

THE DRIVERS OF SERVICES ON NEXT-GENERATION NETWORKS

ABSTRACT

This paper is concerned with the drivers of service development on future telecommunication networks. As these networks are being transformed into next-generation networks, new and different services are being developed and mediated. However, little is known about the drivers of this development, and frameworks for strategic management of service innovation are scarce. This paper offers two contributions. First, it develops a conceptual framework for the identification and classification of drivers. This framework is derived from prevailing theories in organizational economics, strategic management, and marketing. Second, it presents, based on an analysis of contributions from 24 domain experts, which types of drivers for network service development receive the most attention by the experts. The analysis reveals that demand factors like customer values, service quality, and user readiness by far outnumber the supply factors as well as the general environmental factors, demonstrating the importance of the users for service development in this area. The results will assist service providers to identify drivers of a specific service offering and adjust the business model to these drivers.

Keywords: telecommunication, next-generation networks, network services, service development, drivers

1 Introduction

Technological change facilitates new opportunities, but these will only be realized if they are associated with market opportunities in a favorable economic climate. One significant technological change is the convergence of the dedicated single-service networks currently deployed in the telecommunications world toward a universal multiservice network referred to as the next-generation network (NGN). NGN is a generic term that conceptualizes the emerging technology and market developments. NGN is envisioned to be an interworking environment of heterogeneous networks of wired and wireless access networks [1] and the purpose is to enable ubiquitous, real-time, multimedia communications that can be utilized by all types of service providers and for a broad range of services [2]. The vision behind the NGN is to move from a vertical approach, where access, control and services are closely tied, to a horizontal approach, where each network layer provides reusable elements to other layers [14]. The key cornerstone of the NGN is the decoupling of services and networks, allowing them to be offered separately. This implies the separation between transport, control and application layers [3].

From a technological view NGN can be split into three major parts: the core network, the access network, and the service provision control part [4]. NGN uses the Internet Protocol (IP) to enable the provision of different types of services, voice, data and video on any type of physical media, wireless and wire-line, and to any type of terminal, e.g. computer, mobile and TV, as well as any device with digital technology embedded [4]. Sometimes the term "all IP" is used for NGNs. Other characteristics are packet-based transfer, end-to-end quality of service, open interfaces, and the provision of improved end-user mobility [15]. Built on open modular elements, standard protocols, and open

interfaces, the NGN caters to the specific needs of all users, companies and households alike. International Telecommunication Union (ITU-T) defines a next generation network (NGN) as: “A packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.” [16].

The architecture and technologies of NGN are well known, and will allow the deployment of new types of services that are feature-rich, interactive, and multimedia capable, using increased bandwidth and richer devices and incorporating location and presence awareness [5]. Service creation is fundamental to the promises of the NGN, and the future network can be seen by network operators and service providers as a new revenue stream from its potential of increased service offerings [6]. However, the future service-offering assortment is not clear, and a killer application still remains to appear [7, 8]. Furthermore, there is still a lot of uncertainty as to what will drive the development of services on these networks [9], although some conditions are being discussed in the literature.

First, a major driver for the development of new services is technology, and especially the penetration of broadband and Internet access to households and firms, together with improved quality and capacity of terminal devices [10, 11]. Another enabler is the emergence of service platforms and high-level application environments that can be used across different vendors. This will make programmers more productive as they can concentrate on functionality rather than the underlying infrastructure [6]. Technological research conducted to fulfill the vision of NGN has been intense, and is expected to continue growing [12]. Second, since modern information and communication technology has such a great impact on societies and economies, regulators and policy makers are influencing the market by a number of policy instruments, such as access and channel regulation, market control, and property rights. The current and future role of the regulatory bodies on regulation, deregulation, and competition has been discussed by many [10, 13-19]. Third, open standards are a prerequisite as the new services will entail a greater level of interconnectivity, system flexibility, scalability, and quality of service (performance, reliability, and availability). NGN involves complex structures, in a hierarchical fashion, with a meshing of systems and subsystems even for simple services [20]. Standardization in the area is intense and a range of standard bodies exists [21]. Fourth, although policy makers have deregulated the telecommunications market in order to foster competition and reduced prices for end-users, the multi-sided, complex nature of the NGN requires new services to be created and provided in a cooperative business environment including operators, content providers, and other service providers. Especially, third parties are expected to join the market with new and value-added service offerings. Fifth, changes are not taking place merely on the supply side. People familiar with Internet services have new demands and different behaviors. User-centric service creation allows end-users to create, manage, share, and execute their own personalized services that fit their needs [7]. Application development in a NGN context is in many aspects very close to Internet application development [6]. Thus, one may expect service innovations also from the user side of the market. In the service literature, there is a debate on the customers' role in innovation. New perspectives on the roles of customers and companies in creating value of services are developed [22]. Several authors extend the customer-based approach from service value to value-in-use, so-called customer-dominant logic [23] or service-logic [24].

The work reported here is concerned with the variety of factors that may bring about services on next-generation networks—factors that we denote drivers of service development. Researchers have examined innovation from different perspectives ranging from product, market, technology, and organization. A dominant perspective in recent service innovation research has been the resource-based view of the firm [25] combined with the dynamic capabilities' view [26]. Frameworks for the strategic management of service innovation are, however, scarce [22, 27, 28]. This paper adds to the current understanding of service development for next-generation networks in two respects. A first objective is to develop a conceptual framework, based on a multi-perspective view on strategic management, for identifying and classifying drivers of service development. The second objective of this paper is, on a broad scale, to use this framework to identify which types of drivers receive the most attention by a group of 24 domain experts working as service providers, consultants, advisors, researchers, regulators and journalists within telecommunication. Identifying drivers of service development on these networks is an obvious precondition to achieve for the service providers in order to design effective business models. Policy makers will also benefit from such knowledge, for example by assessing more precisely the potential impact of regulations.

