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New service development: managing the dynamic between services and operations resources

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Abstract

Purpose – Previous research suggests new service development (NSD) is characterized by less stable offerings, less formal processes and is more emergent than new product development. In face of these issues, it seems managers must concern themselves more with the management of the underlying resources. To understand this distinctive nature of NSD, this study aims to investigate the relationship between NSD and operations resources.

Design/methodology/approach – Building on the resource and capabilities perspective, a multiple case study was designed to investigate how the NSD is influenced by and reconfigures operations resources and capabilities. Data were collected in three providers of bespoke B2B services.

Findings – The paper proposes a model of NSD composed of three stages: emergence, accommodation and consolidation. This model describes the process that takes place when providers redeploy their operations resources and capabilities to implement emerging service ideas. The findings also show the challenges associated with the reconfiguration of operations resources and capabilities and with the reconciliation of the requirements of the existing and new services.

Research limitations/implications – The paper looked at services successfully implemented in knowledge-intensive SMEs. Other studies could explore these NSD processes in other contexts and initiatives that failed.

Practical implications – The paper presents the risks and efforts involved in using existing resources to take advantage of emerging service ideas.

Originality/value – The model takes a fundamentally different perspective from many NSD models. It shifts the focus from managing the new service to managing the resources that underpin the evolving and emerging service ideas and offerings. This paper should interest people willing to understand the distinctive nature of NSD.

Keywords New service development, Operations resources and capabilities, Emergent service ideas, Reconfiguration of resources and capabilities, Dialectical change processes

Paper type Research paper

Introduction

The large role of services in the world economy today has motivated scholars to understand how new service development (NSD) is distinct from product development (Zomerdijk and Voss, 2011). While differences between service types need to be

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accounted for, the literature on service innovation and NSD proposes that the development of services has peculiar characteristics. New service ideas seem to emerge more commonly from service providers' articulations of how existing services could be delivered differently, e.g. improvements in service processes with high visibility can alter customers' experiences and change the service concept (Zomerdijk and Voss, 2011). Service providers also appear to depend less on coordinated NSD processes with pre-defined stages and on strategic NSD plans (Martin and Horne, 1993). Additionally, Ettlie and Rosenthal (2011) suggest that NSD processes have shorter beta testing stages. So, instead of coming ready to market after intensive testing, services can be seen as having a "perpetual beta", as they are launched and then continuously fine-tuned and updated (Zomerdijk and Voss, 2011). Therefore, although service providers can adopt structured processes oriented to create all the necessary means to develop a new service, they seem to more continuously and informally build upon the means they have to take advantage of new opportunities of improving and expanding existing service offerings.

If new service ideas tend to be more emergent and informally developed, the structured processes portrayed in many NSD models (Scheuing and Johnson, 1989; Bitran and Pedrosa, 1998; Froehle and Roth, 2007) may not fully represent their development processes, since such models revolve around rather stable notions of the service offering. It is also not clear why services are constantly updated and how managers exploit existing strengths to develop new offerings. In the absence of stable and enduring service offerings as the object of managerial attention, it seems that managers must concern themselves more with the underlying resources and capabilities. Therefore, to inform managerial practice on how to take advantage of and minimize the risks of NSD processes, we need to understand further the dynamic relationship between NSD and operations resources.

Given this context, in this paper we bring the ideas from the resource and capabilities literature into the NSD field. For instance, Penrose (1959) explores how firms can put their existing resources into different uses to enter new markets; this perspective potentially provides an understanding of how new ideas can emerge from, and services can be built on, the day-to-day operation of the company. This literature also proposes that the development of new offerings will reconfigure companies' resources and capabilities (Eisenhardt and Martin, 2000) and open up new expansion opportunities (Helfat and Raubitschek, 2000). This theoretical background seems, therefore, fruitful for the study of NSD processes, and, to expand these ideas, we propose two research questions:

RQ1. How does the reuse of operations resources and capabilities influence the NSD process?

RQ2. How does the NSD process influence the consequent reconfiguration of operations resources and capabilities?

To explore these questions, we studied the development process of new services in business-to-business markets in three different bespoke service providers. Softdev is a software developer, which designs, codes and maintains customized software. The other two companies, CRControls and Audiosystems, design and install building control systems and audiovisual (AV) systems, respectively, according to the specifications of the customer. Although Audiosystems' and CRControls' offerings involved product and

service elements, their development initiatives were wholly concerned with the service elements, with any product development being undertaken by their equipment suppliers.

Based on our findings, we propose a conceptual model of NSD composed of three stages: emergence, accommodation and consolidation. This does not simply present a prescriptive, deliberate model of the desirable stages of NSD in three, rather than five (or some other number) of stages, but takes a fundamentally different perspective. Since it appears that NSD is characterized by less stable offerings, less formal processes and is, for various reasons, more evolutionary and emergent than NPD, our model shifts the focus from managing the new service to managing the resources that underpin the evolving and emerging service ideas and offerings. It takes services as, it seems, they are, rather than trying to make them behave like products. As we discuss later, in doing this, we build on the insights of Froehle and Roth (2007), who argue that the management of NSD must consider the resources that support the NSD process as well as the process itself. We extend this by considering the resources and capabilities that comprise the service operation itself, as well as those supporting the NSD process. Our findings show that the managerial challenges are associated with the reconfiguration of operations resources and capabilities and with the need to reconcile the requirements of the existing and new services.

The remainder of this paper is organized as follows. In the next section, we review the literature on NSD, resources and capabilities. We then present the multiple case study research design adopted, including the case selection logic, the data collection method and the analysis process. Next, the findings are presented and followed by a discussion. We conclude and present suggestions for further research in the final section.

Theoretical background

The review of the literature is structured to initially provide a background on the NSD literature and on the relationship between resources, capabilities and new offerings. Then, we explore how the resources and capabilities view can be used to inform our understanding of the NSD process.

NSD models

The NSD process is a set of interconnected tasks, activities, actions and assessments that result in a new service and its launch (Cooper *et al.*, 1994). In OM, the literature has many models to describe the stages and indicate the activities that companies engage into develop new services. For example, the models of Johnson *et al.* (2000) and Froehle and Roth (2007) categorize NSD activities in the design, analysis, development and launch stages. In the design stage, companies need to prepare a formal description of the concept, by outlining the specific features of the new service and the rationale for its purchase (Scheuing and Johnson, 1989; Edvardsson and Olsson, 1996; Tatikonda and Zeithaml, 2002). Companies then should analyze the concept's financial and market viability (Alam, 2002), the availability of internal resources to deliver it (Johnson *et al.*, 2000) and the internal changes associated with its implementation (Tax and Stuart, 1997). Based on the design content, in the development stage, companies should define in more detail the processes, facilities and people requirements of the delivery system (Tax and Stuart, 1997) and identify what needs to be acquired or adapted from preexisting capabilities (Menor *et al.*, 2002). The service can then be launched. The post-launch review ends the NSD process and generates information to improve

the service. Froehle and Roth (2007) provide one of the most comprehensive models available. It encompasses 27 NSD activities validated with experts from service industries. Other models (Scheuing and Johnson, 1989; Tax and Stuart, 1997; Bitran and Pedrosa, 1998; Alam, 2002; Kindström and Kowalkowski, 2009; Kim and Meiren, 2010) present similar or less comprehensive descriptions of the activities and stages involved.

Although NSD processes are most commonly depicted as being iterative and cyclical (Tax and Stuart, 1997; Johnson *et al.*, 2000) and customer involvement, cross-functional development teams, support tools, technology and knowledge are portrayed as vital inputs of the process (Alam, 2002; Kim and Meiren, 2010), the models present strongly goal-oriented conceptions. In other words, they propose that companies should define carefully the service concept and then follow these stages to put together what is needed to provide the service. These models acknowledge the difference between the development of products and services, but they propose stages and activities that resemble the ones in new product development models. However, studies show that service firms take advantage of new ideas that result from alterations in the ways existing services are provided (Zomerdijk and Voss, 2011) or from the interaction with customers (Gallouj and Weinstein, 1997) and adopt less formal and structured NSD processes (Martin and Horne, 1993). They also suggest that service firms have short testing stages (Ettlie and Rosenthal, 2011) and launch services without them being necessarily close to full perfection and, then, continuously update them (Zomerdijk and Voss, 2011). It seems that, rather than using a goal-oriented approach, service firms use a more means-oriented approach[1], in which managers take advantage of emergent ideas by using the available means, launching services to be improved in day-to-day practice. Therefore, this structured progression of well-defined stages and activities does not seem to fully capture these particularities of the NSD process.

