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**The drivers of services on next generation networks**

**By**

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SNF project no 6255

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# **THE DRIVERS OF SERVICES ON NEXT GENERATION NETWORKS**

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## **ABSTRACT**

This report is concerned with the drivers of service development on future networks. As telecommunication networks are being transformed into next generation networks, the communication and media landscapes are being reshaped and a wider range of network services is emerging. However, little is known about the drivers of this service development. Based on an interpretive analysis and categorization of data from an earlier Delphi study (Iden and Methlie, 2009), this report investigates what types of drivers 24 experts are considering most significant for service development in this area. This report finds that the markets structure factors, by far, are considered by the experts as most significant, demonstrating the importance of the users for innovation and service development in this area. Another contribution, and as the basis for the categorizing and analyzing of the drivers, this report presents a conceptual categorization framework, which is derived from existing perspectives within organizational economics and the strategic management.

*Keywords:* Telecommunication, next generation networks, network services, drivers of innovation

## **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. Some new technologies are more significant than others for market developments. One significant technological change is the convergence of current dedicated single service networks currently deployed in the telecommunication world toward a common IP-based multiservice network referred to as the next generation network (NGN). NGN is a generic term that conceptualizes the emerging technological and market developments. NGN enables ubiquitous, real-time, multimedia communications that can be utilized by all types of service providers and for a broad range of services. A definition of NGN is found in ITU-T (2004).

The emergence of these new network infrastructures will reshape telecommunications as well as the media landscape. The architecture and technologies for NGN are well known. The service provision approach is not so clear though. Network operators have traditionally controlled all aspects of service lifecycle by means of walled-garden business models (Yelmo et al., 2008). With the NGN the telecommunications and IT domains merge and open the market for third parties to enter with new and value added service offerings. Service creation is fundamental to the promises of the NGN.

However, a killer application remains yet to be found (op.cit). There is still a lot of uncertainty as to what will drive the development of services on these networks (Ofcom, 2008).

Growing telecommunications privatization has encouraged competition, new services, new business models, and lower prices (Richman & Pant, 2008). Deregulation is expected to introduce many more suppliers than in the past, and the NGN represents a real opportunity for service providers to rapidly create, deploy, and deliver multiple services that will attract new customers, hold on to existing ones, and increase revenues. These services and applications will have different characteristics and traverse unique sets of functions, databases, and servers through the network (Richman & Pant, 2008).

Continuous network innovation is not only making substantial cost savings possible, but is also making it feasible to establish effective competition in more and more segments of the telecom market. This has created a need to ensure that inherited regulations do not provide unjustified biases favoring particular technologies, services, or competitors (ITU, 2004). With Internet technologies now applied to all network services, the market structure of telecommunication services has changed radically. In the new IP-based networks a key cornerstone is the decoupling of services and networks, allowing them to be offered separately. This reduces the technical barriers to entering, and offers opportunities to new players. Both service and network innovations have caused blurring of the telecom sector. However, changes are not only taking place at the supply side by the services. People familiar with Internet services have new demands and different behavior now that telecommunication services are IP-based. Thus, one may expect service innovations also from the demand side of the market. User-centric service creation allows end-users to create, manage, share and execute their own personalized services that fit their needs (Yelmo et al., 2008).

NGN will allow the deployment of new type of services that are feature-rich, interactive and multi-media capable, using increased bandwidth, richer devices and incorporating location and presence awareness (Ladan and Yari, 2008). These services will be created in cooperative business environments by operators, content providers and other service providers. Another important impact of NGN is the separation of access with core transport enabling end-users more freedom in choosing access technology to fit their specific requirements.

The new business environment imposed by NGN changes both supply and demand side of the telecommunication market requiring incumbent operators and service providers to reassess and adapt their business models to a new market structure. A business model is service specific. Its value proposition will change as services are developing, and governance form will change from vertical value chains to horizontal value networks as we move from the traditional telecommunications domain to Internet service domains. Although NGN is expected to change the business environment severely, no academic research on business models for this environment is known to us.

The work reported here, is concerned with factors which bring about or sustain services on next generation networks - factors which we denote drivers of innovation and service development. Identifying the drivers that will affect service development on these networks is an obvious precondition to achieve in order to design effective business models of the service providers. Based on this, the research question for this work is:

*What drivers are most significant for service development on future generation networks?*

To answer this question, we will analyze data from a ranking-type Delphi study with two expert panels, service providers within telecommunication and media services, and markets analysts working as researchers, consultants or analysts (Iden and Methlie, 2009). In the brainstorming phase of the Delphi study, all experts were asked to identify ten services that they thought would be offered on future next generation networks. In addition, for each service they were asked to identify five drivers that they consider being essential for bringing about the service. The complete set of drivers identified by all experts constitutes our research data.

In order to analyze the drivers, a conceptual framework, which was developed as part of this research, has been used. This framework applies several alternative theoretical perspectives taken from organizational economics and strategic management in order to identify factors that may be sources of innovation and service development in this area.

The rest of this report is organized as follows. The next chapter develops the conceptual framework used to analyze and organize the drivers. Then we explain our methodology for data gathering and analysis, followed by the findings of this study which is divided into two parts: 1) a service independent part where all drivers are categorized and analyzed according to the framework; and 2) a service dependent part where those drivers associated with the 17 highest-ranked services in the Delphi study are categorized and analyzed. After that a discussion follows, and finally a summary chapter concludes the report.

## **2. Conceptual framework**

Any discussion of new service development must begin with a definition of what is meant by a “new service”. Several definitions or classifications of new services have been offered. A new service is an innovation that directly or indirectly changes the form or quality of a service offering (Johne and Storey, 1998). Menor et al. (2000) recognizing the need to consider both the newness of the service offering (what service is offered?) and the service concept (how the service is offered?), defines a new service as an offering not previously available to a firm’s customers. Booz et al. (1982) provide an alternative way of defining new services. New services include: (1) new-to-the-world services, (2) new product lines, (3) additions to existing service, (4) improvements and revisions to existing services, (5) re-positioning, and (6) cost reductions (ibid).

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 (Crespi, 2004). Crespi (2004) develops a framework of determinants of innovation by a multi-perspective analysis. This analysis is kept on an aggregated level, a 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 the development of services on the next generation network. It refers services or service innovations that achieve superior performance and competitive advantage of the firm (Agarwal et al., 2003). This is the concern of strategic management. Scholars in strategic management tend to focus on sources of competitive advantage. They develop theories of the firm that explain performance differentials between firms (Stoelhorst and van Raaij, 2004).

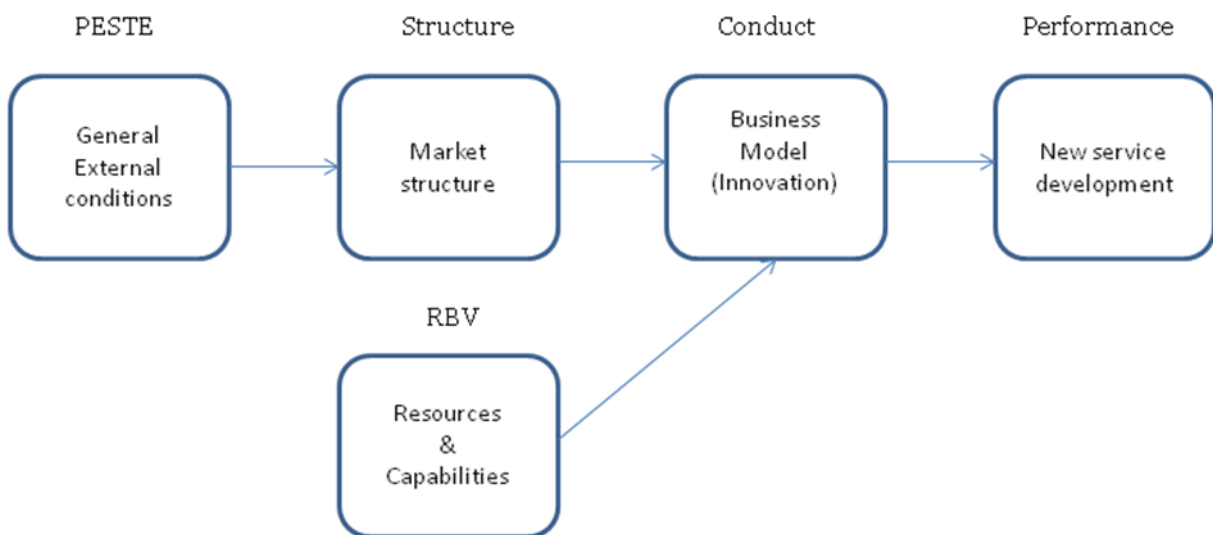
Market factors such as competition and demand have been recognized as crucial determinants of innovation (e.g. Kessler and Chakrabati, 1996; Porter, 1991). Also, market knowledge is recognized as crucial to understand innovations (e.g. Marinova, 2004). Hence in developing a framework for drivers of service innovations it may be fruitful to start with the managerial theory of the firm as developed by Stoelhorst and van Raaij (2004). Their managerial theory is based on four theories from organizational economics that address the performance differentials between firms: industrial organization theory (I/O), the Schumpeterian view, the Chicago school, and the resource-based view (RBV). I/O explains the performance differentials between firms on the basis of product differentiation and market power. The central theoretical notion here is the structure – conduct – performance (SCP) paradigm (Mason, 1939; Bain, 1954). The Chicago school views the differences between firms as due to efficiency differentials. Schumpeter’s view of competition is that of a process driven by innovation (Schumpeter, 1950). This type of competition “*comes from the new consumer goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprises creates*” (op.cit, pp. 82). The resource-based view (RBV) of the firm emphasizes heterogeneity as the driver of performance differentials between firms (Peteraf, 1993). As opposed to the SCP paradigm that sees the performance differentials as a result of a favorable industry structure, RBV sees performance differentials between firms as a result of the firm’s ability to develop unique or difficult-to-copy resources (Barney, 1991; Peteraf, 1993).

In the following we shall in particular pay attention to the SCP paradigm that focus on market power and competitive positioning; and resource heterogeneity based on the resource-based view of the firm; two paradigms that have come to dominate the strategic management thinking the last two decades (Hooley et al., 1998). Both paradigms aim at achieving competitive advantage and performance differentials. The SCP paradigm states that industry structure determines or constrains the conduct of the firm which in turn determines its profitability. SCP is an approach to analyze market structure by determining basic demand and supply conditions. It originates from I/O and has been transferred to the strategic management area (see Porter, 1981). The resource-based view (RBV) is a complementary, but often considered a contradictory paradigm to the external market oriented SCP paradigm. Here the competitive advantage, and the innovation and new service development capabilities are explained by the uniqueness of resources and capabilities of the firm. Thus, we shall complement our search for drivers for new service development by the resource base of the firm using the RBV theory.

As with the classic structure-conduct-performance paradigm, innovation is assumed a conduct variable, is constrained by the external and the internal structures of the firm, and its performance is a result of the conduct to such structure (Jaw et al., 2008). Thus, to catch the external market conditions that may influence innovation and new service development the *SCP* framework seems relevant. This linkage of structure, conduct, and performance was also observed by Porter: “*To explain the competitive success of firms, we need a theory of strategy which links environmental circumstances and firm behavior to market outcomes*” (Porter, 1991, p. 99). Innovation as a conduct variable signifies a behavioral dimension, a choice made by the service providing firm. According to Methlie and Pedersen (2007 and 2008) the *business model* of a firm is what constitutes the decisions about service delivery that generates outcome. Methlie and Pedersen (2007 and 2008) have embedded the business model concept in the frameworks of SCP and Porter’s theory of strategy.