The rest of this report is organized as follows. The next chapter presents the conceptual framework and its theoretical basis. Then, the methodology for data gathering and analysis is accounted for, followed by the results of this analysis. Finally, a discussion and summary chapter concludes the paper.

2 Conceptual framework

2.1 Theoretical basis

New service development is closely associated with innovation. It is recognized among economists and policy makers that the innovative capacity and the ability to imitate new technologies are key factors in determining the rate of growth of an economic system [29]. Crespi [29] develops a framework of determinants of innovation by a multi-perspective analysis. This analysis is kept on an aggregated, macro-economic level, looking at public intervention in promoting innovation and technological change at the policy level. Our focus, however, is at the service level. Which factors will drive innovation and new service development on next-generation networks? Service innovation is an important function of business management [30]. Den Hertog et al. [28] develop a conceptual framework of dynamic capabilities for strategic management of innovation in service firms. This framework is built on the resource-based view (RBV) and the dynamic capability view (DCV) of the firm. They define a service innovation model that can be realized by dynamic capabilities. Their service innovation model is closely related to the business model concept used in this text. We shall deal with some of their ideas in developing our framework below. However, we find focusing on resources as the only source of service innovation to be too narrow.

A more comprehensive view on the conditions that may trigger innovation decisions in a firm may be developed from strategic management theory. Stoelhorst and van Raaij [31] have developed a conceptual model of strategic management that is embedded in organizational economics, management, and marketing. Two schools of thought may explain performance differentials between firms: the positioning school and the competence-based school [31]. The emergence of the positioning school can be largely attributed to Porter [32, 33]. In the positioning school, strategy is

about the identification of superior position within industries and to protect these positions by barriers to competition. The reasoning of the positioning school is outside-in. Porter used the structure – conduct – performance (SCP) perspective to model positional advantages. SCP is a central theoretical notion in industrial organization theory [32, 33]. SCP is an approach to analyze market structure by determining basic demand and supply conditions. In a search for a theory of management, Porter observed that: “*To explain the competitive success of firms, we need a theory of strategy which links environmental circumstances and firm behavior to market outcomes*” [34]. Thus, to capture the market conditions that may influence innovation and new service development, the SCP framework seems relevant.

With the work of Prahalad and Hamel [31] on core competencies focus was set on internal characteristics as sources of performance differentials. The competence-based school sees performance differentials as a result of the firm’s core competencies [35]. Performance differentials are linked to the ability to develop unique or difficult-to-copy resources. It is based on the ideas of the RBV of the firm [25, 36]. Firms that are able to accumulate resources and capabilities that are rare, valuable, nonsubstitutional, and difficult to imitate will achieve a competitive advantage over competing firms [31]. Here, conditions for innovation and new service development are found in the uniqueness of the resources and capabilities of the firm. This view of strategy has since become known as the competence-based school (Sanchez et al., 1996). The positioning school and the competence-based school both have their origin in economic theory and both can be used to explain performance differentials between firms. Since performance differentials are closely associated with innovation [31] we shall be particularly concerned with the SCP-perspective and the RBV theory in developing our conceptual framework in this paper.

The external conditions analyzed by SCP are constrained to the service market in which the firm competes. This market, however, is embedded in a wider environmental context, the society. Changes in this environment may be sources of innovation and new service development. There are both pragmatic and theoretical schools of thoughts that treat this context [37]. The traditional, predominantly taxonomic classification of the contextual or macro environment, PEST (political, economic, societal, and technological), is pedagogically a simple tool to understand the environmental context [38-40]. To analyze drivers for service development induced by the environment, a PEST analysis will be used here.

Innovation is assumed to be a conduct variable constrained by the external and internal structures of the firm [41]. As a conduct variable, innovation signifies a behavioral dimension in which decisions of key business processes concerning service delivery and performance are made. These decisions constitute the business model of the firm [42, 43]. The business model is where the innovation can take place in a firm.

In Figure 1, we have put together the theoretical and pragmatic notions extracted from strategic management thinking in order to develop a taxonomic classification of drivers of service development. We have identified the *business model* as a descriptive framework of the conduct of service developments, complemented by the RBV to organize supportive drivers based on heterogeneous *resources and capabilities* of the firm. To catch the *market structure* that may influence service development, we will use the SCP paradigm, and to analyze the *general environmental factors*, we will use a PEST analysis. In Figure 1, we have put together these elements.

Each one represents a theoretical domain in which changes in conditions represent drivers of service innovation and new service development.

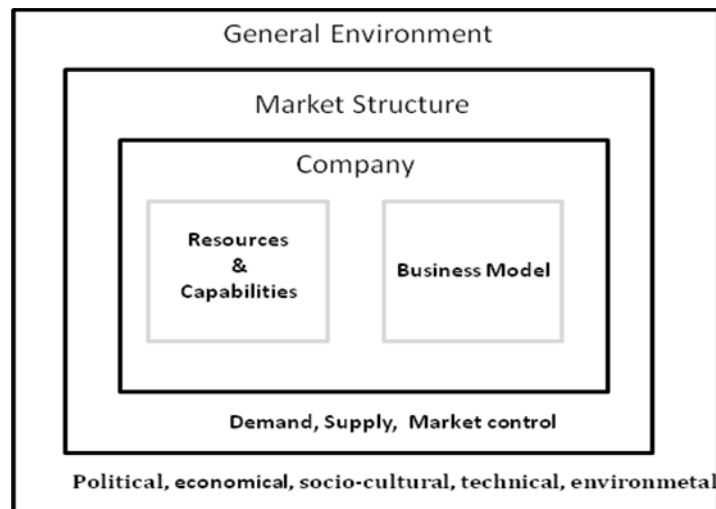


Figure 1: A multi-perspective strategic management analysis of conditions for new service development

2.2 The conceptual framework

By the eclectic collection of concepts from the domains shown in Figure 1, we shall build a conceptual framework that can be used for classification of drivers. Each theoretical concept is broken down to a level where the concepts can be empirically observed.