Exploring the relationship between new services and their underlying resources may be a way to understand these NSD processes further. Froehle and Roth (2007), besides identifying the NSD stages, suggest the NSD process is associated with practices to cultivate resources that support NSD processes. Although their focus is on resources linked to NSD processes, they propose that future research should explore how a wider range of resources and processes is used to carry out NSD initiatives, because it is the interaction between the many activities that take place within a firm that contributes to value creation. This alludes to the argument of Penrose (1959) that resources provide the basis for new offerings. Hence, it seems fruitful to understand the nature of the relationship between new services and the resources that support existing services. Therefore, we introduce next the theoretical ideas from the resource and also the capabilities perspective to understand this link further, and to explore how these ideas can help explain the distinctive nature of NSD.

Background from the resources and capabilities perspective

The resource-based view (Barney, 1991) argues that sustainable competitive advantage resides in the resources possessed by the firm. By extension, a capabilities view argues that future products and services are strongly determined by the resources and capabilities possessed by the company, at least as much as by positioning in markets. Physical assets and employees are the two types of resources firms can use to produce their offerings (Penrose, 1959). Physical assets can include facilities, equipment, patents, stocks and land;

employees on their turn provide firms with their time, knowledge, experience, and relationships with stakeholders (based on Mills *et al.* (2003)) and execute the manual and intellectual work that needs to be done. Firms' productive resources are deployed in capabilities. These are, as defined by Winter (2003), a collection of activities grounded in tacit knowledge, executed to achieve a particular outcome. Knowledge is the basis of any capability, as individuals use their knowledge to execute the activities that form capabilities (Grant, 1996). Loasby (1998) emphasizes that capabilities are based on the knowledge of how to do things, as distinct from declarative knowledge, i.e. "knowing that". For example, it is one thing to "know that" certain chemicals must be mixed to make a particular compound; it is quite another to "know how" to do it reliably on an industrial scale.

At one point in time, firms have a certain configuration of resources and capabilities, which can deliver a set of strategies (Helfat and Raubitschek, 2000). This combination of resources and capabilities should, according to Miller (1996), be in line with the configuration of firms' strategic, structural and environmental elements. Such alignment would create competitive advantage for firms. More recent research also points toward the need to align internal resources and capabilities with the configuration of the network, which depends on issues such as the supply network structure, the information flow between the companies, the relationships between the partners and the structure of products and services (Srai and Gregory, 2008). Therefore, features of the environment companies operate in, of the competitive strategies they adopt and of their relationships with trading partners shape the sets of resources and capabilities firms should have to achieve higher levels of performance.

Established configurations of resources and capabilities can be altered, if firms use existing resources and capabilities in different ways to create new products and services. Helfat and Raubitschek (2000) suggest that companies, through a process of learning, progressively comprehend better and improve their knowledge bases used to deliver existing offerings. This then allows companies to create new generations of existing products or replace old ones, and to develop products for related markets. However, to create new offerings, companies need to have the capability to put this new knowledge into use. When companies have resources with spare capacity, they can be employed in these capabilities, allowing companies to pursue the desired development (Penrose, 1959).

An additional feature of this process is the fact that changes in knowledge bases may cause capabilities to change. Existing capabilities may not allow the full exploration of new knowledge acquired or developed. This sets the "knowledge evolution cycle" proposed by Zollo and Winter (2002) into motion. Individuals start using their accumulated experience to generate ideas, identify different ways of doing things and speculate how existing capabilities can be changed. Then, they articulate and discuss which solutions are better and how to implement them. Capabilities are altered, put into use and, eventually, become instinctively executed by these individuals. The newness of the knowledge base can be such that the company may not possess the capabilities needed to explore it. Therefore, firms may have to develop capabilities anew (Danneels, 2007).

After this process of new knowledge acquisition, redeployment of resources and development and alteration of capabilities for the development of a new offering, the company ends up with a new resource and capabilities configuration (Eisenhardt and Martin, 2000), which should be aligned with the new elements of firms' strategy, structure, environment and network. The decisions made during this process are influenced by managers' beliefs and understanding of the world and shape the way

resources and capabilities are accumulated (Tripsas and Gavetti, 2000). This new configuration opens a combination of opportunities companies can explore in the future; at the same time, it may also make the company less able to take advantage of other opportunities (Leonard-Barton, 1992; Helfat and Raubitschek, 2000).

Empirical studies show that companies go through cycles of incremental and fundamental changes in their knowledge bases that allow the development of new products or moves into interrelated markets (Helfat and Raubitschek, 2000). In the OM field, research on the relationship between resources, capabilities and new products showed that the process of developing and accumulating the manufacturing and distribution capabilities after significant changes in knowledge bases is complex and may take several years (Coates and McDermott, 2002; Pandza *et al.*, 2003).

NSD process: a resource and capabilities approach

We can use these theoretical notions to create a means-oriented understanding of NSD processes. We propose that prior to the development of a new service, companies rely on a set of resources and capabilities to provide existing services. We refer to them as operations resources and capabilities. Among others, these include existing facilities, employees, and tasks to execute the service. There is a certain level of capacity available to provide established services. A new service opportunity appears and companies then react by evaluating how they can explore it. Ideas may come from companies' relationships with customers and partners or from firms' articulations of how existing services could be delivered differently. If companies decide to invest, they may reuse and need to develop operations resources and capabilities. We also suggest that to develop the new service, companies need to perform activities and make decisions related to the design, analysis, development and launch of the service. Companies, however, may execute them in different sequences and with different levels of formalization. We complement this by indicating that the decisions made during the NSD will cause operations resources and capabilities to change. This new configuration will provide the company with a set of new options for future expansion and the cycle can start again. To expand these theory-driven ideas, we investigated these more means-oriented NSD processes and their relationship with operations resources and capabilities.

Methodology

This research employs a multiple case-study design. Case studies allow the observation of the phenomenon in its natural environment and the consideration of its temporal aspects (Meredith, 1998). They enable the in-depth qualitative examination of complex, path dependant and ill-structured phenomena, such as the one studied in this research. Hence, they provide the opportunity to gain rich insights and enhance the existing knowledge (Handfield and Melnyk, 1998) of the influence of operations resources and capabilities on the NSD process and on their consequent reconfiguration. The case-based research made the identification of key events of this process and their sequence possible. The use of theory then enabled the proposition of research insights that can inform future research (Eisenhardt, 1989).

Research setting

The research was conducted in three UK-based organizations that develop bespoke systems for their customers. These service providers rely on the knowledge of their

employees to propose customized systems capable of solving specific problems or addressing specific requirements of customers.

Softdev. Softdev Ltd is a medium-sized information systems developer. It employs 40 people in two divisions. The focus of our analysis was the general systems division, which designs and supports software to manage information flows according to customers' needs. The team allocated to each new project establishes together with the customer the information flows to be managed, defines the information needed and how to process, distribute and access it. The team then programs the software accordingly, integrates it into the customer's operation and trains customer's employees to use it. After the implementation, the developers involved in the project support and upgrade the software. The company designed a business continuity (BC) application for a customer and decided to roll it out in the market.

Audiosystems. Audiosystems Ltd is a small company of eight employees, which sells AV systems for churches. It defines and installs a combination of equipment like projectors, amplifiers, and microphones capable of meeting customers' needs. The production process starts with a visit to the customer to understand its needs and to evaluate the building's condition. Based on this input, the system is designed and a proposal is prepared, which is sent to the customer. Once the customer places the order, equipment and other items are bought in from manufacturers. The system is then installed and the customer trained to use it. Audiosystems mainly sold systems to churches, but saw an opportunity to serve institutions in the education market.

CRControls. CRControls Ltd is a small firm of seven employees that engineers, installs and supports control boards to manage room conditions such as lighting, temperature and pressure. The company mainly serves sites where the storage condition of products is vital, like clean rooms in the pharmaceutical industry. Systems are composed of equipment to maintain room conditions (e.g. fans, filters, sensors), a control panel and a piece of software dictating how components should function. Based on the customer's specifications, the designer defines the composition of the system and programs the piece of software. The production of the panel and installation of the system are outsourced, but the company supervises the equipment delivery and the installation work. It then commissions the system and trains the customer's employees to use it. CRControls has provided systems using TREND products and software as the underlying technology, but has subsequently decided to substitute this with similar technology provided by Honeywell in order to increase its target market.

Case selection

The unit of analysis was the process of development of a new service and the consequent reconfiguration of operations resources and capabilities. In all the cases, companies did not define upfront the service concept. They were presented with an opportunity and decided whether to pursue it or not. Rather than adopting a formalized NSD process with pre-defined stages, companies engaged in an unstructured process and reused existing operations resources and capabilities to create the new service. We selected the most recent service launched to reduce the influence of other NSD processes in the new configuration of resources and capabilities. Additionally, albeit they are from different industries, all the companies provide bespoke systems and, therefore, have productive processes with similar characteristics. Such homogeneity enabled a more focused investigation (Van de Ven, 2001). Finally, the firms' size allowed us to understand the

entire productive process, speak to everyone with knowledge of our unit of analysis and explore the full range of operations resources and capabilities linked to the NSD process, as suggested by Froehle and Roth (2007). The size of the companies has implications for the findings, which are explored in the discussion section.

