capabilities. Ultimately, the SCSM guides managers to avail of enhanced service value proposition and an improved service offering through an open service innovation environment.

7. Discussion

This paper highlights the difference in the traditional approach to valuing IT and the need to differentiate the value of open innovation and newfound resources and capabilities within an open service innovation environment. Our SCSM also emphasises the need to examine how we value IT resources. For example, we examine whose IT resources do we assess through cloud computing – the service provider or the service client. The SCSM demonstrates the need to access the value of IT through a wider scope as it incorporates both internal and external IT resources and the outsourcing value co-creating exchanges between parties.

This paper provides a comprehensive discussion on open innovation and the nature of service capabilities and CMM within this context. However, we draw particular attention on the need to revisit the applicability of CMM in an open service innovation environment. We argue that the fundamental objective of CMM is to examine current maturity of IT investment and describes the need to mature (from level 1 to 5). We have explored some of the leading research in this domain to highlight that we need to redesign the CMM to demonstrate its revised logic in an open innovation context. For example, as organisations move through the IT maturity phases there are more concerns regarding outsourcing IT capabilities. Thus, as this paper argues, we need an alternative view of the modern service environment (e.g. cloud computing) to incorporate an open service innovation environment. This is important as there is often less emphasis on concept of maturity since maturity is influenced by external service demand and the availability of service capabilities. We introduce a novel approach towards developing a sourcing maturity model called the SCSM. The SCSM indicates what level organisations should engage in service solutions to optimise service

maturity and remove burdens such as cost. It comprises of a three tier model of an open service innovation environment which examines:

(1) service strategy: internal maturity assessment to the viability of open innovation;

(2) sourcing decisions: identifying external capabilities to meet maturity requirements through a sourcing process; and

(3) governance: assess whether sourcing IT capabilities via open innovation options have performed as expected.

This model is necessary as the traditional CMM model fails to address external networking factors in a value co-creation and value realisation environment. We explain that IT maturity is dynamic in that capabilities can be rented (i.e. pay-per-usage model) to address service maturity gaps. The emergence of cloud computing provides evidence to the fact that organisations benefit from external influences as cloud computing is a responsive service environment. This indicates that open innovation is a viable option for organisations through a number of service models (e.g. cloud service models).

Understanding the nature of service capabilities in a cloud computing context has become increasingly important as part of their strategic planning. Drawing on TCT, ultimately cloud computing presents organisations with the opportunity to switch from a Capital Expense (CapEx) to an Operational Expense (OpEx) cost model whilst promising to deliver a reduced TCO (e.g. Armbrust *et al.*, 2010; Creeger, 2009; Conway and Curry, 2012). However, while much of the literature is primarily concerned with examining the promise of cloud computing through traditional CMMs (e.g. Conway and Curry, 2012), we have identified the need to introduce an alternative approach to assessing cloud computing services. As organisations choose to deliver and/or avail of the cloud opportunities, this adds greater complexity to the business environment, often making it difficult to assess the formation of service capabilities through cloud developments (Reynolds and Bess, 2009). The motivation for service capabilities varies from both a cloud providers and cloud users perspective. For example, as large cloud service providers compete on pricing strategy it has a huge impact on their revenue models while cloud users avail of greater IT capabilities at reduce costs – often challenging the traditional "supply and demand" economic view. The advantages of cloud computing may be summarised as greater agility, reduced costs and increased competition, and improved resource efficiency (Armbrust *et al.*, 2010). Thus, cloud computing promises increased capabilities with little guidance as to how one can assess their newfound additional capabilities within the cloud. In fact, it is suggested that cloud computing promises to transform the strategic value of an organisation through "incremental and evolving objectives, competencies, and value measures" (Milne, 2010) within an open service innovation environment. Our approach supports the assessment of the business value of service capabilities.

7.1 Research implications

This research has many implications from both a theoretical and practical perspective. We summarise these as follows:

(1) Implication for theory: this research provides a critical platform to understand the applicability of CMM within an open service innovation context. While innovation remains a critical factor to support the driving force of optimising service capabilities, assessing the business value of open innovation warrants

additional research. Considering the fast pace of IT-enabled innovation, it requires us to become more aware and develop an understanding of how open innovation can support the traditional CMM approach. This implies that the incremental (i.e. level one to five) may not be apt in the modern service context. Perhaps the focus ought not to be on the concept of maturity but rather on the process of value co-creation. This research suggests that organisations can unlock the potential of external service capabilities (i.e. knee-jerk reaction) and avail of additional service value through an open innovation environment. However, it is evident that innovation is hampered by regulations and individualistic interests which influence the formation and potential of service technology. This will warrant additional research to examine the socio-technical barriers to open innovation. In addition, the adoption of design science proves to be an excellent approach to further explore the opportunities to build new theories on how we examine the concept of value co-creation in a service environment. Consequently, the paradigm of "Service Science" calls for more theoretical focus on understanding complex service systems, few efforts have surfaced which applies a new theoretical lens on understanding the underlying trajectories of socio-technical dynamics within a service system. Thus, this research introduces the SCSM which also provides a contribution towards the Service Science and enterprise information management body of knowledge.