COMPANY FACTORS

Business model

In our search for drivers of new services, we shall do an inside-out analysis; that is, we start with the service provider's conduct variables. These conduct variables constitute the business model for this service. Business models are defined in many ways [44, 45], but the definitions seem to converge along four conduct dimensions where service innovation can take place in the firm: the service value proposition, i.e., what to offer; the revenue formula, i.e., how value is captured; the marketing strategies, i.e., how to offer; and the value network governance, i.e., how value is created [42].

1. *Service value proposition* offers values to a target customer through a bundle of service attributes catering to this customer's problems or needs. It corresponds to the positioning option often used in the marketing literature [46]. Elements included here are: newness of services, service performance, customization, task support, brand, and price [44].
2. *Revenues* focus on innovations that are driven by new pricing models, new pricing objects, revenue sharing among partners, and costs [27].
3. *Market strategies* focus on the way a service provider addresses the market. Porter [47] suggests to differentiate between broad-based (undifferentiated) or focused market scope. Here, we shall develop that further into the following elements: market segmentation, distribution platforms, new markets, and context-based advertising.

4. *Value networks* are value-creating systems organized as coalitions of actors jointly co-producing a service. These include both partners and customers and are concerned with lock-in elements, new transaction structures, user networks, complementarities, and asset sharing [44, 48].

Although a service innovation materializes first of all in a new value proposition, all dimensions are interrelated. Thus it is important to align the new value proposition with the revenues, marketing strategies, and value networks. Service development may be triggered by changing conditions in any of these conduct dimensions. The performance of the service provider is determined by the choices made along these four dimensions.

Resources and capabilities

Sources of service development are also embedded in the resources and capabilities of the firm. Theoretically, the resource-based view (RBV) combined with the dynamic capabilities view (DCV) of the firm may help us to identify these sources. In the RBV/DCV tradition, competitive advantage is achieved through assembling and orchestrating difficult-to-copy assets [26]. A number of definitions of classification schemes of resources and capabilities have been suggested [26]. RBV defines resources as a bundle of assets, capabilities, organizational process, firm attributes, information, and knowledge.

5. *Assets* can broadly be categorized as tangible *assets* consisting of technological, financial, and human; and as intangible *assets* such as brand name, market share, knowledge, skill, etc.
6. *Capabilities*. To create value from these assets, the company needs capabilities. Several contributions to the capability-paradigm emerged in the late 1990s [26, 49]). Teece et al. [26] use the term “capability” to refer to the abilities to organize, manage, coordinate, or undertake specific sets of activities. Hooley et al. [50] distinguish between strategic capabilities such as interpretation of market knowledge and competitive positioning; functional capabilities such as customer relationship management; and operational capabilities such as implementation capabilities.
7. *Firm attributes*, such as size and location do also play a significant role.

We can search for drivers of service developments in all these dimensions.

MARKET STRUCTURE FACTORS

Complementary to RBV, which bases its competitive advantage on company resources and capabilities, we find the market orientation in which competitive advantage is achieved by positioning of the firm within its market [50, 51]. We use the SCP-paradigm as described by Waldman and Jensen [52] to identify sources of innovation in the market structure. The market competitive structure is determined by basic demand and supply conditions together with specific governmental interventions to control the behavior of the players in the specific market.

Demand

Demand conditions include customer values, price sensitivity, substitutes, method of purchase, service quality, and user readiness.

8. *Customer value* is acknowledged in most business models [53]. Superior customer value is the source for competitive advantage [54] and the real driver of financial performance, especially in

nascent service markets. Creating customer value means meeting target customers' needs and customer satisfaction. Kim and Mauborgne [55] define customer value as six utility levers: innovations that help improve task execution – functional; innovations that offer enhanced ease of use – simplicity; innovations that make the service easier to obtain – convenience; innovations that minimize customers' financial and physical risks – risk reduction; innovations that delight customers – fun and image; innovation that facilitates recycling, etc. – environmental friendliness. In addition to these functional and rational utility levers, Holbrook [56] adds a socio-psychological dimension (prestige, social interaction, novelty, and hedonism). Finally, we shall add the network effect, which is the change in customer value that derives from a service as the number of users changes [57]. An in-depth literature review on the customer value concept can be found in Chang [58].

9. *Price sensitivity* expresses the users' willingness to pay for new services and also denotes price tolerance [59], price sensitivity of substitutes, and economics of scope.
10. *Substitutes* are new services that cover needs already provided by existing services. These erode profit by stealing business in the market, and include here substitutability, product differentiation, and switching costs. A related concept is the complement that boosts the demand for the service in question by service bundling.
11. *Method of purchase* is related to changes in transaction costs in acquiring the service, and includes the convenience condition suggested by Kim and Mauborgne [55] as a utility lever for customer value above.
12. *Service quality* includes conditions such as functionality, trust, scalability, and security.
13. *User readiness* indicates the user's experience with the technology of the service, and includes factors such as technological maturity, digital skills, standards, and user friendliness. Nysveen and Pedersen [60] have found this condition to be a moderating factor of users' perceptions, attitudes, and behavior in technology acceptance.

According to Crespi [29], the role of demand side factors of innovation has been almost neglected. Economic theory seemed to be more concerned with the analysis of supply side factors. "*Market is seen as capable of absorbing passively all the introduced innovations*" (op. cit, p. 16). Looking at recent developments in net-based services in general, and in the social network services in particular, we know that the demand-pull is very strong.

Supply

The competitive structure of the market can be measured by a number of supply factors, which we will organize into two main categories: competition and concentration, and entries and entry barriers.