Data collection

To carry out the analysis, we had to identify the NSD; look into the development of the new service; and understand the reuse of existing and development of new operations resources and capabilities. Because such a process alters operations resources and capabilities, their configuration prior to and after the NSD had to be investigated.

Data were collected through interviews and from available documents. The initial interview enabled the identification of the NSD process of interest and increased the knowledge of the companies. We then interviewed employees involved in the NSD to collect their experience of the activities and decisions of this process; and interviewed the employees responsible for the design and installation of systems to identify the existing operations resources and capabilities and understand how they changed due to the NSD. The interview protocols can be found in the Appendix. A list of the interviewees, their roles in the organizations and the evidence we tried to obtain is in Table I.

We carried out 16 interviews that lasted between 1 and 3 hours. The following steps were followed to enhance construct validity and reliability of the data collected (Yin, 2003). All interviews were semi-structured and a protocol was used to assure that similar questions would be asked in the different companies. During the interviews, no particular order to ask the questions was followed and questions were introduced whenever they made sense. People were left free to answer the questions and share all the information they had. Interviewees were interrupted as little as possible, but probed further when something was not clear. As the quality of interview data can be limited by the extent to which respondents can remember facts (Denzin and Lincoln, 1998), this procedure can enhance the richness of detail in the data.

All interviews were face-to-face, recorded, transcribed and summarized. The summary was sent to the interviewee, who checked the content and made eventual suggestions and corrections. Questions that emerged during the data analysis were answered in a follow-up interview or by e-mail. Public and internal documents, like the companies' web sites, marketing plans, business plans, case-studies about the company and about the new service were also an important source of information. They provided additional information and confirmed initial impressions from interviews, as suggested by Jick (1979). Table I lists the documents collected and their content.

To minimize bias, we prepared an individual report for each company with the results of the data analysis. After one month, a follow-up interview was carried out with the owners of CRControls and Audiosystems and with the business development manager at Softdev to discuss the accuracy of the analysis. The data from these interviews confirmed some aspects of the analysis and improved others.

Data analysis

The data analysis had three main stages: within-case analysis, cross-case comparison and interpretation. The principles suggested by Miles and Huberman (1994) guided the within-case analysis. We started the coding with three themes originated from the research questions: operations resources and capabilities before NSD, the NSD process and

Case	Source of data	Interviewees' position/type of document	No. of interviews	Content of data collected[a]
Softdev	Interview	Business development manager	3	Identify NSD process NSD process
		Software developers	3	Op. R&C before and after NSD
		Project manager	1	NSD process
	Document	Marketing plan 2011		NSD process
		NSD business plan 2009		NSD process
		Web site (2011)		Op. R&C before and after NSD NSD process
		Service proposals		NSD process
		Case studies		Op. R&C before and after NSD NSD process
Audiosystems	Interview	Administrative manager and owner	1	Identify NSD process NSD process
		Design engineer and owner	1	NSD process Op. R&C before and after NSD
		Project manager	1	Op. R&C before and after NSD
		Installation manager	1	Op. R&C before and after NSD
	Document	Web site (2011)		Op. R&C before and after NSD NSD process
		Case study		Op. R&C before and after NSD
CRControls	Interview	Design engineer and owner	2	Identify NSD process NSD process
		Services manager and owner	1	NSD process Op. R&C before and after NSD
		Project manager	1	Op. R&C before and after NSD
		Services analyst	1	Op. R&C before and after NSD
	Document	Web site (2011)		Op. R&C before and after NSD
		Case study (2010)		Op. R&C before and after NSD NSD process

Table I.
Summary of data collected

Notes: [a]Op. R&C – operations resources and capabilities; NSD – new service development

reconfiguration of operations resources and capabilities. We thoroughly reviewed interview transcripts and documents classifying pieces of text in these themes and made brief notes on interesting passages. New ideas were compared to the literature and, consequently, categories were gradually elaborated and new dimensions added. These categories were then classified into the broader themes that provided answers to the

research questions. This process created 11 categories (Table II) that represented the NSD process and explained the relationship between resources, capabilities and NSD.

In the cross-case analysis, these conceptual categories were used to identify similarities and differences across cases (Eisenhardt, 1989). We paid attention to the sequence of and causality between events to understand the processes companies went through. The process models presented by Van de Ven (2001) guided this analysis. Finally, we used theory to make sense of the findings, which are presented next.

Findings

In this section, we first present the NSD process the companies went through and then the influence of operations resources and capabilities on the NSD process and of the NSD process on the reconfiguration of resources and capabilities.

The NSD process

This subsection describes the companies' operations resources and capabilities before the NSD process, the NSD process and the new opportunities that became available

Construct[a]	Definition	Key references
NSD process related		
Operations R&C before NSD	Resources, e.g. main physical assets, knowledge, employees, and capabilities used to produce the existing services before the NSD	Mills *et al.* (2003), Winter (2003), Eisenhardt and Martin (2000)
New service concept	Specific features of the service, the rationale for its purchase and the elements required for its delivery	Edvardsson and Olsson (1996), Tatikonda and Zeithaml (2002)
NSD activities	Activities executed and decisions made to develop the concept, analyse the opportunity, implement and launch the service	Cooper *et al.* (1994), Johnson *et al.* (2000)
Reused operations R&C	Operations resources and capabilities that were put into a new use for the NSD	Penrose (1959), Danneels (2007)
Operations R&C needed	Additional resources and capabilities companies needed to provide the new service and did not possess	Danneels (2007)
Reconfigured operations R&C	Operations resources and capabilities companies ended up with after the NSD process	Eisenhardt and Martin (2000)
Future opportunities	Possible new services that companies became capable of developing due to the operations resources and capabilities acquired in the NSD analyzed	Helfat and Raubitschek (2000)
Research questions related		
Motivation to invest	Factors that influenced companies' decisions to invest in the new service	Data driven
Capacity/capacity management	Volume of output that can be produced by resources in a period of time/decisions to manage capacity levels	Slack *et al.* (2010)
Outsourcing decision	Decision to buy resources and capabilities from the network	Based on Menor *et al.* (2002)
Reconfiguration of operations R&C process	Activities and decisions made to create anew, acquire and adapt to the resources and capabilities needed	Based on Pandza *et al.* (2003)

Notes: [a]R&C – resources and capabilities; NSD – new service development

Table II.
Constructs definition

to them after the NSD. We identified knowledge and people as the main productive resources of these bespoke providers and, therefore, we concentrate our description on them as well as on the operations capabilities. Table III compares key features of the NSD processes across the cases.

Construct[a]	Softdev[b]	CRControls[b]	Audiosystems[b]
New service concept	Web-based BC application + remote information hosting + support and maintenance	Control systems using Honeywell equipment and software as the main technology	Provision of audiovisual systems for education institutions
Operations resources and capabilities before NSD *Reused operations resources and capabilities*	*Nine employees* *K. of information engineering* K. of how to design systems previously sold *K. of programming languages* *C. to design software solutions* *C. to install systems* *C. to maintain and support systems*	*Four employees* K. of TREND equipment K. of TREND programming language *K. of customers' needs and problems* *C. to design TREND systems* *C. to supervise installation* *C. to support TREND systems*	*Two employees* *K. of AV equipment* K. of customers' needs and problems in the church market *K. of how to evaluate buildings* *K. of installation* C. to design systems for churches *C. to install systems in churches* *C. to support systems for churches*
Operations resources and capabilities needed	C. to do BC consultancy K. of BC to design the application K. of web-design programming language	K. of Honeywell programming language K. of Honeywell equipment	K. of customers' needs and problems in the education market K. of projectors and whiteboards C. to tender and bid
Reconfiguration of operations resources and capabilities process	BC software design K. provided by partner Learn-by-doing web-design programming Outsource BC consultancy C. to independent consultants Develop C. to manage independent consultants Change design and testing C	Learn-by-doing Honeywell programming Gain K. of new equipment Change installation and maintenance C Develop ways to access information on external devices Develop activities to train customers on how systems interact	Outsource design C. to partner Gain K. of new equipment Develop C. to manage partner Acquire a premises Become accredited by manufacturers Hire two employees Develop activities to bid and tender Develop new proposal and quotation forms
Future opportunities	Development of risk assessment software	Control systems for data centres Access and lighting control systems	Audiovisual systems for public organizations, e.g. councils and the forestry commission

Table III.
NSD processes: comparative data from the cases

Notes: [a]The italic font indicates the operations resources and capabilities reused in the NSD; [b]K – knowledge; C – capability; BC – business continuity

Softdev. Before the NSD analyzed, Softdev relied on the knowledge of software programming languages and information engineering – gathering, organizing and managing information – to provide bespoke software. The nine employees of the general development team used these knowledge bases in the capabilities to:

- design software by coding, testing and debugging software;
- install software on customers' facilities; and
- support and upgrade software.