However, the market or industry structure is embedded in an environmental context – the economic climate. Changes in the external environment may imply a threat to the firm, but may also create new opportunities both of which may be a source to innovation and new service development. There are both pragmatic and theoretical schools of thoughts that treat this context (McKiernan, 2006). The traditional, predominantly taxonomic classifications of the contextual or macro environment – PEST (political, economic, societal, and technological), and its derivatives: PESTE, PESTEL, and PESTLED where environmental; environmental and legal; and legal, environmental and demographic are added respectively to the traditional PEST, are pedagogically simple tools to understand this context (Burt et al., 2006). More on PEST analysis can be found in Hitt et al. (2005) and Worthington and Britton (2006). To analyze conditions of innovations induced by the environment on the market, a PESTE analysis will be used here.

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 innovation and service development. We have identified the *business model* as a descriptive framework of the conduct of innovation and new service developments complemented by the *RBV* to organize supportive drivers based on heterogeneous resources and capabilities of the firm. To catch the market conditions that may influence innovation and new service development we use the *SCP* paradigm, and to analyze the general external environment we use a PESTE analysis. It should be emphasized that in this paper we will develop a classification framework of drivers that influences service development. However, the effects of this framework on performance are not evaluated here.



**Figure 1:** Theoretical frameworks applied in this study for the development of driver categories

In each of the elements of figure 1 we find factors that may initiate changes that may trigger innovation – a driver of new service development. In the following we shall describe these factors in more detail.

The conduct factors are decision variables that shape the service in the market in order to achieve certain performance measures, for instance adoption of a service, under the constraints of structural market and firm specific conditions. These conduct factors constitute the business model for this service. Business models are defined in many ways (e.g. Osterwalder et al, 2005; Zott and Amit, 2008), but the definitions seem to converge along four conduct dimensions: the service value proposition, i.e. what to offer; the marketing strategies, i.e. how to offer; the revenue formula, i.e. how value is captured; and the value network governance, i.e. how value is created (Methlie and Pedersen, 2007). *Service value proposition* creates values for customers through service attributes catering to the customers' needs. *Marketing strategies* focus the way the service provider addresses the market, i.e. segmentation and differentiation. *Revenue formula* focuses innovations that are driven by cost effectiveness, pricing, and revenue sharing. Finally, *networking and governance* are concerned with how the value creating system is organized. 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 revenue formula, marketing strategies and governance. An innovation 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. These business model dimensions are classified as direct supply factors.

Sources of innovation and new service development are also embedded in the resources and capabilities of the firm. Theoretically, the resource-based view (RBV) of the firm may help us to identify these sources. A number of definitions of classification schemes of resources and capabilities have been suggested. Barney (1991) defined resources as a bundle of assets, capabilities, organizational process, firm attributes, information and knowledge. The resources 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. To create value from these assets, the company needs capabilities. Teece et al. (1997) used the term "capability" to refer to the abilities to organize, manage, coordinate or undertake specific sets of activities. Hooley et al (1998) distinguish capabilities of *strategic capabilities* such as interpretation of market knowledge and competitive positioning; *functional capabilities* such as customer relationship management; and *operational capabilities* such as implementation significance. In addition *firm attributes* such as size and location play significant roles. We can search for drivers of new service developments in all these dimensions. These drivers are classified as indirect supply factors.

Complementary to RBV which bases its competitive advantage on internal resources and capabilities, we find the market orientation in which competitive advantage is achieved by positioning of the firm within its market (see Hooley et al., 1990; Kohli and Jawkorski, 1990). We use the SCP-paradigm as described by Waldman and Jensen (2001) to identify sources of innovation in the external market conditions. The market structure is first determined by the basic market conditions, namely the demand conditions and supply conditions. In addition we include governmental interventions that influence the service specific market. Other, more general governmental policies are treated as general environmental conditions.

Demand conditions include customer value, price sensitivity, substitutes, methods of purchase, service quality, and technology maturity. *Customer value* is acknowledged in most business models (Cravens et al., 1997). Superior customer value of services is the real driver of financial performance



especially in nascent markets. Creating customer value means meeting targets customers' needs and increasing customer satisfaction. *Price sensitivity* expresses the users' willingness to pay for new services. *Substitutes* are new services that cover needs already provided by existing services. It erodes profit by stealing business in the market. A related concept is the complement that boosts the demand for the service in question by service bundling. *Method of purchase* is related to changes in transaction costs in acquiring the service. *Service quality* includes conditions such as convenience, security, scalability and communication quality (QoS). Finally, *technology maturity* is a condition that indicates the users experience with the technology of the service in question. Nysveen and Pedersen (2004) have found this condition to be a moderating factor of users' perceptions, attitudes and behavior in technology acceptance. According to Crespi (2004) 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, pp. 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.

The supply conditions include competition and concentration, barriers to entry, product differentiation, and economics of scale and scope. *Competition and concentration* refers players of a specific market with respect to firm attributes such as market share, firm size and location. *Barriers to entry* are those 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 (Besanko et al., 2007). *Product differentiation* is a means to distinguishing a service offering from others, to make it more attractive to a particular target market. *Economics of scale and scope* define the horizontal boundaries of the firm. Economics of scale is obtained when the average cost of a service declines as the quantity increases, while economics of scope occurs when the firm achieves savings as the variety of the services the firm offers increases.

Government policies to regulate a specific service market include the rules imposed by the government that the players in the market must follow and the penalties that those firms may suffer that do not comply with these rules. It includes rules set by the governmental agency assigned to regulate to the market in question or some general competition rules. It includes taxes and price control on specific services.

To analyze the general environmental conditions that affect the society as such we use a PESTE analysis. It implies looking at political, economical, socio-cultural, technological, and environmental conditions in the macro-environment that may be sources of innovation. *Political* environment includes general issues such as labor market politics; anti-trust laws; taxes; price regulations; etc. The *economic* environment refers to the general buying power of the consumers; economic growth rate; interest rates; inflation rates; etc. The *socio-cultural* factors include demographics, lifestyle trends, buying patterns, etc. *Technology* is related to the proliferation of specific technologies and infrastructures including recent technological developments; technology access; technology impact on cost structure; patents and licensing. *Environmental* factors relate to energy, pollution and climatic change.

The full scheme of conditions using the theoretical frameworks of business model, resource-based view of the firm, SCP, and PESTE is shown in figure 2.

- 1) *INTERNAL FIRM FACTORS*
  - a) CONDUCT (BUSINESS MODEL)
    - i) Service value proposition
      - Intrinsic values, network effects, novelty, accessibility
    - ii) Revenue formula
      - Pricing, revenue sharing
    - iii) Market strategies
      - Differentiation, cost leadership
    - iv) Networking (governance)
      - Interaction with customers, suppliers, co-operating parties
  - b) RESOURCES AND CAPABILITIES
    - i) Assets
      - Tangible: Technological, financial, people
      - Intangible: brand name, market share
    - ii) Capabilities
      - Strategic: business vision, management support
      - Functional: external focus, market sensing, NSD, innovation
      - Operational: implementation, time-to-market
    - iii) Firm attributes
      - Firm size, location
- 2) *MARKET STRUCTURE FACTORS*
  - a) DEMAND
    - i) Increased customer value (customer needs and wants)
    - ii) Price sensitivity
    - iii) Substitutes
    - iv) Method of purchase
    - v) Service quality
    - vi) Technology maturity
  - b) SUPPLY
    - i) Competition and concentration
    - ii) New entries
    - iii) Product differentiation
    - iv) Economies of scale and scope
  - c) GOVERNMENT POLICIES
    - i) Regulation
    - ii) Taxes
    - iii) Price control
- 3) *GENERAL ENVIRONMENTAL FACTORS*
  - a) POLITICAL
    - i) Political Stability, legal frameworks, wage legislation, etc.
  - b) ECONOMIC
    - i) Economic growth, interest rates, buying power
  - c) SOCIO-CULTURAL CONDITIONS
    - i) Demographics, lifestyle trends, buying patterns
  - d) TECHNOLOGY
    - i) Technological synergy, technology access, patents, licensing, standards
  - e) ENVIRONMENTAL
    - i) Energy savings, pollution

**Figure 2:** The theoretical framework for categorization of drivers

### **3. Research methodology**

The purpose of this report is to determine the drivers most significant for service development on future generation networks. This study is based on an interpretive analysis of empirical data (drivers) collected as part of a Delphi study on services on future networks (Iden and Methlie, 2009). The Delphi method, which is a widely employed and accepted method of establishing forecasts of future issues when experts are geographically dispersed (Story et al., 2001), was used to forecast services and to identify related drivers. The Delphi method is characterized as a highly formalized method of communication between researchers and a panel of experts, and is designed to extract the maximum amount of unbiased information from the experts. Readers interested in detailed descriptions and discussions of the Delphi method are referred to (Schmidt, 1997; Rowe et al., 1991, Rowe & Wright, 1999; Story et al., 2001; Okoli & Pawlowski, 2004).

Two panels of experts were established for the Delphi study, one is called the service provider panel, and the other is called the market analyst panel. The following main criteria were used to establish the panels:

1. The service provider panel was recruited from experienced, high-level managers in Norwegian telecommunication companies and regulation authorities. The companies range from large incumbent operators to smaller broadband services.
2. The market analyst panel was recruited from well-known analysts, researchers, and consultants in Denmark, Norway, and Sweden.

An invitation letter was sent to a group of people knowledgeable in the field of tele-/media services. The letter explained the research area of interest, the purpose of the research, and the research method to be used. 24 experts agreed to participate, 13 service providers and 11 market analysts. The problem of non-response was exceptionally low, as only one expert left during the study.

#### ***3.1 Data collection method***

Data collection was based on the method provided by Schmidt (1997) and Schmidt et al. (2001). A welcome letter was sent to each expert by e-mail, in which he or she was asked to identify at minimum six services that he or she expected would be offered in next generation networks within the next five to 10 years. The experts were also asked to identify up to five drivers associated with each service. We defined drivers for the experts as “factors and trends of political, technological and economical conditions 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. In total, 462 drivers were identified by the experts.

#### ***3.2 Data analysis method***

For analyzing the total set of drivers, the following method was applied. First, by applying the conceptual framework derived and presented in section 2 above, each driver was assigned to a driver category. This was done in two phases. In the first phase, the two researchers worked independently, assigning each driver to a driver category. In the second phase, the two independently constructed

categorizations were jointly compared and reconciled by the researchers working together, leading to one validated set of categorized drivers. See Appendix.

Second, the drivers suggested by the experts for each of the 17 highest-ranked services in the Delphi study (Iden and Methlie, 2009) were analyzed and compiled independently. This was also done in two phases, following the same procedure as for the whole set.

## 4. Results

### 4.1 The total set of drivers

In this section we shall analyze the whole set of drivers collected from the 24 respondents in the brainstorming phase of the Delphi study where each respondent was asked to propose a minimum of six future services on NGN. For each service the respondent was also asked to identify up to five factors that would drive the emergence of this service. The total set of drivers after interpretation and classification according to our framework in Figure 2 is shown in Appendix. The list consists of 462 drivers. In table 1 we show the distribution of these drivers. As can be seen the majority of drivers are found in the overall demand category. Here 200 drivers, with a domination of drivers based on customer values demand.

**Table 1:** The distribution of the drivers according to category

Drivers	Number	Totals
<i>INTERNAL FIRM FACTORS</i>		<b>77</b>
1. CONDUCT (BUSINESS MODEL)		73
a. Service value proposition	28	
b. Revenue formula	17	
c. Market strategies	11	
d. Networking (governance)	17	
2. RESOURCES AND CAPABILITIES		4
a. Assets	4	
b. Capabilities	0	
c. Firm attributes	0	
<i>MARKET STRUCTURE FACTORS</i>		<b>237</b>
1. DEMAND		200
d. Increased customer value (customer needs and wants)	108	
e. Price sensitivity	29	
f. Substitutes	6	
g. Method of purchase	1	
h. Service quality	37	
i. Technology maturity	19	
2. SUPPLY		20
j. Competition and concentration	5	
k. New entries	0	
l. Product differentiation	10	
m. Economies of scale and scope (Vertical and horizontal integration)	5	
3. GOVERNMENT POLICIES		17
a. Regulation	10	
b. Taxes	5	
c. Price control	2	
<i>GENERAL ENVIRONMENTAL FACTORS</i>		<b>148</b>
1. POLITICAL	0	
2. ECONOMIC	4	
3. SOCIO-CULTURAL CONDITIONS	38	
4. TECHNOLOGY	92	
5. ENVIRONMENTAL	14	
		<b>462</b>

## **INTERNAL FIRM FACTORS**

### **Conduct - business model**

The conduct factors are the decision variables that shape the service offering in the market. Taking the business model concept from Methlie and Pedersen (2007) the decision space is spanned by four dimensions.

*Service value proposition* focuses the service values delivered to the market. The drivers collected in this category include on three aspects: content, TV, and applications. The drivers that are content based include preparing content for mobile formats; media libraries and intelligent media portals; file sharing (Youtube etc.); and location based information. The TV-based drivers include HD and commercialization of hologram technologies giving rise to high quality presentations of theater plays and concerts; universal remote control devices; and free channel choice. New applications are driven by new entrants, more user friendly and simpler interfaces, services as software and cost effective application hosting; and more real time applications.

*Revenue models* focus innovations that are driven by cost-effectiveness, pricing and revenue sharing. A major driving force in this category is the opportunity for cost savings and lower marginal costs that NGN brings. IT units will experience a price pressure. Also, cheaper mobile transponders offer manufacturing industry large scale implementation of embedded sensors. New price positioning will appear on NGN with more flat rate pricing, lower data access pricing, and variable day-time profiles (eg. free nights and week-ends) pricing of services.

*Marketing strategies* include innovations that change the way the service provider addresses the market. The drivers identified here are aggressive marketing by major global players (e.g. Microsoft, Google, Apple, etc.); more market segmentation by service differentiation, e.g. more niche channels; alternative marketing based on closer customer relationships, e.g. gaming with embedded product marketing. New markets for broadband suppliers and network operators; and finally, new distribution channels and platforms for user driven content production.

*Networking and governance* include how the service provider organizes its value creating system (value chain/value network). Value network innovation may be driven by new inter-organizational relationships and new governance forms. The drivers identified here can be summarized to customer lock-in; elimination of intermediaries in the distribution channel; using third party vendors for horizontal bundling of complementary services; and community building; ubiquity access to home servers (from car, boat, buss, train, etc.); peer-to-peer file sharing.

### **Resources and capabilities**

Barney (1991) considers resources as the ultimate source of performance differentials between firms. Thus, one can expect to find innovation drivers in the *assets* and *capabilities* in the firm. In addition certain firm attributes such as geographic location and firm size are parts of a firm's resources. Very few drivers have been identified by our respondents in these categories. Drivers identified here are new markets for operators; energy companies moving into the M2M markets;

recycling of network components; and more brand relationships between mobile handset providers and consumers.

No drivers were mentioned regarding capabilities and firm attributes

## **MARKET STRUCTURE FACTORS**

Moving from the internal firm factors to the market structure factors as sources of innovations changes the perspective from a resource based to a market orientated emphasis.

### **Demand**

The demand category is by far the most dominant driver category. Our respondents seem to expect future services on NGN to be primarily driven from the demand side by customer needs.

*Customer values* relate to the benefits perceived by the customer in what is consumed. Factors driven by customer productivity demand are increased supply chain effectiveness; optimal time-to-market; rightsourcing (lean production, value chain integration); networking; and automated and self regulating processes (system integration); global collaboration and team work. On the personal level ecommerce includes increased self servicing and location-based information and services. Other demand drivers are associated with delighting the customers (Kim & Marbough, 2000) such as entertainment, news learning, and virtual adventures. Also to reduce risks customers want increased surveillance, better security and control. Generally value added services and increased servitization of products are mentioned as driving factors. Several drivers are associated with communication and channel access such as file sharing (family digital archives), better navigation facilities, real time anywhere and any-time access, increased communication intensity, and being visible (e.g. Facebook). Increased individualism among consumers will drive the need for personalization and customization of the service. Simplicity is another key word here.

*Price sensitivity* increases as a result of the financial crises. However, the users' willingness to pay increases in certain segments such as demand for nich content channels, reality entertainment, location-based information and more selective acquisition of useful content. Users with large bills on international calls innovate the call market. New price models with day-time profiles (e.g. free nights and week-ends) will increase demand. Hardware prices will be pressed down as a result of the change to software as a service. This will lead to cost savings of different kinds: less operating costs, less labor, reduced travelling, lower prices due to less production costs.

Few drivers are mentioned under the category *substitutes*. In certain markets mobile phones will substitute for PCs. Complementary services will increase.

Drivers of *methods of purchase* are new ordering forms (e-commerce) of products and services.

*Service quality* will be driven by the demand for increased convenience, service operation entrusted to professional companies (application hosting), and one provider and one invoice for many services (multiplay). Demand for security increases. More business critical information mediated over the net and more open networks must be secured against criminal actions. Service quality will also be driven by better scalability on changing demand, needs to monitoring SLA requirements, guaranteed quality of service, interoperability between platforms, and more unique specifications of data. Control



includes access control for children, better control of information access, and real time control of system operations.

*Technology maturity* refers to the users experience with current technology. Two drivers are mentioned. First, web browsers will be developed with greater functionality and based on a more standardized technology. Secondly, IPTV matures and the set top box will be menu driven with simple functionality and connection to internet.

## **Supply**

The supply category contains four subtypes. *Competition* will increase 1) between content and channel providers; and 2) between different standards. Software providers will strengthen their position in the value chain. No drivers identified on *barriers to entry*. W.r.t. *product differentiation* drivers are found in new markets for operators; in new infrastructures for narrowband communication by entrants such as energy and security companies; in media and films to differentiate from user generated content; and in entertainment. Also, open nets and decoupling content from distribution increase differentiation opportunities. *Economies of scale and scope* drivers cover better utilization of bandwidth; increased effectiveness of energy companies; better use of content bases; and new markets for operators.

## **Government policies**

The government policies category contains three subtypes: *regulation, taxes, and price control*. Several governmental decision bodies are involved in regulating this market. The politicians in Norway are concerned with regional politics and put pressure on the media industry to take regional considerations by offering services everywhere in the country. The government issues laws and decrees such as forcing service providers to track customer related processes (e.g. financial counseling) and implementing global civil rights (e.g. EU directives). Governmental agencies enforce these laws and decrees such as IPR, and control the competition in the market by multichannel regulation and new pricing models, for instance for IPTV/video services, remote meter readings of electricity, etc.

## **GENERAL ENVIRONMENTAL FACTORS**

### **Political**

No specific political drivers are mentioned. The more general external conditions seem to be found under other headings such as governmental policies and other external conditions.

### **Economic**

External economic drivers mentioned are *developments of large scale public service programs* to reduce costs and public spending due to economic crisis, higher unemployment rates, and increasing aging population on public pension plans; *lack of innovation* in new service developments by service providers and operators due to reluctance to invest in times of economic instability; more *entertainment at home* substituting for leisure activities outside.

### **Socio-cultural conditions**

The socio-cultural category looks at demographics, life style trends, and buying patterns. Drivers mentioned associated with *demographics* are new generation users experienced in web searching and usage; a global labor market; and more elderly people also used to the Internet. *Life style trends* include everybody connected to broadband; more individualism with virtual socialization through communities and social media; more entertainment; increased demand for better quality video/TV; social media such as Facebook and Twitter recruits new users; change usage patterns; and increase web based collaboration. Finally, buying patterns changes with all-in-one and always-on devices which can be used for payments, also small amounts.

### **Technology**

Technology push is thought to be a major driver in NGN service developments. This push will come in device developments with smartphones, screens, PCs with camera, GPS technology and RFID embedded in most devices, new gadgets, and set boxes with extended functionality. Increased capacity and lower investment costs in networks, 3G in the 900 Mhz frequency band and extended spectrum in 2Ghz frequency band, femtocells in WLAN, ipv6 deployment are some of the drivers in network technologies. Other technological drivers are peer-to-peer technology, 3-dimensional (holographic) TV, TV on demand. Developments in IT technology such as increased storing and processing capacities at lower costs.

### **Environmental**

Environmental conditions mentioned are of the general types such as environmental considerations, energy savings and focus on climatic conditions. These conditions of interest to the general public, politicians, government, business and individuals, will drive the development towards net based applications to substitute for real life events (e.g. web based collaboration to substitute for physical meetings requiring travelling).

## 4.2 The 17 highest ranked services and their drivers

This chapter presents and comments upon the drivers for the 17 highest-ranked services from the Delphi study (Iden and Methlie, 2009). The 17 services were identified according to the following procedure. First, the seven services that were ranked by both panels were selected, the combined list. Second, the five highest-ranked services from each of the panels, the markets analysts and the service providers respectively, which were not on the combined list, were selected. See table 2 for an overview of the 17 services.

**Table 2:** The 17 services selected for presentation in this chapter

<b>From the combined list of seven services:</b>	<b>From the market analysts' list:</b>	<b>From the service providers' list:</b>
Secure communication over open networks	Web-based computing	Mobile broadband
Multimedia cross-platform meeting systems	Collaboration tools based on social networking and Web 2.0	Channel-independent access to content
Real-time tracking of goods	Mobile video and game platforms for business services	Internet on handheld devices
Family media center	Meta-information management	Open operator-neutral fiber networks
Remote control of home functions and properties	Environmental surveillance over the Internet	Voice over IP
Field mobile computing		
Remote meter readings		

In the following the driver categories, based on an interpretation and classification of the experts' own verbalization of the drivers, for each of the 17 services are presented and commented.