14. *Competition and concentration* in a specific market refer to firm attributes such as market participants, participants' relationships, and product differentiation, which means to distinguish a service offering from others, to make it more attractive to a particular target market.
15. *Entries and entry barriers* are factors that allow incumbent firms to earn positive economic profits, while making it unprofitable for newcomers to enter. Barriers to entry may be structural,

such as cost or marketing advantages, or strategic, such as predatory pricing [61]. The economics of scale and scope condition define the horizontal boundaries of the firm. Economics of scale are obtained when the average cost of a service declines as the quantity increases, while economics of scope occur when the firm achieves savings as the variety of the services the firm offers increases. Among the structural entry barriers, Besanko et al. [61] include new entrants, incumbents' marketing advantages, and control of essential resources.

Market control

Government regulation of a specific service market includes rules that the players in the market must follow and the penalties that those firms may suffer when they do not comply with these rules. Regulation can be divided into two broad types, that relating to standards, and that relating to competition [62]. The basic aim of regulation is to *"facilitate competition in markets primarily by means of access and interconnection regulation, to enhance the access to limited resources such as radio frequencies, and to implement social aims instituted by policy decisions regarding, for example, universal access and service"* [63]. NGNs with multi-service platforms raise new challenges for the regulators. Their actions, on the other hand, influence the innovation climate of the market.

16. *Regulations* are here divided into access regulation and market power control.

GENERAL ENVIRONMENTAL FACTORS

To analyze the general macro-environmental conditions that affect society as such, we use an extended PEST analysis [39, 40] where we add environmental conditions (E) to the PEST-acronym. This implies looking at political, economical, socio-cultural, technological, and environmental conditions in the macro environment that may be sources of innovation.

17. *Political analysis* includes general issues such as wage and trade regulations, taxation, and intellectual property protection.

18. *Economic growth* refers to the general buying power of the consumers: economic growth rate, personal wealth, interest rates, and inflation.

19. *Socio-cultural* factors include demographics, education, culture, and leisure interests.

20. *Technology* is related to the proliferation of specific technologies and infrastructures including recent technological developments: innovation rate and technology impact on product offering.

21. *Environmental factors* relate to energy savings and climate change.

Figure 2 shows the full scheme of factors identified by our multi-perspective analysis.

COMPANY FACTORS

Business Model

1. Service value proposition
 - Newness of services, performance, customization, task support, brand, price
2. Revenues
 - Pricing models, pricing objects, revenue sharing, costs
3. Market strategies
 - Market segmentation, distribution platforms, new markets, context-based advertising
4. Value Networks
 - Lock-in, new transaction structures, user networks, complementarities, asset sharing

Resources and Capabilities

5. Assets
 - Tangible, intangible
6. Capabilities
 - Strategic, functional, operational
7. Firm attributes
 - Size, location

MARKET STRUCTURE FACTORS

Demand

8. Customer values
 - Functionality, simplicity, risk reduction, socio-psychological, environmental friendliness, network effects
9. Price sensitivity
 - Willingness to pay, price sensitivity of substitutes, economics of scope
10. Substitutes
 - Substitutability, product differentiation, switching costs
11. Method of purchase
 - Convenience
12. Service quality
 - Functional, trust, scalability, security
13. User readiness
 - Technological maturity, digital skills, standards, user friendliness

Supply

14. Competition and concentration
 - Market participants, participants' relationships, product differentiation
15. Entries and entry barriers
 - New entrants, economics of scale and scope, incumbents marketing advantages, control of resources

Market Control

16. Regulation
 - Access regulation, market power control

GENERAL ENVIRONMENTAL FACTORS

17. Political analysis
 - Wage and trade regulations, taxation, intellectual property protection
18. Economic growth
 - Economic growth, personal wealth, interest rates, inflation
19. Socio-cultural
 - Demographics, education, culture, leisure interests
20. Technology
 - Innovation rate, technology impact on product offering
21. Environmental conditions
 - Energy savings, climate change

Figure 2: A conceptual framework for classification of drivers

3 Research methodology

The purpose of this paper is twofold. First, to develop a conceptual framework for the identification and classification of drivers for service development on next-generation networks, and, second, to use this framework to analyze which types of drivers receive the most attention by a group of 24 domain experts. As the development of the framework was accounted for in the previous section, this section will give attention to how the experts were recruited, and how the drivers were collected.

Composition of the expert group

The success of an expert group study depends on highly qualified professionals with thorough understanding and knowledge of the topic in question. This study does not, however, depend on a statistical sample that attempts to be representative for a certain population [64].

What kind of experts could inform our research? We expected that the most experienced and knowledgeable persons regarding next-generation networks would be found among operators serving the market with telecommunication services (Internet, broadband, telephony, and mobile), consultant companies, universities and research institutions, regulation authorities, and telecommunication magazines. We chose telecommunication operators because they have direct experience with service developing for networks. We chose consultants, advisors, researchers, regulators and journalists because they form a range of various experiences and perspectives, and because they by profession need to have an eye on future developments. The following main criteria were used to recruit the experts. There should be a mix of a) highly experienced senior managers and personnel in telecommunication companies and regulation authorities, and b) distinguished analysts, researchers and consultants in the subject area.

As a result of the researchers' preceding research and regular contributions at research industry conferences and seminars, it was a straightforward matter to identify potential participants. An invitation letter was sent to people satisfying the criteria. The letter explained the research area of interest, the purpose of the research, and the research method to be used. We also asked them to nominate other participants that satisfied the criteria. Finally, from a list of fifty-five potential candidates, twenty-four experts agreed to contribute. Eleven experts came from various telecommunication companies ranging from large full scale operators to smaller firms with few services. Seven experts came from different consulting companies. Three experts came from universities and research institutions, and were researching on future telecommunication networks and services. Two experts were recruited from the national post and telecommunications authority, and one expert worked as a telecommunication journalist. Only one expert was recruited from each company, except the national post and telecommunications authority, from where two experts participated. In total, the experts represented 23 different companies from various domains in the telecommunication area (Table 1). All in all, we believe that our ensemble of experts represents a satisfactory variation to bring up views from many perspectives, and avoids a bias of a particular mode of view on drivers of services on next-generation networks.

Table 1. Descriptive data of the experts

Areas of business	Number of experts
Consulting company	7
Full scale telecommunication operator	6
Broadband operator	3
University / research institution	3
National post and telecommunications authority	2
IP-telephony operator	1
Mobil operator	1
Newspaper (journalist)	1
In total	24

Data collection

After establishing the expert group, a welcome letter was sent to each expert by e-mail, in which he or she was asked to suggest six services that he or she expected would be offered on next-generation networks, and to identify five drivers associated with each service. We defined a driver for the experts as “a factor and a trend of political, technological, and economical condition which most likely will lay the foundation for the establishment of the service in question.” For this purpose, a plain document template was attached for the experts to fill in and return. The complete catalog of drivers that the 24 experts suggested constitutes the data set for this study. In total, 462 drivers were suggested by the experts.

4. The analysis and classification of the drivers

The following method was applied for the classification of the drivers according to the conceptual framework. First, the two researchers worked independently, each interpreting and assigning each of the suggested drivers to a framework category. Duplicates and non-valid factors were removed during this procedure, resulting in a considerable reduction in the number of drivers. That way, each researcher produced one categorized list of drivers based on the data set. Second, the two researchers jointly compared and reconciled the two independently lists into one validated list of 232 categorized drivers (Appendix 1.) Third, the number of drivers for each category was counted in order to determine which types of drivers the experts paid the most attention to. Table 1 shows the result of the classification. The purpose is to present a taxonomy of drivers for service development.

Table 1: The classification of the drivers

COMPANY FACTORS		MARKET STRUCTURE FACTORS		GENERAL ENVIRONMENTAL FACTORS	
Business Model	53	Demand	94		
Service value proposition	16	Customer values	46	Political analysis	5

Revenues	11	Price sensitivity	10	Economic growth	8
Market strategies	13	Substitutes	4	Socio-cultural	13
Value networks	13	Method of purchase	3	Technology	37
Resources and Capabilities	4	Service quality	16	Environmental conditions	3
Assets	4	User readiness	15		
Capabilities	0	Supply	11		
Firm attributes	0	Competition and concentration	8		
		Entries and entry barriers	3		
		Market Control	4		
		Regulation	4		
TOTAL COMP. FACTORS	57	TOTAL MARKET FACTORS	109	TOTAL ENVIRONM. FACT.	66

5. Discussion

The first objective of this work was to develop a conceptual framework for the identification and classification of drivers for service development on future networks. The framework has been developed by an original combination of both pragmatic and theoretical schools of thought in economics, strategic management, and marketing. This work aims at investigating the plausibility of this framework by organizing drivers identified by 24 domain experts. The ultimate goal of the framework is to normatively assist service providers to identify drivers of a specific service offering and adjust the business model to these drivers.

With respect to the classification scheme of drivers, it fits well with findings in more recent literature, as is further shown below. The framework seems to catch and classify the drivers fairly well. However, further refinements may be necessary. For example, there is a duality between customer value on the demand side and the service value proposition on the supply side. The classification to one or the other may be arbitrary—a matter of wording. A further clarification of these two categories would benefit the classification scheme. Furthermore, the demand category is subdivided into six subcategories partly taken from demand conditions found in the SCP paradigm [52]. However, customer values and user readiness, both of which are outside the traditional SCP paradigm, are introduced here. We find that customer value, which is acknowledged on most business models, may be too broad a category, and the interpretation of the drivers indicates that it overlaps with other subcategories, such as service quality and method of purchase. Further clarifications here may be beneficial. User readiness is taken from Nysveen and Pedersen [60], who found that user experience has an effect on the adoption of new services.

The second objective of this work has been to identify the drivers of services on next-generation networks (NGN). We define drivers as political, technological, and economic conditions that most likely will bring about service development in this area. The drivers were initially proposed by the experts in the brainstorming phase of a Delphi study, and have in this paper been classified by applying the conceptual framework.

The classification provided in Table 1 shows that of the three main categories, the market structure factors constitute about 45% of the total number of drivers (109 of 232). This is in line with Schmookler [65], who suggests that innovation is driven by market requirements. If we look at the subcategories within this category, we find that the demand factors dominate with about 40% of the total number of drivers, and the majority of the market structure factors belong to this subcategory. This is interesting because it differs from the general perspective in the economic innovation literature, which emphasizes supply-driven innovation. Schumpeter [66], for example, argued that economic change normally is initiated by producers. In contrast, sociologists have emphasized the role of the demand side in innovation processes [67], while the innovation literature, Dosi [68] and more recently den Hertog et al. [28], does take into account both supply and demand-driven factors. In our study, company factors constitute about 25%. New methods and skills from social sciences are increasingly being applied in the mapping of customer experiences and non-recognized customer needs. *“If a profound understanding of customer needs is the source and driver of the innovation process, this is referred to as user-driven innovation”* [69]. User-driven innovation emphasizes the need of studying the role of user needs in innovation activities. The results in this study show that the experts place an emphasis on user-driven service development.

