Business model performance
Reflections from three studies of mobile data services

Leif B. Methlie  
is Professor in strategy and information management at the Norwegian School of Economics and Business Administration (NHH), Bergen, Norway

Per E. Pedersen  
is professor of information management at University of Agder, Norway, and adjunct professor at the Norwegian School of Economics and Business Administration

ABSTRACT
The main research problem raised in this paper is whether strategic choices in the business model of mobile service providers have performance implications for mobile data services. The research model applied is based on the proposition that structural market conditions constrain the decision options under which the service providers can design their service offerings that ultimately provide values to end-users. This chain of causality is explored via three separate empirical studies of mobile data services in Norway. A final discussion on the research framework used and the main industry and research implications are included. The paper identifies paths of influence from business model decisions through service attributes to perceived customer value. Particular attention should be paid to the mobile specificity of the service providers’ value propositions in order to gain customer value. Another important conclusion is that the influence of business model choices is service category dependent.

KEYWORDS:  
Mobile data services, business models, Structure-Conduct-Performance

1. INTRODUCTION
In 2000 and 2001, licenses for 3G mobile networks were awarded to operators in many European countries. In Norway four operators obtained licenses. The costs of deploying these networks were staggering and it was assumed that average revenue per user (ARPU) had to be doubled for these networks to be profitable. It was therefore expected that revenues had to be generated from other sources than the voice market. Wireless Internet-based data services were believed to offer the new source of revenue generation. It was also assumed that developing and providing these new services in the market would have profound effects, not only for the operators of the networks, but for end-users and service providers as well. It was suggested that new value chains were needed. However, for the new services to really affect revenue streams, they would have to be adopted by the end-users in the market.

The ultimate research objective of this project is to explore the relationship between business model decisions and customer value perceptions under the constraints of structural market conditions.

To study the impacts of mobile data services in Norway, a three-year project was initiated by a consortium of industry partners. The industry partners were carefully selected to represent different parts of the value chain of wireless Internet-based data services. The following partners joined the project: A-pressen (media/content provider), Easypark (application provider), Telenor (operator), DnB NOR (bank/transaction provider), and Ericsson (terminal and network infrastructure provider). The ultimate research objective of this project was to explore the relationship between business model decisions and customer value perceptions under the constraints of structural
market conditions. The normative implication of this is to inform practice about how business model options may be constrained by the business environment, and how business model options under these constraints may impact perceived customer value.

Due to the slow implementation of new services in the Norwegian market it was not possible to carry out empirical survey studies of widely adopted advanced 3G data services. Instead, the research has been limited to studies of content-based services in the GSM network carried by SMS and MMS. However, the research has produced a series of findings of relevance to advanced data services as well as current mobile data services.

The chain of relationships which links structural conditions and business model decision behaviour to perceived customer value encompasses complex paths through shifting units of analysis from markets, firms and customers. Thus, multiple theoretical frameworks and various methodological approaches are required. Due to the complexity of this environment it was therefore decided to split the chain of relationships into three parts, each studied by a separate sub-project.

The first sub-project looked at the supply side. A series of case studies were conducted on selected services provided by the consortium partners using a structure-conduct mapping taxonomy. The purpose of these case studies was to establish the relationship between structural market conditions and strategic choices made by the service providers in their business models.

The second sub-project was concerned with the relationship between the service providers’ choice of business model options and the attributes of the services offered. Because mobile data services are networked services, for which both intrinsic and extrinsic attributes are believed to represent sources of customer value, the providers’ choice of business model options extends beyond the traditional dimensions of a service strategy. These business model options include dimensions of how to generate and share revenue in networks; how to organise the development and provision of services across partners in a value network; and how to collaborate with partners horizontally to obtain large networks of end users creating direct network effects.

The third sub-project studied the behavioural conditions for adoption and value creation of new wireless services. Here, six individual end-user surveys were used to investigate differences in the effects of service attributes on customer value. These services were the same as those studied for the supply side study.

The three sub-projects were carried out partly sequentially and partly in parallel. They have been reported and published separately (see Methlie and Gressgård, 2006; Methlie and Pedersen, 2007; Thorbjørnsen et al., 2009).

In this paper, we integrate the results from these sub-projects to identify paths of influence from structural conditions, to service providers’ strategic choice of business model options, and to perceived customer value. The purpose of this paper is to show how we have dealt with the complexity of the causal chain of relationships (by splitting it into separate parts); the theoretical foundation and methodology used in each part; and subsequently, how we have used the findings from each part to discuss paths of influence in the causal chain. In this discussion we give an account of reasons for our approach. Finally, we include a section on implications which are aimed at informing practice of our integrated findings.

