INNOVATING BACKWARDS: REVERSE R&D PROCESS IN SERVICE INNOVATION

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Abstract
Services have traditionally been perceived as less innovative than product, raising questions about why service firms are less able to apply best innovation practices than their product counterparts, and whether the process of service innovation is well understood. Based on the case-study research performed on four product-service providers, our findings reveal that conventional product-oriented thinking about the nature of the innovation process does not extend to services. While product innovation begins with research, continues with design/development, and is followed by production and use respectively, the innovation of a service starts with the initial design, while the actual research is...
performed simultaneously to production and use of this ?first service?, as the experiential nature of service implies that a significant part of the service is unknown in the initial design stage and that the first learning experience comes in production/use. The initial service delivery (production and use) tends to be less successful, which can be seen as the actual research investment that is to be recouped in the following service-delivery projects. The inverted design-research sequence, and simultaneity between initial service production/use and research, also results in a different risk profile of service innovation. Given that customers commit to pay for the ?innovative? service delivery after they are presented with an initial design, service innovators don?t face the market risk that the products face, but instead face a delivery risk of that first service. This paper discusses at length the implications of the reverse innovation process and associated risks.
ABSTRACT

Services have traditionally been perceived as less innovative than product, raising questions about why service firms are less able to apply best innovation practices than their product counterparts, and whether the process of service innovation is well understood. Based on the case-study research performed on four product-service providers, our findings reveal that conventional product-oriented thinking about the nature of the innovation process does not extend to services. While product innovation begins with research, continues with design/development, and is followed by production and use respectively, the innovation of a service starts with the initial design, while the actual research is performed simultaneously to production and use of this ‘first service’, as the experiential nature of service implies that a significant part of the service is unknown in the initial design stage and that the first learning experience comes in production/use. The initial service delivery (production and use) tends to be less successful, which can be seen as the actual research investment that is to be recouped in the following service-delivery projects. The inverted design-research sequence, and simultaneity between initial service production/use and research, also results in a different risk profile of service innovation. Given that customers commit to pay for the ‘innovative’ service delivery after they are presented with an initial design, service innovators don’t face the market risk that the products face, but instead face a delivery risk of that first service. This paper discusses at length the implications of the reverse innovation process and associated risks, as well as managerial recommendations on how to capture learning, make the right investments and mitigate risk.
INTRODUCTION

Organisations respond to the changing nature of the market environment with innovation. Innovation has traditionally been seen as an outcome of a collision between technological opportunities and user needs that are usually embedded in new products, and represents a critical dimension of economic value creation (Schumpeter 1934). A number of valuable concepts at the level of a product (e.g. innovation funnel, stage-gate innovation, open innovation), as well as firm (e.g. innovation portfolio mapping, innovation roadmaps), have helped academics and practitioners inform their understanding of how firms innovate their products. However, during the last decades researchers have broadened the concept of innovation to include types of innovation other than technology driven. Amongst others these include: design innovation (Verganti 2006; Walsh 1996), business model innovation (Amit & Zott 2001; Zott & Amit 2010); and process innovation (Hammer 2004). Furthermore, the interest in different innovation contexts – service environments as opposed to the well-studied product environments – is gradually increasing (Drejer 2004).

Early interest in innovation in the service context soon faced its first challenges. Several innovation studies have reported that innovation activities in the service sector and service firms are less organised than those of firms in the industrial or manufacturing sectors, and that service firms rarely have R&D (research and development) departments for innovation activities. In a service firm, innovation tends to be conducted by different units and in relation to different functions, such as strategic planning, training, and market development (Fagerberg et al. 2006). Potentially due to the significant differences in the organisational design of the innovation function (mostly centralised in product firms versus mostly dispersed in service firms), the quantitative measures of innovation (e.g. R&D spend) have been failing
to capture all innovation efforts in the context of services (Gallouj 2010). At the same time, anecdotal evidence suggests that a number of highly innovative service firms have not only obtained competitive advantage but also succeeded in disrupting their competitors as a result of ‘radically innovating’ the overall business model. A celebrated example of a radically new service is low-cost air-transportation.

The presence of this, and many other examples, serves as an illustration of shortcomings that the traditional product innovation lens may pose for the understanding of innovation in the service context. Furthermore, given the differences in organising innovation, one may wonder whether the underlying process of innovation is the same in product and service firms. Does the linear funnel-based approach from research to development, followed by production and customer use, apply to service firms as well? This question is particularly apposite when one considers the well-established difference in the process of production and use; unlike products where production is followed by sales and then use, services are first sold and then simultaneously produced and consumed/used in a process that has been intuitively labelled as co-production (Anderson et al. 1997; Grönroos 2008; Zeithaml 1981). Some more recent research has pointed to different types of innovation that can be found in services (Gallouj 2010). Namely, service innovation can be in the form of a project, rapid application and/or ‘daily’ practice (Toivonen 2010). At the same time, much of this discussion has focused on innovation of isolated services, without much consideration for the implications at firm level.