### **1. Secure communication over open networks. To guarantee secure transmission of commercial communication and transactions over open networks**

Drivers:

- Internal firm factors: a) Conduct: i) Service value proposition
- Market structure factors: a) Demand: i) Increased customer value, v) Service quality
- General environmental factors: d) Technology: i) Technology access

Comments: This service was proposed by three experts. New value propositions will provide powerful mechanisms for protection of communication. On the demand side this will cover the needs for trust and security for users, especially in financial and governmental sectors. Furthermore, the lack of competence in firms about security makes them vulnerable, and thus more robust services for secure communication are needed. Technologically the development and deployment of ipv6 will push this service.

### **2. Multimedia cross-platform meeting systems. Enable employees on different platforms to meet and share multimedia content**

Drivers:

- Internal firm factors: a) Conduct: i) Service value proposition
- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity, iii) Substitutes, v) Service quality, vi) Technology maturity
- General environmental factors: d) Technology: i) Technology access; e) Environmental

Comments: This service was proposed by four experts. The need for more effective integration and networking internally and through partnerships will drive the demand of new collaborative communication platforms. The penetration of social media (web 2.0) for communication will change the collaboration patterns increasing the need for QoS. Standard PCs will be equipped with camera making the demand side technologically mature for multimedia communication. Also the technological development of broadband opens access to these new collaborative tools. These collaborative tools may substitute travelling and reduce costs.

### **3. Real-time tracking of goods. The use of RFID and sensors for logistics**

Drivers:

- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity, c) Government Policies: ii) Regulation

Comments: This service was mentioned by two experts. It was suggested that this service will be driven by the demand for better control, the maturity of RFID, WLAN, and GPS infrastructure technologies, and the ability to optimize time-to-market. Lower investment costs due to this maturity will drive a price sensitive market. Legal requirements may further drive this market.

**4. Field mobile computing. Applications and solutions enabling mobile phones and specialized handhelds to be used as work tools in the field (out of the office)**

Drivers:

- Internal firm factors: a) Conduct: i) Service value proposition, ii) Revenue formula, iii) Market strategies
- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity
- General environmental factors: d) Technology: i) Technology access

Comments: This service was proposed by three experts. The providers will innovate to stimulate handset sales and utilize consumers positive brand relationship. It was also noted that new markets are emerging, as parts of the world are getting access to mobile phones and mobile broadband, while wired infrastructure are lacking. This population may afford handhelds, but not computers. Handhelds as work tools will be a standardized practice, as mobile phones are today. Handheld technologies are advancing; improved user interfaces, display qualities, battery capacity, network connections, while bandwidth increases and communication fees decreases.

**5. Remote control of home functions and properties. Relevant for air conditioning, alarms, VCRs, white goods, and robots, as well as for commercial things such as vending and feeding machines**

Drivers:

- Internal firm factors: a) Conduct: i) Service value proposition, b) Resources: i) Assets, financial
- Market structure factors: a) Demand: i) Increased customer value, v) Service quality, vi) Technology maturity, b) Supply: iii) Product differentiation iv) Economies of scope
- General environmental factors: b) Economic, c) Socio-cultural conditions: i) Lifestyle trends, d) Technology: i) Technology access, e) Environmental: i) Energy savings

Comments: This service was proposed by twelve experts. It was commented that vendors, for example energy and security companies, are investing heavily in machine-to-machine services. A new narrowband infrastructure is emerging outside network operator infrastructures. However, this is also regarded a new market for operators where they can take advantage of their economics of scope. New value propositions emerge focusing on control and security in the consumer market and on changing supply chains in the business market. From the demand side, proprietors will have control of their properties while away (security) and that people are increasingly being used to applying digital tools for administrating and simplifying their lives. Required technology, such as digital sensors and smart phones, are spreading. This is a service very much driven by socio-cultural trends. In addition, environmental and economic concerns attract the attention to such services.

**6. Family media center. Centrally located media server reachable by the household's PCs, mobile devices, media streamers, etc., irrespective of location**

Drivers:

- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity

- General environmental factors: c) Socio-cultural conditions: i) Lifestyle trends, d) Technology: i) Technology access

Comments: This service was proposed by four experts. This service is demand driven by households needing solutions for file sharing and backup, and thus, their own centralized digital archives for photos, home videos, computer files, music and videos, that can be accessed by all PCs, mobile phones and media streamers, wherever the household's members find themselves. Furthermore, the service is driven by general technology trends such as storage, wireless broadband, and media players are maturing, being standardized, and prizes are decreasing, thus leading to socio-cultural changes in the society..

### **7. Remote meter readings. Meters in private homes are read remotely and automatically**

Drivers:

- Internal firm factors: a) Conduct: iii) Market strategies, b) Resources: i) Assets
- Market structure factors: a) Demand: i) Increased customer value, b) Supply: i) Competition and concentration, ii) New entries, c) Government Policies: ii) Regulation
- General environmental factors: c) Socio-cultural conditions: i) Lifestyle trends, d) Technology: i) Technology access

Comments: This service was proposed by one expert. This service is driven by socio-cultural trends such that nearly all households are connected to broadband with available capacity. From the supply side energy companies can increase their efficiency, and on demand side that property owners demand more convenient solutions. Governmental pressure exists in this area.

### **8. Web-based computing. Scalable and virtualized computer resources provided as a service over the Internet. Also called cloud computing and Internet computing**

Drivers:

- Internal firm factors: a) Conduct: i) Service value proposition, ii) Revenue formula
- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity, iii) Substitutes, iv) Method of purchase, v) Service quality, vi) Technology maturity
- General environmental factors: d) Technology: i) Technology access, e) Environmental: i) energy savings

Comments: This service was proposed by three experts. This is a supply driven service development where physical in-house computer resources are substituted by net-based services. This will change the service value proposition and revenue formula of the service providers. On the demand side the service will be driven by changing customer values in terms of lower costs, simplicity, and scale economics. Furthermore, ICT support resources can be devoted to primary value creating activities such as differentiating business processes. Environmental focus shows the way to optimization and consolidation of computer resources, and cost focus leads firms to outsourcing computer centre services. Technology development at all levels, computer centre, networks and local platforms, is

enabling this evolution. Firms' trust on outsourcing vendors is increasing. Finally, environmental factors such as energy savings will have an impact.

## **9. Collaboration tools based on social networking and Web 2.0**

Drivers:

- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity, v) Service quality, vi) Technology maturity
- General environmental factors: c) Socio-cultural conditions: i) Lifestyle trends

Comments: This service was proposed by two experts. This service will be driven by demand for effective cooperation with partners requiring novel collaboration tools. Social media and high quality networks are now technological mature; and sociologically well accepted.

## **10. Mobile video and game platforms for business services**

Drivers:

- Market structure factors: a) Demand: ii) Price sensitivity
- General environmental factors: d) Technology: i) Technology access

Comments: This service was proposed by one expert. Technological development and affordable solutions are driving this service.

## **11. Meta-information management**

Drivers:

- Market structure factors: a) Demand: i) Increased customer value, v) Service quality, c) Government policies: i) Regulation
- General environmental factors: d) Technology: i) Technology access

Comments: This service was proposed by one expert. The driving force is the need for unambiguous data specifications in interorganizational data exchange. Also, authorities need to administer terms- and address-resources as they are being developed. As more and more devices are being connected to the network, meta-information must be efficiently managed.

## **12. Environmental surveillance over the Internet**

Drivers:

- Market structure factors: a) Demand: ii) Price sensitivity
- General environmental factors: d) Technology: i) Technology access, e) Environmental: i) Pollution

Comments: This service was proposed by one expert in the brainstorming phase. It was commented on that both environmental and economic concerns will advance the interest for such services, and that capable technology exists.

### **13. Mobile broadband. Providing wireless high-speed Internet access through portable devices**

Drivers:

- Internal firm factors: a) Conduct: i) Service value proposition, ii) Revenue formula
- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity, iii) Substitutes
- General environmental factors: d) Technology: i) Technology access

Comments: This service was proposed by two experts. This service is driven by technology access to new frequencies for 3G and new and more powerful terminals. Service providers will offer anywhere use, for instance entertainment, at low prices as investment costs/bits decrease. Demand side will be driven by new customer values, price sensitivity and technology maturity. Also, substituting cables with wireless will drive this service.

### **14. Channel-independent access to content**

Drivers:

- Internal firm factors: a) Conduct: i) Service value proposition, iv) Networking, b) Resources and Capabilities: ii) Capabilities (strategic)
- Market structure factors: a) Demand: i) Increased customer value, b) Supply: i) Competition and concentration
- General environmental factors: d) Technology: i) Technology access

Comments: This service was proposed by three experts. The demand side will require freedom of choice of channels. The supply side will evolve their business models towards open networks separating content from network. This will change the completion on the supply side. Also, with IPTV the technology is mature for this.

### **15. Internet on handheld devices (Internet in the pocket)**

Drivers:

- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity, iii) Substitutes, vi) Technology maturity
- General environmental factors: d) Technology: i) Technology access

Comments: This service was proposed by one expert. This service most probably would become a people's demand, expected the same way mobile phones are today. Handheld technologies are advancing; improved user interfaces, display technology, battery capacity, network connections,



while mobile bandwidth increases and communication fees decreases, especially at nights and weekends.

**16. Open operator-neutral fiber networks. A network access model based on fiber where the infrastructure (platform) is owned by a network access company and services are provided by separate companies**

Drivers:

- Market structure factors: a) Demand: i) Increased customer value, b) Supply: i) Competition and concentration, c) Government policies: i) Policies
- General environmental factors: d) Technology: i) Technology access

Comments: This service was proposed by one expert. Customers demand freedom of choice and flexibility, and it is political agreement on the matter. New content providers are emerging, and network neutrality is required. Fiber technology now is mature and standardized.

**17. Voice over IP. VoIP over several channels, including mobile VoIP**

Drivers:

- Internal Firm Factors: Conduct: i) service value proposition, ii) Revenue formula
- Market structure factors: a) Demand: i) Increased customer value, ii) Price sensitivity, iii) Substitutes, v) Service quality, vi) Technology maturity

Comments: This service was proposed by two experts. On the conduct side new value-added services can be added to the value proposition offered at relatively lower prices. At demand side the demand for cheaper telephone services in a price sensitive is high given that quality of service can be met. Competition in the market will increase.

**Table 3:** The drivers proposed for each of the 17 ranked services

Services	INTERNAL FIRM FACTORS							MARKET STRUCTURE FACTORS					
	Conduct (BUSINESS MODEL)				Resources and capabilities			Demand					
	Service Value Proposition	Revenue formula	Market strategies	Networking	Assets	Capabilities	Firm attributes	Increased customer value	Price sensitivity	Substitutes	Method of purchase	Service quality	Technology maturity
1	x							x				x	
2	x							x	x	x		x	x
3								x	x				
4	x	x	x					x	x				
5	x		x		x			x				x	x
6								x	x				
7			x		x			x					
8	x	x						x	x	x		x	x
9								x	x			x	x
10									x				
11								x				x	
12									x				
13	x	x						x	x	x			
14	x			x		x		x					
15								x	x	x			x
16								x					
17	x	x						x	x	x		x	x
<b>Sum</b>	8	4	3	1	2	1	0	15	11	5	0	7	6
<b>Total</b>	16				3			44					

Services	MARKET STRUCTURE FACTORS							GENERAL ENVIRONMENTAL FACTORS				
	Supply				Governmental Policies			Political	Economic	Socio-cultural conditions	Technology	Environmental
	Competition and concentration	New entries	Product differentiation	Economics of scale and scope	Policies	Regulation	Price control					
1											X	
2											X	
3						X						
4											X	
5			X	X						X	X	X
6										X	X	
7	X	X					X			X	X	
8											X	X
9										X		
10											X	
11							X				X	
12											X	X
13											X	
14	X										X	
15											X	
16	X					X					X	
17												
<b>Sum</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>14</b>	<b>3</b>
<b>Total</b>	<b>6</b>				<b>3</b>			<b>21</b>				

In table 3, we have filled in the driver-categories assigned to the drivers that were proposed for each service. We see that the market structure factors are overwhelmingly represented as drivers that will emerge service development in this area, with a total of 50 drivers (demand: 44 + supply: 6), and especially the demand factors are dominated (44 out of 50). This result is in line with the findings presented in the previous chapter.

The experts believe that these 17 services will be established because (ranked by number):

- They will increase customer value
- Users will be seeking for services that will reduces their costs
- The required technology is already mature and is spreading
- These services will improve the quality of services already in use
- They substitute already existing services.

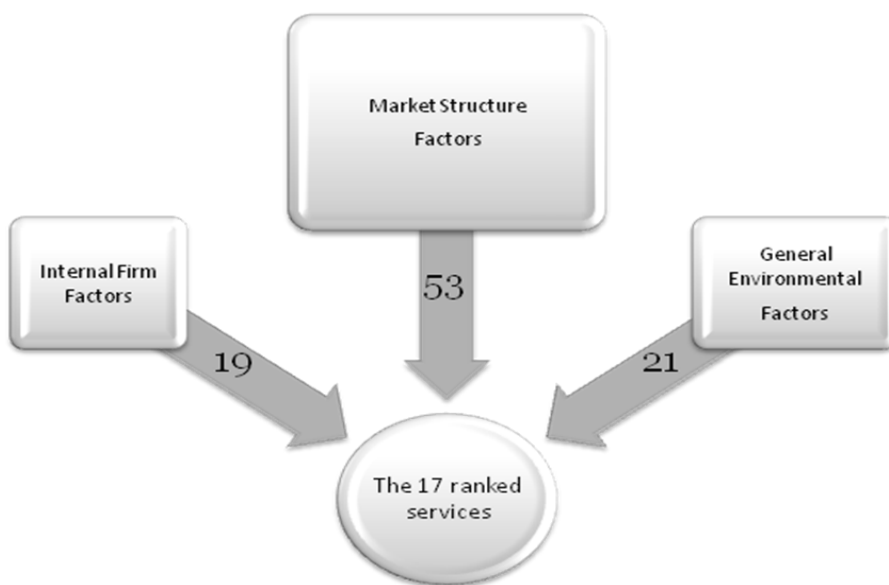
The *supply* and *governmental* policies factors in the *market structure category* received a total of nine drivers, and we find that these drivers are almost evenly spread over the seven sub-categories.

The two other major categories, *internal firm factors* and *general environmental factors*, received 19 and 21 drivers respectively. Regarding the internal firm factors, especially those factors related to the business model (conduct) of the suppliers, 16 items were mentioned. The experts believe that services will be established because (ranked by number):

- Providers are able to offer services that have a clear value proposition to the market
- But also because providers are looking for ways to increase their revenue (revenue formula), and differentiate their offerings as a market strategy.

Networking, the ability to interact with customers, other suppliers or co-operating parties, as well as factors related to the suppliers' assets, capabilities and other attributes are almost non-existent in the responses.

Regarding the general environmental factors, the experts believe that services will be established because required technology is spreading and already available to customers. Social and cultural trends, for example demographics and lifestyle trends, as well as environmental concerns are also drivers which are mentioned. However, the overall picture is clear. The *market structure factors* are emphasized, and this is thus considered the most significant area. Further, the *internal firm factors* and the *general environmental factors* are regarded as equal important. See figure 3 for a graphical presentation of the relative dominance that each of the driver categories will have on the establishment of the 17 services, according to the experts.



**Figure 3:** The number of drivers proposed for each of the three main categories

## 5. Discussion

The first objective of this work is to determine the drivers most significant for service development on future generation networks. We define drivers as factors and trends of political, technological and economical conditions which most likely will advance the establishment of the service in question. The drivers were initially proposed by the experts in the brainstorming phase of a Delphi study, and have in this report been categorized by applying the conceptual framework presented in section two. The framework has been applied to two different sets of drivers; the complete set of drivers and the set of drivers associated with the 17 highest-ranked services.

First, all the drivers suggested by our experts were collected, interpreted and organized according to the framework. The total of 462 factors was spread over the main categories of the framework as follows:

- Market structure factors: 237
  - Demand: 200
  - Supply: 20
  - Governmental Policies: 17
- General environmental factors: 148
- Internal firm factors: 77
  - Conduct (Business Model): 73
  - Resources and capabilities: 4

The summary above shows that the market structure factors constitute more than 50 % of the total number of drivers. This is supported by Schmookler (1966) who suggests that innovation is driven by the external requirements of the market. Dosi (1982), on the other hand, views the activities and internal capabilities of firms as the primary drivers of innovation. In our study, internal firm factors constitute less than 20 %. If we look at the subcategories of the market structure factors we find that the demand factors dominate with 43 % of the total number of suggested drivers. This is in contrast to the economic innovation literature which emphasizes supply driven innovation. Shumpeter (1934/1983) argued that economic change normally is initiated by producers. To a larger extent than in economics, the role of the demand side in innovation processes is more emphasized by sociologists (Metcalf, 1997). 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”* (Rosted, 2005, pp. 10). User-driven innovation emphasizes the need of studying the role of user needs in innovation activities. Our results show that the experts used in this Delphi study really emphasize a user-driven innovation process. Looking at the subcategories of demand the dominating subcategory here is increased customer values (108 drivers). Further details show that the experts believe that network services will be established merely because of two major reasons: a) network services increase customer value, and b) network services increase productivity by reducing operational costs.

On the supply side internal firm factors (77) dominate over the supply-side market structure factors (20). Innovation may take place in any part of the value creating system (chain or network).

According to Rosted (2005) 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 internal firm factors with the largest number of drivers (28). The last market structure factor is governmental policies. Only 17 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 external environmental factor influencing service innovation in this technological domain of network services. Of a total of 148 drivers 92 were classified as technology drivers followed by 38 socio-cultural factors. As an overall conclusion, the service innovation processes for next generation networks can be described as primarily a user-driven process.

Second, the framework has also been applied to a subset of the 462 drivers; namely those drivers associated with the 17 highest-ranked services in the Delphi-study. A total of 93 drivers were proposed by the experts for these 17 services. The main finding from the categorization of these 93 drivers is comparatively equal to what was found for the complete set; more than 50 % belongs to the market structure factors, and the demand factors represent the vast majority within this category. The finding that innovation is user-driven is thus supported by this analysis. We found, however, one notable difference between the two sets. The percentage of drivers associated to the *Internal firm factors* category are notable higher for the 17 prioritized services than for the set of drivers as a whole. From our study we do not have data that allows us to analyze this relationship further, but we find it interesting, and suggest this as a matter for further investigation.

How about the agreement between the two panels? Do the two panels agree or do they perceive the drivers differently? In an earlier study, we found that the two panels identified, selected and ranked the services differently (Iden and Methlie, 2009). In this present report, we find that the service providers and the market analysts, when adjusted for the difference in the number of panel members (13 and 11), have proposed almost the same amount of drivers. The 13 service providers have proposed 271 drivers, while the 11 market analysts have suggested 200 drivers. If we compare the drivers suggested by the two panels by category and adjust the number according to the difference of panel size, we find that the market analysts have emphasized some categories considerable higher than the service provider. These categories are: *revenue formula* (Internal firm factors), market strategies (Internal firm factors), networking (Internal firm factors), and improved "quality of service" (Market structure factors). See the rectangles in Table 4. It is evident that the market analysts as a group pays more attention to the internal firm factors (the business model) and consider these factors more important for service development, than the service providers. This may be considered as an unforeseen finding, as one may anticipate the opposite; persons who currently are belonging to the supplier firms would be those that are most focused on the characteristics of their firms' operation. Further, we also find that the service providers on their part have emphasized some categories higher than the market analysts. This accounts for the following categories: *Increased customer value* (Market structure factors), price sensitivity (Market structure factors). See the ellipsis in Table 4. *Technology* (General environmental factors) and *Environmental* (General environmental factors) are also emphasized higher by the service providers, but to a lesser extent.

**Table 4.** The number of drivers proposed by each panel, MA – market analysts and SP – service providers, for each of the categories

	INTERNAL FIRM FACTORS							MARKET STRUCTURE FACTORS					
	Conduct (BUSINESS MODEL)				Resources and capabilities			Demand					
	Service Value Proposition	Revenue formula	Market strategies	Networking	Assets	Capabilities	Firm attributes	Increased customer value	Price sensitivity	Substitute	Method of purchase	Service quality	Technology maturity
Sum MA	9	12	10	12	3	3	0	34	8	1	0	19	5
Sum SP	13	6	5	3	0	0	0	60	15	2	0	12	15

	MARKET STRUCTURE FACTORS							GENERAL ENVIRONMENTAL FACTORS				
	Supply				Governmental Policies							
	Competition and concentration	New entries	Product differentiation	Economics of scale and scope	Policies	Regulation	Price control	Political	Economic	Socio-cultural conditions	Technology	Environmental
Sum MA	2	0	3	3	5	0	0	0	2	11	35	5
Sum SP	2	0	5	1	5	2	0	0	1	11	43	8

The second objective of this work is to develop and test a conceptual framework for the categorization of drivers for service development on future networks. This work aims at investigating the plausibility of this framework in organizing drivers identified by experts in a Delphi study for service development in NGN. The framework is developed by an original combination of both pragmatic and theoretical schools of thought in organizational economics and strategic management. The ultimate goal of the framework is to assist normatively 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 shown above. The framework seems to catch and classify the drivers fairly well. However, further refinements are necessary. It should be emphasized that the respondents had no guidance in answering the question which 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 the new market environment created by NGN which should imply considerations on both the supply and the demand side of this market. The majority of demand factors observed here indicates that the experts view service development in NGN to be user-driven or a demand side innovation process.

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 (Waldman et al., 2001). However, customer value is introduced here and technology maturity is taken from Nysveen and Pedersen (2004) who found that experience has effect on the adoption of new services. Customer value may be a too broad category and the interpretation of the drivers indicate that it overlap with other subcategories such as service quality and method of purchase. Further clarifications here may be beneficial.

## 6. Conclusion

The aim of this report has been to a) determine the drivers most significant for service development on future networks, and b) to develop and test a conceptual framework for driver categorization. First, by analyzing the data from the Delphi- study, a total number of 462 drivers were identified. Second, by interpreting and organizing the drivers according to the conceptual framework, the categorization envisages that, in the view of the experts, service development on future networks is considered a user-driven innovation process. The demand-oriented factors dominate clearly on behalf of the supply-oriented factors. International statistics indicate that Scandinavia is a leader in establishing telecommunication infrastructure and adopting new technologies and their services. The economic climate in this region has for a long period of time been favorable, which may explain why the experts emphasize what they do. A natural path for further research is to compare our findings with similar research in other regions. We would also like to investigate in more detail, why the experts perceive internal firm factors more important for the highest ranked services than for the services in general. The different views of the two groups of experts when it comes to the significance of the various categories, is also an issue which may be examined further.