What does it actually imply for service development in NGN to be user driven? By studying the drivers, we find that a series of drivers in the demand category have expressions like: “there is an increased need for...”, “people want...”, and “there is a call for...” It seems obvious that the experts have the opinion that users—firms and households alike—have an expressed need for more network functionality and better quality than what is presently available. This includes services that are easier to use, that simplifies work, and makes living more convenient. Users also demand more alternatives to choose from, compared to today’s offerings. The experts are also attentive to the growing environmental consciousness among the population, and their call for services that will reduce travelling needs, whether business or pleasure. It is also evident that the experts consider the users to have the capabilities needed. In the user readiness category, we find a number of drivers confirming an adequate level of technology maturity and computer skills among the users. To condense, user-driven service development entails that users are in demand for better and new services that will increase customer value, and that the experts perceive users as capable of using these services and taking benefit from them; the required technology is already mature and is spreading.

Of the 57 drivers identified as company factors, 53 belong to the business model dimensions and only four drivers to resources and capabilities. Do resources and capabilities not support service innovation? Den Hertog et al. [28] put special emphasis on the resource-based view (RBV) and dynamic capabilities in their framework development for service innovation. The reason for the mismatch between resource-based drivers and business model drivers in this study is probably that RBV aspects are embedded in the business model concept. Therefore, we find considerable overlap between our business model dimensions and the service innovation model of den Hertog et al. [28].

On the supply side, comparing company factors with supply-side market structure factors, we find that company factors (57) dominate the supply-side market structure factors (11). Innovation may take place in any part of the value-creating system (chain or network). According to Rosted [69], innovations are most often found in production processes and product attributes but the largest

economic benefits from innovations are found in business models and branding/marketing. Product attributes correspond to our service value proposition, which is the subcategory of the company factors with the largest number of drivers (16). The last market structure factor is market control, i.e., governmental regulation etc. Only four drivers were found in this subcategory, indicating that our respondents did not pay much attention to these aspects. Not surprisingly, we find technology to be the dominant general environmental factor influencing service development in this technological domain of network services. Of a total of 66 drivers, 37 were classified as technology drivers followed by 13 socio-cultural factors.

How do the drivers proposed by the experts in this study correspond to other research? From the literature study presented in the introduction chapter, technologies, policies, standards, value chain cooperation, and users were identified as major driver types for the development of service on future networks. Each of these types is found in the material assembled in this study. However, as we see from our analysis, the experts are paying considerably more attention to drivers related to technology and users, than on policies, value chain cooperation, and standards. The experts seem to agree with Houssos et al. [12] that the technological innovation rate so far has been persuasive and that this is expected to be maintained. Technology impact on product offering is immense, and the experts name a number of technological drivers that they believe will foster service development. As a driver type, policies gained few suggestions from the experts. Only nine proposals belong to the *regulation* and *political analysis* sub categories. Value chain cooperation was mentioned by the experts, but they were equally paying attention to increased competition and the elimination of members in the value chain, as to increasing cooperation and new collaboration patterns. The issue of standards was not frequently mentioned by the experts, and those that were suggested pointed at high level “standards” like the fact that all PCs now have a camera and media players, that interoperability among platforms is increasing, and that we now see an increasing use of open standard formats for playing digital media contents. However, the experts did not point to the more detailed standards and standardization work that is ongoing in the field [21].

It should be emphasized that the respondents had no guidance in answering the question that was formulated as a very open question: “for each service name five drivers.” Thus, the level of analysis in this study is the *service*. The service is related to the new market environment created by NGN, which should imply considerations on both the supply and the demand sides of this market. The majority of demand factors observed here indicate that the experts view service development in NGN to be user-driven or a demand-side development process.

6. Conclusion

The aim of this paper is to contribute to a better understanding of what drives service development on next-generation networks; where management can look for conditions that may trigger an innovation; and what experts in the field of NGN services perceive as important conditional segments. The empirical basis of this study is taken from a data set where 24 experts are asked to propose services on NGN and what they think will drive the emergence of these services. A total of 462 suggestions for drivers were received, which, after interpretation and validation, resulted in a catalog of 232 drivers. In order to organize these drivers, a classification scheme was needed. A conceptual framework of driver conditions was therefore developed based on a multi-perspective

strategic management theory. This conceptual framework was used to organize the 232 drivers of NGN services into classes of conditional factors relevant for management.

This paper contributes to service innovation in general and to service development of NGN services in particular. Firstly, we have developed a conceptual framework for identification of drivers for service innovation in a firm. This framework is based on strategic management theory as a joint concern of theories in organizational economics, strategic management, and marketing. The framework is built on a multilayered theoretical basis starting at the core with company-specific factors taken from the business model concept and a resource-based view of the firm. The next layer, market structure factors, consists of elements taken from organizational economics and the structure – conduct – performance paradigm. The outer layer, general environmental factors, draws its elements from the PESTE framework. Secondly, this paper presents specific drivers of NGN services as an organized list classified to the lowest level of our framework. This list should be of interest to service providers of NGN services as it represents the perception of 24 experts in the field. Thirdly, by aggregating the drivers to levels as shown in Table 1, a class-wise distribution of drivers can be obtained. The pattern that emerges from Table 1 is the domination of the market structure drivers, and particularly the customer value drivers, over company and environmental factors, indicating that service innovation will be dominated by user-driven processes. Table 1 can therefore be used by managers to focus their search for drivers. The empirical results do also offer possibilities for further research. As we are considering drivers for future services, the time dimension is an obvious issue; the temporal sequence of the complete set of drivers is open for investigation. Significance and importance is another research theme, and tools such as the Analytic Hierarchy Process (AHP) can be applied to unveil priority differentiations among the set. And for those who are engaged in service innovation, techniques such as the Quality Function Deployment (QFD) can be used to identify the characteristics and requirements of new and existing network services.