The purpose of this paper is to contribute to the existing literature on the process of innovation in general, and specifically the process of service innovation, by seeking to understand and conceptualise the process of service innovation at the level of a single service as well as at firm level. Furthermore, our research seeks to understand the relationship
between service innovation and other types of innovation, such as business model innovations, product innovation (in technology or design) and process innovation.

In order to answer these questions, we decided to concentrate on the multiple comparative case-study analysis of companies that provided durable products and multi-year (relational) service contracts, related to these products. Relational services, such as multi-year leasing and maintenance contracts, are among the most complex examples of the co-production process, which is significantly different than that of typically transactional products. In addition, studying product-service providers allows us to contrast their process of product innovation to that of service and also inspect their interrelationships.

The paper is structured as follows. First we introduce the well-established literature on the process of product innovation, followed by the first contributions on the process of service innovations. We then present our research methodology, followed by the case-study results and discussion of conceptual framing for the process of service innovation. The paper ends with conclusions, where we revise both the theoretical and practical implications and discuss the challenges for further research.

THEORETICAL BACKGROUND

Product innovation: characteristics, typology and process

Innovation has already been recognised as a source of value creation in organisations in the first part of the twentieth century (Schumpeter 1934). Nevertheless, the adoption of innovation as a core component of firm strategies and value-creation function became widespread during the last decades of the twentieth century, complementing and even
overtaking the interest in flexibility and efficiency as the core sources of value creation (Bolwijn & Kumpe 1990). One of the most significant early contributions was an understanding of the process of innovation and its conception as an R&D funnel (Wheelwright 1992). What accompanied the interest in understanding the process of innovation was interest in its success factors and productivity of the R&D process (Cooper 2008). Looking to address the major problems associated with productivity – promotion of non-promising candidates in the later and more expensive stages of product development – Cooper (1992) proposed a stage-gate process as a way to optimise return on the investments in R&D. The further developments on the funnel process provide a roadmap to facilitate R&D projects, define the project leaders’ objectives and tasks and perform stage-based evaluation to better rank projects and focus resources (Cooper, 1990).

More recent contributions have focused on the opportunities to improve innovation success by opening up the R&D funnel and engaging with the ecosystems and firm surroundings. Examples include customer involvement in the early stages of R&D (von Hippel 1990) or sourcing of innovation ideas and projects externally through licensing, partnerships or intermediaries (Chesbrough et al. 2006), as well as the potential use of alternative business models or routes to commercialise promising technology that doesn’t fit firm strategy (Chesbrough et al. 2006).

Building on the milestones of these contributions, a growing number of studies further examined the impact of ‘opening’ up the innovation process. For example, Becker and Dietz (2004) investigated the role of R&D cooperation in the innovation process – in particular the impact of R&D cooperation on firms’ innovation input and output, as well as the number of cooperation partners – on the innovation behaviour of firms. Bidault et al. (1998) instead probed the adoption of Early Supplier Involvement (ESI) in the product development process
at the early stages of concept development and design. Busom and Fernandez-Ribas (2008) looked into the effects of R&D subsidies and the way they organise their innovation process. The findings suggest that public R&D programmes trigger a behavioural change in firms’ R&D partnerships, alleviating barriers to cooperation.

Furthermore, the innovation processes in certain industries, such as low- and medium-technology (LMT) industries, depend on non-formal R&D activities and the use of external sources (Santamaria et al. 2009). The results strongly support the view that non-R&D activities, such as design, the use of advanced machinery, and training, are crucial to understanding the innovation process of any firm. The empirical evidence also revealed the importance of external sources of innovation like consultants, hired-in personnel, collaboration agreements, and external R&D. Howells (2006) offered a typology and framework of the different roles and functions of the intermediation process within innovation, and operationalised the typology within the context of the UK using the case-study approach. Tether (2002) presented the analysis showing that the relationship between innovation and co-operation is not straightforward. Tether’s (2002) findings suggested that firms that engage in R&D and attempt to introduce higher-level innovations, i.e. 'new to the market' rather than 'new to the firm', are much more likely to engage in cooperative arrangements for innovation.