An important contribution of this research is the conceptual framework, developed to identify and classify drivers for service development for next generation networks. We have looked at the development of this framework for service innovation as a joint concern of theories in organizational economics and strategic management. The framework is built on a multilayered theoretical basis starting at the core with firm specific factors taken from resource based view of the firm. The next layer consists of elements taken from organizational economics and the structure - conduct - performance paradigm. The outer layer, the general environmental, draws its elements from the PESTE framework. These theories were used to explain where conditions may be found that drive service development. The framework has been applied, and thus tested, on two sets of drivers, 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 were focus on service development for NGN is, namely on the demand side with user-driven innovations. A natural path for further research is to further develop this framework and to test it on this or other data sets.

Furthermore, the empirical data are an important source of information either in its raw form as shown I Appendix, or in its aggregated form as described in the Result section. These findings can be used normatively by service providers in the NGN domain to look for drivers and to adjust their business model for a particular service accordingly.

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**Appendix. Classified list of drivers as proposed by the respondents (raw data)**

***Service Value Proposition***

- Tilretteleggelse av innhold for mobil-formatet (kortere episoder, to-the-point)
- Fremvekst av Software as a service og application hosting med kost-effektive prismodeller for bedriftskunder
- Den som tilbyr den mest tilgjengelige og bruksmessig enkleste løsningen vil få større brukermasse, tjenesten ligger på nettet.
- Kringkasting suppleres med innholdsportaler/on demand tjenester
- Digitale innholdsbiblioteker gjøres tilgjengelig (film, video, radio, musikk etc.)
- Nye distribuerte medieformer med deling av innhold, eks. youtube m.fl.
- Frikobling av nettverksabonnement og tjenesteabonnement
- Båndbredde en ressurs som man får/deler/abonnerer på uavhengig av tjeneste
- Dedikerte nett/infrastrukturer blir erstattet av åpne båndbreddetjenester
- Individualisering (eksplosjon i antall TV-kanaler og etterspørselen forventningen til on-demand innhold)
- Nye tjenester
- Bransjen utvikler seg i retning av friere kanalvalg
- Re-vitalisering av ordinær TV
- Forenkling ("en fjernkontroll for alt")
- Snygga levande presentationer för företag
- Ett antal nya tjänster kan appliceras
- Realbaserade tjänster kan erbjudas i stor skala. Efterfrågan från företag och konsumenter
- Stöd för säkrare betalningar via Internet
- Detta föder intelligenta medieportaler till rimliga priser
- Kan slå av og på elektriska komponenter
- E-Handelsföretagen bygger upp nya tjänster och produkter
- kommersialisering av «hologram» teknologi brukt under valgkampen i USA (viztr teknologi)
- Forretningsmulighet for høykvalitets teatere og filharmonier
- Lokasjons og målrettet reklame gir høyere treffsikkerhet og større betalingsvilje for de som skal reklamere, muliggjør mikroannonsering (annonsering til et svært snevert utvalg)
- Providers must find new ways to stimulate conservative users' exploration of new services
- Ved å tilby innhold lovlig bremser man piratkopiering.
- Store muligheter for inntekter ved et "vellykket" spill. Eksempelvis World of Warcraft 11 millioner spillere pt. 110 Nkr pr mnd.

***Revenue Formula***

- Cost saving
- Mobil-sendere/mottakere prises nedover og gir mulighet for storskala implementering av embedded mobiler (eks. biler, containere) fra produsent
- Flat-rate pricing og lavere prising av data-aksess
- Innholdsleverandører ser potensiale for inntekter fra nye kanaler (samme innhold på flere kanaler)
- Fremvekst av Software as a service og application hosting med kost-effektive prismodeller for bedriftskunder
- Kost-press på IT-enheter

- Terminaler og leverandører kommer legge til rette for bruk av flere aksesskanaler for å optimalisere bruk av ressurser for optimal bruk av tjenesten
- Tids-/Døgn-basert prising
- Økt inntjening for telekom-aktørene via maskinell datatrafikk (sannsynligvis behov for innovasjon knyttet til betalings-/abonnementsmodeller etc). Annet alternativ: tjenesten kan også sees koblet opp mot budfirma/dagligvarebutikk eller lignende - der teleaktøren får "cut" av omsetningen hos disse.
- Cost reduction resulting from NGN investments in integrated provider networks will enable considerably lower marginal prices for traditional and new services
- Fastpris / gratistjeneste
- Sikre inntekter for innholdsprodusentene
- Nødvendig for operatører for å kunne sikre marginer (automatisering)
- Bonus program
- Bankerna/kontokortsføretagen får billigere kostnader men behåller kontrollen
- Forretningsmodellene modnes (inntektsdeling mellom netteier og rettighetseier)
- Sterkt reduserte distribusjons kostnader, mulighet for å ta ut marginer

#### ***Market Strategies***

- Branding/komersiell reklame gjennom produktplassering direkte i spillet
- Market segmentation
- Massiv markedsføring fra premissgivere i SW-markedet (Microsoft etc)
- Alternativ markedsføring
- Nisjekanaler
- Nye forretningsmodeller (hyttetjenester, osv.)
- Bredbåndsselskaper ønsker større tjenestespekter
- Flere distribusjonskanaler og plattformer for bruker/konsumentprodusert innhold
- Måte å differensiere innhold på for mindre mediehus, skape nærhet til bruker
- Innholdsaktørene ønsker det slik (TV2)
- Bedre distribusjon, større omsetning på varen
- Locking-in customers
- Capacity saving

#### ***Networking (Governance)***

- Locking-in of customers
- Samling av brukerdata/status i directories
- Droppe distribusjonsledd
- Droppe distribusjonskanaler / droppe ansatte / redusere kostnader
- Se film hos naboen fra egen server hjemme hos seg selv (tilgang til eget innhold hvor som helst fra og på hvilket som helst medium: Bil, Båt, Buss, Tog, Hytte, osv.)
- Applikasjoner fra 3dje part
- Telecom-aktører bør kunne oppnå økt binding/kundelojalitet, i hvert fall midlertidig, og øke antall abonnement per kunde. Kan posisjonere seg som totalleverandør av kommunikasjon (men krever integrasjon av nye kommunikasjonsformer som lynmeldinger, twitter/friendfeed, facebook-meldinger etc. etc - åpenheten i disse plattformene gjør dette mulig???)
- Produsentene/leverandør kan tjene på mer direkte tilgang til konsumentene

- Tilgang på mer direkte kommunikasjon (markedsføring) med brukere (fans) - gir mulighet til å bygge community og øke lojalitet. Og igjen økt salg komplementære produkter/tjenester, og andre produkter/tjenester innen samme genre.
- Elektrobransje med fremtidig "konsumerisering" av produkter som i dag brukes for overvåking/styring av kommersielle anlegg (f.eks innen fiskeoppdrett, olje og gass (integreerte operasjoner), og andre industri/produksjons-formål)
- Medieleverandørene (tele, internett, TV, film, ..... ) og større "grep" om forbrukeren
- Leverandører og operatører sammen - ønske om å "binde" seg til kundene
- Integrasjon Microsoft mm
- Endring fra produksjon for publikum til produksjon av publikum
- Kontokortsföretag och mobiltilverkare samarbetar för gemensam standard

#### **Assets**

- New markets for operators
- Gjenbruk av installert base av nettverk
- Energy companies heavy investment in M2M services
- Consumers positive brand relationships with handset providers will be better utilized

#### **Increased Customer Value**

- Security demands
- Demand for personalisation
- Ease of use / demand
- Increasing sense of risk/insecurity among users
- Demand for interactivity
- Demand pull
- Kostfokus (for lean-tilnærming til leveransekjeder) og for industrialisering (eks datainnhenting)
- Leveranse av verdiøkende tjenester trenger slik infrastruktur
- Integrasjon med bedriftsløsninger (dette er i første rekke bedriftsmarkedsorientert)
- Behov for mer strømlinjeformet håndtering av kommunikasjon
- Konsumenters ønske om tilgang til innhold uavhengig av kanaler
- Trafikk kontroll for å styre unna flaskehals
- Kontroll på verdifult utstyr/personer (barn)
- Kontroll på varer, kvalitet, sporing
- Optimal time to market
- Tillit til kommunikasjonskanalen
- Automatiserte prosesser
- Selvregulerende systemer
- Globale team
- Virtuelle opplevelser
- Tidselementer / Konkurransetrinn / Miljøfokus
- Globalt samarbeid
- Se film hos naboen fra egen server hjemme hos seg selv (tilgang til eget innhold hvor som helst fra og på hvilket som helst medium: Bil, Båt, Buss, Tog, Hytte, osv.
- Bekvemmelighet
- Enklere for brukerne (stadig flere kommunikasjonstjenester gir økt behov for forenkling)
- Større kommunikasjons-(informasjons-)flom gir behov for å navigere/filtrere



- Ønsker forenklet tilgang til medieinnhold, uavhengig av oppholdssted og tilgjengelig duppeditt/fremviser
- Ønsker oppdatert/patchede spill (jf. Spilltjenesten Steam) / Ønsker abonnement på hele genre/databaser (jf. Musikk-tjenesten spotify)
- Mer automatisert innkjøp/lagerhold av standard forbruksprodukter (reduisert tids/energibruk hos forbruker).
- Mulighet for å sjekke varebeholdning uavhengig av tid og sted personen befinner seg.
- Fokus på differensierende prosesser (og for de færreste vil dette være eierskap og fysisk nærhet til egen teknologisk plattform)
- Verdikjedeintegrasjon/Rightsourcing (plasser ulike prosesser der de hører hjemme. For de færreste vil drift og forvaltning av teknologisk infrastruktur være tjenester det er hensiktsmessig å håndtere selv)
- Verdikjedeintegrasjon / Rightsourcing (effektiv integrasjon av partnere krever nye samhandlingsverktøy)
- Verdikjedeintegrasjon / Rightsourcing (øker behovet)
- Enkelhet (færrest mulig reiser)
- Enkelhet (convenience - kunder og ansatte forventer å kunne benytte den kommunikasjonskanal som til enhver tid passer dem best)
- Enkelhet (alt innhold via ett grensesnitt – den fysiske video- eller platebutikken er snart død)
- Individualisering (hver person blir sin egen TV-kanal)
- Consumers will increasingly want to control their video/TV consumption
- Consumers/citizens will require increased service and self-service levels for public services
- Forbrukermarkedet - drives fram av mulighetene, jfr. tjenesten over.
- Effektivisering av prosesser / overvåking - industri
- Det offentlige ønske om å effektivisere
- Ønske om tjenester mens man er i bevegelse - mobilitet
- Skreddersydd innhold – basert på profiler og forhåndsinnstillinger får man de tv-tjenester man ønsker
- Ønsker om spesifikk informasjon 'der man er' – gjerne 'forhåndsprogrammert' vha web-interface ol
- Dette vil trolig bli et 'folkekrav' i den horisonten som er spesifisert – på samme måte som mobiltlf er en helt normalitet i dag (men ikke for 5 år siden)
- Utrygg verden, kontroll over hjemmet..
- Forenkling av hverdagen.
- Kunden ønsker å gjøre flere operasjoner selv
- Basalt kommunikasjonsbehov mellom mennesker
- Nyhets- og underholdningsbehov
- Ønske om økt tilgjengelighet for TV-tjenester
- Nyhets- og underholdningsbehov
- Økt behov for / forbruk av båndbredde, både opp- og nedlasting
- Lærings- og informasjonsbehov
- Underholdningsbehov
- Lærings- og underholdningsbehov
- Ønske om reduksjon av reisetid og reisekostnader
- Effektivisering av overvåknings-, styrings- og produksjonsprosesser
- Behov for fildeling og backup tjenester
- Behov for hosting