Based on the conceptual framework presented, we see major research challenges. The framework has been applied, and thus tested, and although the framework seems to catch and classify the driver population fairly well, our study suggests that we need refinements of the classification scheme, but also that the scheme indicates well where the focus on service development for NGN is, namely on the demand side with user-driven development. A natural path for further research is to further develop this framework and to test it on this or other data sets. The second challenge is to link service innovation efforts in general and drivers in particular, to firm performance. Thus, a research model should be developed based on the conceptual framework presented here with performance differentials as the dependent variable. The third challenge is to look at how the dimensions of the business model interact with each other. Given the domination of market structural factors as service innovation drivers, it is a challenge to find how the business model processes can best meet these factors.

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Appendix: The validated list of drivers

COMPANY FACTORS

BUSINESS MODEL

1 Service value proposition

Newness of services

- Digital libraries with anywhere/anytime/any-channel access
- Intelligent media portals to affordable prices
- TV broadcasting complemented with media portals and on-demand services
- HD presentation of high-quality theater and concert performances
- Commercialization of hologram technology
- File sharing through distributed networks
- Content adapted to mobile formats (shorter episodes, etc.)

Performance

- Cloud computing
- Remote control of appliances
- One general remote control device for everything
- Integration of new communication modes (messaging, Facebook-messages, Twitter, etc.)

Customization

- Free selection of TV channels
- Open access broadband services
- Operators need for documenting usage patterns in the SOHO/private segments
- Separation of network and service subscription

Task support

- Support for secure payments on the Internet

Brand

Price

2 Revenues

Pricing models

- Flat rate pricing

- Differentiated time- and day-based pricing
- Cost-efficient pricing models for business customers drive web-based computing

Pricing objects

- Lower pricing on data access
- Lower pricing on mobile senders/receivers
- Content providers have secured revenues on property rights

Revenue sharing

- Revenue sharing between content provider and network owner

Costs

- Lower production costs
- Lower distribution costs
- Lower operating costs for security
- Cost reduction enables lower marginal prices for traditional and new services

3 Market strategies

Market segmentation

- Commercial advertising embedded in games
- Content providers differentiate to create closer relationships to customers
- Conservative users are being stimulated to explore new services
- Animated firm presentations
- Niche TV channels

Distribution platforms

- More distribution channels and platforms for user-generated content
- Machine-to-machine – M2M (Internet of things)

New markets

- New markets for operators
- Broadband providers want to offer a broader scope of services

Context-based advertising

- More knowledge about users' habits and traveling patterns
- Goal-directed advertising increases advertisers' willingness to pay
- Micro advertising

4 Value networks

Lock-in

- Lock-in of customers
- Network operators become overall providers of communication in order to increase control of customers

New transaction structures

- Global broadcasters want to eliminate the distribution agents
- Content providers and network operators in joint collaboration for closer relationship with customers
- Collaboration between payment card providers and mobile device producers to develop common standards
- From production for to production by users
- New collaboration tools sustain value chain integration and rightsourcing

User networks

Complementarities

- Community building increase sales of complementary services

Asset sharing

- Capacity sharing
- Better utilization of broadband in trunk networks
- Applications from 3rd parties
- Transfer of industrial surveillance solution to households
- Directories for user data

RESOURCES AND CAPABILITIES

5 Assets

Tangible

- Energy companies' heavy investments in machine-to-machine (M2M) services
- Reuse of installed network base
- Multiple access channels for optimization of resources

Intangible

- Positive brand relationships between handset providers and consumers will be utilized

6 Capabilities

Strategic

Functional

Operational

7 Firm attributes

Size

Location

MARKET STRUCTURE FACTORS

DEMAND

8 Customer values

Functional

- Increased need for hosting
- Increased need for file sharing and back-up services
- Increased need for real-time and time shift services
- Increased need for tools for navigation and filtering due to increased communication
- Increased need for bandwidth – up and down
- Increased needs for education, news, and information
- Increased use of mobile phones for task support
- People want to be reached anytime, anywhere
- Peoples' call for entertainment
- Peoples' call for continuous news update
- People want to build their own TV program tables
- People want convenient methods for micro payments
- More shopping
- People want access to services while moving
- Entertainment in touch with reality (Reality entertainment)
- Virtual adventures
- Office integration
- Global teams – global collaboration
- Lean approach to supply chains
- Optimal time-to-market
- More automated processes
- Efficiency needs in public services
- Self-regulating systems

- Real-time surveillance and tracking of things and persons
- Automated meter readings (water and energy)
- GPS-driven information about service centers, shops, etc.
- More focus on applications differentiation than on technological platforms
- Cost reduction by use of electronic paper
- Cost savings for alarm and surveillance services
- User groups with large international call bills will innovate user patterns

Simplicity

- Peoples' call for simplification
- Peoples' call for variety and freedom of choice
- Peoples' call for personalization and customization
- Users want solutions that make their life more convenient
- Consumers' call for increased control of their video/TV consumption
- Citizens will require increased service and self-service for public services
- Consumers want one single point of contact for broadband access, invoice, and help desk support
- Channel independent access – all services on one common terminal device
- Customized content based on profiles and advanced settings
- Control of stock independent of time and place

Risk reduction

- Increased need for safety

Socio-psychological

- Individuals' desire to be visible – to become a star

Environmental friendliness

- Less traveling – more entertainment at home
- Less traveling – cost and time savings

Network effects

- Increased participating in social networks and communities
- Increased integration of partners and value chains

9 Price sensitivity

Willingness to pay

- For targeted advertising
- For reality entertainment
- For used/demanded content
- For niche channels

Price sensitivity of substitutions

- Cheaper IT units and devices
- Cheaper telephony given today's service level
- Cheaper video conferencing
- Predictable prices
- Web-based computing leads to increased price sensitivity (less costly to develop and run)

Economies of scope

- Demand-side economies of scope (ex. Multiplay)

10 Substitutes

Substitutability

- Mobile phones will substitute PCs in certain markets
- Wireless connection – need to break away from cable
- Customers' call for complementary products and services within their field of interest