(2) Implication for management: while management are often tasked with uncovering the latest innovations to assess whether it can enhance their service offerings, it is worth noting that we need additional focus on the service analytics of innovation, particularly in an open innovation context. In addition, service metrics ought to shift focus towards socio-technical analysis to understand the impact of technology on service dynamics (e.g., Carroll, 2012). This research introduces the need to reassess how we view service capabilities but more importantly, we should question how we assess these newfound capabilities. It is anticipated that managers can gain greater insights on service operations, i.e. what works well, what needs improvement, and what needs to be removed, through the SCSM. In addition, this SCSM can offer a contribution to:

- enhance service management decision-making tasks (service management); and
- assess performance information against service requirements engineering (service computing).

Service providers advise service actors that their business operations will be conducted more efficiently, but discreetly they appear to neglect to explain from whose point of view the efficiency is warranted or what might be its costs. It is evident that should the end-user grow sceptical of opening up their service operations, managers need to describe the promise and benefits of innovation, which in high-insight, has only marginal relevance to the practice of the end-users experience. This also highlights the need for a service capability matching process (Carroll *et al.*, 2013). For the service world to make sense of actors and their actions, they are conditioned by regulation and numeric tools to understand performance and structure as a concept of reality into numeric formats (e.g. percentages). The nature of service is steering towards an ideological state that we continue to embed tools as an ideological bias, a predisposition to construct the world as one thing rather than another, to value one thing over another.

This is our attempt of dealing with the complexity of open innovation and assessing the value of newfound service capabilities. However, this research suggests that the concept of value co-creation requires more focus in the CMM context. This highlights the need for educational developments to focus research developments to:

- evolve new service models;
- strategize, design, and configure more "open" processes;
- examine the potential for open services and open linked data within an analytics framework;
- extend methods to examine relational structures of service networks; and
- examine where and how various types of innovation improve service.

Service Science is clearly a discipline which acts as an interface for business and IT research developments and a field which has significant potential to bridge many of the developments discussed throughout this paper.

This research also provides a significant platform to build future research in the field of enterprise information management. As part of our future research, we acknowledge the need to implement this work in a case study to generate some evidence-based findings and explore the suitability of the SCSM across various domains.

8. Conclusion

Organisations increasingly have to adapt and design new business models to retain a competitive advantage in highly networked, dynamic environments. In this respect, we agree with Trott and Hartmann (2009) work which claims that the term "open innovation" invites much criticism. However, radical open innovation service models can co-exist in immature ecosystems but the assessment process must evolve to develop an understanding of the potential business value of newfound service capabilities. This paper presents the SCSM. Our work offers an insight on the development of a new service maturity framework whereby maturity models can guide the development of our revised service maturity sourcing model. The benefits of the SCSM include the inclusion of open innovation logic which supports the explanation of service capability maturity within an open service innovation environment. We extend the CMM approach to examine the process of value co-creation within a modern service environment. We identify how an open service innovation environment may benefit through the adoption of the assessment of "value-added" benefits through a service lifecycle view of service capabilities. As part of our future work, we will implement this model to determine the key service metrics which support the assessment of service capabilities across a number of industries. We will extend theoretical developments on an open service innovation environment through our SCSM. The SCSM can support service providers in the ecosystem collaborate to create and share business value. This research has several implications for business model design for organisations in early-stage adoption of open innovation. The framework illustrates how an open service innovation environment supports a value network. It is useful for organisations to take a holistic perspective on their service provision. This work will further improve our approach to revise and refine the model. As part of our future work, we will also incorporate mechanisms to weigh risk and value-at-risk factors in the sourcing of service capabilities, for example, trust metrics. While open innovation is considered a critical part of the service environment, we identify the need to incorporate methods to assess trust and govern the exchange of innovative resources within a service ecosystem.

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About the authors

Dr Noel Carroll teaches in the field of Knowledge Management and Information Systems at the University of Limerick, Ireland both at undergraduate and postgraduate level. He previously worked as a Postdoctoral Researcher at the Dublin City University. Noels research is currently focused on developing service analytics and methods which support the assessment of service ecosystems. He completed his PhD at Lero – the Irish Software Engineering Research Centre, University of Limerick which focuses on the emerging discipline of Service Science. His research explores methods to examine the socio-technical dynamics of complex service systems. The research examines Service Science initiatives and identifies methods to investigate the value of IT across service networks. He is particularly interested in applying social network analysis and actor-network theory to examine the socio-technical influence of IT systems on service dynamics. He also holds a Masters (research) in Business and a Degree (Hons) in Information Systems Management. His research activities cover a wide scope from Service Science, Software Engineering, Health Informatics, Cloud Computing, and Education. Dr Noel Carroll is the corresponding author and can be contacted at: n.m.carroll@hotmail.com

Dr Markus Helfert is the Director of the Business Informatics Group and a Lecturer in Information Systems at the School of Computing, Dublin City University (Ireland). He is research affiliate at The Open Government Institute at Zeppelin University in Germany. His research interests include Information Quality Management, Innovation, Cloud Computing and Service Science, Enterprise Architecture and Open Data and Smart Cities. Markus Helfert has authored more than 200 academic articles and book contributions and has presented his work at international conferences. Prior to his appointment at the Dublin City University, he held a research position at the Institute of Information Management at the University of St. Gallen. Dr Helfert holds a PhD from the University of St. Gallen (Switzerland), an MSc from the University of Mannheim (Germany) and a BSc from the Napier University in Scotland (UK).