2. THEORETICAL FRAMEWORK

Research on business models for network services has focused primarily on two complementary streams: taxonomies of business models and conceptual frameworks (Osterwalder et al., 2005). This research, however, is mainly descriptive and proposes normative implications directly from descriptive models. It is directed at assisting decision-makers to think through the problem by understanding the firm and its environment (Porter, 1991). However, very few empirical survey studies linking business models to performance are known to us. Amit and Zott (2001) consider how business model drivers affect performance, as measured by business values. A recent study by Malone et al. (2006) developed a business model typology which empirically measures how different business models capture what firms do and how they create business value.

The research approach in this project is based on the proposition that business model design implications should be derived from studies of empirical relationships between structural conditions, strategic choices and consumer behaviour.
This proposition relates to general theory of strategy, as found in the early structure-conduct performance (SCP) paradigm (Bain 1951; Kadiyali, et al., 2001), and later in Porter’s chain of causality (Porter, 1991). In his article on a dynamic theory of strategy, Porter observes: “To explain the competitive success of firms, we need a theory of strategy which links environmental circumstances and firm behaviour to market outcomes. My own research would suggest a chain of causality for doing so…” (ibid. at 99).

**Our proposed conceptual model** follows this chain of causality as presented above. For the performance indicator we use perceived customer value. After all, the potential firm’s profit derives from customer value. By applying wireless network technology to data services we regard the value creation process as involving both technological change and innovation. Mobile data services are nascent, but are rapidly growing markets. New performance attributes are being introduced to customers and the demand is uncertain. The technology used can be defined as disruptive (Bower and Christensen, 1995). Both Evans (2002) and Funk (2004) claim that mobile business technology is a key disruptive technology. In such an immature, uncertain and complex environment, the performance of new services is best understood by measuring how the service is valued by the customers – the perceived customer value.

The **overall conceptual model** for our research objective is illustrated in figure 1.

This model has three main components: structural market conditions, business model dimensions, and performance.

The **external environment in** which a firm operates creates opportunities for, and constraints on, the managerial behaviour of the firm. These external opportunities and constraints include regulatory constraints, technology opportunities, market conditions, etc. To study the relationship between structural conditions and business model dimensions we used a mapping framework called MAPIT (Methlie and Pedersen, 2002). The MAPIT framework is further elaborated in section 3 below. Structural conditions were mapped onto three business model dimensions as shown in figure 1: service strategy, governance form, and revenue model.

**Service strategy includes service** value proposition corresponding to the positioning option often used in the marketing literature (e.g. Gosh and John, 1999), and market focus corresponding to Porter’s (1985) generic strategy elements. The options for the service value proposition are service dependent and related to the specific gratifications sought by mobile data services. Two options are suggested: mobile specificity (uniqueness) and proposition breadth (scope). For the market focus options, the focused versus undifferentiated options suggested by Porter (1985) were applied.

**Governance form describes the** infrastructural dimension of the value creating network and includes the options traditionally found in new institutional economics and organisation theory: market, relational, and hierarchy (e.g. Gosh and John, 1999). In this paper, relational or market governance forms imply open access for service providers to the service platform, while hierarchical forms mean closed governance forms in which access to the service platform is regulated by the platform operator.

**Revenue model includes revenue** valuation and sharing. Many different revenue models exist and the choice of model is likely to be tied to who has the influence in the value-creating network of the particular service (Gressgård & Stensaker, 2006). Here, differentiation was made between content-based and transport-based revenue models.
Business model choices are believed to have performance effects. However, we cannot directly measure this link since the customer only knows the service he or she is using, and has no explicit knowledge of the business model of the provider. Furthermore, we did not have sufficient empirical data to vary the business model dimensions systematically over a set of services and measure the effects on the customers. Therefore, we split the conduct performance relationship into two parts by introducing service attributes as the interlinking elements. The relationship between business model choices and service attributes was empirically tested with data from the service providers, and the relationship between service attributes and perceived customer value was measured by data collected in end-user surveys.