In the development of a piece of bespoke software to measure and report risk in the health care industry, the company acquired knowledge of the principles required to design risk management software.

A business continuity (BC) consultant approached Softdev to build, in partnership, a BC piece of software for a city council. Both companies would retain the intellectual property rights and sell the tool to other customers. The existing operations resources and capabilities enabled Softdev to develop and support bespoke software for different uses, and were employed to develop the BC tool. During the project for the council, the consultancy company provided the knowledge of BC needed to design the piece of software. As the remote access to BC plans is a requirement of the methodology, a web-based application was needed and developers learned web-based programming languages. Existing software design and testing capabilities were then adapted to develop web-based applications.

The service concept presented to the market was an off-the-shelf BC solution composed of the web-based BC tool, the remote hosting of information and Monday-to-Friday support and maintenance services. The capability to provide BC consultancy services was also necessary to sell the off-the-shelf BC solution, for it introduces the methodology to customers. To get access to this capability, Softdev started working in partnership with independent BC consultants. With the knowledge of how to design BC software and web-based platforms added to the operations resources and capabilities, Softdev then considered it possible to develop a piece of software for the risk management market:

> If you start looking at risk assessment and different methods for looking at risk and mitigation, we could develop a separate product [...] One of the products we have is HCRisk and I have learned a lot about risk assessment there [...] That is another opportunity (Softdev, Business Development Manager).

CRControls. CRControls previously provided systems composed of equipment manufactured by TREND, a leading manufacturer. CRControls had to use the programming language adopted by TREND to code the software that controlled these systems. The four employees involved in the service delivery possessed the knowledge of the types and quality of the TREND equipment and on the TREND programming language. After many years providing systems for clean rooms, they also knew well the common requirements of customers and the main design and maintenance problems. These knowledge bases were used in the capabilities to:

- design systems by selecting the convenient equipment, coding the piece of software, and preparing the proposal;
- install systems by supervising the installation work, running the implementation according to plan, and commissioning systems; and

- maintain systems by finding faults, fixing systems, and conducting periodic checkups.

Honeywell, a manufacturer of control boards and equipment, launched a new technology, and CRControls decided to adopt it, for it enabled the control system to communicate with other systems in the building, like fire alarms and access control systems. To adopt the new technology, all employees of CRControls had to learn the Honeywell programming language and acquire knowledge of the equipment portfolio. The installation and maintenance capabilities had to be adapted to the new technology. With the adoption of the Honeywell technology, CRControls became capable of producing more versatile systems and was considering expanding into new markets:

> There is the lighting, control access and security, there is that move [. . .] There is actually another area we talked about going into and that is data centre [. . .] It's a secure building and again temperature and humidity is very important, because they can damage the equipment (CRControls, Design Engineer and Owner).

Audiosystems. Prior to the NSD, Audiosystems relied on four knowledge bases to serve the church market. One was the knowledge of the types, prices and quality of AV equipment. Another one was the knowledge of what is important for churches and on the main design and implementation problems. The two other knowledge bases were the knowledge of how to evaluate the conditions of the building receiving the system and of how to install AV equipment in buildings. Two employees used these knowledge bases in the capabilities to:

- design systems by understanding customers' needs, defining equipment, and costing systems out;
- install systems by setting up scaffolding, doing the wiring and physically fitting equipment; and
- support systems by assessing systems' condition, fixing and replacing faulty equipment.

Audiosystems spotted the opportunity to sell AV systems to education institutions, e.g. schools, universities. Many churches had schools attached to them and started inquiring after equipment for classrooms. Some of Audiosystems' knowledge of AV equipment was employed to design systems for education institutions, but the company had to learn about projectors, whiteboards and other complementary video equipment. The installation capability could be fully reused; the installation manager mentioned it was like installing the system in a different building. One system designer and one installation manager were hired to cope with the demand.

The knowledge of education customers' needs was, however, important to the design capability and the company acquired it by doing the installation work for a company that designed AV systems for schools. After some time, Audiosystems started to design systems for the education market and had to adapt its design capability. Education institutions have more skilled buyers, who require detailed specification of equipment. They may also adopt more structured buying processes. Audiosystems adapted the proposals and quotation sheets to serve these new customers and learned how to respond to invitations to tender and to bid for services. These changes in the design

capability and the experience in the education market allowed Audiosystems to offer AV systems for public organizations like councils and the UK Forestry Commission.

The influence of operations resources and capabilities on the NSD

The possibility of reusing existing capabilities and knowledge and the availability of spare capacity influenced the investment decision in all three companies. The business plan presented to the Softdev board after six months of the launch, described the following (words in italic were altered for confidentiality purposes):

> When presented with the opportunity by *ConsultPlus, Softdev* decided to go ahead with the development of the BC tool because:
>
> - BC seemed to be a steadily growing market place.
> - Its professional body (BCI) is only 15 years old.
> - The ISO standard is due to be adopted in 2011 (ISO22301).
> - Civil Contingencies Act of 2004 makes BCM a statutory requirement for public bodies.
> - Existing products derived from disaster recovery and not the standard.
> - We had spare development resource with suitable skills.
> - Only new costs were the hosting and marketing, as the development has benefited from "start-up" funding through the project with the council.
> - Our involvement in life critical systems and support means we should demonstrate involvement in BCM.
> - The approach to BCM echoes that of information engineering, i.e. understanding the organization (NSD Business Plan, September 2009).

The four later points suggest the company decided to invest in the BC tool because the knowledge needed to do it was already within the company. The design principles needed for the BC tool were grounded in information engineering, a key knowledge base of the company. Softdev also had experience with life-critical and disaster recovery systems, which were related to BC. The business case also mentioned the availability of spare development resources. When further inquired about this, the business development manager explained that Softdev had two software developers that were not allocated in any other bespoke development. Had these two developers not been available, the company would not have reallocated designers from other projects nor have hired temporary designers. Our data also suggest that the availability of operations resources and capabilities had a more pronounced weight on the investment decision:

> So we did do a fair bit of looking at the market, but we didn't go out and do interviews or send surveys out or employ a market research organization. We felt that since we were being paid for the development of the tool, it was worth getting on board. It was worth taking the development in anyway. But of course we had to invest more since then. We obviously still think it's worthwhile, but the market at the moment is really difficult (Softdev, Project Manager).

The drivers of Audiosystems' investment decision were the belief that the move was worth pursuing and that the company had the ability to install the new systems. Audiosystems saw the education market as a "cash cow" due to its high revenues and profit margins. For instance, the average revenue for systems sold to schools is £15,000, ten times higher than for churches. The passage below suggests that the

owner also considered the transferability of installation skills in its decision to enter in the education market:

> So I had a decision because I've always been interested in new ideas and stuff, and it took me five minutes to make it and I decided that I would. Obviously, a lot of the skills were the same; you are running cables from A to B, mounting things, wiring things up. The first few jobs we lost money on it because we did not get it right. We finished, but our costs were such that in a few jobs we just lost some money. And so we diversified into it (Audiosystems, Design Engineer and Owner).

In the case of Audiosystems, however, the lack of capacity – in the strict operations management sense of the word – hindered the provision of the new service. The company spotted the opportunity to provide systems for education institutions in 2000. At that time, it only had two employees to design and implement the systems and was operated from a small office in the back of the owners' house. The owner and administrative manager explained that they were unable to open accounts directly with whiteboard and projectors manufacturers, because they had no place to store equipment. As such, the company had to buy these items from retailers, which reduced their profit margins.

Audiosystems then worked for four years for a company that needed freelance installers. During this period, Audiosystems learned about the education market requirements. In 2004, they bought a new premises, which allowed proper storage of equipment and had a showroom for demonstration. In the same year, Audiosystems became accredited by Smart, the whiteboard manufacturer, and by other manufacturers. Being able to source equipment directly from manufacturers enabled the company to start serving the education market with good profit margins. One year later, two employees were hired to cope with the demand of both markets.

At CRControls, the owners believed systems using the Honeywell technology would be more appealing to customers. The case study of Honeywell systems prepared by CRControls in 2010 argued that such systems can provide up to 15 percent reduction in electricity and gas bills for customers and employ open-protocol that can be expanded at any time. In addition, the existing capabilities enabled CRControls to test the new technology before fully migrating into it. The company started using the Honeywell technology when customers did not specifically ask for TREND. Initial systems were developed with difficulty and very low margins. As the company did not have spare capacity to produce TREND and Honeywell systems at the same time, the owners traded more profitable TREND projects for Honeywell projects.

The influence of NSD on the reconfiguration of operations resources and capabilities

In the thematic analysis, four issues emerged from our attempt to answer this research question.

Consequences of outsourcing needed capabilities. Audiosystems outsourced a capability needed for the development of the new service, but required additional capabilities to manage the relationship with the external provider. The company outsourced the design capability, as it did not possess capacity (only two employees) and the resources (facility to store equipment and accreditation with manufacturers) needed to enter in the new market. Audiosystems, however, had to learn how to deal with its partner and created activities to manage the relationship, e.g. handing over information for systems installation, sharing information on the status of the job, managing payments from the partner. This could be seen as an indirect capability;

the ability "to get things done for us either by gaining control of other capabilities or obtaining access to them" (Loasby, 1998).

Softdev also had to develop an indirect capability to manage an outsourced capability. To sell the off-the-shelf BC solution, an advisory service was needed for most customers. The business plan prepared by the company in 2009 showed that besides selling the BC solution to organizations with their own BC team, Softdev promoted the BC solution to consultancy companies and independent consultants, which could include the tool in their proposals. To make consultants work with its interests in mind, Softdev had to invest financial and human resources into it. The marketing plan presented to the board in 2011 showed that Softdev provided consultants with a free demonstration version, joint marketing opportunities, training to use the tool and other IT-related training. The plan also indicated that the business development team produced marketing material and web-based tutorials to attract consultants. Finally, the business development manager mentioned that they were estimating the potential benefits for consultants when choosing the tool over alternative substitutes.

New knowledge use. Case evidence suggested that companies had to learn to use new knowledge efficiently in existing capabilities. CRControls required time to learn how to use the Honeywell technology efficiently, even though they were able to reuse most of the design, installation and maintenance capabilities. The owner and design engineer made an analogy, suggesting it was like learning to speak a new language: you can communicate with other people, but you may not get the structures right. Below, he links his analogy back to the provision of the service:

> There are things you are not familiar with and the first jobs you go out and do. They are not the best ones [...] because you haven't done them as well as you could do. And you haven't got the same margin because it takes you twice as much. If you get maintenance contracts, you then go back and change it because after a while you see better ways of doing it (CRControls, Design Engineer and Owner).

A similar situation happened at Audiosystems. As the company was just installing not designing the systems during the partnership, the system designers have not learned to forecast the material and time needed for the installation of these systems. In some projects, the company had to re-source equipment at the installation stage because it was unable to choose correctly during the design stage. As already mentioned in a quote of Audiosystems' owner, the company lost money in the initial jobs executed for schools in spite of using the same design and installation capabilities. Softdev did not experience this situation when it started using the web-based programming language. The project manager explained that, although the two designers involved in the project were concerned at the beginning, they were able to master it to a cost-efficient level during the project for the council. When asked further about why she thought developers learned quickly, the project manager said the following:

> The level of resources on the Internet now it is just phenomenal and if you have been trained as a programmer, the transition is usually fairly straightforward. Obviously C. and D. have been programming for years, they certainly wouldn't need a basics course (Softdev, Project Manager).

The alteration of capabilities. To provide the Honeywell systems, CRControls had to add some activities to the operations capabilities. The Honeywell systems can have an interface with 800 different devices. To code the software properly, the company had to create a way to collect information on how the devices will communicate.

The installation capability was also altered. CRControls started preparing manuals for customers on how the control system interacts with other systems in the building and training customers on how to control the interaction between systems. The company also changed the maintenance capability by devising a new set of criteria to maintain the Honeywell systems and by creating a set of steps to respond to callouts remotely. Honeywell are IP-based systems and allow an easy remote access. Older TREND systems use modems or do not have on-site communication systems. As such, callouts commonly involved site visits. The company then started adopting the same steps to support TREND systems with better remote communication devices.

At Softdev, the web-based knowledge enabled improvements in the design and implementation of software. In computer-based software, when a fairly advanced prototype was ready for testing, developers had to visit the customer, install the application in the computer of a selected number of users, wait for them to test the system, meet again to discuss necessary alterations, execute alterations, and visit the customer again to install the altered version. This cycle would be repeated until the customer was happy with the system. With the web-based systems, customers receive a login and password to test the system. No installation visits are necessary and many employees of the customer can test the system. Softdev now uses virtual meetings to discuss alterations with customers. Meetings can be held weekly, reducing the time needed to develop the software. Support and maintenance are also provided remotely. The company is now encouraging the use of web-based applications in other bespoke projects.

Capacity implications. In the cases, the companies shared operations resources and capabilities between the new and the existing services, rather than creating a delivery system with dedicated resources and processes, similar to a focused factory (Skinner, 1974), to provide the new service. Sharing operations resources and capabilities created the need for balancing capacity according to customers' demands. Audiosystems hired two full-time employees to be able to cope with the overall demand – churches and the education market. One full-time employee was hired to design and sell systems and the other was hired to install systems. The company also needed to manage demand peaks of the different markets. The project manager explained how they dealt with this situation in 2011:

> [. . .] we got a block of the summer holidays coming up and would have to devote all that time to schools work. So we kind of had to put all our normal church corporate non-educational work on hold at the summer whilst we spent six weeks in schools (Audiosystems, Project Manager).

At Softdev, the developers of the BC piece of software are responsible for upgrading it periodically and responding to callouts of customers of the BC solution. An informal conversation with the business development manager indicated that when developers are allocated to new bespoke projects, they are not able to dedicate much time to upgrade the BC tool. Alterations in the program and its mobile version took twice the time to be implemented. When asked about this in an interview, one developer mentioned that if the demand for the BC application kept increasing, an alternative way to maintain it would be needed.

Discussion

Based on the findings from the cases and on insights from the literature, we propose a conceptual model of NSD composed of three stages: emergence, accommodation

and consolidation (Figure 1). As outlined in the introduction, this differs from many NSD models, which propose that companies have to follow a sequence of stages, e.g. design, analysis, development and launch, to create a service. Such models resemble what Van de Ven and Poole (1995) describe as a life-cycle process of change, which occurs in a progression of pre-defined stages[2]. We, however, suggest that the more means-oriented development processes typical of service firms are dialectical processes of change. According to Van de Ven and Poole (1995), in such processes, change starts to occur when a new entity has enough power to change the *status quo*, e.g. an organization takes actions that challenge the competitive dynamic of an industry. There is then reconciliation between the requirements of this entity and the existing ways of doing things and, eventually, a synthesis is produced. This becomes the new *status quo* and another cycle begins when a new entity challenges this position.

In our conceptual model, the actions and decisions required for the implementation of the new service will cause operations resources and capabilities to change during the accommodation stage. Then, in the consolidation stage, there is a fine-tuning between the requirements of the new and the existing services and companies become used to the reconfigured operations resource and capabilities base. Eventually, this reconfigured base becomes the way companies operate, which will be altered again by the implementation of a new service. The key aspects of this model are the following:

- *Emergence stage.* There is an ongoing mutual adjustment between the existing services provided and the operations resources, capabilities and capacity levels of the company. The emergence stage starts when the prospective service is identified. The idea is sketchy, and may be predominantly market segment driven ("Given my knowledge of our resources, we could make for schools what we do for churches")

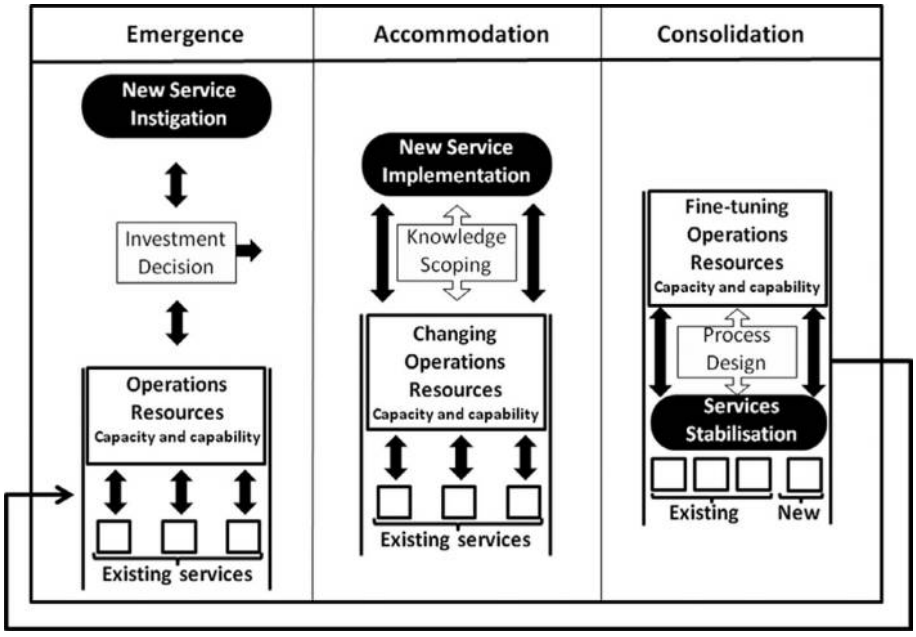

Figure 1.
The NSD process

or resource-driven ("Given my knowledge of our resources, and of a new resource (Honeywell systems), we could develop our resource base to provide similar solutions in a better way"). Companies consider in their investment decision if, and how, existing operations resources, capabilities and capacity enable them to provide the new service. The decision to invest in the service leads to the accommodation stage.