- Behov for full integrasjon av bedrifter/kontorer, både datakom/video/tale
- "Always on", alltid tilgjengelig, alltid tilgang til data – uansett nett-teknologi
- Privatforbrukere ønsker høykvalitet og høystabilt internett, TV, telefoni på samme aksess, samme faktura, samme leverandør/kundesenter inkludert kvantumsrabatt
- Avhengig av hvor man er (GPS) ønsker folk informasjon om servicepunkter, butikker, gode kjøpstilbud etc.
- Valgfrihet (Behovet for å google filmer, TV-programmer, nyhetsinnslag, musikk)
- Som i dag: Behovet for effektiv hvor-som-helt/når-som-helst kommunikasjon
- Behov for både sanntids- og tids-shift kommunikasjon
- Behov for sikkerhet og trygghet
- "morsomt" å overvåke sitt eget hjem (kamera) når man er borte
- Behovet for å ha sitt eget, sentraliserte digitale arkiv av bilder, hjemmevideoer, filer, musikk, filmer,... som kan sikkert nås fra alle husstandens PCer, mobiltelefoner, mediastreamere uavhengig av hvor i verden disse befinner seg
- Behov for underholdning
- Behov for shopping
- Manglende / lite kompetanse i bedriftene innen et viktig område som gjør de sårbare ved innbrudd
- Effektivisering for større bedrifter i forbindelse med avtalehåndtering
- Forbruksmønsteret endrer seg, vi ønsker å gjøre mer selv og få en raskere håndtering av endringer / tillegg.
- Fleksibilitet
- Behov for kontroll
- Aktiv hverdag, ønsker tilgang "her og nå" ikke "der og da"
- Fleksibilitet
- Brukeren har behov/ønske om mer fleksibilitet
- Spill utviklere
- Vill ha kontroll på ditt boende når du inte är där
- Optimal energiforbrukning ger lägre kostnader
- Enkla funksjoner åberopas av konsumenter för att handla de vanligaste sakerna genom enkla menyval
- Sømløst
- Kostnadseffektivisering av offentlig sektor
- Mindre reising (miljøavgifter og «finanskrise») = mer underholdning hjemme
- Enkeltindivids ønske om å bli stjerne/få oppmerksomhet
- Emerging markets: store deler av verdens befolkning inkl India og Kina vil få tilgang til mobiltelefon/mobilt bredbånd, mens kablet infrastruktur er fraværende
- Drevet av land i sterk utvikling og hvor infrastruktur og TV og bredbånd er dårlig
- Effektivisering, automatisering
- Krav om sanntidsinformasjon i alle kanaler - nyhet og informasjon på papir er gammelt nytt når de kommer på døra eller på butikken → fremtvinger hurtigere distribusjonskanaler
- Mer virkelighetsnær underholdning og økt underholdningsverdi, høyere betalingsvilje
- Forbrukerkrav
- Enklere for sluttbrukeren
- Økonomisk fokus på det å være synlig (reklame) i denne type portaler
- Markedsføringsarena
- Nettverksbygger

- Sammensmelting av mediene for distribusjon av underholdning, ref NRK – se neste episode allerede nå på nrk.no, denne ønsker du også på "stor skjerm".
- Høyere reisefrekvens medfører større behov for fjernkontroll av hjem.
- 2VK (AMS) gir informasjon til kraftselskap og kunde og kan danne grunnlag for lastberegning, nye energiprodukter, forbrukskontroll m.m.
- Miljøhensyn, opplæring/kompetanseoverføring
- Høyere attraktivitet hos arbeidsgiver / tilbyr fleksible modeller
- Mobilitet, enklere å tilby mobile løsninger når tjenesten uansett ligger eksternt
- Dette er en form for nettbaserte samfunn, som i tillegg er underholdning
- Læring, personlig utvikling

### ***Price Sensitivity***

- Cost saving
- Demand side economies of scope
- Minimere driftskostnader på sikkerhetshåndtering
- Besparende ved mindre bruk av menneskekraft
- Driftskostnader
- Gir telekom-aktøren unik kunnskap om brukernes vaner/reisemønster etc. Kan brukes for å skreddersy geografisk/situasjonsbasert reklame (jf. Google-tankegang) (skaper interessante personvernproblemer).
- Kostnadspress (vesentlig billigere enn å kjøpe/utvikle/drifte/forvalte selv)
- Financial crisis will increase price sensitivity (price sensitivity for new services will collapse)
- New user groups with large bills for international call will innovate user patterns
- Gunstig pris – flat rate med døgnprofil (free nights and week ends)
- Lav pris
- Reduserte kostnader for produksjon av tjenesten
- Mer etterspørsel etter og betalingsvilje for nisjekanaler
- Kostnadsbesparelser som følge av økonomiske nedgangstider og økt miljøfokus begrenser reisevirksomhet.
- Forutsigbare priser
- Behov for billigere telefoni forutsatt tilsv. kvalitet/oppetid som i dagens analoge nett
- Billige videokonferanser i næringslivet
- Kostoptimalisering
- Priserna på boxar pressas i och med ökad efterfrågan från konsumenter
- Lägre försäkringspremier via larm och övervakningstjänster
- Lavere priser på devicer
- Billige kamera
- Større betalingsvilje
- Revolusjon mhp kostnader, eliminerer behov for papir, eliminerer transport og logistikkostnader
- Mer virkelighetsnær underholdning og økt underholdningsverdi, høyere betalingsvilje
- Lokasjons og målrettet reklame gir høyere treffsikkerhet og større betalingsvilje for de som skal reklamere, muliggjør mikroannonsering (annonsering til et svært snevert utvalg)
- Kunder ønsker å betale kun for innhold de benytter (programmer og video)
- Økonomiske fordeler for arbeidstaker og arbeidsgiver
- Mer etterspørsel etter og betalingsvilje for nisjekanaler

### ***Substitutes***

- Ønsker om komplementære produkter/tjenester innenfor interesseområdet
- Kjøp og salg av varer/tjenester
- Økt behov for å løsrive seg fra kabelen. Arbeid/surf der du er.
- Modernisering av dagens bestilling av varer via telefon
- Bättre Webb-TV ger behov av att titta i vanlig TV
- Befolkningen vil ha råd til mobiltelefon, men ikke nødvendigvis PC. I disse markedene vil mobiltelefonen i stor grad innta den posisjonen bærbare PCer har i vesten

### ***Method of Purchase***

- Mer automatisert innkjøp/lagerhold av standard forbruksprodukter (reduisert tids/energibruk hos forbruker)

### ***Improved "Quality of Service"***

- Fokus på kvalitet (måling, oppfølging, proaktivitet ift service)
- Convenience for users
- Brukerkrav på at kommunikasjon skal virke og enkleste måten å få til redundans er å bruke flere kanaler
- Internett er for mye "støy"
- Tillit til leverandører øker
- Tillit til systemer øker
- Bedre tjenestekvalitet
- Funksjonalitet for å håndtere tjenestekvalitet implementert
- Åpne nett som Internett brukes til det meste og trenger derfor generelle sikkerhetsmekanismer
- Standardiserte underliggende båndbredde tjenester er åpne, men kan suppleres av kraftige sikringsmekanismer for aktører som trenger slike garantier og sikkerhet.
- Bedrifter og offentlige virksomheter må kunne sikre seg robuste kommunikasjonstjenester for forretningskritisk kommunikasjon.
- Behov for omforente og entydige spesifikasjoner for data/informasjon som skal utveksles mellom virksomheter
- Behov for myndigheter som kan forvalte navne-/adresseressurser etter hvert som slike utvikles/videreutvikles
- Flere og flere enheter kobles på nett, og for at dette skal fungere må navne- og adresseressurser administreres effektivt, men ikke nødvendigvis sentralisert verken nasjonalt eller globalt.
- Kvalitet
- Styring og kontroll (tilgangskontroll for barn)
- Radikal skalerbarhet (lansering av nye tjenester i et globalt marked krever skalerbarhet som få bedrifter er tjent med å håndtere selv)
- QoS – høyere krav til garantert kvalitet (eks. båndbredde og latency) stiller nye krav til nettverkene.
- Sikkerhetsbehov
- Folks behov for inegrasjon av tjenester mot en operatør og en aksessform
- Folks behov for å styre tilgangen av informasjon og ha interaktiv dialog med innholdsleverandør (toveis TV)
- Privatforbrukere ønsker høykvalitet og høystabil internett, TV, telefoni på samme aksess, samme faktura, samme leverandør/kundesenter inkludert kvantumsrabatt
- Behov for trygghet / vite at sikkerheten er "på" og fungerer.
- Bedrifter / personer kan følge med i hva som skjer, og være trygge på at det fungerer

- Sikre oppfølging av SLA krav og tjenestekvalitet
- I SoHo / privatsegementet; operatørers behov for å dokumentere forbruksmønsteret og øke forståelse i markedet for hvordan dette teknologisk sett fungerer
- Sikkerhet vs kriminalitet
- Krav på ett nytt säkrare internet från företag och privatpersoner
- Ökad säkerhet för företag och konsumenter
- Skalerbart
- Bedre sikkerhetsløsninger
- Krav om sporbarhet og logistikk
- Digital sikkerhet/digital signatur
- Sikrere å lagre bilder og video enn lokalt på PC
- Drifthsyn – profesjonell drift
- Tiggengelighet tjenestetilgang, sikkerhet
- Høyere interoperabilitet mellom plattformer

#### ***Technology Maturity***

- Webleseren kan støtte all den funksjonalitet som er "vanlig"
- Enkelt og tilgjengelig
- Brukervennlighet – dette må være tjenester som er særdeles brukervennlige – meget lette å ta i bruk
- Brukervennlighet
- Teknologisk utvikling, enklere, billigere, bedre.
- Teknologisk utvikling, enklere, billigere, bedre.
- Økt brukervennlighet (eks håndtere voicemail via web grensesnitt)
- Enkelhet, lav bruker terskel
- Funksjonalitet blir standard i PC'ene og lett anvendbare
- Boxen är kopplad till Internet, men fastställda menyer och enkla funktioner gör det enkelt för den ovane internetanvändaren
- Lettvint å benytte
- større grad av standardformater for avspilling (codecer, playere osv)
- Teknologi; like brukervennlig og samme egenskaper som vanlig papir kan brettes, bøyes, noteres på og som har batteritid
- Moden og standardisert fiberteknologi
- Teknisk modent på IPTV
- Enklere og billigere enn dagens MS Windows
- Teknologi moden
- Alle har kamera på mobil og PC
- Billigere og standardisert teknologi

#### ***Competition and Concentration***

- Supply push
- Konkurransen mellom ulike std – alt fra tv i de mobile nettene til tv kringkastet til håndholdte mini-tv'er – gjerne integrert i samme device
- Bye-bye Nortel mfl.
- Nye innholdstilbydere vil konkurrere med dagens kanalleverandører
- Programbolagen tar en mer betydende plass i värdekedjan

### ***Product Differentiation***

- New markets for operators
- Differensierende for fixed/mobile telcos i konkurranse med andre aktører
- Parallel infrastructure for narrowband data communication established with cheap equipment outside traditional network operators infrastructure (e.g. energy companies and security companies)
- Spesiell tilrettelegging av programmer/sendinger
- Tendensen går mot åpne- nett. Dvs. den tette koplingen mellom innhold og nett oppløses
- Programbolagen ger tillstånd för IP-TV via TV, Webb och Mobil utan särskiljning
- Media og filmbransjen behov for å differensiere sitt innhold fra brukergenerert innhold
- Differensiering mhp underholdning (Nintendo har kommet langt her)
- Mer tilgjengelighet på innhold
- Bredere innhold, ikke alt trenger å gå TV primetime

### ***Economies of Scale and Scope***

- Integrated providers will utilize their cost advantage in countries where regulation admits this
- New markets for operators
- Bedre utnyttelse av båndbredde i sentrale nettverk/stamnettene
- Integrated TV networks will seek to better utilize previous investments in large content bases
- Effektivisering for energiselskapene

### ***Regulation***

- Policy pressure
- Policy push
- Lovmessige krav
- Globale rettigheter
- Myndighetskrav (eks myndighetskrav til logging og sporbarhet ifm rådgiving i finanssektoren)
- Politikerna vill att nya medietjänster ska kunna användas av så många som möjligt
- Regeringar
- Politiker
- Politisk bred enighet
- Distriktpolitikk

### ***Taxes***

- Multi-channel regulation
- Krav om fjernmåling av kraftforbruk for alle innen 2014
- Regulation and collapse of price sensitivity will require new pricing models for video/tv services
- Rettighetsbeskyttelse
- Regulatoriske krav

### ***Price Control***

- Sterkere avgifter på utslipp fra bilsbiler
- Mindre reising (miljøavgifter og «finanskrise») = mer underholdning hjemme

### ***Economic***

- Economic crisis will initiate large scale public service development programs
- Increasing unemployment rates and number of citizens on pension plans will require cost reductions in public service production

- Lack of service provider and operator innovation as a result of financial crisis will force handset providers with deep pockets to innovate to stimulate handset sales
- Mindre reising (miljøavgifter og «finanskrise») = mer underholdning hjemme

### ***Socio-Cultural Conditions***

- Ny generasjon kommer som har vokst opp med Internett og internaktive tjenester
- Kundens ønske om å kunne få alle tjenester på samme apparat.
- Folks behov for underholdning
- Folks behov for kontinuerlig nyhetsoppdatering
- Folks behov for førsteklasses /høykvalitet lyd/bilde
- Konsumenten vill ha enkle betalningsløsninger ved småbeløp, buss, parkering etc
- Konsumenten vill att mobilen kan göra så mycket som möjligt, finns alltid med
- Konsumenten får en ny dimention på TV-tittande
- Konsumenten vill göra sina egna programtablåer
- Konsumenten ser webb-TV via datorn eller via TV-apparaten
- forbrukerkrav om forenkling
- Global arbeidskraft
- Folk er kontinuerlig på nett (men med ulike duppeditter)
- Bruk av twitter og statusfelt i facebook lærer stadig flere om konseptet
- Bruk av gruppeinnstillinger i f.eks facebook gjør brukerne vant til å filtrere informasjon mot ulike grupper (den begrensede rekkevidden/arbeidet som må legges ned - legger sannsynligvis demper på dette. Greier en å gjøre dette mer universelt gjeldende på tvers av sos. nettverk og andre kommunikasjonsteknologier/plattformer øker nytteverdi og brukerinnsett)
- Mer avanserte brukervaner, og vant til bruk av digitale verktøy for adm. Av våre liv
- Sosialt media (baner veien for nye samarbeidsformer)
- Sosialt media (gir overtid økende aksept for og ønske om for selvpubliserings)
- Demographic
- Increasing unemployment rates and number of citizens on pension plans will require cost reductions in public service production
- Brukere alltid online via mobil etc.
- Mange eldre og funksjonshemmede trenger en slik funksjon
- Individualisme
- Folks behov for å vise seg fram ("moments of fame")
- Effektivisering av arbeidsprosesser
- Globale nisje-communities
- Communities
- Arbetstillfällerna kommer att öka
- Handikappsorganisationer
- Minoritetsspråksorganisationer
- Opinionen
- Sosiale trender; underholdning som aktiviserer og bidrar til sosialisering
- Forbrukerne krever valgfrihet og mangfold
- Valgfrihet er en selvfølge
- Ungdommen lager det idag
- Trend på å være synlig – høyere person fokus i politikk, kjendis verden.
- For spiller, nettbaserte samfunn/sosial
- "Virtuelt" sosialiserende

### **Technology**

- Technology push
- Ease of network access for users
- Technology push
- Smart phone penetrasjon
- Forbedring av skjermkvalitet
- Høyere hastigheter,
- Bedre og mer stabli kvalitet i nettverk
- Smartere nettverk på ruting og sikkerhet
- Utvikling og utrulling av Ipv6
- Mobile terminaler (eks. iPhone) kommuniserer over de nett som er tilgjengelige
- GPS –funksjonalitet inkludert i elektronikk generelt
- Mobilt bredbånd (integrasjon med IP-baserte oppslag/tjenester)
- Web-baserte applikasjoner
- Web-baserte tjenester (lagring, fellesområder, osv.)
- Peer-to-Peer - teknologi
- 3-dimensjonale teknikker for for eksempel prøving av klær
- Båndbredde
- Web 2.0
- Båndbredde
- Prosesseringskapasitet
- Båndbredde
- Tilgang til informasjon på tvers av plattformer (Ref. for eksempel "Sling-box")
- Fokus på 3 skjermer (TV – PC – Mobil)
- IMS
- Integrasjon av tradisjonelle teknologier (VOIP – IPTV – IP – Osv.)
- Stadig større utbredelse av smartphones,
- Økt utbredelse av RFID o.l. (sannsynligvis igjennom økt bruk i logistikk frem til butikk)
- Økt utbredelse av RFID, flere digitale sensorer som kommuniserer basert på IP-nettet
- Økt utbredelse av smartphones, bilcomputere og andre alternative digitale duppeditter
- Teknologisk utvikling (web 2.0, lavere kostnader)
- Teknologisk utvikling (høyere båndbredde lavere kostnader)
- Teknologisk utvikling (stemme-, billed- og videoanalyse, høyere krav, lavere pris)
- Teknologisk utvikling (høyere krav til kvalitet)
- Teknologisk utvikling (stemme-, billed- og videoanalyse, søketeknologi, lavere priser)
- Cable networks will be upgraded to carry this kind of service (NGN upgrades)
- Bedre skjermer og bedre batterikapasitet på håndholdte terminaler
- Økt overføringskapasitet i de trådløse nettene
- Bedre håndsett – skjermkvalitet, batterikapasitet , oppkoblingsmuligheter
- Økt overføringskapasitet i de trådløse nettene
- Tilgjengelig båndbredde.
- Web 2.0, få Facebook etc. i sanntid med lyd og bilde.
- I bedriftsmarkedet gjennom innfasing av nye kommunikasjonsplattformer.
- "Alle" nye PCer kommer med integrert kamera.
- Bredbånd everywhere



- Tilgjengelighet
- Langt kraftigere terminaler
- Økt tilgjengelig båndbredde
- Frekvenser for 3G nett i 900 Mhz og utvidet spektrum i 2GHz området
- Fallende investeringskostnad pr/bit
- Utvikling av femtoceller/miniceller for høyere kapasitet + utvidet WLAN
- Muligheten for toveis kommunikasjon i kabel-TV nett åpner for dette.
- Utvidet funksjonalitet i Set-Opp bokser og i fjernsyn
- Økt båndbredde på kundens bredbåndslinje
- PVR funksjonalitet og økt minnekapasitet for lagring av store datamengder
- Nya sikkerhetsløsninger kopplat till chip och PIN-kod/eller annan form av ID
- Ökad bandbred ger möjligheten
- Ökad datorkapasitet ger tekniska förutsättningar
- Fastighetsägarna kan kommunisera med sina hyresgäster via TV-apparaten
- Integrationen mellan TV och Internet ger större näthandel
- I dag tekniskt genomförbart men politiskt svårt
- Kommer att kräva stora lagringsutrymmen
- Tvetydheter angående tekniska plattformar suddas ut
- TV on demand när du vill kommer att slå igenom snart.
- Hus byggs på nytt sätt där teknik och tillhörande tjänster är lika viktigt som materialval.
- TV med Ultra-HD slår igenom och föder ett nytt produktsegment
- Billiga supertunna vägg-TV lanseras
- Hologram, 3 D TV slår igenom
- Høyhastighets trådløse nett - overalt
- Billig sentral lagring
- Web og mediaspillere på alle devicer
- Høy båndbredde
- Digitalt styrte motorer
- Alle kjøretøy blir koblet til nettet
- Digitaliserte kontrollpanel i bil
- Displayteknologi
- Høy båndbredde
- Nye kompresjonsalgoritmer
- Høyhastighets bredbånd
- Billigere teknologi og bedre distribusjonsnett
- Teknologi for å kunne produsere innhold billig nok for "hvermannen"
- Teknologi som muliggjør ok TV opplevelse på mobiltelefonen
- Infrastruktur for aktive RDIF brikker allerede på plass, mindre kostnader ved installasjon (for eksempel WLAN og GPS)
- Teknologisk utvikling, nettene avgir brukerens geografiske lokasjon og kanskje noe data om brukeren (som kjønn, tilhørighet til gruppe, for eksempel student)
- Nye nett gjør det mulig (større båndbredde)
- Mindre og billigere terminaler (ungdomsterminaler)
- Nesten alle er tilknyttet et bredbåndsnett
- Kapasiteten er tilgjengelig
- Større kapasitet i nettene
- Større lagringskapasitet

- Nettet får bedre kapasitet
- Mobilitet (det er spådt sterk(5X) økning i antall mobile enheter med Internett mot 2011)
- UMS (Unified messaging system) alt på en enhet, sømløst/mobilt

#### ***Environmental***

- Miljøfokus ->kjøling og ventilasjon knyttet til servere distribuert. Optimalisering ved konsolidering
- Energibesparende
- Miljø
- Sosialt media (senker terskelen for bruk)
- "Grønn bølge" - energieffektivisering
- Miljø-"trenden"
- Miljøhensyn og besparelser gjennom f.eks. avansert klimakontroll.
- Miljøhensyn
- Energisparing
- Mindre reising (miljøavgifter og «finanskrise») = mer underholdning hjemme
- Miljøvennlig, politisk støtte for å bevare regnskoger
- Økonomi – energi sparing.
- Tilsvarende ved hytter og fritidsleiligheter.
- Miljøhensyn, opplæring/kompetanseoverføring

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