In addition to focusing on the ‘opening’ of the R&D process, literature has also looked at the interrelationships across projects within the overall firm innovation process. Wheelwright (1992) was amongst the first to notice that a company focus on innovation projects in isolation may lead to suboptimal decision-making that neglects knowledge created across related projects or at the level of ‘product platforms’. It has been argued that firms need an ‘aggregate project plan’ to optimise their R&D productivity (Wheelwright 1992). Thomke et al. (1998) extended this conception through the description of the ongoing trial-and-error
problem-solving processes and strategies for experimentation used in the development of new products and services, the rapid advances being made in problem-solving methods, and the impact that such advances can have on the competitive position of adopting firms (Thomas et al. 2008). More recently, the dependency and path creation in firm innovation has been mapped out with the focus on the effect of cognitive frames and organisational processes (Thrane et al. 2010). The results of Thrane et al.’s (2010) study illustrate how firms are cognitively locked into an innovation path focusing on generating ever-new product versions on different technological platforms, regardless of cannibalisation among the firm’s different product versions.

Until recently, the main focus of innovation research has been on product innovation and the R&D processes that lead to successful and novel products. Admittedly, certain interest in process innovation has long been present (Hammer 2004). On the other hand, recent research efforts have started to focus on other types of innovations, which may have value-creation potential that meets or even exceeds the potential of product innovation. Innovation in business models, for example, has reached considerable interest in practice as well as in academia. Defined as content, structure and governance of transactions (Amit & Zott 2001) and activity systems (Zott & Amit 2010), or alternatively seen as value proposition, the value-delivery system and value-capture mechanism (Teece 2010) business model represents a significant source of the innovation potential. Amongst the latest contributors, Doganova & Eyquem-Renaul (2009) investigated the role performed by business models in the innovation process. They indicate that the business model is a narrative and calculative device that allows entrepreneurs to explore a market by playing a performing role and by contributing to the construction of the techno-economic network of an innovation.
Service innovation: link to products and service innovation characteristics

Along with the interest in different types of innovation came the interest in innovation in different contexts, such as services or the service-oriented business model of manufacturing firms (Gallouj & Weinstein 1997; Sundbo 1997). Cooper (2011) suggests that in mature and commoditised markets, product innovation is not sufficient for success. According to him, the answer is radical innovation – breakthrough products, services and solutions that rely on larger-scope and more systems-oriented solutions and service packages, such as Apple’s iPod/iPhone with iTunes features. Cooper (2011) gives a couple of examples on how to shift the focus to services, but the question remains about what the innovation process of services looks like and whether it is the same as the innovation of products, particularly in light of the production/consumption differences between products and services (Anderson et al. 1997; Grönroos 2008; Zeithaml 1981).

This question remains difficult to answer, given that the focus of the innovation literature has been on the innovation process and development of new products, while services have been under-represented. Nevertheless, first contributions have started to appear. Gallouj and Weinstein (1997) laid the foundations of a theory that can be used to interpret innovation in the service sector, drawing on the product innovation frameworks. The results illustrate various modes of innovation in the service sectors and also stress the difference of measuring productivity in product vs service innovations.

While first contributions mostly tried to draw parallels between the products and services, several other authors further focused on the differences between products and services with
respect to innovation (Gann & Salter 2000; Hipp & Grupp 2005; Sirilli & Evangelista 1998). Hipp and Grupp (2005) suggested that the notion of innovation established in the manufacturing sector couldn’t simply be transposed to the service sector. Their work criticised existing measurement concepts derived from manufacturing, and introduced a new typology with a view to obtaining a better understanding of innovation in services. Further to that, Castellacci (2008) compared the sectorial patterns of innovation in manufacturing and services, stressing the increasing importance of vertical linkages and inter-sectorial knowledge exchanges between these interrelated branches of the economy. Sirilli and Evangelista (1998) provide empirical evidence on the characteristics of technological innovation in the service sector, and highlight major similarities and differences with manufacturing, emphasising the diffused and variegated nature of technological innovation and reliance on a wide range of innovation sources, and the role of software and investments in other service-related machinery/tools. At the same time, Amable and Palombarini (1998) studied the pattern of technical change in the service sector using an indicator of total technology intensity, which takes account of the R&D incorporated in purchases of intermediates and equipment, and suggests that the service sector does not appear as homogeneous.

Understanding the process of service innovation

After the comparison of the characteristics of product and service innovations, research has started to focus on comparison between their innovation processes. Building on the work of Gallouj and Weinstein (1997), de Vries (2006) made a notable contribution by distilling three approaches to studying innovation in services: assimilation, demarcation and synthesis. The synthesis approach attempts to arrive at a theory relevant for service and manufacturing. A
specific set of contributions involves the process of innovation of highly complex, project-driven product-service systems, such as design, engineering and construction firms. Gann and Salter (2000) found that project-based firms rely upon combining technical expertise from other organisations in order to deliver their own technical capabilities, usually in one-off processes. Their study also argues that these firms are only able to effectively harness and reproduce their technological capabilities by integrating project and business processes within the firm. Blindenbach-Driessen (2006) built on this knowledge of project-oriented firms by focusing directly on new service-development projects in these firms. They found that some of the success factors for functionally organised firms, as described in the literature, appear to be more important in project-based firms, while others seem redundant; and the specific structure and capabilities of project-based firms seem to provide an explanation for these differences.

While innovation management literature seems to concentrate significant attention on the innovation trajectories of product firms and new product-development processes, understanding how service firms innovate, and what kind of processes they rely on to do so, seems to be still in its infancy, in particular at firm level. This is surprising, given the evident importance of services in the economy, recent technological trends that seem particularly to be offering opportunities for service firms to innovate (e.g. advent of the Internet or instruments, such as RFID technology and sensors), as well as a clear difference in production processes of products and service firms. To clarify and contribute to this line of research, we decided to conduct a case-based study that seeks to shed light on the following questions:

1. What kind of processes guides service innovations? How does it differ from the product-innovation process?
2. How is service innovation related to other types of innovations, such as product innovation, business model innovation or process innovation?

METHODS

To study the process of service innovation and its potential relationships with other types of innovations, we opted for an inductive case study (Yin, 2009). Our intention was to map out the fundamental innovation processes and associated phases for each of our cases and note presence and interrelationships with any other types of innovation that took place either before, concurrently or after the focal service innovation/s. Using this research design, we were looking to accurately capture the characteristics of the innovation process at the level of a service as well as at the level of a firm.

We perceived case-study design to be appropriate for a variety of other reasons as well. First, case-study design has proved to be particularly adequate when trying to answer the ‘how’ type of questions, such as ‘how innovation processes occur in our case organizations’ (Eisenhardt 1989). In addition, we identified a research gap in the literature that led us to assume that no theoretical frames in this area existed. Only a limited number of research contributions addressed the question of the service innovation process. Furthermore, to our knowledge there were no contributions that considered the firm-wide implications of the process of service innovation, and in particular interrelationship between different service innovation projects and other types of innovation (Eisenhardt & Graebner 2007); i.e. the level of analysis has mostly been on individual service/product innovation processes.
Four comparative case studies were selected to allow for replication logic and to incite an enriched understanding of the service innovation processes and innovation dynamics at play (Yin 2009). The choice of the firms was both deliberate and representative (Eisenhardt 1989; Yin 2009). First, given that our research has focused on understanding the process of service innovation, and in particular how it might compare to the process of product innovation, we opted for firms that provided both products and services. Our expectation was that the respondents from these firms would be likely to contrast product and service innovation processes. At the same time, we chose in particular manufacturers and service providers of complex engineered equipment. Given that these products have a lifespan of ten years or more, they provide a market opportunity for the relational services that may be of a duration that even matches their lifespan (Neely 2008; Wilkinson et al. 2009). Relational services represent the most demanding service categories, as they imply uncertainty over long periods of time and often also assumed risk-taking on the provider’s side (Visnjic and Neely 2011; Wilkinson et al. 2009). Finally, they are the best examples of the production/consumption or so-called co-production between service provider and client, because they require significant client involvement over extended periods of time (Anderson et al. 1997; Grönroos 2008; Zeithaml 1981). It seemed appropriate to contrast the innovation process of these services with the more transactional products that have been frequently used as an exemplar in research of the innovation processes.

Furthermore, looking to isolate our findings from the potential sector-specific characteristics of the innovation processes, we opted for two firms that were originally engine manufacturers and two firms that began as train manufacturers. All of these firms operate globally, while our primary contact was with their UK-based management. Finally, four companies anecdotally shared different impressions with the service innovation trajectories. One train manufacturer
experienced minor hurdles initially, while the other had significant hurdles and losses; one engine manufacturer exhibited no difficulties throughout the process, while the other experienced minor hurdles.

Research has evolved in several phases, starting from data collection and description to analysis and validation (Pentland 1999; Pettigrew 1990). As is common with case-study research projects, we allowed for phases to overlap and intertwine (Faems, Janssens, Madhok, & Van Looya 2008). Data collection and analysis were oriented towards organisational data, retrievable from both archival data and semi-structured interviews (Kvale 1996). We conducted a minimum of two interviews in all the organisation case studies, and these mainly targeted top management, who were aware of the innovation procedures and specifics in their organisation.

The interview protocol was built around four high-level questions: 1) What innovations have been adopted and taken to the market over the past 20 years; 2) How would you describe these innovations (e.g. product, service, business model, process); 3) What did the process and sequence of these innovations look like, and were there interdependencies? 4) What were the outcomes of each innovation project and the overall innovation process in general?

In addressing respondents with these questions, we asked additional questions to gain further insight where appropriate. Given the focus of our research, we concentrated in particular on the service innovations. To counter disadvantages inherited through partially retrospective data collection, we have concentrated on concrete events, client details, timelines and project examples (Miller & Salkind 2001). In addition to the interview data, we used company reports, financial data and historical records to gain triangulation to deepen our understanding.
of each case (Eisenhardt & Graebner 2007). Archival data was particularly helpful in tracking evolutionary aspects of innovation processes.

We started the analysis process by having two individual researchers perform detailed within-case analysis following a write-up of detailed descriptions for each case (Yin 2009). Within-case analysis performed by two individual researchers was chosen in order to take into account the richness of the contextual data and gain more confidence in the research findings (Barratt et al. 2011). To avoid any bias towards the status of the informants we decided to cross-analyse the data so that the respondent’s position in the firm remained anonymous (Miles & Huberman 1994). The first constructs and their relationships started to emerge and we gained initial insights into the possible characteristics of the service innovation processes and the relationship between service and other innovations at the level of each case.

After the initial screening we conducted a cross-case analysis to recognise the patterns of innovation processes across the cases. We selected two cases at a time and compared them to find differences; we repeated this until all our cases were considered. With this procedure we were able to map out the innovation processes for services and their relationships to other innovations. To validate our findings the results were presented to the company representatives, so that they had the opportunity to correct and provide feedback on some of the specifics that we had possibly misunderstood. The detailed descriptions and models of different types of innovation processes and their relation to other innovations will be discussed next.
SERVICE INNOVATION IN PRACTICE: THE FOUR CASE STUDIES

Please note that the detailed descriptions of the individual case studies have been omitted to comply with the DRUID length restriction. In Table 1 below you will find a summary of the insights for each of the four cases.

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TOWARDS A FRAMEWORK OF THE PROCESS OF SERVICE INNOVATION

Drawing on the findings above, we isolated some of the characteristics of the innovation process as well as the inter-relationships with other types of innovation common to all the cases we investigated.

For all the manufacturing firms, attempting to develop innovative service offering, business model innovation (Cooper 2011) seemed to be an important precursor to the first service innovation. Moreover, the more ‘radical’ the service innovation seemed to be, the more the adequacy of the business model adopted seemed to matter. For example, while Railco and Trainco had similar service innovation ‘increments’, while Railco changed towards service business models and acquired experienced managers ex ante, and had only minor challenges in the process of innovation, Trainco, largely managed under a product-oriented business model, faced severe losses. Furthermore, Logico opted for ex ante investment in a separate
unit that hosted the new business model, and modest, incremental service innovations, and subsequently reported a smoother innovation process.

**PROPOSITION 1:** *Business model innovation may be an important antecedent of service innovation. The adopted business model needs to support the service innovation, in particular when the innovator is a product-oriented firm.*

Unlike product innovation where research and development steps roll out sequentially and are followed by production and then consumption/use, the innovation process in services tends to intertwine and overlap with other value-chain steps. In services, the initial service design (development) seems to come first: service innovation begins with negotiations of what the service will look like based on the desired service outcome of the client. Having never delivered this relational service in the past, the service provider relies on his experience in service delivery, back-of-the envelope calculations of service delivery costs and risks, and the customer’s input as a user and service co-producer. As we have seen from the cases discussed, Trainco, Railco and Airco had to sign risky service contracts due to lack of information-sharing on the client side. On the other hand, Logico was substantially helped by a partnering relationship with the first client, who supported them in the development of initial service innovations.

Once the design is finalised and legalised in a multi-year contract, the provision of the initial service starts. The customer is directly involved in the service provision and his involvement and responsiveness, as suggested in the case of Airco, plays a crucial role for the success of the service. Because services are only produced and, hence, visible once they are consumed, in many instances their success depends on factors that are only visible once the service has
been delivered. Once the service is being consumed, both provider and customer start to learn about the value of the service. The initial service is the first significant learning experience. For example, Trainco had to re-engineer radically the process of service delivery, while Railco had to learn from scratch how to deliver the service they promised.

Hence upfront research and development may be of limited applicability for the use (that would be like testing one product and producing and selling a similar, but not the same, product). Given that prototypes and pilots are not possible for relational services, or are at least very costly (reproducing a five-year contract in a prototype phase would take five years), the service provider only gets a chance to learn about service delivery once it starts providing it. Hence, this ‘learning phase’ or research phase comes at the same time as the first service production takes place.

The service provider makes investments in the tools and equipment needed to deliver service (e.g. investments in IT infrastructure are a frequent follower of service innovation in our cases) once the contract has been signed. As a service provider has a guarantee for service revenues for a particular number of years, the role of the client in the innovation process can be seen as changing from intellectual input, as is common in user-driven innovations (von Hippel 1990), to a role of financier as well as co-producer.

This in turn implies that the nature of risk and the dynamics of risk-bearing differ between products and services. Given that the customer commits to pay for the service for a number of years after the contract has been signed and before production/use (and hence research), the service provider faces limited market risk for its service innovation. More specifically, the service provider does not face the risk that it will develop an expensive service only to
discover that there are no clients for it, as may happen in the case of products. Investments that are made are covered by projected revenues from the customer and are usually financed with preferential loans given clients’ contractual guarantee. This has been assumed in the case of all the relational service cases we examined.

While the market is known *ex ante*, resulting in limited market risk, the service provider faces uncertainty regarding the exact nature of the delivery process and associated risks, for example, estimating performance levels of the service outcomes it commits to (Visnjic and Neely 2011). As the delivery or production of the service is simultaneous with consumption, and subject to contracted performance standards, the service provider becomes exposed to *delivery risk* in the form of higher service costs that lead to penalties and losses or simply reputational losses in the face of a dissatisfied customer. Indeed, Railco and Airco reported decreased profitability at the beginning of their services, while Trainco faced losses.

**PROPOSITION 2a:** In the process of service innovation initial service development may precede the research. The research phase may overlap with the production and delivery of the first service.

**PROPOSITION 2b:** The client (user) gets involved in the process of initial service design and development by stating his/her requirements and expected outcome. In the subsequent phase of (initial) service research, the client figures as a co-producer and financier.

**PROPOSITION 2c:** The nature of the risk in service innovation changes is likely to shift the balance from market risk towards delivery risk.
Given that research occurs simultaneously with delivery of the initial service, the question that poses itself is how a manufacturer benefits from these learnings, in terms of return on the investment. Indeed, three of our case studies demonstrate challenges with service innovation that may even result in losses generated at the level of the initial service.

In order to benefit from the full scope of learnings and get return on the initial service research (initial service delivery), service firms tend to focus on signing a subsequent service contract. Design of the subsequent service with the same or another customer represents a return on investment on learning/research from the initial service. Logico is a good example of a service provider that manages to drive a spiral of service innovation extending from 1 to 24 services and from 1 client to more than 50.

Given the importance of learning from the initial service and the reputational factor, first-mover advantage matters a great deal in service innovation. More specifically, firms that get a chance to sell a service in advance of other firms entering the market have already completed the R&D process. In the case of a sector where contracts are typically signed over five years, this would give a five-year advantage. In addition, some of the investments made in the first period may be cross-leveraged to the second period (IT systems). Hence, to be the first one to enter into a promising new service market, firms are willing to decrease the price of the initial service in order to gain the experience and reputation (piloting). In the words of Railco’s
service manager: ‘We had to take a hit on a price, in order to win the business development opportunity.’ Railco, as well as the three other service providers we studied, signed service contract extensions with the same customers as well as additional service contracts with other customers.

**PROPOSITION 3:** The initial service development and research phase may be followed by a service extension or provision of a similar service to other clients. Design/development and delivery of a subsequent service may be seen as a point where the research insights of the first service are leveraged.

At the same time, initial service innovation may be a springboard for other types of innovation; Railco and Trainco reported innovating their processes directly after they had adopted innovative service design. For example, promising a level of train availability at Trainco rather than reactively delivering maintenance service at the client’s request meant that the process of maintenance had to be streamlined and reconfigured. Both Trainco and Logico further innovated their business models. Finally, coping with the initial service innovation represented for Trainco’s management an incentive to change their business model from product- to service-oriented. Logico’s parent company gave the green light to having their internal supply-chain services handed over to the Logico SC unit that used to focus only on logistics for external clients. Initial service innovation has lead to other service innovations as well. Both Trainco and Airco developed more sophisticated monitoring services based on the investments made into the monitoring centres they developed. In addition Trainco was contemplating a move towards in-train service for passengers, while Railco was extending its availability contract towards energy-efficiency performance. Logico made additional service innovations a step-wise process for each of the subsequent services. In addition, service
innovation has led to innovations in product offering. Logico entered a multi-party alliance and developed supply-chain optimisation software, while Railco reported a number of changes in train design as a result of comprehensive involvement in service delivery.

**PROPOSITION 4:** Initial service innovation may be a trigger for other types of innovation, such as process, product or subsequent service and business model innovations.

Figure 2 illustrates the interdependencies between initial service innovation and subsequent service innovations.

CONCLUSION

Our results suggest that prior to opting for a service innovation, a firm needs to consider whether its business model is adequate for hosting a particular service innovation. In particular, product firms that are looking to develop a service offering (Cooper 2011), or service firms that are looking to change from transactional services, which are more similar to products than to relational services, should also strongly consider an innovation of their business model (Chesbrough 2003). For example, IBM commenced the transition from a product-driven business model in the 1990s and gradually shifted towards a service-oriented business model by acquiring PWC in the early 2000s, divesting its laptop hardware business in the mid-2000s.
Furthermore, our findings suggest that the process of service innovation is fundamentally different to the process of product innovation. Service innovation starts from the initial service design and development and, once the service starts being co-produced jointly with the customer, the service provider starts to learn and conduct the research. Hence, not only is the intellectual input of the client/user indispensable (von Hipel 1990) at the stage of development, but the client also becomes an active agent in the process of co-production and research. Moreover, having committed to the service contract after the service has been designed, the client also indirectly finances investments in the new service by paying the customer for the delivery. For the service provider, this fundamentally changes the nature of the risk; while the provider has secured its customer in advance and, hence, avoided the market risk, the provider starts to face a delivery risk of not being able to provide service with a calculated cost base or to a certain standard, and hence faces penalties. In both cases service innovation would generate loss.

While business model innovation might need to be kicked off before initial service innovation begins, innovating services may in turn be a good driver for further innovation of the business model as well as for other types of innovation such as process innovation, service innovation and product innovation. In the IBM example, the development of extended, relational services led to the setting-up of a new business model known as a ‘smart planet’ agenda that combines and extends IBM’s product and service offering in an unprecedented way.

Clearly, characteristics of the service innovation process bare a number of implications for the potential service innovator. For experienced product innovators, the product-driven process of innovation may be a cognitive impediment to designing a service-driven approach to innovation. Companies that, for example, host strictly technology-driven and closed-
innovation departments may need to consider involving the customer in the process of product innovation before they take the more radical step of conducting R&D on ‘live’ services.

Probably the most important lesson for firms to take away would be to understand the across-project and over-time interdependencies of the R&D process in services, and to consider the implications of service innovation at firm level rather than as an isolated project. Firstly, this platform-level view would ensure that all the investments were properly accounted for, as well as all the value creation potential considered. For example, while direct service innovation investments are indirectly borne by the paying customer, upfront investments in the business model innovation may be the hidden cost and need to be accounted for too. Similarly, even though the direct returns from the initial service innovation may be modest or even absent, returns on this innovation may come during the delivery of subsequent services as well as the knock-on effect on other types of innovations. Lack of understanding of service innovation dynamics can discourage innovation, lead to premature abandonment of unprofitable initial service innovations, or failure to realise the learning potential of the research phase (initial service provision), in particular when it comes to the ‘less tangible’ experience-related factors and the customer’s role in co-production.

Besides the role it plays in adequate estimates of the project-value creation (balancing cost and reward), as well as value-appropriation regime (the timeframe of the return on investments), understanding the process of service innovation is crucial in decisions concerning size of the innovation increments, and the risk and length of the innovation process. Understanding the process of innovation of service firms and the delivery and market risk mechanisms should help firms mitigate that risk through careful consideration of the
initial service design; more modest service innovations (e.g. smaller performance guarantees) or more flexible service design (e.g. performance within the bands with gain-share mechanisms or limitations to certain types of uncertainties, such as natural disaster) would result in lower risk.

The risk would also depend on the length of the initial service. Admittedly, a longer service contract would mean that the client has been locked in for a longer period of time, which offsets the market risk of innovation. At the same time, the cumulative delivery risk on the project would increase as the timeframe increases exponentially. Firstly, cumulative risk proportionally increases as the contract (and hence risk) is extended for longer periods of time. Secondly, the latter years bare more risk as the ability to foresee the future decreases and general uncertainty increases. Hence the time of the contract would be optimal when it balances the coverage of the market risk for baring investment while not execrating the delivery risk. A number of other expected customers and the likelihood of the renewal would also need to enter into this calculation: the more potential customers follow, the lower the expected market risk and the dependence on the initial clients.

In addition to practical contributions, this paper hopes to contribute to the literature on innovation management in general, and specifically on new product/service development. Our paper congregates insights from a number of research contributions, ranging from open innovation (Chesbrough 2003), to user-led innovation (von Hippel, 1990) and product platforms, (Wheelwright 1992), and builds on this stream of literature, as well as the upcoming literature on service innovation (Drejer 2004) by providing a perspective on the process of service innovation and its firm-level implications in particular.
It goes without saying that the research reported in this paper has limitations. Relying on the experience of four cases allowed us to obtain detailed insights, but it introduced limitations on generalisability. In particular, we focus on the innovation process of relational services, such as multi-year performance and maintenance contracts, and we draw on the experiences of the product-service providers in the industrial services context. In that respect, translating the obtained findings into larger-scale research efforts that involve quantitative testing may be worthwhile pursuing. We hope that our findings and the research topic inspire other scholars to engage in such efforts and develop valuable insights for both practitioners and researchers.

REFERENCES


<table>
<thead>
<tr>
<th>Company alias</th>
<th>Railco</th>
<th>Trainco</th>
<th>Airco</th>
<th>Logico</th>
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<tbody>
<tr>
<td>Core business area</td>
<td>Train solutions</td>
<td>Train solutions</td>
<td>Engine and equipment manufacturer</td>
<td>Engine and equipment manufacturer</td>
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<tr>
<td>Challenges with the service innovation</td>
<td>Some operational challenges resulted in decreased profitability initially.</td>
<td>Significant operational challenges resulted in losses in the first years.</td>
<td>Some challenges in co-creation with customer resulted in decreased profitability initially.</td>
<td>Negligible challenges, unremarkable on the profitability levels.</td>
</tr>
<tr>
<td>Prior to service innovation: business model</td>
<td>Change from product-oriented to service-oriented business model (from selling trains to selling train availability) followed by investment in staff.</td>
<td>Grounded in a product-oriented business model where services used to be seen as a support function.</td>
<td>Anticipated service business opportunity early on and transformed business model from airplane engine producer to aero solution provider.</td>
<td>Investments in a dedicated business unit with a focus on logistics and supply-chain (SC) services for external clients, with an accompanying business model.</td>
</tr>
<tr>
<td>Service innovation: process, customer involvement and risks</td>
<td>Large service innovation step (9-year train availability &amp; reliability performance contract for 27 trains). Two years of serious contract negotiations where client was reluctant to share all information. Service delivery estimate based on a number of assumptions (e.g. performance of secondee). Sizeable investments (new depot).</td>
<td>Large service innovation step (multi-year train all-in performance contract priced by km for &gt;70 trains). Customer taking stance of a heavy negotiator and pushing the price down in a bidding contest. Severe operational issues at the beginning, penalties incurred on a daily basis. Maintenance process innovation, investments in train monitoring centre led to impressive turnaround to the best service contract in UK. See above for the process innovations and technological innovations. Business model innovation towards service-oriented business model and associated investments in leadership. Further service innovations towards monitoring and in-train service under development.</td>
<td>Sizeable service innovation step (total care’ package of a customer’s aero-engine fleet). Uncertainty about the exact service delivery process at the time of the (outcome-based) contract design. Delivery hurdles associated with client participation and willingness to collaborate resulted in early issues with decreased profitability. After organisational innovation has been adopted (joint team with customer as well as risk-sharing mechanism) the delivery process started to function and performance picked up.</td>
<td>Incremental service innovation steps; gradually expanded from a warehousing service to a portfolio of 24 SC services with performance levels, embedded in multi-year contracts. Contracts always allow for the time to recoup investments (usually ICT systems). Capabilities and client base (expanded from 1 to &gt;50) gradually expended from one service to another.</td>
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<tr>
<td>After service innovation: additional service sales and subsequent innovations</td>
<td>Additional service innovation (a 27-year contract on train availability with retained ownership). Additional service innovations contemplated (energy-efficiency performance contract), product design innovations for better endurance and serviceability.</td>
<td>Organisational innovation (see above) and subsequent process innovations (visibility of the scheduling process).</td>
<td>Service innovations (see above). Business model innovation (internal parent SC logistics performed by the dedicated unit too). Product innovation (multi-party software solution development).</td>
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Figure 1. Innovation Process and Related Steps in Value Chain: Products vs Services

**PRODUCTS:**
- Research
- Design & Development
- Production
- Use

**SERVICES:**
- (Initial) Design
- Co-production (Production + Use)
- Research & Development
- New Services and/or Renewal of Service

Figure 2. Relationship between Initial Service Innovation and Subsequent Innovations

- Business Model Innovation
- (Initial) Design
- Co-production (Production + Use)
- Research & Development
- Service (Process) Innovation
- Services Innovation
- Product Innovation
- Business Model Innovation