

2 Theoretical Background

This chapter describes the main terms of the research and its underlying theoretical foundation in the context of literature review.

2.1 Product – Service and Physical Good

The term product is often used inconsistently, both in theory and practice. Usually product and good is used synonymously, without any distinction between intangible service and physical good (Segelod & Jordan 2004). Rathmell (1966) defines that all economic products lie along a goods-service continuum, between the two extremes of pure goods and pure services. Influenced by the emergence of service discussions in academic literature during that time, the author identifies 13 characteristics of services, including intangible nature, standards cannot be precise and cannot be inventoried (Rathmell 1966).

Based on extensive literature review, Zeithaml et al. (1985) identify that the most frequently cited characteristics of services are intangibility (non-physical nature), heterogeneity (not standardized), inseparability (of service creation and consumption) and perishability (inability to store) (Zeithaml et al. 1985). Some authors argue that intangibility, heterogeneity, inseparability and perishability is not generalizable to all services and that they fail as criteria to adequately distinguish services from goods, because many services possess one or more of the opposite characteristics, namely, tangibility, homogeneity, separability and durability (Lovelock & Gummesson 2004; Vargo & Lusch 2004b). Accordingly, Vargo & Lusch (2004) suggest that the strategy of distinguishing goods from services should be abandoned and replaced by a strategy of understanding how they are related. Consequently, the authors offer a new definition for services: “the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself” (Vargo & Lusch 2004a).

Following similar thoughts, Howells & Tether (2004) classify services into four groups, based on different transformation processes: *services dealing mainly with goods* (such as transport and logistics), *services dealing with information* (such as call centers), *knowledge-based services*, and *services dealing with people* (such as health care) (Howells & Tether 2004). Keeping this

classification in mind is important for new product development, because even though the term product covers goods and services alike, they imply very different innovation approaches. Service innovation requires other organization and principles than physical products (Chen 2011), e.g., the design of processes can be more informal for services than for goods (OECD & Eurostat 2005).

Software as an intangible asset has always suffered from the tension of being both good- as well as service-oriented and the convergence of internet and classical software products and IT services as well as new technologies like service-oriented architecture led to a new dynamic (Leimbach & Friedewald 2010; Segelod & Jordan 2004). The importance of innovation in the services sector and of the services sector's contribution to economic growth is increasingly recognized and has led to a number of studies on innovation in services (OECD & Eurostat 2005). Following that recent shift towards services (European Commission & Open Innovation Strategy and Policy Group 2011), the present study focusses on innovating non-physical products. Tangible, physical complements might be necessary to access the described services, usually provided by a supplier, however, its invention, production and supply are not part of this study.

Consequently, for the purpose of this study intangibility is the most important criteria to distinguish the analyzed partly goods-like services from physical goods, allowing cheap and easy scalability, neglecting logistics, setting-up assembly lines and replication costs – similar to the common communication services portfolio of telecommunication companies. Due to economic reason, focus of the described innovation projects is to develop a homogeneous solution that can be delivered to various customers with minor adaptations and efforts, what is a main differentiation criterion to individual customer projects (Segelod & Jordan 2004). Moreover, consumption is entirely separable from the development process what is also founded in the ability to store digital data.

2.2 From Invention to Innovation

Innovation consists of two parts: the generation of an idea or invention, and the conversion of that invention into a business or other useful application. The

formula 'Innovation = Invention + Exploitation' briefly describes the relationship among the concepts (Roberts 2007).

Inventions are discoveries, novel ideas, processes, methods, objects that generally result from R&D activities. They become innovations when they are transformed into marketable products or technologies, by means of investments in complementary manufacturing, technological and marketing assets. Not all inventions turn into innovations and reach the market (Giuri et al. 2007).

While the OECD and Eurostat used a very narrow definition¹ of innovation in its second edition of the Oslo Manual in 1997 (OECD & Eurostat 1997), it widened the scope in the third edition in 2005 (OECD & Eurostat 2005) taking recent research literature into account (Johannessen et al. 2001): "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations." The authors further specify: "A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics." (OECD & Eurostat 2005)

The distinction between product and process innovation is clear in respect to goods, but it may be difficult to distinguish in respect to services, especially when production, delivery and consumption of a service occur at the same time. Hence, if the innovation includes new or significantly improved characteristics to meet an external market or user's needs, it is a product innovation. If the innovation affects the organization's production process or service operations of new elements (e.g., input materials, task specifications, work and information flow, and equipment) that are used to produce a product or render a service, it is a process innovation. And if the innovation involves significant improvements in both the characteristics of the service offered to the customer and significantly

¹ „Technological product and process (TPP) innovations comprise implemented technologically new products and processes and significant technological improvements in products and processes. A TPP innovation has been implemented if it has been introduced on the market (product innovation) or used within a production process (process innovation). TPP innovations involve a series of scientific, technological, organisational, financial and commercial activities.“ (OECD & Eurostat 1997)

improved methods, equipment and/or skills used to perform the service, it is both a product and a process innovation. (OECD & Eurostat 2005; Damanpour 1996)

Most accepted definitions of innovation focus on novelty and newness. Consequently, it is necessary to distinguish the degree of innovation radicalness further, ranging across a single continuum and encompassing aspects such as what is new, how new and new to whom (Johannessen et al. 2001)? Generally radical or breakthrough innovations are those that result in fundamental changes in the activities of an organization and involve a large departure from existing practices. While incremental or continuous innovations are those that require a lesser degree of departure from existing practices (Damanpour 1996). A related concept is the one of disruptive innovation. This type of innovation has a significant impact on a market and on the economic activity of organizations in that market. The impact may change the structure of the market, create new markets or render existing products obsolete, however, the disruptive character of an innovation might not be apparent until long after it has been introduced (Christensen & Euchner 2011; OECD & Eurostat 2005). Moreover, literature generally distinguishes between new to the organization, new to the market and new to the world innovation (OECD & Eurostat 2005).

Roberts (2007) sums up: “Technologically innovative outcomes come in many forms: incremental or radical in degree; modifications of existing entities or entirely new entities; embodied in products, processes or services; oriented toward consumer, industrial or governmental use; based on various single or multiple technologies.” (Roberts 2007)

2.3 Innovation Processes and Open Innovation Approaches

Various innovation process models arose within the past decades. The cross-industry innovation approach is grounded in recent open innovation developments.

2.3.1 Generations of Innovation Process Models

Nobelius (2004) notes that the concept of innovation process generations is one way to communicate different types of approaches and to describe to some extent an evolution of innovation processes. The author concerns that most companies constitute a mixture of the generations and that corresponding time period of the generations differ depending on industry segment, demographics, company age, research intensity, legislation demands, etc. (Nobelius 2004)

Du Preez & Louw (2008) and Nobelius (2004) expand Rothwell's (1992) overview of dominant innovation process models from the 1960s to today (Du Preez & Louw 2008; Nobelius 2004; Rothwell 1992). The authors identify that the first and second generation models, typically applied until the early 1970s, are sequential linear models that explain innovations by being pushed by technology or pulled by market needs (von Hippel 1976; Quinn & Mueller 1963).

The third generation describes sequential, coupling models with a series of functionally distinct, but interacting and interdependent stages, linking various in-house functions and recognizing market needs and new technologies. Cooper (1990) presented the stage-gate-model, that applies process-management methodologies to innovation process and that typically involve from four to seven stages and gates (Cooper 1990). The model allows dividing the company specific innovation processes, from ideation to launch, in a number of stages or work stations, and quality control checkpoint gates in between the stages. This creates evaluation steps that guarantee quality throughout the project and lead to early cancelation of ideas not fulfilling the expectations. Even though some authors note that the gates should be permeable to facilitate an iterative and interactive process of experimental design and exploration (Gassmann, Enkel, et al. 2010; Lynn et al. 1996), the stage-gate process model can be easily applied in organizations, and hence, is one of the most applied process models in practice.

In contrast to the linear models, the fourth generation of innovation process models emphasize cross-functional, parallel and interactive integration of innovation activities within organizations, and also stress horizontal strategic alliances, strategic vertical relationships with suppliers and coupling with leading edge customers (Niosi 1999).

The fifth generation models, from mid-1990s onwards, focus on systems integration and networking to realize a fully integrated parallel development, including strong linkages with leading edge customers and strategic integration of primary suppliers (DeSanctis et al. 2002; Iansiti & West 1997). Characteristics are extensive communication activities with the external environment and knowledge accumulation and processing (Galanakis 2006; Blomqvist et al. 2004). Despite of its focus on integration of external input sources across the entire network, the models represent a closed innovation view, because core innovation activities take secretly place within the company's boundaries.

From the beginning of the 21st century, the sixed generation of innovation models contains open innovation models, focusing on openness and collaboration across the network, allowing access to a much larger base of ideas, knowledge and technologies. These models describe a new paradigm that allows combining internal and external paths to market (Lazzarotti & Manzini 2009) (cf. figure 4). Gassmann & Enkel (2006 and 2004) identify three core processes of the open innovation approach. The (1) *outside-in process* includes the integration of external knowledge, technologies or experts in the organization. It reflects that the locus of knowledge creation does not necessarily is equal to the locus of innovation (Enkel et al. 2009). The (2) *inside-out process* includes the external commercialization of innovation while investing in new markets and licensing technologies to increase the multiplication of solutions (Inauen & Schenker-Wicki 2012; Inauen & Schenker-Wicki 2011). And the (3) *coupled process*, that includes a cooperative innovation process with complementary partners in alliances or innovation networks, characterized by integration and externalization of knowledge to reach a joint win-win situation (Gassmann & Enkel 2006; Gassmann & Enkel 2004). The authors add that in particular these companies focus on the coupled process, which are able to increase their revenues by multiplying the sales of their solutions.

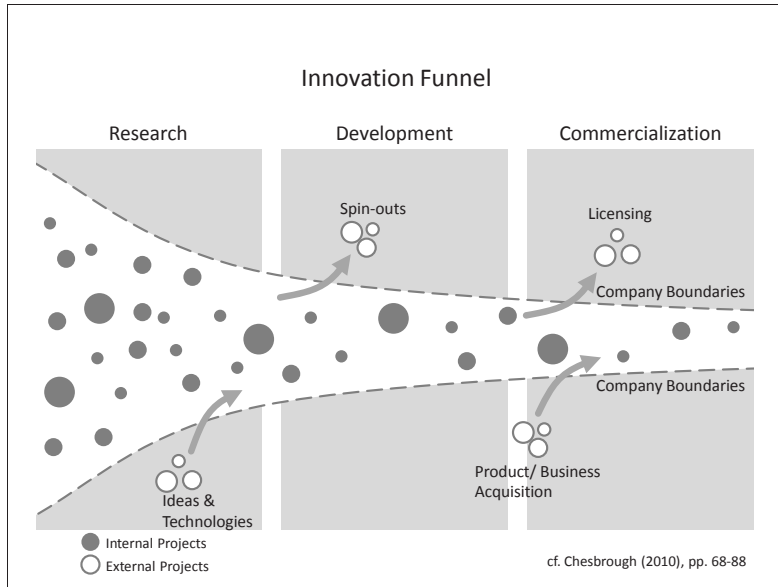


Figure 4: Innovation Funnel

2.3.2 Phases, Differentiation and Practical Integration

Models based on sequential phases differ in terms of the level of granularity. Those with just a few phases are more likely to be congruent among each other and describe real processes very well, but in a simple, abstract way. In contrast, models with many phases describe the processes of specific industries, companies or innovation types. Innovation models, hence, should be as detailed as possible and as complex as necessary.

Some authors propose an open innovation process, consisting out of three consecutive phases, namely early innovation phase / fuzzy front end, technical product development/new product development and commercialization (Gassmann, Kausch, et al. 2010). Others identify four stages of project development: idea generation, project (i.e. prototype) design, technology development and commercialization (Gales & Mansour-Cole 1995). Some authors divide the stages further, e.g.: Alam (2007) and Alam & Perry (2002)

propose a ten stages service innovation model (Alam 2007; Alam & Perry 2002).

Song et al. (2009) sum up that developments in literature typically suggest a five-stage process, from idea or concept generation through business analysis, design and technical development, testing, and launch or commercialization (Song et al. 2009). Eveleens (2010) literature review identifies a very similar process from idea generation, selection, development and testing, and implementing/launch. The author additionally considers post-launch and learning/evaluation phases, that entails sustaining, supporting and scaling up the innovation and reviewing the innovation process (Eveleens 2010). In conclusion, the diversity of accepted innovation process models and its various intentions of application show that not one best model exist, rather different objectives justify the coexistence of different models.

Academic literature is representing the different requirements very well, however, even though our economy is increasingly dependent on services, today's innovation research is mainly product oriented and the services sector is still underdeveloped in terms of innovation processes (Gassmann, Enkel, et al. 2010; Thomke 2003). Most of the proposed business-to-business new service development models in literature are very similar to new product development models and generally little distinction is made if physical goods or services are applied to the processes (Song et al. 2009; Alam 2007). Opening up the service sector to the innovation process will provide new opportunities for service innovations (Gassmann, Enkel, et al. 2010; Thomke 2003). Moreover, it is getting more and more important to analyze the respective specifics, because due to an increased bundling of products and services into new industrial offerings, the processes of new product development and new service development are increasingly interdependent and cannot be conducted in isolation from one another (Kindström & Kowalkowski 2009).

The purposeful management of the innovation process is complex and involves the effective integration of *people/staffing*, planning of *organizational processes, -structures and -systems* and *plans/strategy*² (Yang 2007; Roberts 2007). These

² Yang additionally suggested a 'process of quality design' that, in this paper, is considered to be a permanent activity in the innovation process. A fourth dimension 'systems support' was considered by Roberts in earlier studies, but not followed in the cited 2007 article. In

three dimensions are subject to managerial influence and need to be considered while implementing the innovation process within organizational boundaries. Roberts (2007) exemplifies the challenges that several roles of experts need to be appointed and wisely composed in order to achieve successful project results. Typically they are bound in matrix structures, namely their original discipline-based functional group and the focused project group, and hence, are influenced by competing sets of objectives. Moreover, strategic planning and strategic implementation aspects need to be considered on organizational level and technology development level. An organization's product line need to be considered while incorporating technological considerations into an overall business strategy and each stage of a technology is associated with different strategic implications (Roberts 2007). The present paper follows Roberts' thoughts. It considers the three dimensions in chapters 7.2-7.4, right after the description of the ideal practical innovation process model in chapter 7.1 and reverts to it in chapter 8.2 while discussing theoretical implications.

2.4 Cross-Industry Innovation

Cross-industry innovation is the creative imitation and retranslation of existing solutions to meet needs in other industries. Such solutions can be technologies, patents, specific knowledge, capabilities, business processes, general principles, or whole business models (Enkel & Gassmann 2010).

2.4.1 The ICT Industry and its R&D Characteristics

After various deregulation and liberalization activities, the telecommunications industry was characterized by optimism in the late 1990s, with exponential growth rate expectations for products and services (Gupta et al. 2007; Christensen & Roth 2001). The industry experienced a dynamic environment with continuous restructuring activities and an evolution from value chain to value network (Cansfield 2009; Li & Whalley 2002; Fransman 2002). Information- and communication technology organizations converged and

the structure of the present study 'systems support' is considered as supportive tools within the discussion of the collaboration category. (Yang 2007; Roberts 2007)

technical innovation started to challenge the companies' traditional business models. When the positive anticipations have not been fulfilled and the industry was faced with decreasing revenue streams from its communication services, the optimism changed and the industry more and more started trying to generate new revenue sources around and beyond its core-telco products and -services.

Especially internet technologies have fundamentally affected and transformed the telecommunications industry (Hess et al. 2012). Therefore, telecommunication companies developed software-specific competences, to counter complementary or substitutionary products that increasingly challenged the existing telco product portfolio (Wulf & Zarnekow 2011). Accordingly software and software-based services account for a major part of the ICT industry and are recognized as a key element in developing the information society (Leimbach & Friedewald 2010). Nowadays, all major telecommunication companies offer managed services or have IT services subsidiaries or divisions predominantly for business customers, such as T-Systems International GmbH (TSI) of Deutsche Telekom AG (DT), Vodafone Global Enterprise Inc. (VGEI) of Vodafone Group Plc. (VF), Telefónica Multinational Solutions of Telefónica, S.A. (TEF), BT Global Services plc. of British Telecom Group Plc. (BT), Orange Business Services (OBS) of Orange S.A., NTT Data Corporation of Nippon Telegraph and Telephone Corporation KK (NTT), National Computer Systems Group (NCS) of Singapore Telecommunications Ltd. (SingTel), Verizon Enterprise Solutions of Verizon Communications Inc. (VCI).

The increased diversification and the disruptive nature of technologies led to R&D activities that moved to a great extent from central research laboratories of the telecom operators to specialist equipment suppliers. Similar to other high-technology, knowledge-based industries, such as semiconductors and consumer electronics, innovation speed is high and alliances have been prevalent (Grant & Baden-Fuller 2003). The industry is characterized by a fragmented, disaggregated player landscape, that include independent, multi-country, multi-culture and multi-lingual players across the value chain/network, as well as a fragmented customer base that demands complex products and services out of a wide portfolio of technology offerings and services (Gupta et al. 2007). Consequently, the industries R&D activities are significant and involve cooperations of geographically dispersed entities and the management of

<http://www.springer.com/978-3-658-08826-2>

Cross-Industry Innovation Processes
Strategic Implications for Telecommunication
Companies

Hahn, T.

2015, XIII, 190 p. 16 illus., Softcover

ISBN: 978-3-658-08826-2