- *Accommodation.* The implementation of the service will reveal what it is realistic to take on inside the firm – both in terms of newness of capabilities, and the capacity of the operation to find time to do new/additional things. Some basic approach to the new scope of knowledge will be determined, bring challenges to the implementation of the new service and cause capabilities to change. Working to try to develop the new service will also cause intensive changes in operations resources, capabilities and capacity levels. It may reveal hidden more generally-applicable resources that are already deployed in existing services; new capabilities will start to develop; capacity trade-offs will appear as effort is directed toward the new service, possibly at the expense of existing ones.
- *Consolidation.* This stage is reached when companies have a better understanding of the new service and can define its process design, i.e. activities, costs, capacity demands ("How many schools can we do a month?") and job descriptions. Besides the stabilisation of the new service, the process of existing services may also change because, for example, new ways of delivering these services may have become available. In addition, process design decisions can fine-tune operations resources and capabilities, e.g. opportunities may emerge for continuous improvement or for economies of scale between the services. Operations resources and capabilities are then carried forward into subsequent NSD efforts.

Our model does not suggest that emergence, accommodation and consolidation are the three stages companies should follow if they want to plan for the development of a new service. Rather, it portrays the process that takes place when service providers redeploy their operations resources and capabilities to implement a service idea they were presented with. In the following subsections, besides describing the three stages in detail, we highlight the aspects that companies should reflect upon in each one of them.

Emergence stage

In this stage, which occurs before the investment decision, companies are presented with a new service opportunity and, then, consider how they can redeploy existing operations resources and capabilities to provide these services. New service ideas can emerge from different places, rather than be formally defined by the company. In the cases, they came from the possibility of rolling out a bespoke piece of software to a broader market, using a better technology to design the control systems and serving the education market. The possibility of using existing operations resources and capabilities will influence the decision to invest in the new service. Softdev, for example, decided to invest in the off-the-shelf solution because its existing knowledge of information engineering and risk management and its software development capabilities enabled the development of the BC tool with minor efforts. At CRControls, the operations capabilities enabled the company to test the Honeywell technology and decide if it was worth adopting it or not. However, the lack of capacity and proper installations delayed the move of

Audiosystems into the education market. The company only started to design and install systems for education institutions when it acquired a new premises and hired two employees. As such, in the emergence stage, service ideas emerge and managers look at their operations resources and capabilities to understand if they have the means to invest in the new service or not. Therefore, existing operations resources and capabilities will enable, delay or make it impossible for companies to take advantage of new opportunities.

Point for consideration – capacity availability. Existing capabilities may allow the company to invest in the new services. However, companies need to have spare capacity to do it. At Audiosystems, lack of spare capacity delayed the investment decision. Softdev decided to develop the BC tool, amongst other things, because it had two spare software developers. CRControls had to trade the more profitable TREND systems for Honeywell systems to learn how to use the new technology, because its employees did not have time to develop both systems. Although some resources like knowledge and skills can be put more freely into different uses, because they are less rivalrous[3] and, therefore, can be consumed at the same time to produce different offerings, our data suggest that companies rely on a combination of resources to provide services; some of these resources do have capacity constraints. And as it follows from the theory of constraints, the process capacity is limited to the capacity of the most constrained resource (Goldratt and Cox, 1993). So, companies need to have available capacity to reuse capabilities to pursue expansion. This is a point made by Penrose (1959), but not further developed in more recent analyses. The availability of capacity seems particularly relevant for these means-oriented NSD processes because companies may choose not to pursue a NSD opportunity, if they do not have the necessary means.

Accommodation stage

The accommodation stage starts after the investment decision. If companies decide to invest in the new service, they will have to adapt operation resources and capabilities to the requirements of the new service. Companies will deal with the requirements of the new service as they arise. They will have to learn how to use new knowledge bases. Audiosystems and CRControls struggled, in the beginning, to use the knowledge in an efficient way, even though existing capabilities were reused. The initial systems were not efficiently designed and, therefore, had lower margins. Change in the knowledge bases will also lead companies to change existing capabilities, as proposed by Zollo and Winter (2002). At CRControls, activities were added to the design, installation and maintenance capabilities. Softdev reconfigured the activities to test and implement software because the web-based technology enabled the remote interaction with the customer. Companies will also have to decide whether they will outsource the capabilities they need or not. Using capabilities available in the market will require companies to develop indirect capabilities (Loasby, 1998), i.e. to create activities and employ resources to manage the capabilities outside the company. During the period Audiosystems was working in partnership with the company designing systems for schools, it had to contact the partner, discuss characteristics of the service, and update the partner on job status. The business development team at Softdev also had to create ways to engage with the consultants. In conclusion, the decisions made and activities executed during this stage reconfigure the operations resource and capabilities base.

Point for consideration – knowledge newness and capabilities alteration. We observed an interesting relationship between the newness of the knowledge required by the new service and the change of operations capabilities. Change in the knowledge bases did alter existing capabilities, but the extent of the capabilities change did not seem related to the newness of the knowledge. At CRControls, the Honeywell technology differed considerably from the TREND, but only a few activities were added to existing capabilities. At Softdev, capabilities were reconfigured in a more significant way, even though web-based programming was considered similar to other programming languages. However, knowledge newness did bring challenges to CRControls and Audiosystems. This did not happen at Softdev. This is in line with the argument of Henderson and Clark (1990) that innovations requiring the knowledge underlying systems' components to change create more radical challenges for firms. Based on these findings, therefore, the challenges do not seem to be due to changes in capabilities, but due to the need for learning to use the new knowledge in existing capabilities.

Point for consideration – capabilities outsourcing. Another interesting point relates to the decision to outsource capabilities. The indirect capabilities needed to manage external partners consume capacity of operations resources. At both Audiosystems and Softdev, employees had to use their time to manage the relationship. This consumption of the resources should, therefore, not be ignored in the decision to outsource capabilities. Another point associated with this decision derives from the path dependant nature of resources and capabilities, which enables and restricts future activities (Teece *et al.*, 1997). By developing capabilities to manage external providers, firms may become more likely to rely on the network to produce new services in the future. The decision to rely on capabilities located outside the domain of the company should take these factors into account.

Consolidation stage

During this stage, companies get used to the new and changed operations resources and capabilities and make adjustments between the requirements of existing and new services. In some cases, the changes brought by the new service will become the new way of operating. Softdev, for example, started to propose web-based applications for customers of bespoke services after the NSD. The same happened with the activities created to maintain the Honeywell systems. CRControls started using them to support the TREND systems with remote communication devices. Also, if companies decide to share resources between the new and existing services, at this stage, they will have to make OM decisions that enable them to provide the different services. For example, Audiosystems had to deal with the peaks of demand from both markets. Softdev could also benefit from practices to allocate the time of the software developers better. These practices could enable developers to update the application and support the BC solution customers efficiently at the same time that they are engaged in new bespoke projects. In other contexts, companies may also need to make improvements in the service processes, create more flexible job designs, and establish strategies to deal with the different customers. At the end of this stage, there is no distinction anymore between the previously existing and the new services. Companies' operations resources and capabilities are adapted to provide them all. The cycle will start again when a new service opportunity arises.

Point for consideration – allocation of operations resources and capabilities. An important issue in the consolidation stage relates to the allocation of operations

resources and capabilities to existing and new services. In the cases, to a certain extent, allocation decisions were influenced by strategic and environmental elements; this is in line with the fit argument of Miller (1996). For example, when Audiosystems hired the additional employees in 2005, the company dedicated more time of its resources to install systems in education institutions due to the better profit margins of this sector. Later in 2006, the company made a conscious effort to get back into the church market because of its stable and continuous demand. The employees' time then became more evenly distributed across the two markets. At CRControls, the activities used to install and support Honeywell systems became the standard way of operating because the strategy was to concentrate on Honeywell systems. These examples illustrate how elements, like profitability, market stability, and strategies, influence the prioritization between services and the allocation of resources. Therefore, companies undergoing such NSD processes should consider how to use OM practices, like demand and capacity management, to better link their operations resources and capabilities to other strategic intents.

NSD process: implications of a dialectical process

This dialectical model offers a different conceptualization on the generation of ideas, on the implementation of services, and on the cyclical nature of the process than the life-cycle NSD models. In this NSD, new concepts can come from different sources, e.g. customers and changes in existing services. The alignment between what customers want and the service concept is important and companies have to consider how the emergent concept meets customers' requirements. However, they do not have to follow a progression of stages to identify customers' needs and to create a formal description of the concept and of the delivery system. In addition, the implementation phase is not only about training people or acquiring facilities or deciding what capabilities to develop (Menor *et al.*, 2002). It is also about adapting to changes brought by the new service and deciding how to reconcile the requirements of the new and the existing services. Once companies start providing the new service, they learn to use new knowledge bases and alter existing capabilities. If companies decide to outsource capabilities, they will have to develop capabilities to manage external providers. Companies have to decide if the services will share resources and capabilities and make strategic OM decisions. Finally, in this process, companies eventually reach a state in which they are adapted to the reconfigured operations resources and capabilities. Once new service ideas emerge, the cycle can start again. As such, the cyclical nature of the process is not due to the fact that companies will launch the service and then try to improve or adjust the service concept, as proposed in the models of Tax and Stuart (1997) or Johnson *et al.* (2000). Rather, our model proposes that NSD is cyclical because the reconfiguration of operations resources and capabilities, caused by the NSD, enables companies to exploit new service ideas in the future. If NSD creates new means for companies to invest in new ideas and service companies are more likely to pursue emergent ideas, it is perhaps understandable why services can have continuous development cycles. These differences in relation to life-cycle NSD models provide some ground to understand the more means-oriented and informal nature of NSD.

Besides this understanding, seeing NSD as a dialectical process of change allows us to acknowledge and comprehend better the dynamic between resources and new services. We can see the process through which resources enable new services to be

implemented and are changed by them. If we use a life-cycle approach to look at the model of Froehle and Roth (2007) that proposes a relationship between NSD processes and the resources that support these processes, we are not able to explain the dynamic of this relationship. Using a dialectical model, we can capture this interaction. As Van de Ven and Poole (1995, p. 510) say "a way of seeing is a way of not seeing". Perhaps, the reason why Froehle and Roth (2007) do not explain this relationship in detail, although they present it as relevant for NSD, is that they were looking at it from a life-cycle point of view.

Recent studies (Ettlie and Rosenthal, 2011; Zomerdijk and Voss, 2011) and research on the features of service innovation (Martin and Horne, 1993; Djellal and Gallouj, 2001; Hipp and Grupp, 2005) evidence a peculiar nature of new services creation, which our model describes and provides insights to understand further. Our findings may, however, be influenced by the setting in which we studied these processes, i.e. small firms providing knowledge- and labour-intensive services. Small companies may engage more in these means-oriented NSD processes due to their relatively informal structures. Low capital investment requirements may also reduce the risks of investing in emergent service ideas. It would, therefore, be interesting to see how the issues around this topic would change in different contexts, perhaps larger organizations or different types of services, like professional services that are shaped by professions' regulations or services with higher capital investment requirements that may be more constrained by capacity issues and require the acquisition of physical assets.

Managerial implications

Managers can use some conclusions of our model to better foster their NSD processes. For instance, this research reinforces the argument of the behavioral theory of the firm, as presented by Pitelis (2007), that slack resources enable innovation and that firms with slack resources are more likely to innovate. Managers would probably welcome the possibility of operating with a certain level of spare capacity to take advantages of opportunities that come about. However, this strategy may be difficult to sustain due to its financial implications. Perhaps, managers could, in periods of downturn in their industries, use existing resources to explore other markets. In these periods, managers could also improve resources and capabilities so that they can be put into different uses when the time comes. In a knowledge-intensive service context, as the one studied, training employees during these periods could create means for firms to serve new markets in the future. In this case, the path dependant nature of resources and capabilities should be considered. In making decisions about which resources and capabilities to develop, managers choose the path they will pursue and define the options for future expansion opportunities (Helfat and Raubitschek, 2000). As such, their judgment on which paths are "good bets" is critical. A similar argument could be made for the decisions made during the NSD process.

Our study also shows that, although using existing resources may appear attractive, it can have hidden costs. The reuse of resources and capabilities requires the development of additional capabilities (Danneels, 2007). New knowledge bases may be needed and will cause existing capabilities to change. This research showed that even small changes in knowledge bases can alter capabilities significantly. Companies will also have to learn how to use this new knowledge in existing capabilities. During this learning period, new services may not be as profitable and this should be considered

in the investment decision. Managers, therefore, should not underestimate the effort involved in reusing resources and capabilities.

Finally, due to the size of the companies studied, the managers in charge of operations were heavily involved in marketing and other strategic decisions within the companies. This is probably not the case for most large organizations. Companies willing to take advantage of emergent ideas through the redeployment of operations resources and capabilities should perhaps stimulate the cooperation between operations, marketing and other departments. Building on the idea that companies can use certain individuals to integrate departments (Lawrence and Lorsch, 1967), some activities might include moving managers to operations departments so that they can spot new service opportunities and see how existing resources can be used to support NSD initiatives, or encouraging operations managers to lead cross-functional NSD projects.

Conclusion

This exploratory study set out to investigate further the dynamic relationship between NSD and operations resources and capabilities to understand the more means-oriented and informal nature of NSD. The case studies, conducted with three small and medium sized bespoke service providers operating in business-to-business markets, allowed us to observe these NSD processes in-depth and comprehend further that dynamic. Based on our findings, we propose a dialectical model of NSD composed of three stages: emergence, accommodation and consolidation. Rather than prescribing that companies should pursue these stages to develop new services, this model is a conceptual representation of the process that takes place when service providers redeploy their operations resources and capabilities to implement a service idea they were presented with. In the discussion, we also indicate the managerial challenges of this process, which are associated with capacity issues, the reconfiguration of operations resources and capabilities and the allocation of resources to meet the requirements of the existing and new services. The analysis of the means-based NSD process also provides managerial guidelines. From a more theoretical point of view, in this work, we shift the focus from the management of new services to the management of the resources that underpin the evolving and emerging service ideas and offerings. In doing this, we addressed the call of Froehle and Roth (2007), who proposed that we should look at the wide range of resources and processes used to carry out NSD initiatives, by considering the resources and capabilities that comprise the service operation itself.

This research certainly has limitations. We looked at knowledge-intensive SMEs. As mentioned, this probably made some aspects of the process studied more relevant than others. We also did not study unsuccessful new services, which could reveal the drawbacks of these means-oriented NSD processes. Moreover, the companies did not engage in a concurrent product and service development process, which could show a different process dynamic. Our aim was, however, theory building. We brought ideas from the capabilities and resources literature into the NSD field and provided an account of the role of operations resources and capabilities in these processes. We learned from our cases and identified issues that could enhance the understanding of the different nature of NSD processes. This naturalistic generalization (Creswell, 1997) enabled the formulation of a model and ideas that need to be evaluated in future research.

Besides exploring these more means-oriented NSD processes in other contexts, future research could look at how outsourcing, capacity, and knowledge acquisition decisions

during the NSD would influence the reconfiguration of operations resources and capabilities. Although, due to the path dependant nature of capabilities and resources, we may never be able to predict the outcomes of such change processes, such research could help managers understand the consequences of their decisions. Also, in this research, we were not able to explore further how new service ideas emerge and where they come from. In the three cases, the new service idea came from external partners. Perhaps, future research could explore how service companies manage interorganizational resources to develop ideas co-created with partners. Finally, we focused on the means-oriented nature of NSD, but service firms also engage in formal goal-oriented NSD processes. Future research could investigate what leads companies to prefer one approach to the other.

Notes

1. Our statement in this sentence suggests NSD may rely more on effectuation processes of decision-making. In effectuation processes, actors see what can be achieved with existing means and select what to do based on affordable losses and acceptable risks, as opposed to causation processes in which actors choose the means to achieve a particular outcome that will bring the expected return (Sarasvathy, 2001).
2. Existing models are probably a combination of life-cycle and teleological models, in that there are pre-defined stages, but these are enacted in pursuit of a particular goal such as growth or defence of market share, rather than being immanent in the entity being studied. Van de Ven and Poole (1995) explore a number of such hybrid model types.
3. In economics, rivalry is a feature of goods. A good is non-rival when one individual can consume it without reducing the chance of consumption of other individuals. If a good is rivalrous, users may compete among themselves for the consumption of the good (Cornes and Sandler, 1996). We applied the concept of rivalry to resources assuming that goods and services consume resources. As such, when a resource is rivalrous, it cannot be used to produce two different products or services. This will not create rivalry between offerings, but limit the level of output. This proposition links to the idea of capacity availability.

References

Alam, I. (2002), "An exploratory investigation of user involvement in new service development", *Academy of Marketing Science*, Vol. 30 No. 3, pp. 250-261.

Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17, pp. 99-120.

Bitran, G. and Pedrosa, L. (1998), "A structured product development perspective for service operations", *European Management Journal*, Vol. 16 No. 2, pp. 169-189.

Coates, T.T. and McDermott, C.M. (2002), "An exploratory analysis of new competencies: a resource based view perspective", *Journal of Operations Management*, Vol. 20, pp. 435-450.

Cooper, R.G., Easingwood, C.J., Edgett, S., Kleinschmidt, E.J. and Storey, C. (1994), "What distinguishes the top performing new products in financial services", *Journal of Product Innovation Management*, Vol. 11 No. 4, pp. 281-299.

Cornes, R. and Sandler, T. (1996), *The Theory of Externalities, Public Goods, and Club Goods*, Cambridge University Press, Cambridge.