Service attributes for mobile data services emerge from two fundamentally different streams of sources. Intrinsic attributes refer to the inherent attributes of the service itself, whereas extrinsic attributes refer to attributes associated with the networks that provide and use the service. Extrinsic attributes are unique to network services. According to Lee and O’Connor (2003: 244): “Extrinsic value is the set of benefits derived from outside the product (service) itself, such as the size of the installed base and the availability of compatible and complementary products that enable greater use of the base product”. We argue that extrinsic attributes can be divided into user network attributes and complement network attributes. These three drivers of value are shown in figure 1. In sections 4 and 5 below, we deal with specific measures of these drivers.

The conceptual model shown in figure 1 may be split into theoretical, analytical and empirically testable models. The relationship between structural conditions and business model conduct has been modelled by Methlie and Pedersen (2002), and this model has been employed to investigate mobile data services by Methlie and Gressgård (2006). The conduct performance relationship has been modelled and investigated empirically for six mobile data services markets by Pedersen et al. (2005). The results from studies applying the analytical and empirically testable models derived from the conceptual model in figure 1 are elaborated in the following sections: section 3 on the relationship between structural conditions and business model dimensions; section 4 on the relationship between business model dimensions and service attributes; and section 5 on the relationship between service attributes and customer value. In section 6 findings from the three studies are integrated and conclusions and implications for both research and business model design are suggested.

3. STRUCTURAL CONDITION - BUSINESS MODEL RELATIONSHIP STUDY

Although the choice of business model is a strategic decision, the options are constrained by the structural conditions of the individual service provider as well as the industry structure. Research on structural and institutional dynamics, and on technological strategies of large equipment manufacturers, is found in Hommen (2003) and Edquist (2004). Research on innovations in mobile communications using the conceptual framework of sectoral systems is found in Breschi and Malerba (1997) and Malerba (2004). Less attention has been devoted to how structural conditions impact business model design. Instead, explanations of mobile data service successes span from focusing on specific factors, such as the choice of an appropriate revenue model (Foros et al., 2001), to general systemic explanations, such as the dynamics of industry ecosystems (Vesa, 2003). The most common approach, however, is to combine a set of technological, business strategic and behavioural or cultural factors. For example, Henten et al. (2004) suggested technology, economy, market development and structure, marketing, socio-cultural, policy intervention and regulation as the relevant explanatory factors.

Authors have also investigated different forms of regimes, facilitating or inhibiting specific behaviour by service developers and providers. For example, Godø (2000) suggested that the innovation regime of a nation or sector is a structural determinant of the behaviour that is likely to be exercised by service developers and providers. Hommen (2003) suggested that in the future, regulatory structure and technological development will favour equipment suppliers and service providers to the detriment of conventional telecom operators. Another example is Funk (2004), who suggested that regimes in the form of technological trajectories of a sector or nation may facilitate or inhibit particular business model designs. Finally, regulatory regimes such as licensing policy (Ure, 2003), or interworking requirements (Hagen and Nafstad, 2003; Northstream, 2002), have been suggested as important conditions for stimulating or inhibiting particular business models.
METHODOLOGICAL APPROACH AND CHALLENGES

Methlie and Pedersen, (2002) have categorised the structural conditions or determinants for business model options into market-, actor-, product-, influence-, and transaction-related determinants and defined a structure-conduct mapping taxonomy called MAPIT.

The Market determinant includes three main factors; fragmentation, knowledge and regulatory policies. Knowledge or competencies include knowledge of the technical infrastructure, knowledge about value creation by the technology applied, and market knowledge. Also included in market conditions are the regulation policies. However, research designs capturing variation in these conditions should include regulation regimes as the unit of observation and be considered via cross-country studies. Since this study is carried out in one country, regulatory regimes have not been included here.

The Actor determinant includes the potential for scale and scope economies, and elements related to the cost structure of firms in the industry.

The Product determinant defines the content of a transaction and is measured by the degree of differentiation potential and complexity of the service when distributed in a network infrastructure. The differentiation potential refers to the specificity of the service category.

The Influence determinant refers to the social mechanisms and established resource and power relationships between players in the industry.

The original MAPIT framework contained a transaction component. However, we think that the available technology impacts strongly on the options of the business model of network-based services in general, and on mobile data services in particular. Therefore, we changed the label to Technology. The technology determinant refers to the disruptiveness, complexity, degree of specialisation and standardisation (the heterogeneity) of the technology. All these determinants were measured by applying qualitative indicators that were captured using interviews as the data collecting instrument.

Ideally, when investigating structural conditions and how they affect the choice of business model options, systematic variation in structural conditions should be observed. Given the many variables in the framework and the complex interactions among them, rigorous statistical testing represents a methodological challenge. