Understanding service infusion business models:

a network perspective

Abstract

This study recognizes *service infusion* as a fluid phenomenon to redesign *service business models* by explaining the network processes underlying firms' service related strategies. The strategic importance of such service business models is rooted in the need for firms to be able to adapt to a constantly changing business environment in an effort to stay competitive. This study derives a conceptual framework of service infusion from theory, which is exemplified with a multi actor network case analysis. The framework provides an understanding of service infusion as a process of affecting business model changes according to transaction content, structure and governance. Furthermore, this study introduces the concept of *service defusion* as an important counterpart to *service infusion.* Both concepts *together* are found to fully capture firms' movements up and down the value stream (transaction content), as well as their engagement with, and disengagement from, important business partners (transaction structure), and therefore capture important processes for successful service business model redesign. Finally, this study demonstrates the importance of *tacit* and *explicit knowledge transfer and co-creation* mechanisms in successfully managing the redesign of service business models. Thus, this study provides managers with a framework to understand and impact upon the processes underlying service business model change as well as links this with crucial knowledge creation and transfer processes.

Keywords

Business networks; Service business models; Service infusion; Service defusion; Dynamic capabilities.

1. Introduction

Services are becoming increasingly important for firms competing in industrial markets (Ostrom et al. 2010; Ulaga and Reinartz 2011). Firms that traditionally produced goods are driven to reinvent themselves to stay competitive by offering additional services (Mathieu 2001a; Mathieu 2001b). This is due to a need to counter ever-quicker commoditization that threatens their product offerings and thus erodes their market position (Baines et al. 2009; Kowalkowski et al. 2012; Ostrom et al. 2010; Shankar, Berry and Dotzel 2009). As suggested by the strategy literature, firms can tackle such negative developments by following an innovation-based product or cost leadership orientation, and thus distinguish their offering in a superior way to that of their competition (Porter, 1980, 1985; Zott and Amit 2008). These strategies would be in line with the traditional product-based offering of such manufacturing companies, as this relates to the area where these firms have built up their core competencies.

However, business marketing literature suggests that as an alternative differentiation strategy, an inclusion of more services allows manufacturers to increase the value of their offerings (Baines et al. 2009; Frambach et al. 1997; Vandermerwe and Rada 1988). Such *service infusion* as a new business model option is argued to both sustain their market position, and also allows them access to promising new revenue streams related to their original product offerings (Gebauer and Friedli 2005; Johnson et al. 2008; Mathieu 2001; Oliva and Kallenberg 2003). Several recent studies indicate positive effects of service infusion strategies on firm performance; however, they also caution that this is not an automatic effect (Eggert et al. 2011, 2014; Fang, Palmatier and Steenkamp 2008; Homburg, Fassnacht and Guenther 2003; Neely 2008). In addition to differentiating manufacturers' offerings, additional services are difficult to imitate by competition and thus provide competitive advantages that would otherwise be hard to achieve in mature markets via core product differentiation strategies (Baines et al. 2009; Gebauer and Friedli 2005).

The marketing and service literature refers to the concept of using higher value services by manufacturing companies as 'servitization' (Vandermerwe and Rada 1988), 'service infusion' (Brax 2005; Eggert et al. 2011; Kowalkowski et al. 2012), or 'transition from products to services' (Oliva and Kallenberg 2003). According to Oliva and Kallenberg (2003), the transition into services follows

a continuum with increasing degrees of services added to the total offering of a manufacturing firm, coupled with higher integration of services and products (Vandermerwe and Rada 1988), and more complete offerings (Penttinen and Palmer 2007). Service infusion therefore spans a wide range of hybrid forms, from merely adding basic services to augment the traditional product offering (Frambach, Wels-Lips and Gündlach 1997), through to major shifts of manufacturing firms to integrated solution providers (Davies 2004; Matthyssens and Vandenbempt 2008; Windahl and Lakemond 2006), or even business service organizations (Oliva and Kallenberg 2003).

Research into service infusion has focused on providing manufacturers with guidance as to different strategies they can adopt to successfully venture into service provision (e.g. Gebauer 2008; Gebauer et al. 2010; Löfberg, Witell and Gustafsson 2010). Furthermore, the literature focuses on aspects of organizational culture, structure, as well as capabilities and resources that are necessary to successfully implement service infusion strategies (e.g. Bjurklo, Edvardsson and Gebauer 2009; Homburg, Fassnacht and Guenther 2003; Neu and Brown 2005). However, only recently has research started to perceive service infusion as a way of changing a firm's *business model* (Ferreira et al. 2013; Mason and Leek 2008; Mason and Spring 2011; Zott and Amit 2007), thereby noticing that success in service infusion processes largely depends on relationships with business partners beyond the manufacturer-customer dyad (Cantú, Corsaro and Snehota 2011; Ferreira et al. 2013; Nenonen and Storbacka 2010; Spencer and Cova 2012; Windahl and Lakemond 2006).

According to Amit and Zott (2001, p. 511), a firm's business model can be defined as "*the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities*". Such a business model is centred around a particular firm, which 'owns' the business model and competes with other firms' business models on the basis of creating value for customers, and appropriation value for the firm (Johnson et al., 2008). Business models therefore are a firm's specific response to a certain business opportunity, are customer focused and include the interactions with other relevant business partners within business networks (Amit and Zott, 2001). Furthermore, business models are dynamic (Mason and Leek 2008: Ferreira et al. 2013) and need to be continuously redesigned as firms try to stay competitive or move along the product-service continuum (Gebauer, Fischer and Fleisch 2010; Fischer et al. 2010; Kindström 2010;

Kowalkowski et al. 2012). Firms that have adopted a service infusion-based strategy still need to keep agile and reshape their resulting service business models to continue to add value as well as to increase the efficiencies of delivering a service-infused offering. Moreover, these repeated (and continuous) adaptations that need to take place based on service infusion-based strategies are not a manufacturer-centred process, but instead "*a question* [...] *relative to relationships and market context, and corresponding management of interfaces and interaction within and between relationships and networks*" (Ferreira et al. 2013, p. 1100). Therefore, the success of the service business model based on service infusion depends upon the flexibility not only of the manufacturer and customer firm, but also of the surrounding network and market (Spencer and Cova 2012; Ferreira et al. 2013). This dynamism of the innovative business model related to service-infusion strategies, and the interactive, relationship and network-focused view of the business model, are vital for firms to maintain market position (Ferreira et al. 2013).

The literature on service infusion as a process to achieving an innovative business model is yet still in its early development, and primarily centres on how firms in networks co-create value (Cova and Salle 2008; Nenonen and Storbacka 2010; Jaakkola and Hakanen 2012), as well as on different value constellations and network typologies in which such service infusion strategies manifest themselves (Gebauer, Paiola and Saccani 2013; Kowalkowski, Witell and Gustafsson 2013; Mathieu 2001a). Establishing service infusion processes underlying innovative service business models relating to structures, content, and governance mechanisms constitutes a major managerial challenge for manufacturing firms moving into services (Möller and Svahn 2003 & 2006; Möller, Rajala and Svahn 2005; Spring and Araújo 2013). Taking this challenge and the related gap in the literature as the starting point for our article, the main aim of our argument is to provide a conceptual framework that outlines the primary mechanisms underlying the establishment and evolution of service infusion processes in affecting service business model redesign, and to provide insights into managing these business model change processes.

Based on this aim, the contribution of this article is threefold. First, we offer a concept of dynamic business models to cope with service infusion processes as a fluid network phenomenon based on the relationships that a focal company has with important exchange partners. This concept

enables an understanding of service infusion and associated dynamics according to three levels: their transaction content (nature of the offering), transaction structure (actors involved) and transaction governance (operations). Secondly, adopting a dynamic capability view of the firm and retaining the business model perspective, we introduce the concept of *service defusion* as an essential counterpart of the *service infusion* phenomenon. Similar to service infusion, defusion impacts on the transaction content, transaction structure and transaction governance levels of firms' business models. The concepts of service defusion and service infusion *together* allow us to capture how firms move up and down the value stream (transaction content) in reaction to changing business environments. However, it also captures the dynamics related to the business partners involved on the structural level of the business model (transaction structure). Thirdly, we contribute to the service infusion literature by stressing the importance of knowledge transfer and co-creation of knowledge in the mobilization of business partners in the relevant network to manage the service infusion/defusion-related transition processes between business models.

The reminder of the article is structured as follows. In order to provide a theoretical framework, we first carry out a review of the widely dispersed literature on service infusion, juxtaposing different perspectives on the topic. Next, we discuss the concept of dynamic business models as a perspective, relate it to service infusion processes, and introduce the concept of service defusion as its counterpart, on both the content and structural level of the business model. We then discuss the critical role of knowledge transfer and co-creation for the success of dynamic business models. This is followed by an in-depth analysis of an exemplifying longitudinal multi-actor case study, which provides a dynamic description of the service infusion and defusion activities over time in the business network of a Norwegian manufacturer of automated warehouse systems. The case provides rich insights into the processes underlying different infusion and defusion processes. Finally, we provide a discussion of the insights gained from our conceptualization and empirical exemplification of service infusion and defusion, and outline theoretical implications, as well as limitations and further research related to our study.

2. Theoretical Framework

2.1. Service infusion

Service infusion has been defined in the general marketing and management literature as referring to a strategic shift in firms' offerings from "*traditional core product business* [to] *developing ancillary service offerings and value-added solutions*" (Eggert et al. 2011, p. 661). Oliva and Kallenberg (2003, p.160) refer to this as a "*transition from products to services*" along the product-service continuum and thus towards increasing service content and service integration in firms' total offerings ("*…from services as 'add-on' to tangible goods as 'add-on'"*, p. 162). Vandermerwe and Rada (1988), who refer to this shift as *servitization* define it as a move towards "*the increased offering of fuller market packages or 'bundles' of customer focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings*" (Baines et al. 2009, p.554). According to Kindström (2010) companies not only augment their product offering with services, but also develop new offerings when products are no longer central to the company's value proposition. On the other hand Kowalkowski et al. (2012) challenge the common view of service infusion as being a unidirectional transition taken in a few large steps, arguing that it evolves gradually and is incremental; and, moreover, that "*managers have implemented strategies, not from a master design plan, but as a reaction to changing demands and client needs"* (p.771). From this perspective, service infusion is an emergent strategy driven by firms' fast-paced changing business environments.

The literature outlines several strategic drivers providing a rationale for companies to adopt service infusion strategies. Service infusion, in particular in industries characterized by increasing commoditization and accelerating product life-cycles, allows firms to achieve competitive advantage through service differentiation (Frambach, Wels-Lips and Gündlach 1997; Mathieu 2001a; Matthyssens and Vandenbempt 2008). Due to their more *tacit* nature, services are more difficult to imitate and service-based differentiation can provide a sustainable source of competitive advantage (Baines et al. 2009; Gebauer and Friedli 2005). Besides strategic drivers, financial and marketing-related drivers have also been identified. Manufacturers consider venturing into business services as these generally promise higher profit margins and provide more stable cash flows than products,

which often follow economic cycles and are thus less predictable (Davies 2004; Eggert et al. 2011; Frambach, Wels-Lips and Gündlach 1997; Mathieu 2001a). From a marketing perspective, business customers are increasingly demanding product-related services and generally more complete offerings, while manufacturers have found that enhancing product offers with services positively influences the purchasing decision and so helps to increase product sales (Frambach, Wels-Lips and Gündlach 1997; Mathieu 2001a; Oliva and Kallenberg 2003).

Different frameworks exist that guide manufacturers' service infusion activities. Most of them can be placed along the product-service continuum suggested by Oliva and Kallenberg (2003), ranging from 'services as add-ons' to 'goods as add-ons' at the extreme points. *Product-related services* can be considered as the starting point for this continuum and are defined by Frambach, Wels-Lips and Gündlach (1997, p.341) as "*the set of all potential additional services a supplier can supplement this product offering with, in order to differentiate his offering relative to the competitors' as perceived by (potential) customers and distributors.*" For example, a machine tool manufacturer may add training and maintenance service to its offering, or provide financial services such as leasing arrangements. According to Frambach, Wels-Lips and Gündlach (1997), such product-related services can be classified according to their relevance in the purchasing process as being pre-sales, sales, or post-sales services. They also recognize that these services can be distinguished as either transaction or relationship-related. Thus, they hint at the issue that such services could provide the central point around which a relationship with the customer develops.

Mathieu (2001b) follows this line of thinking and distinguishes between *services supporting the product* and *services supporting the client*, with the latter requiring close customer relationships, customization, and adaptation. As we move further up the product-service continuum, the product and service components become less separated from each other. These are referred to as hybrid offerings (Ulaga and Reinartz 2011), bundles (Stremersch and Tellis 2002), full services (Stremersch, Wuyts and Frambach 2001), systems (Mattsson 1973), and integrated or customer solutions (Brax and Jonsson 2008; Davies 2004; Nordin and Kowalkowski 2010; Tuli, Kohli and Bharadwaj 2007). They all have in common a "*shift in emphasis from production to use*" and "*from output (of the production*

process) to input (in the value creating process of the customer system)" (Windahl and Lakemond 2006, p. 807).

Research has proposed several frameworks that capture the associated resources and capabilities, as well as the development process (e.g. from developing a sense of customers' needs, offering development, sales, to offering delivery) to design new solutions, industrial services, or hybrid offerings (Storbacka 2010; Kindström and Kowalkowski 2009; Tuli, Kohli and Bharadwaj 2007; Ulaga and Reinartz 2011). Nevertheless, the literature almost unanimously recognizes that moving along the continuum most importantly requires firms to build and manage closer customer relationships and provide increasingly customized offerings (e.g. Kindström 2010; Mathyssens and Vandenbempt 1998; Penttinen and Palmer 2007; Tuli, Kohli and Bharadwaj 2007; Wise and Baumgartner 1999). While closer relationships offer many opportunities, they also require sets of relational capabilities that typically go beyond that of traditional product-focused manufacturers (Kindström and Kowalkowski 2009). Developing these capabilities enables a shift from product-centred to service-oriented business models (Homburg, Fassnacht and Guenther 2003; Mathieu 2001a, 2001b; Oliva and Kallenberg 2003), which often starts with acquiring new resources and bringing about new mental models of employees, later manifesting itself in the development of services-specific capabilities (Baveja, Gilbert and Ledingham 2004; Bjurklo, Edvardsson and Gebauer 2009; Homburg, Fassnacht and Guenther 2003; Neu and Brown 2005). However, the solutions literature cautions against a total shift towards services-dominated offering bundles, and stresses that there needs to be a balance between goods and service orientations (Brax and Jonsson 2009; Windahl and Lakemond 2010).

According to literature, service infused offerings also require new services-based performance metrices (Wise and Baumgartner 1999), measurement and reward systems (Anderson and Narus 1995; Neu and Brown 2005), as well as costing and pricing methods to ensure profitability (Anderson and Narus 1995; Gebauer and Fleisch 2007; Malleret 2006; Kindström 2010). With respect to organizational structures, Oliva and Kallenberg (2003), Gebauer and Fleisch (2007) and Gebauer, Fischer and Fleisch (2010) suggest that successful service infusion is facilitated by setting-up distinct organizational units dedicated to the service offerings. Contrary to this, Neu and Brown (2005) found

that firms successful in service infusion move away from autonomous business units towards higher integration and cross-unit collaboration. Both perspectives represent valid contextual approaches: while separate business units for services may facilitate the initial move towards product-related services, the further firms move along the product-service continuum, the more they have to become comprehensively service oriented and thus integrated (Fischer et al. 2010).

Many different services strategy frameworks have been introduced (e.g. Gebauer et al. 2012; Raddats and Easingwood 2010; Ulaga and Reinartz; 2011), and research has found that the specific strategy type is contingent on firm size and position in the supply chain (Gebauer, Paiola and Edvardsson 2010; Löfberg, Witell and Gustafsson 2010; Paiola, Gebauer and Edvardsson 2012), and ultimately has to be aligned with the firm's competitive or business environment (Gebauer 2008; Gebauer, Paiola and Edvardsson 2010). However, business environments are constantly changing, and service infusion marks an evolutionary journey pursuing and reacting to changing customer needs and dynamics in the environment (Kowalkowski et al. 2012). Thus, firms have to stay agile and flexible with regard to their position on the product-service continuum (Anderson and Narus 1995; Kindström 2010). This requires dynamic capabilities of sensing and seizing service opportunities, as well as reconfiguring and aligning the organizational design with the corresponding services strategy (Fischer et al. 2010; Kindström, Kowalkowski and Sandberg 2012). This does, however, not necessarily mean that firms are consistently moving up the product-service continuum in a staged fashion, as implied by many frameworks (e.g. Gebauer, Fischer and Fleisch 2010; Fischer et al. 2010; Paiola, Gebauer and Edvardsson 2012; Penttinen and Palmer 2007). Flexibility should mean staying flexible in both directions on the continuum to react to changing business environments or to seize market opportunities.

Some of the literature has moved beyond the buyer-seller dyad and recognized that service infusion can be understood as a *network phenomenon*. Value creation through service infusion may involve multiple relevant actors, such as customers, distributors, suppliers, development partners, third party service providers, and others (e.g. Cova and Salle 2008; Kowalkowski, Witell and Gustafsson 2013; Windahl and Lakemond 2006). As many manufacturers venturing into services do not have prior experiences or expertise of service infusion, such networks of relationships offer access

to necessary resources and capabilities (Cantú, Corsaro and Snehota 2011; Jaakkola and Hakanen 2012; Mathieu 2001a). In addition, firms' supply network position, in particular in the case of SMEs, determines to some extent their level of reliance on third actors (e.g. distributors and resellers) for the provision of service infusion activities (Gebauer, Paiola and Edvardsson 2010; Paiola, Gebauer and Edvardsson 2012). Kowalkowski, Witell and Gustafsson (2013) argue that due to their size and corresponding resource limitations, SMEs rely substantially on others for service infusion activities. They found nine different value constellations, and conclude that there is no pre-defined value constellation for service infusion: often multiple parallel value constellations need to be developed. Relationships with business partners constitute a central element for service infusion for many such value constellations, making relational capabilities key for their success. Gebauer, Paiola and Saccani (2013) found four different service network types and demonstrate the importance of dynamic capabilities (sensing, seizing, reconfiguring), as well as operational capabilities (manufacturing, integrating, selling, delivering); in line with those identified by the operations and supply chain literature (Johnson and Mena 2008).

The literature therefore points towards service infusion as a concept involving not only seller and buyer firms, but one characterized by a network of relationships with different actors combining their resources and capabilities. These networks can take many forms. They are not pre-defined, but dynamic, in that they are continually reconfigured as companies sense opportunities and threats, seizing or overcoming them. Operational capabilities are helpful as long as service strategies and networks are stable; however, the managerial challenges of organizing and ensuring superior performance of those networks that are in transit, due to their dynamic environment, have not yet been addressed in the literature.

2.2. Dynamic business models and service infusion

In order to address the managerial issues involved in the dynamic networks associated with service infusion processes, the underlying mechanisms and processes of the changes are first disentangled. As service infusion processes are aimed at changing and innovating existing business models, we employ *business models concepts* to provide us with a lens through which we depict and analyse different process dimensions. Building on Hamel and Prahalad (1994), who identified

structure and routines as the key features of business models, Mason and Leek (2008) define dynamic business models as "*preconceived organizational and network structures built through the development of interdependent operational and administrative routines that evolve through problem solving activities*" (p.776). According to Amit and Zott's (2001) definition, business models can be conceptualized along three dimensions: 1) *transaction content*, 2) *transaction structure*, and 3) *transaction governance*. While *transaction content* refers to goods, services, and information exchanged, and the associated resources and capabilities necessary to facilitate these exchanges, *transaction structure* refers to the actors involved in the exchange and the way they are interlinked. Finally, *transaction governance* describes the governance mechanisms in place that control the flow of goods, services, resources and information as part of the inter-organizational transactions.

These three dimensions enable us to capture any change processes associated with service infusion activites. Service infusion affects the *transaction content* of the business model by, for example, adding product-related services, or by integrating services and goods into new solutions. Because service infusions are often a network phenomenon, additional actors such as suppliers, distributors, or third party service providers can become involved as part of the infusion. This is captured via the *transaction structure* dimension. Both transaction content and structure can change independently of each other, so that content changes do not necessarily affect the structural level of the network (e.g. a supplying firm may add maintenance services to its products and provide these services itself) and *vice versa* (e.g. a service already provided related to a core product or application, such as fleet management offered by a forklift truck manufacturer, is at some point outsourced by this manufacturer to a specialist service provider). However, transaction content and structure often vary together, so that service infusion can happen along the two dimensions of the content level (i.e. along the product-service continuum), and on the structural level (i.e. the business actors involved) (see figure 1). Thus, novel services can be infused with the help of existing network members or new actors. While the former primarily causes changes on the content level, the latter leads to shifts on both content and structural levels. On the other hand, the provision of existing services can be re-allocated to new actors or among existing actors on the structural level. Any shifts in transaction content or the structure of the business model in turn require adaptations of the associated governance,

coordination and monitoring mechanisms on an operational level to ensure all actors involved in the final offering are in harmony. For example, on the one hand *transaction content*-related shifts, namely shifts upwards on the product-service continuum towards high service content and integration, require more relational involvement, adaptation and collaboration between the firms involved and the customers (i.e. more relational norms are important) (Tuli, Kohli and Bharadwaj 2007). On the other hand, shifts in the *transaction structure* of the business model by involving a third party acting as a service provider for the manufacturer, or as an independent outsourcing provider, affect the governance level. In addition, involving a network of distributors as part of the business model requires different sets of governance mechanisms compared to a model based on a direct sales channel.

Insert Figure 1 about here

2.3. Dynamic business models of service defusion

This inherent dynamism of service infusion is rooted in the dynamic capability view of the firm. This requires organizations to sense and react to opportunities and threats (Teece, Pisano and Shuen 1997). Opportunities may not only lie downstream and threats upstream in the value chain. The concept of service infusion, which is often interpreted as implying a unidirectional path up the product-service continuum, by itself falls short of fully capturing the dynamic capability of the firm. Therefore, a counterpart to the concept of service infusion is needed, which captures situations where firms decide to discontinue certain services, disintegrating or de-bundling certain solutions as reactions to their changing environment. We offer the concept of *service defusion* for this process. Similar to service infusion, service defusion is not limited to the content level, but includes the structural level of the underlying business model. From this perspective, the reallocation of services within the network, as in the case of service infusion, constitutes at the same time a service defusion phenomenon. In other words, a reallocation of services within the network may require first the defusion of the respective service in one part of the network before it can be infused in another part, and therefore be reallocated. For example, a manufacturing company that adds maintenance services to its core product offering (a product-related service infusion) represents only one aspect of the

overall changes. Customers of this firm had to engage in maintenance activities all along; they may have done these themselves, or used third party specialists to do them. With the manufacturer now offering such infused service offerings together with their core products, customers who buy these in fact defuse this service, i.e. they do not engage in it themselves anymore, or do not mobilize external partners to do so.

Figure 2 illustrates the overall framework of infusion and defusion. We arrive at a systemic picture of service infusion/defusion by examining the transaction content and structure level of the business model. From this perspective, a structural service infusion can be accompanied either by a structural service defusion (line a; the service provision of an existing service within the business model is shifted to a new network actor) or by a content service infusion (line b; a new service is introduced to the business model with the help of a new network actor). The other way around, a structural service defusion could mirror a structural infusion (line a) as well as represent a content defusion (line c; the service provision of an existing service is removed from the business model). These simultaneous infusion and defusion activities in the network also affect the governance mechanisms of all actors involved on an operational level. Such a perspective assumes that within business systems, an equilibrium is maintained, so that if one part of the system is affected (e.g. by a manufacturer deciding to add business services to its offering), there is also an impact on another part of the network keeping the system in its equilibrium (e.g. a customer company reducing its service activities). Even in cases where we consider the infusion of novel services on a content level (i.e. business services which were not previously done internally by the customer or a third party), the systemic view presupposing an equilibrium of service infusion and defusion holds: with every new service that an actor introduces, the hypothetical 'option' to offer this service by another network actor would 'expire' (line d). Thus, if at some point another actor were to infuse the same service, it would need to be defused from the actor that originally had infused it, which would then represent a structural service defusion (line a). Similarly, the defusion of a service from the content level of the business model would create the hypothetical option to infuse this service by another actor within the network (line d).

Insert Figure 2 about here

The business model concept provides a framework that allows us identifies important infusion and defusion process dimensions driven by the dynamic capabilities of the firm. The strategic goals that drive service infusion can only be achieved if these processes (and their interdependences) are understood and managed. As a network phenomenon, service infusion and defusion processes require the possible mobilization of other actors within the network (Mouzas and Naudé 2007; Mouzas, Henneberg and Naudé 2008). This mobilization requires these actors to be motivated and/or incentivised to perform new tasks. On a content level, the infusion of novel services may require the actors to co-create the relevant knowledge and expertise. Furthermore, on a structural level, actors defusing certain services may need to support those actors that subsequently infuse them, as the defusing actor has built up knowledge and capabilities relating to these services, which the infusing actor may lack. This means that the redistribution of services within the network creates the need to infuse additional services or to establish a support structure between the infusing and defusing actors to facilitate knowledge transfer between them. Managing this knowledge transfer and knowledge co-creation among actors is critical for the successful innovation of service business models.

2.4. Knowledge transfer in service infusion and defusion

Based on the dynamic business model concept, service infusion and the involvement of multiple actors in the service provision, is facilitated by knowledge transfer activities as well as knowledge creation among the actors. Such knowledge-related activities become a central element for managing the innovative service business models based on service infusion and defusion. In cases where pre-existing services are reallocated to new or existing network members, the primary focus is on knowledge transfer. On the other hand, in cases where novel services are introduced, the new knowledge associated with these activities needs to be co-created among the actors involved (see figure 3).

Insert Figure 3 about here

The success of knowledge transfer is contingent on several factors related to the characteristics of the firms involved, the characteristics of the knowledge itself, and the knowledge transfer process (Grant 1996; Easterby-Smith, Lyles and Tsang 2008). Knowledge recipient-related factors include the recipient's absorptive capacity (Grant 1994; van Wijk, Jansen and Lyles 2008),

experience (Simonin 1999), motivation (Szulanski 1996), and learning intent (Pérez-Nordtvedt et al. 2008). According to Cohen and Levinthal (1990, p. 128), absorptive capacity refers to "*the ability of the firm to recognize the value of new, external information, assimilate it, and apply it*. Given the necessary motivation and intentions of the recipient, absorptive capacity plays a major role in the overall learning process (Ernst and Kim 2002). Knowledge sender-related factors centre on the motivation of the sender to share (Szulanski 1996). Szulanski (1996) also found that '*arduous*' relationships are a substantial barrier to successful knowledge transfer. The nature of the relationship between sender and recipient firms constitutes a critical element for knowledge transfer. With respect to the characteristics of the knowledge that is transferred, past research has found that knowledge transfer is affected by the degree of tacitness, complexity and ambiguity of the knowledge to be transferred (Grant 1996; Simonin 1999; Zander and Kogut 1995).

The literature makes an important distinction between tacit and explicit knowledge as these substantially affect the transfer process (Nonaka 1994; Polanyi 1966). According to Ernst and Kim (2002, p. 1423), "*explicit knowledge refers to knowledge that is codified in formal, systematic language (encoded knowledge). It is knowledge that can be combined, stored, retrieved, and transmitted with relative ease and through various mechanisms*". On the other hand, tacit knowledge "*is hard to codify and communicate*" and "*can only be expressed through action, commitment, and involvement in a specific context and locality. Tacit knowledge is based on experience: people acquire it through observation, imitation, and practice*" (Ernst and Kim 2002, p.1423). The authors stress that tacit knowledge plays a crucial role both as a knowledge carrier, and as an enabler for the utilization of explicit knowledge. Nonaka (1994) suggests four mechanisms of knowledge conversion: "*1) from tacit knowledge to tacit knowledge, 2) from explicit knowledge to explicit knowledge, 3) from tacit knowledge to explicit knowledge, and 4) from explicit knowledge to tacit knowledge"* (p.18). The conversion from tacit to tacit knowledge is primarily achieved though *socialization* (Nonaka 1994), requiring close interaction between receiver and sender. Tacit knowledge is difficult to codify, and therefore the receiver learns through observation, training and application under the guidance of the sender. The transfer of tacit knowledge from one organization to another can also be achieved through the transfer of staff in whom the knowledge is embedded (Blumenberg, Wagner and Beimborn 2009;

Ernst and Kim 2002). The generation of novel tacit knowledge can also be achieved through *socialization* by means of joint development projects and mixed work groups (Blumenberg, Wagner and Beimborn 2009). Explicit knowledge on the other hand can be easily transferred and, according to Nonaka (1994), new explicit knowledge is created though *combining* different pieces of explicit knowledge held by the actors involved. Although explicit knowledge can be codified and transferred, for example in the form of documents, blueprints, manuals, decision support systems, project management software, service level agreements, and contracts (Easterby-Smith, Lyles and Tsang 2008; Blumenberg, Wagner and Beimborn 2009; Kim and Ernst 2002; Zollo and Winter 2002), its utilization is contingent on a proper *internalization* of the knowledge and thus transition into the tacit knowledge base of the recipient (Nonaka 1994). In this case new explicit knowledge is transferred, and through its application broadens, extends, and reframes the original tacit knowledge (Ernst and Kim 2002). Finally, the conversion from tacit to explicit knowledge is referred to as *externalization* and is achieved through the articulation of tacit knowledge (Ernst and Kim 2002). According to Nonaka (1996), new knowledge is primarily created through an interactive and iterative process between the four knowledge conversion modes.

Mason and Leek (2008) follow a similar rationale and refer to hard and soft knowledge transfer mechanisms. While soft transfer relates primarily to tacit knowledge and is achieved through "*sharing of experience through practice, observation and articulation*", hard transfer refers to codified knowledge (Mason and Leek 2008, p. 795). The transfer of explicit knowledge requires its *internalization* by the recipient and thus conversion into tacit knowledge. On the other hand, the transfer of tacit knowledge is often facilitated with the aid of explicit knowledge. For the sufficient transfer of knowledge often both tacit and explicit knowledge transfer mechanisms need to be utilized simultaneously. For both transfer mechanisms, a common language and thus common frame of reference between the sender and the recipient is essential (Blumenberg, Wagner and Beimborn 1996).

3. Business Network Case of Service Infusion and Defusion

3.1. Focal case company and business network

In order to exemplify and further develop the theoretically derived generic framework of service infusion and defusion in a network, as well as to understand the crucial role of knowledge in the service infusion/defusion processes, we conducted a retrospective and longitudinal in-depth multi-actor case study (Hartley 2004; Siggelkow, 2007; Yin 1994). This research strategy was selected as it "*provides an analysis of the context and processes which illuminate the theoretical issues being studied*" (Hartley 2004, p. 323). This strategy is suitable for answering '*how*' and '*why*'-type questions (Stake 1994; Yin 1994) that can only be understood by looking into context-specific developments occurring over a period of time (Eisenhardt and Bourgeois 1988; Yin 1994). An in-depth case study has frequently been argued to be an appropriate way to explore a novel and area of research (see for example Ryals and Humphries, 2007; Siggelkow 2007). The same has been observed for the adoption of a longitudinal or retrospective longitudinal approach (see the studies by Maurer and Ebers 2006; Van Gestel and Hillebrand 2011; Woiceshyn 2000).

We focus our attention on process issues (Mohr 1982; Langley 1999), namely those underlying the dynamics of service business models as conceptualized in our service infusion and defusion framework, and the interaction between the two. These processes constitute our units of analysis in an embedded case (Punch 1998; Yin 1993, 1994), and can be understood at the company, relationship, and network level. We focus particularly on the content, structure, and governance elements of the service business models, and on the knowledge creation and transfer mechanisms involved in the service infusion and defusion processes over time.

The case was built around a focal company and its service infusion and defusion-related business network (i.e. the main distributors and end-customers involved in the company's service provision). We adopted a multi-actor approach to cover all relevant entities involved in the provision of the focal company's core offering, as well as the service infusion and defusion processes. The focal firm is a Norwegian manufacturer of an automated warehouse system. The company's core offering involves sophisticated robotic technology and comprises both tangible and software elements (the identity of all firms involved is kept anonymous). An initial analysis of press coverage and of the company's website, combined with several exploratory, informal interviews with representatives of the focal firm at an international trade fair in Germany, led us to identify this case as suitable for our

purposes. These preliminary discussions allowed us to gain an overview of the case and to begin mapping the main external firms related to the service business model (Hartley 2004).

This specific case was therefore selected not for any specific intrinsic features, its deviant nature, one-off access, extreme context, or uniqueness (Mason 1996; Yin 1994), but instead to portray and further explore the suggested conceptual framework in a setting of reduced variance, based on the premise that it would allow us to "*achieve information that* [would] *permit logical deductions of the type, 'If this is (not) valid for this case, then it applies to all (no) cases*'" (i.e., a critical case; Flyvbjerg 2006, p.230). This purposive and theoretical sampling (Denzin and Lincoln 2000; Silverman 2000) supported our aim of applying the developed framework. The selected case is therefore instrumental (Siggelkow 2007; Stake 2000): it exemplifies the network dynamics of business service model innovations via service infusion/defusion, and provides rich and detailed insights into the processes underlying those dynamics.

In order to arrive at a holistic picture, we collected data from all relevant firms in the network, i.e. the focal firm itself, its main distributors, and end-customers. Data collection took place during the first half of 2012, and was retrospective and longitudinal in nature, covering the period between 2008 and mid-2012. This specific timeframe was selected as it corresponded to a dynamic time in the focal firm's service business model development: The firm changed from having very few, close customer relationships (during the initial commercialization of the automated warehouse offering), to having a substantial customer base and distribution network through which it channels all product sales, service provisions, and customer relationship management. While the initial close customer relationships were aimed at the development and homing of the offering, the decision to switch the channel structure was driven by growth opportunities and resource limitations. Utilizing the market position of the distributors, the firm was able to remain slim and agile while allowing rapid expansion across Europe, Asia and North America within a short period of time. The selected case therefore highlights the transition on content, structural, and governance levels of the business model, and outlines the knowledge transfer and co-creation efforts essential for accomplishing the underlying service infusion and defusion processes.

3.2. Data collection and analysis

Primary data was collected via multiple semi-structured telephone and face-to-face interviews with several managers from all firms included in the network. In total, twenty-five interviews were conducted; some respondents being interviewed on multiple occasions. This includes several interviews that took place during the preliminary stage of the data collection. Interviewees occupied diverse positions within their firms: in the focal company, we interviewed the company's founder, marketing manager, sales manager and software engineer. At the company's main distributors, we spoke with sales and product managers; and finally, interviews with end-customers included managers of the central warehouse, logistics, and IT departments, and also the chief operating officers and warehouse managers. All respondents were very knowledgeable about the product or service provisions in the network, and were all involved with the focal firm's product on a daily basis (for example, the Product Manager of the main distributor held primary responsibility for the focal firm's product in his firm). The diversity of positions and perspectives of our respondents allowed us to capture different and cumulatively complete perspectives of the same phenomenon (Dubois and Araujo 2007; Hartley 2004). Thus, a rigorous triangulation process underpins our findings (Eisenhardt 1989; Jick 1979), an aspect of particular importance in retrospective research approaches (Huber and Power 1985).

All interviews were recorded and transcribed *verbatim*. Interviews lasted on average between 60 and 90 minutes, and all were conducted in English (all respondents were highly proficient in the language). Secondary data was collected mainly from institutional reports, firm websites, strategy documents, and press coverage, with the aim of getting a more complete view of the situation, as well as to triangulate and validate the interview data (Yin 1994; Stake 1994). The data collection process was ended when 'theoretical saturation' was reached for all the categories identified within the theoretical framework (Buchanan, Boddy and McCalman 1988; Strauss and Corbin 1990), i.e., "*...no additional data* [was] *being found whereby the (researcher)* [could] *develop properties of the categor*[ies]." (Glaser and Strauss 1967, p.65).

All collected data was content analysed (Gray 2004; Ritchie and Lewis 2003). This analysis was based on the theoretically developed conceptual framework of service infusion/defusion as related to dynamic service business models, thereby assuring construct validity and providing

important insights relevant to the phenomenon of interest (Dubois and Gibbert 2010; Eisenhardt 1989). As a consequence we used an abductive approach (Dubois and Gadde 2002; Robson 2002). This approach reflects the iterative process adopted between the conceptual framework, the data, and the emerging findings (Glaser and Strauss 1967; Hartley 2004). Inter-rater reliability was tested for (i.e. more than one researcher analysed the same set of data, which was followed by a juxtaposing of the different analyses results), and the resulting replicability of findings assured the reliability of the analysis (Brito 1999; Krippendorff 2004). The main findings were summarized and sent to the respondents in order to further validate the research. A few suggested changes resulted from this process, which contributed to the study's validity (Gibbert, Ruigrok and Wick 2008; Yin 1989).

3.3. Case findings: service infusion and defusion processes

3.3.1. The beacon customer phase of service infusion – pre-transition business model

In 2008, after several years of development and testing in-house, the focal firm sold and installed their first automated warehouse system to a Norwegian distributor of electronic components. This beacon customer perceived new value in this core offering, agreeing to be a pilot-customer, in effect functioning as a laboratory and test centre for the further system development. This required a close and cooperative relationship, with high levels of commitment and communication across all hierarchical levels between the two parties. The focal firm provided their customer with the latest upgrades, the customer feeding back information on how to improve the system. In parallel, the focal firm started to involve the future distributor it had selected for selling the system to customers. At that stage, the involvement of the distributor had two main purposes: 1) providing support to the focal firm in planning and integrating the automated warehouse in the existing warehouse of the customer, and 2) learning how to install and service the system. While the main expertise of the focal firm concerned the product and software features of the system, the distributor's competencies centred on planning the overall warehouse infrastructure at the customer in which the system would be integrated. The actual independent service provision of the distributor to the customer was minimal during this stage, as most of the planning and integration work performed by the distributor was still mediated by the focal firm.

On the content level of this initial business model, in addition to planning and installing the system at the customer site, and integrating it into the existing warehouse of the customer both physically and in terms of software, the primary services surrounding the system that needed to be performed for the customer were: spare part delivery, maintenance and repair services on the physical elements of the solution, upgrades, optimization and trouble shooting on the software elements, as well as training for the customer on the system and the individual components. At that time most of these services were novel to the business model of the focal firm and had to first be developed and subsequently infused into the relationship with the customer. Most of these services can be characterized as product-related services; however, some optimization services show aspects of customer-related service provision and therefore resemble a hybrid offering (Mathieu 2001b).

With respect to the structural level of the service business model, the focal firm planned from the outset that it would eventually establish a distributor network to facilitate growth. Initially the direct and close relationship between the focal firm and the first customer (without intermediate distributor) was essential for the purpose of further developing the system, as well as building-up, codifying, and transferring the relevant knowledge of how to install, integrate, and service the system at a customer's site. On the other hand, the desired business model of the focal firm was always aimed at minimizing the direct interactions (including those that related to service provisions) between the focal firm and the end customers. Thus, distributors were eventually supposed to fully take over all aspects of customer acquisition, installation, and service provision in the future. Depending on the distributor, the focal firm's system would be sold by the distributor as a sub-system integrated into larger warehouse solutions involving, for example, conveyor systems or other auxiliary components. Distributors would then also provide warehouse management software to control the overall system, as well as consulting services to optimize the overall warehouse system. This required changes to both the content and the structural level of the business model relating to servicing the focal company's initial customer, both of which in turn affected the governance level in the network.

As most of the relevant services did not exist at this initial stage, they had to be developed and infused. In knowledge terms, this was very much a situation of transferring and jointly creating knowledge through tacit-to-tacit transfer mechanisms among the focal firm, the customer, and the

distributor (*socialization*). The previous experiences of all firms involved with respect to the warehouse system in a real practical environment were minimal, and a lot of relevant knowledge had to be created jointly. As the focal firm had most expertise with respect to the actual hard- and software aspects of the system, it was leading the joint work on knowledge creation, with each of the other two parties contributing their relevant competencies and experiences. For example, the focal firm relied strongly on the distributor to help plan the overall warehouse footprint and integrate the focal firm's system into it. Nonetheless, due to a lack of expertise with the new system, the distributor also relied heavily on guidance from the focal firm to enable them to do this. At that time, most of the knowledge of the focal firm was tacit and not codified; it was transferred to the other actors by involving them in all relevant stages from planning, installing, integrating, optimizing and ultimately servicing the system. The primary knowledge creation and transfer mechanisms were tacit-to-tacit in this phase. Soon the focal firm started to use the experiences gained during this process of service infusion with the beacon customer to codify some of the knowledge into manuals, training processes, documents, service guidelines, contracts, and other support systems (*externalization*). This, in turn, enabled initial explicit knowledge transfers (explicit-to-explicit as well as explicit-to-tacit) to the other parties, and thus reduced some of the transaction costs associated with the tacit-to-tacit knowledge transfers (*combination* and *internalization*). However, as will be seen later, the tacit-to-tacit knowledge transfer mechanisms remained important throughout the transition of the business model. Despite the increasing amount of codified knowledge, the focal firm would continue to support each new distributor (in the already transformed final business model) onsite with its first few installations. In particular, while explicit knowledge is not sufficient on its own at this stage, it however serves a crucial role as it facilitates the tacit knowledge transfer.

Figure 4 visualizes the structural and content aspects of the initial business model regarding the beacon customer phase. There exists a direct relationship between the focal firm and the customer, with the former having the lead on most of the service infusion activities developed and provided to the customer (see figure 4, arrow 1). On the other hand the relationships between the focal firm and the distributor and between the distributor and the customer were initially dormant (see figure 4, dashed arrows). The interactions between the distributor and focal firm were primarily characterized

by knowledge creation and transfer. At this stage service infusion primarily concerned the content level of the business model of the focal firm in the relationship with its customer, i.e. the provision of a hybrid offering.

Insert Figure 4 about here

3.3.2. The business model transition phase of service defusion

In order to achieve the desired service business model of the focal firm, i.e. a situation where all relevant business services are provided by the distributors in their relationships with customers, the relationship between the focal firm and the customer companies needed to be defused, while the relationships of the distributor and the customer needed to be infused along the entire service spectrum. This constitutes a shift on the structural level of the overall business model. These defusion and infusion processes constituted a transitory state between the initial and the final service business model, and required considerable support and knowledge transfer between the defusing and the infusing actors. This service business model in transit is depicted in figure 5. The distributor increasingly took over the service provision activities aimed at the customer (see figure 5: arrow 1b), so that the distributor-customer relationship became service infused. However, the focal firm remained partly involved in these interactions with the customer to support the distributor during the transitory stage of the business model (see figure 5: arrow 1a), i.e. the relationship became partially service defused.

In order to fully accomplish the defusion and infusion of the different relationships in the network, additional services to support the distributor with its service provision needed to be infused in the relationship between the focal firm and the distributor (figure 5, arrow 2). Those infusion activities related primarily to novel services that the focal firm developed to serve two main goals: 1) to support the distributors' interaction with the customer, and 2) to facilitate knowledge transfer to the distributor. The focal firm invested extensive resources into developing manuals as well as training (sales, installation, service, etc.) for its distributors (at some point during that development, about 25% of the focal firm's workforce were engaged in these service infusion activities with the distributor). As the warehouse system is continuously under development, both manuals and training need to be constantly updated. The focal firm first had to document any changes/upgrades being made, then

announce these in a release plan well in advance of when they would become effective, and, finally, to synchronize distributor training schedules with the release plan in terms of timing as well as content. This process represents knowledge transfer by codification of tacit knowledge in to manuals and trainings, and thus into explicit knowledge (*externalization*), which is transferred and *internalized* through its application, and enters the tacit knowledge base of the distributor.

The focal firm also continuously supported the distributors with a new account management team dedicated to each distributor, as well as 24/7 technical support, on which the distributors could rely when additional support was needed. This occurred primarily as customers acquired more and more knowledge about the system themselves in the process of using it. Thus, through tacit knowledge creation, customers learned to perform the basic services, as well as repairs and troubleshooting independently. Over time they acquired knowledge levels that were similar to, or even more advanced than, those of the distributors, who typically did not develop in-depth knowledge of installed and fully operational systems. Service requests by customers that required outside help became more specific and advanced over time during this phase, which presented a challenge to the distributors if they were not able to achieve a comparable level of expertise to the customer. However, if a distributor required help from the focal firm for a specific problem, the two parties interacted closely in seeking a resolution, in the hope that the distributor would be able to address similar issues independently in the future. This constitutes another tacit-to-tacit knowledge transfer mechanism (*socialization*) and is particularly important as not all knowledge can be codified and transferred in an explicit format through manuals and training routines. Thus, tacit-to-tacit knowledge transfer mechanisms remained important throughout the transition of the service business model.

Furthermore, the focal firm developed several support tools to help the distributor during sales, installation, and servicing of the system. One of these (a service infusion resource) was a computer simulation that allowed the user (i.e. distributor) to design the system and determine both the scope of supply (i.e. physical components of the system) and the optimal configuration for the system, while also verifying and monitoring the actual performance of the installed system. Due to its comprehensive nature, this tool supports the distributors in the sales, installation, and after sales phases. Distributors could use the simulation tool to develop business cases for customers in the sales

process. During installation, it allows the distributor to design and configure the system with the customer, while providing performance diagnostics and maintenance insights in the after-sales phase. Another of these tools is a service portal that the focal firm developed to provide the distributor with detailed schedules, steps, descriptions, and processes by which the system has to be serviced and maintained. With the help of both of these tools, the focal firm codified knowledge and made it available for use by the distributor (*externalization*); this exemplifies another explicit knowledge transfer mechanism. Through training and application, the knowledge captured in those tools was transformed into the tacit knowledge base of the distributor (*internalization*).

Finally, although marketing activities are the distributors' responsibility, the focal firm also provides marketing support in the form of brochures, animations, trade show displays, demonstration material as well as a demonstration system that can be taken to trade shows. Furthermore, the focal firm facilitates access to the system of one of the earlier customers, thereby enabling the distributor to showcase a fully operational system to potential customers.

On the other hand the distributor took over activities that did not exactly constitute services to the customer, but were done on behalf of the focal firm, such as marketing, sales and customer relationship management (see figure 5: arrow 3). This in turn allows the focal firm to maintain its slim operation while growing the business through the distributors.

Insert Figure 5 about here

3.3.3. Fully defused business model - post-transition business model

In order to arrive at the desired model for the focal company, the relationship between the focal firm and its now numerous customers had to be fully defused. By reducing the focal firm's involvement (and therefore its relational interactions) with end-customers, its relationship with the distributors became more important, as they would have to provide both the support and knowledge needed in order for these distributors to being able to fully service the end-customers (including different product-related and customer-related services). This is critical as the underlying warehouse system is technologically advanced, requiring extensive expert knowledge. In this post-transition phase, while the intended business model minimizes the involvement between the focal firm and the end-customers, the relationship between the focal firm and the distributors became ever more

important. To take full advantage of the distributor model and allow scalable growth as well as lean operations, a well-functioning relationship between the focal firm and its distributors, coupled with a well-defined distributor support structure and knowledge transfer mechanisms were key.

Figure 6 depicts the final service business model after the transition phase, in which the distributor is responsible for customer acquisition, as well as planning, integrating, installing, and optimizing the system, providing both product and services to the customer. During the installation phase, the distributors would often involve external parties who would help with some basic service tasks. To manage the relationships and streamline communication with the customers, the distributors developed dedicated account manager positions. The distributor would also manage all relevant after-sales services on the hard and software elements of the system and independently train the customer on using the system (see figure 6, arrow 1b). The training for the customer primarily concerns running and maintaining the system and is mainly achieved through tacit as well as explicit knowledge transfer mechanisms between the distributor and the customer.

The effectiveness of any customer training is to a large extent contingent on the preceding knowledge transfer processes between the focal firm and the distributor. Supported by the training offered, customers continue to build their own expertise in running and maintaining the system, as well as performing repairs. These competencies are essential for customers, as they allow them to decrease their dependence on third parties in terms of operating and maintaining the system, and it allows them to anticipate and react quickly to issues, which is especially important considering that the automated warehouse constitutes a key element in their logistics operations, thereby directly affecting their company performance. However, although the customers build up in-depth knowledge about the system, situations occur in which they need support from the distributor. The focal firm, on the other hand, would only get involved directly with the customer in exceptional cases (i.e. where fundamental adaptations to the system need to be made due to special customer requirements) and also indirectly by means of the 24/7 second line support (see figure 6: arrow 1a), otherwise the relationship between the focal company and its customers is now service defused.

In comparison to the original situation, the primary interaction of the focal firm shifts to the distributor for support and knowledge transfer purposes (see figure 6, arrow 2). This new structure

also required adaptations on the governance level of the business model (see figure 6, arrow 4). The focal firm introduced account management teams for each distributor. It holds quarterly business reviews to discuss commercial targets as well as project implementation issues with the distributors. Furthermore, the services that the distributor provides to the customer are specified through service level agreements between the distributor and the customer. These agreements in turn are enforced through contracts between the distributors and the focal firm. In particular, the training of the customer is crucial, as many errors and system failures occur through improper use and maintenance. However, to ensure proper training (and also monitoring the quality of that training) that the distributor is providing to the customer is a difficult task for the focal firm, as it holds only limited direct control over the relationship between the distributor and the customer. In order to achieve the required standard of knowledge at the customer firm, an accreditation scheme has been put in place by the focal firm that codifies the essential knowledge a user of the system needs to have in order to operate it. The distributor in turn provides training and awards certification according to these standards.

The contract between the focal firm and the distributor serves another important governance purpose, as it defines the performance parameters of the system and provides clear expectations and benchmarks against which the systems can be measured. Given that the interactions between the focal firm and the customers have been reduced to a minimum, the former has developed a software tool that allows it to monitor the system at the customer site, thereby ensuring that the system is performing optimally. This tool serves as a relational safeguard by providing a quality control system that essentially monitors the work of the distributors. It also allows the focal firm to perform root-cause analyses of system errors and thereby allows more targeted and timely trouble-shooting. Furthermore, it protects the focal firm from claims related to errors that are caused by the distributor or customer. The simulation tool and the service portal constitute mechanisms that indirectly allow the focal firm to bridge the lack of a direct relationship with the customer and ensure that the system is correctly designed, serviced, and maintained (and that the business model is running smoothly). Finally, as the markets of the distributors overlap to some extent, the focal firm has put a system in place that protects the accounts of distributors from competition by other distributors. To achieve this,

the distributor registers and provides details about any new account to the focal firm, which in turn provides discounts off the regular price list. This provides a governance mechanism on the network level to enforce the business model and disincentivizes distributors from competing with each other for the same customers.

Insert Figure 6 about here

4. Main Findings and Conclusions

Tables 1, 2, and 3 provide summaries of the service business model characteristics and the knowledge transfer and co-creation mechanisms involved for each of the three phases underlying the dynamic business model: 1) the Pre-transition business model phase, 2) the Business model transition phase, and 3) the Post-transition business model phase. According to Table 1, the pre-transition phase is primarily characterized by developing a service infrastructure for the focal firm's automated warehouse system, and thus primarily affects the content level of the model (i.e. service infusion on the content level). Although both the initial customer and future distributor were involved in this phase, the focal firm took the lead on both service development and service provision. In particular, during this stage the distributor's expertise in planning warehouse solutions and integrating different components into one solution was of value for the focal firm. However, the interactions between the distributor and focal firm were characterized primarily by knowledge creation and transfer. Thus, from a structural perspective of the business model, during this stage the focal firm was the central actor in terms of service provision. In terms of the governance level, the business model relied primarily on close and collaborative relationships and not on formal contracts among the actors. In addition to having developed a service infrastructure for the focal firm's system (i.e. service infusion on the content level), a second major goal was to prepare the transition of the service business model in which the distributor would manage all relevant services associated with the system (service infusion on the structural level). To accomplish both goals, *tacit* knowledge co-creation (development of novel services for service infusion on the content level) and transfer mechanisms (training of the distributor to facilitate service infusion on the structural level) were crucial, given that much of the

relevant knowledge had not yet been codified, and was more embedded in the focal firm's *tacit* knowledge base.

Insert Table 1 about here

As we move into the business model transition phase (Table 2) the distributors start to take the lead on service provision (service infusion on the structural level) with the focal firm withdrawing somewhat (service defusion on the structural level). At that stage, the focal firm only gets involved in the service provision to support the distributors in their new role. From a structural perspective, the relationship between the focal firm and customers is service defused and that between the distributors and customers service infused. To accomplish this shift, the relationship between the focal firm and distributor becomes central and new services are developed by the focal firm to facilitate knowledge transfer and support the distributors in their service provision to the customers (service infusion on the content level). From a content level of the business model, while the customer services essentially remained the same and only the provider changed, novel services have been introduced in the relationship between the focal firm and the distributors. *Tacit* knowledge transfer mechanisms still play a crucial role in this transitory stage of the business model; however, the focal firm started to codify knowledge into manuals, trainings and support tools in order to reduce some of the transaction costs associated with *tacit* knowledge transfer mechanisms. On a governance level, the relationship between the focal firm and the customers becomes more discrete (i.e. defused) while that between the distributors and the customers is more close and cooperative (i.e. infused). Although the infused relationships (between distributors and customers; between focal firm and distributors) are close and cooperative, they are increasingly formalized through contractual arrangements (e.g. contracts, service level agreements).

Insert Table 2 about here

Finally, as the business model transition is complete (see Table 3), the relationship between the focal firm and the customers is defused and that between the distributors and customers infused on both a relationship level and in terms of the service provision (service defusion and infusion on the structural level). To successfully maintain this service business model shift, the relationship between

the focal firm and the distributors had to be infused with support services (service infusion on the content level). At that stage, the infused relationships among the actors are primarily governed by contractual arrangements. Further, due to the lack of control of the focal firm over the relationship between the distributors and customers, additional control and governance mechanisms have been put in place to ensure proper service delivery and quality and to safeguard the focal firm from potential opportunistic behaviour of the distributors (these included the accreditation scheme's training control; the service portal's maintenance control; the simulation's performance and design control; and the customer registration's cannibalization control among distributors). Although *tacit* knowledge transfer mechanisms are still important at that stage, a shift to primarily *explicit* knowledge transfer mechanisms can be observed.

Insert Table 3 about here

We set out to study service infusion and how is affects dynamic business models, recognizing that service infusion is a network phenomenon, and also driven by a fast-paced changing business environment. The ability to manage dynamic business models constitutes a critical success factor for firms to sustain their competitiveness. The business model concept allowed us to track dynamics on three important levels: structure, content and governance, as well as highlighting the importance of the associated knowledge co-creation and transfer mechanisms. As demonstrated by the case study, when transiting through the three stages, we can observe service infusion and defusion processes affecting major shifts on all three levels of the business model, and the interconnectedness of those shifts with important knowledge co-creation and transfer mechanisms. Thus, while *tacit* knowledge co-creation and transfer mechanisms are of primary importance with service infusion on a content level, more *explicit* forms of knowledge transfer support the service infusion on a structural level. From a structural perspective of the business model, service defusion plays a critical role as the knowledge transfer primarily flows from the defusing to the infusing actor. The defusion of the relationship between A (defusing actor) and B (recipient of the service) goes hand in hand with the infusion of the relationship between C (infusing actor) and B, but also with the infusion of supporting services in the relationship between the infusing and defusing actors (A and C). While service infusion on a content level requires close, collaborative and less formalized governance mechanisms,

service infusion on a structural level is primarily governed by contractual arrangements (e.g. contracts, service level agreements). Finally, due to a lack of control over defused relationships, the defusing actor may require relationship safeguard or control mechanisms to ensure both the appropriate service delivery and the quality of the service provided by the infused actor.

5. Theoretical and Managerial Implications

Our study responds to a recent call for advancing research in *service infusion, service business model*, as well as *interorganizational service networks* (Ostrom et al. 2010). We offer a concept of a focal firm's dynamic business model, i.e. business model change driven by service infusion processes. This is conceptualized as a fluid network phenomenon, involving relationships with important exchange partners, in line with recent research (Ferreira et al. 2013; Nenonen and Storbacka 2010; Spring and Araújo 2013). The strategic importance of dynamic service business model is rooted in firms' need to constantly being able to adapt to forces emanating from their surrounding business environment in an effort to stay competitive (Teece, Pisano and Shuen 1997). The framework we introduce understands service infusion and resulting business model dynamics according to three levels: their transaction content (nature of the offering), their transaction structure (actors involved) and their transaction governance (operations), and thereby provides an important framework for the managerial processes involved to successfully redesign service business models (Amit and Zott 2001; Zott, Amit and Massa 2011).

Secondly, we introduce the concept of *service defusion* as an essential counterpart of the *service infusion* phenomenon on both the content and structural levels of the business model, and demonstrate its impact on governance. The concepts of service defusion and infusion *together* enable us to fully capture firms' movements up and down the value stream (transaction content), as well as their engagement and disengagement of important business partners along the way (transaction structure). Service infusion and defusion therefore capture important processes for successful service business model redesign. Staying competitive in a fluid business environment requires firms to move up the product-service continuum by engaging additional business partners, but it also means being flexible in the opposite direction (i.e. down the product-service continuum). Certain solutions may

need to be disintegrated or scaled down, while other services may need to be discontinued altogether. This may also require disengaging relationships with business partners that have not been performing as expected, in order to free up resources that can be used more effectively elsewhere. By enriching the discussion on service infusion with the concept of service defusion, our study demonstrates that service infusion, in particular from a network perspective, is a much more complex phenomenon than previously recognized; moreover, it shows that the success of service infusion depends not only on the relationship between the infusing actor and the recipient of the service, but also on the relationship between the defusing actor and infusing actor, and on the associated governance and control mechanisms that guarantee service quality and safeguard against potential opportunism.

Thirdly, we contribute to the service infusion literature by demonstrating the importance of knowledge transfer and co-creation of knowledge in successfully managing the transition between service business models. We examine the involvement of *tacit* and *explicit* knowledge transfer mechanisms (Nonaka 1994; Polanyi 1966) to find that *tacit* knowledge co-creation and transfer mechanisms are critical for service infusion on a content level, while more *explicit* forms of knowledge transfer become increasingly relevant with respect to the structural level of service infusion.

Finally, emerging from the exemplifying empirical study, this article offers a process framework along which the transition of business models can be understood and analysed according to three phases: 1) the Pre-transition business model phase, 2) the Business model transition phase, and 3) the Post-transition business model phase. This model highlights the major shifts involved at all three levels of the business model, and shows the interconnectedness of those shifts with important knowledge co-creation and transfer mechanisms.

Even if managers are aware of the fact that their firm's service business model requires adaptation in order, for example, to facilitate faster growth, the ability to design and manage this business model transition is often done by way of successful adaptation. This study provides managers with a framework from which they can approach a service business model redesign in a more systematic manner. The service infusion and defusion framework introduced does not only give managers a tool to understand the nature of the business model change (on content, structure, and

governance levels) they have to manage, but also links this with knowledge creation and transfer processes that are key in successfully accomplishing such a business model redesign.

6. Limitations and Future Research

As with any research, this study is not without limitations. We employ an instrumental and critical multi-actor longitudinal case study (Flyvbjerg 2006; Siggelkow 2007; Stake 2000). The methodology and research design was deemed appropriate for the objectives set: to exemplify and further explore both the business model transition processes as proposed by the conceptual framework, and the knowledge transfer and co-creation processes associated with service infusion and service diffusion. Moreover, our case considered all relevant network actors involved in a focal company's service business model, thereby taking multiple perspectives into account. However, future research could include a multiple case study design across different network settings, which would facilitate an investigation into the replicability of the findings in other contexts, as well as the generalizability of the conceptual framework (Kaplan and Goldsen 1965; Yin 1994).

Additionally, while the case allowed for the observation of service infusion on both the content and structural levels, service defusion could only be illustrated on the structural level. Future research should investigate more in-depth issues around service defusion on a content level. Researchers who study processes and their managerial challenges realize the limitations of quantitative techniques in accounting for the richness of such phenomena and accept that qualitative research and in-depth case studies present viable alternative research approaches. We therefore suggest that future investigations should adopt an exploratory approach, which can be based on qualitative and interpretative research strategies.

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FIGURE 1
Dynamic Business Models of Service Infusion

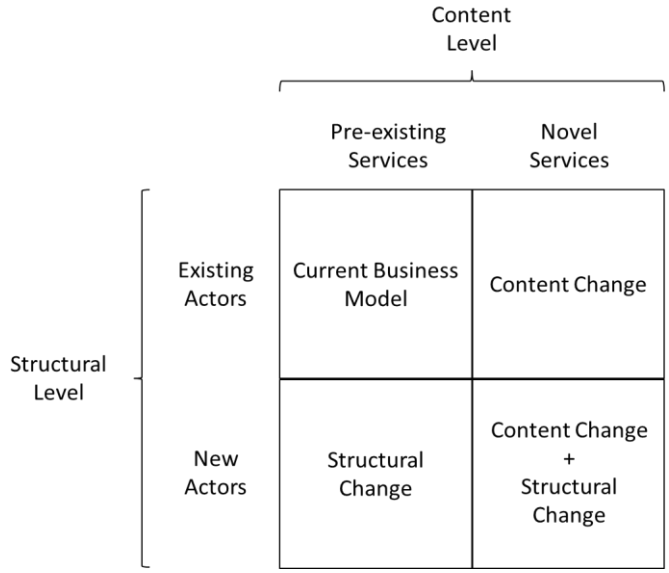

FIGURE 2
Business Model Framework of Service Infusion and Service Defusion

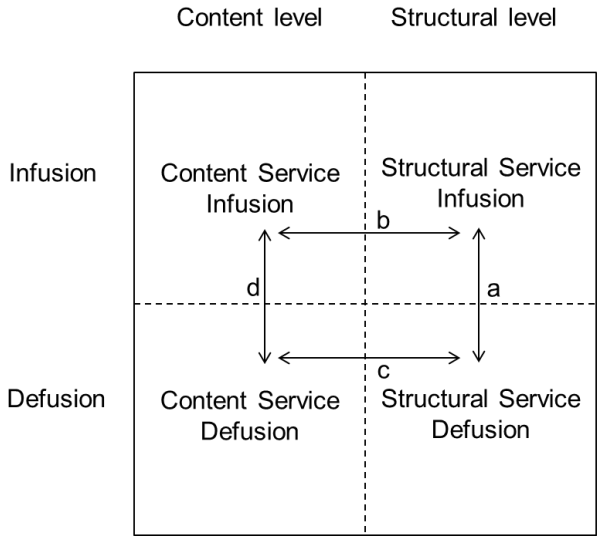

FIGURE 3
Knowledge Transfer and Co-creation in Dynamic Business Models of Service Infusion and Defusion

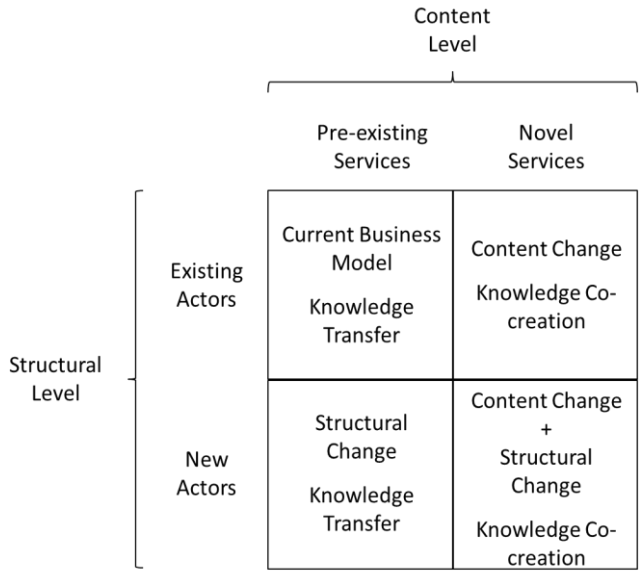

FIGURE 4
The Beacon Customer Phase: Pre-transition Business Model Phase

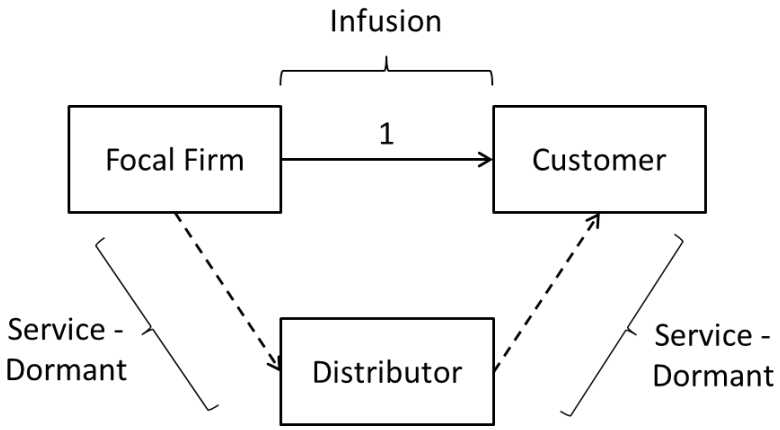

FIGURE 5
Service Defusion: Business Model Transition Phase

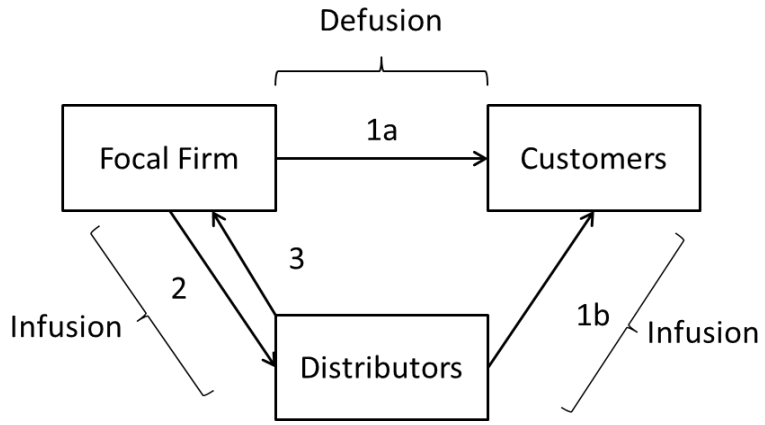

FIGURE 6
Post-transition Business Model Phase

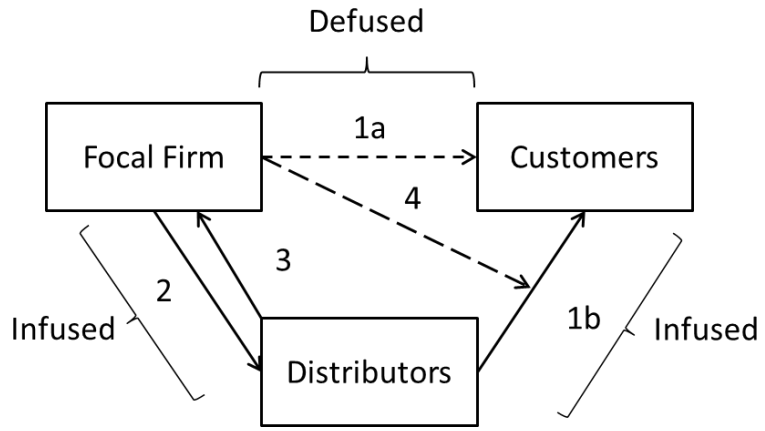

TABLE 1
Business Model Characteristics and Knowledge Transfer Mechanisms: Pre-transition Business Model Phase

Structural Level	Content Level	Governance Level	Knowledge Transfer Mechanisms
Focal Firm → Customer	• Installation • Planning and integration • Spare part delivery • Maintenance and repair services • Upgrades • Optimization • Trouble shooting • Training	• Very close and cooperative relationship • High levels of commitment and communication across all hierarchical levels between the focal firm and initial customer • Not formalized	• Knowledge transfer & co-creation through primarily *tacit-to-tacit* mechanisms (*socialization*): practically involving customer in servicing and operating the system • Customer feedback to focal firm on how to improve the system
Focal Firm → Distributor	• No explicit service transactions. Relationship primarily characterized by knowledge transfer and co-creation	• Very close and cooperative relationship • High levels of commitment and communication across all hierarchical levels between the focal firm and initial customer • Not formalized	• Knowledge transfer & co-creation through primarily *tacit-to-tacit* mechanisms (*socialization*): practically involving distributor in all relevant stages (planning, installing, integrating, optimizing, servicing the system)
Distributor → Customer	• Planning and integrating the automated warehouse in the existing warehouse of the customer, which was, however, primarily mediated through the focal firm	• Discrete and limited relationship confined to warehouse planning and integration mediated by the focal firm	• No particular knowledge transfer or co-creation
Distributor → Focal Firm	• No explicit service transactions. Relationship primarily characterized by knowledge transfer and co-creation	• Very close and cooperative relationship • High levels of commitment and communication across all hierarchical levels between the focal firm and initial customer • Not formalized	• Knowledge transfer & co-creation through primarily *tacit-to-tacit* mechanisms (*socialization*): joint planning and integration of automated warehouse in the existing warehouse of the customer

TABLE 2
Business Model Characteristics and Knowledge Transfer Mechanisms: Business Model Transition Phase

Structural Level	Content Level	Governance Level	Knowledge Transfer Mechanisms
Focal Firm → Customers	• Partial involvement in the interactions with customers (primarily trouble shooting) to support the distributor during the transitory stage of the business model, i.e. partially service defused • System upgrades, but mediated through distributor	• Discrete relationship and limited to situations where focal firm helps out the distributor	• No particular knowledge transfer or co-creation
Focal Firm → Distributors	• Support the distributors' activities vis-à-vis the customer • Facilitate knowledge transfer to the distributor • 24/7 technical support • Distributor support tools for sales, installation, and servicing of the system: computer simulation, service portal • Distributor marketing support: brochures, animations, trade show displays, demonstration material, demonstration system for trade shows, access to demonstration site • Training and manuals	• Cooperative relationship, but primarily limited to knowledge transfer • More utilization of contracts as relationship and transaction governance mechanism • Account management system	• Knowledge transfer by codification of tacit knowledge in to manuals, trainings and support tools and thus into explicit knowledge (*externalization*), which is transferred (*explicit-to-explicit*) and *internalized* through its application and goes over into the tacit knowledge base of the distributor (*explicit-to-tacit*) • *tacit-to-tacit* knowledge transfer mechanism (socialization) through engaging the distributor in the resolution of problems (trouble shooting) • Very limited knowledge co-creation
Distributors → Customers	• Distributors take the lead on service provision activities aimed at the customer, i.e. partially service infused: installation, planning and integration, spare part delivery, maintenance and repair services, optimization, trouble shooting, training, etc.	• Cooperative relationship, but characterized by utilization of contracts and service level agreements as relationship and transaction governance mechanism	• Knowledge transfer through primarily *explicit* knowledge transfer mechanisms: trainings and manuals • Very limited knowledge co-creation
Distributors → Focal Firm	• Marketing, sales and customer relationship management on behalf of the focal firm	• Cooperative, but primarily limited to knowledge transfer • More utilization of contracts as relationship and transaction governance mechanism	• No particular knowledge transfer or co-creation other than feedback to focal firm on how to improve the system

TABLE 3
Business Model Characteristics and Knowledge Transfer Mechanisms: Post-transition Business Model Transition Phase

Structural Level	Content Level	Governance Level	Knowledge Transfer Mechanisms
Focal Firm → Customers	• Fully service defused • Focal firm only gets involved directly with the customer in very exceptional cases • System upgrades, but mediated through distributor	• No direct relationship between focal firm and customers	• No particular knowledge transfer or co-creation
Focal Firm → Distributors	• Distributor support tools for sales, installation, and servicing of the system: computer simulation, service portal • Distributor marketing support: brochures, animations, trade show displays, demonstration material, demonstration system for trade shows, access to demonstration site • 24/7 technical support • Training and manuals	• Cooperative relationship, but primarily limited to knowledge transfer • Account management system • Contract as primary relationship and transaction governance mechanism • Quality control systems: accreditation scheme (training control), service portal (maintenance control) and simulation (performance and design control) • Customer registration (cannibalization control among distributors)	• Primarily *explicit-to-explicit* knowledge transfer mechanisms (training, manuals, support tools) • *tacit-to-tacit* knowledge transfer mechanism (socialization) though engaging the distributor in the resolution of problems (trouble shooting) • Very limited knowledge co-creation
Distributors → Customers	• Fully service infused: installation, planning and integration, spare part delivery, maintenance and repair services, optimization, trouble shooting, training, etc.	• Cooperative relationship, but characterized contract and service level agreement as primary relationship and transaction governance mechanism • Account management system	• Knowledge transfer through primarily *explicit* knowledge transfer mechanisms: trainings and manuals • Very limited knowledge co-creation
Distributors → Focal Firm	• Marketing, sales and customer relationship management on behalf of the focal firm	• Cooperative, but discrete relationship • Contract as primary relationship and transaction governance mechanism	• No particular knowledge transfer or co-creation other than feedback to focal firm on how to improve the system