Product differentiation

- Better Web-TV increases traditional TV viewing

Switching costs

11 Methods of purchase

Convenience

- Changing consumer patterns – more self-service
- More automated purchase of standard consumer products
- E-shopping

12 Service quality

Functional

- People want to control access to information
- People's call for high-quality sound and image
- People want to have interactive dialog with the content providers
- Consumers demand reliable, high-quality, Internet, TV and telephony services

- Access control for children
- Increased focus on service quality (measurement and following-up)
- Need to determine Service Level Agreement (SLA) fulfillment
- Firms need unambiguous and standardized specifications for data to be exchanged
- Demand for effective name and address data management (not necessarily centralized)

Trust

- Private and public firms need reliable services for business-critical communication
- Users require reliable communication services
- Users' trust in vendors is increasing
- Users require reliable security measures

Scalability

- Growing demand for flexible scalability to the computer and network resources

Security

- Open networks (Internet and basic broadband services) require differentiated security mechanisms
- Increased demand for digital security services and digital signatures

13 User readiness

Technology maturity

- All users have a camera on their mobiles and PCs
- Web and media players on every device
- Thin client services for personal use
- User-friendly electronic paper
- Web 2.0 applications are making users familiar with applying information filters
- Twitter and Facebook are making users familiar with being telepresent

Digital skills

- Web-based computing reduces the demands for users' IT management skills
- New generations have grown up with Internet and interactive services
- People are familiar with making use of digital tools for administrating their lives

Standards

- Everything is now becoming web-based
- Increasing interoperability among platforms
- Increasing use of open standard formats for playing digital media contents

User friendliness

- Defined menus and easy-to-understand user interfaces make advanced set top boxes trouble-free for users unaccustomed to the Internet
- Online self-service services are becoming easier to use
- Voice-over Internet Protocol (VoIP) is user-friendly with respect to device freedom

SUPPLY

14 Competition and concentration

Market participants

- Emerging content providers will compete with today's channel providers
- Television broadcasters obtain a more extensive position in the value chain

Participants' relationships

- The trend is towards open networks. The tight coupling between content and network dissolves

Product differentiation

- Increased variety, not everything is geared to TV primetime
- Competition among different standards
- Media and film industry need to differentiate their content from user-generated content
- Television broadcasters will provide IP-TV via TV, web and mobile without differentiating
- Fixed/mobile telcos can differentiate their services by integrating content across platforms

15 Entries and entry barriers

New entrants

- Parallel infrastructure for narrowband data communication established with cheap equipment outside traditional network operators'

infrastructure (e.g., energy companies and security companies)

Economics of scale and scope

- Content providers who see revenues potential from new distribution channels

Incumbents marketing advantages

- Massive advertising from globally dominant players

Control of resources

MARKET CONTROL

16 Regulation

Access regulation

- Multi-channel regulation (packaging of TV channels)
- Regulation and price sensitivity require new pricing models for video/TV services

Market power control

- Legislation
- Governmental requirements

GENERAL ENVIRONMENTAL FACTORS

17 Political analysis

Wage and trade regulations

- Politicians would like new media services to be available for as many as possible
- Regional politics
- Demand for remote reading of power consumption

Taxation

- Increased discharge taxes on motor vehicles

Intellectual property protection

- Global rights (rights protection)

18 Economic growth

Economic growth

- Economic crisis initiates large-scale public service development programs
- Economic crisis substitutes traveling by multimedia conferencing systems
- Reduced innovation rates by service providers and network operators due to financial crisis force handset providers to innovate to stimulate handset sales

Personal wealth

- The number of mobile devices in use are increasing
- Broadband penetration
- Smart phone penetration
- Large parts of the world's population have network access by mobile phones and mobile broadband
- Mobile phones will replace laptops in less-developed countries. People can afford a mobile phone but not necessarily a PC

Interest rates

Inflation

19 Socio-cultural

Demographics

- Communities
- Changing demographics in the society (more elderly people etc.)
- Global workforce
- Global niche-communities
- Organizations for people with disabilities
- Organizations for people belonging to minority languages
- Increasing unemployment rates and number of citizens on pension plans will require cost reductions in public service production

Education

Culture

- Individualism
- Users are always online

- Social media develops new means of cooperation

Leisure interests

- Homemade videos by younger people
- Social media brings acceptance for self-publishing
- Trend that entertainment activates and contributes to socialization

20 Technology

Innovation rate

- Manufacturers pushing 3D technology on TV, PC, and Mobil screens
- Hologram TV is rapidly developing
- Technology for content production is affordable for everybody
- Digital control panels in cars
- Digital motor control in cars
- Internet-connected vehicles
- GPS-functionality included in common electronics
- New building architectures with electronic networks and services embedded
- Cable networks upgraded to carry NGN services

Technology impact on product offering

- Improved displays, batteries, and connectivity on hand-held devices
- Improved display technology
- Ultra-thin LCD TV
- Ultra High Definition Television (Ultra HDTV)
- Technology for high-quality TV on mobile phones

- Three-dimensional technologies for real-time virtual clothing trials
- Increased network bandwidth
- New compression algorithms
- Mobile broadband
- Improved and more predictable network quality
- 3 G mobile phone services operating in 900 Mhz networks with extended spectrum to 2 GHz
- Mobile devices are able to communicate over a range of various networks
- Increasing computer power
- Cost-effective centralized data storage
- Falling investment costs per bit
- Infrastructure for RFID is in place
- Increasing number of digital sensors communicating over the IP network
- New security solutions based on chip and PIN-code
- Peer-to-Peer technologies
- PVR functionality and increased storage capacity
- Networks with improved routing and security mechanisms
- Advances in the development of femtocells
- Networks identify users' locations and personal information
- Access to media across platforms (ex Slingbox)
- Unified messaging system (UMS)
- Development and deployment of IPV6
- Web-based applications