Creswell, J.W. (1997), *Qualitative Inquiry and Research Design: Choosing Among Five Traditions*, Sage, London.

Danneels, E. (2007), "The process of technological competence leveraging", *Strategic Management Journal*, Vol. 28, pp. 511-533.

Denzin, N.K. and Lincoln, Y.S. (1998), *Collecting and Interpreting Qualitative Materials*, Sage, London.

Djellal, F. and Gallouj, F. (2001), "Innovation in services, patterns of innovation organisation in service firms: postal survey results and theoretical models", *Science and Public Policy*, Vol. 28 No. 1, pp. 57-67.

Edvardsson, B. and Olsson, J. (1996), "Key concepts for new service development", *The Service Industries Journal*, Vol. 16 No. 2, pp. 140-165.

Eisenhardt, K.E. (1989), "Building theory from case studies", *Academy of Management Review*, Vol. 14 No. 4, pp. 532-550.

Eisenhardt, K.E. and Martin, J.A. (2000), "Dynamic capabilities: what are they?", *Strategic Management Journal*, Vol. 21, pp. 1105-1121.

Ettlie, J.E. and Rosenthal, S.R. (2011), "Service versus manufacturing innovation", *Journal of Product Innovation Management*, Vol. 28 No. 2, pp. 285-299.

Froehle, C.M. and Roth, A.V. (2007), "A resource-process framework of new service development", *Production and Operations Management*, Vol. 16 No. 2, pp. 169-188.

Gallouj, F. and Weinstein, O. (1997), "Innovation in services", *Research Policy*, Vol. 26, pp. 537-556.

Goldratt, E.M. and Cox, J. (1993), *The Goal: A Process of Ongoing Improvement*, Gower Publishing Ltd, Aldershot.

Grant, R.M. (1996), "Prospering in dynamically-competitive environments: organizational capability as knowledge integration", *Organization Science*, Vol. 7 No. 4, pp. 375-387.

Handfield, R.B. and Melnyk, S.A. (1998), "The scientific theory-building process: a primer using the case of TQM", *Journal of Operations Management*, Vol. 16 No. 4, pp. 321-339.

Helfat, E.C. and Raubitschek, R.S. (2000), "Product sequencing: co-evolution of knowledge, capabilities and products", *Strategic Management Journal*, Vol. 21, pp. 961-979.

Henderson, R.M. and Clark, K.B. (1990), "Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 9-30.

Hipp, C. and Grupp, H. (2005), "Innovation in the service sector: the demand for service-specific innovation measurement concepts and typologies", *Research Policy*, Vol. 34, pp. 517-535.

Jick, T.D. (1979), "Mixing qualitative and quantitative methods: triangulation in action", *Administrative Science Quarterly*, Vol. 24 No. 4, pp. 602-611.

Johnson, S.P., Menor, L.J., Roth, A.V. and Chase, R.B. (2000), "A critical evaluation of the new service development process: integrating service innovation and service design", in Fitzsimmons, J.A. and Fitzsimmons, M.J. (Eds), *New Service Development*, Sage, Thousand Oaks, CA.

Kim, K.J. and Meiren, T. (2010), "New service development process", in Salvendry, G. and Karwowski, W. (Eds), *An Introduction to Service Engineering*, Wiley, Hoboken, NJ.

Kindström, D. and Kowalkowski, C. (2009), "Development of industrial service offerings: a process framework", *Journal of Service Management*, Vol. 20 No. 2, pp. 156-172.

Lawrence, P.R. and Lorsch, J.W. (1967), "Differentiation and integration in complex organizations", *Administrative Science Quarterly*, Vol. 12 No. 1, pp. 1-47.

Leonard-Barton, D. (1992), "Core capabilities and core rigidities: a paradox in managing new product development", *Strategic Management Journal*, Vol. 13, pp. 111-125.

Loasby, B.J. (1998), "The organization of capabilities", *Journal of Economic Behavior & Organization*, Vol. 35, pp. 139-160.

Martin, C.R.J. and Horne, D.A. (1993), "Services innovation: successful versus unsuccessful firms", *International Journal of Service Industry Management*, Vol. 4 No. 1, pp. 49-65.

Menor, L.J., Tatikonda, M.V. and Sampson, S.E. (2002), "New service development: areas for exploitation and exploration", *Journal of Operations Management*, Vol. 20, pp. 135-158.

Meredith, J. (1998), "Building operations management theory through case and field research", *Journal of Operations Management*, Vol. 16 No. 4, pp. 441-454.

Miles, M.B. and Huberman, A.M. (1994), *Qualitative Data Analysis: An Expanded Sourcebook*, Sage, London.

Miller, D. (1996), "Configurations revisited", *Strategic Management Journal*, Vol. 17, pp. 505-512.

Mills, J., Platts, K. and Bourne, M. (2003), "Applying resource-based theory: methods, outcomes and utility for managers", *International Journal of Operations and Production Management*, Vol. 23 No. 2, pp. 148-166.

Pandza, K., Polajnar, A., Buchmeister, B. and Thorpe, R. (2003), "Evolutionary perspectives on the capability accumulation process", *International Journal of Operations and Production Management*, Vol. 23 No. 8, pp. 822-849.

Penrose, E.T. (1959), *The Theory of the Growth of the Firm*, Blackwell, Oxford.

Pitelis, C.N. (2007), "A behavioral resource-based view of the firm: the synergy of Cyert and March (1963) and Penrose (1959)", *Organization Science*, Vol. 18 No. 3, pp. 478-490.

Sarasvathy, S.D. (2001), "Causation and effectuation: toward a theoretical shift from economic inevitability to entrepreneurial contingency", *The Academy of Management Review*, Vol. 26 No. 2, pp. 243-263.

Scheuing, E.E. and Johnson, E.M. (1989), "A proposed model for new service development", *The Journal of Services Marketing*, Vol. 3 No. 2, pp. 25-34.

Skinner, W. (1974), "The focused factory", *Harvard Business Review*, May/June, pp. 113-121.

Slack, N., Chambers, S. and Johnston, R. (2010), *Operations Management*, Pearson Education, Harlow.

Srai, J.S. and Gregory, M. (2008), "A supply network configuration perspective on international supply chain development", *International Journal of Operations and Production Management*, Vol. 25 No. 5, pp. 386-411.

Tatikonda, M.V. and Zeithaml, V.A. (2002), "Managing the service development process: multi-disciplinary literature synthesis and directions for future research", in Boone, T. and Ganeshan, R. (Eds), *New Directions in Supply-chain Management: Technology, Strategy and Implementation*, American Management Association, New York, NY.

Tax, S.S. and Stuart, I. (1997), "Designing and implementing new services: the challenges of integrating service systems", *Journal of Retailing*, Vol. 73 No. 1, pp. 105-134.

Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18, pp. 509-533.

Tripsas, M. and Gavetti, G. (2000), "Capabilities, cognition, and inertia: evidence from digital imaging", *Strategic Management Journal*, Vol. 21, pp. 1147-1161.

Van de Ven, A. (2001), *Engaged Scholarship: A Guide for Organizational and Social Research*, Oxford University Press, New York, NY.

Van de Ven, A. and Poole, M.S. (1995), "Explaining development and change in organizations", *Academy of Management Review*, Vol. 20 No. 3, pp. 510-540.

Winter, S.G. (2003), "Understanding dynamic capabilities", *Strategic Management Journal*, Vol. 24, pp. 991-995.

Yin, R. (2003), *Case Study Research: Design and Method*, Sage, London.

Zollo, M. and Winter, S.G. (2002), "Deliberate learning and the evolution of dynamic capabilities", *Organization Science*, Vol. 13 No. 3, pp. 339-351.

Zomerdijk, L. and Voss, C. (2011), "NSD processes and practices in experiential services", *Journal of Product Innovation Management*, Vol. 28 No. 1, pp. 63-80.

Appendix. Interview protocol

Company's name:
Interviewee's name:
Interviewee's position:
Company
1) History of the company
2) Organizational structure and attributions
3) Customers (direct and indirect)
4) Portfolio of products and services (Check main markets and systems sold)
5) When did you last launch a new system in the market or start to serve a new market? Any other?
Operation Resources and Capabilities
1) Main activities involved in designing and implementing a system?
2) Common activities across the development of systems for different customers?
3) What is usually customized for one particular customer?
4) What are your key resources, capabilities and knowledge bases?
5) Do you subcontract any part of the process? What? Why?
NSD
1) How did you come up with the idea?
2) What was necessary to develop and compete in the new market?
3) What did you have to learn for the development of the new system?
4) How did the provision of the new service change the way in which you used to work e.g. the design, development, and installation of services?
5) Do you see new markets you could enter?
6) Main difficulties limiting further expansion?
Probes:
1) That's interesting, could you tell me more about that?
2) Could you give me an example
3) Do you have any document I could see

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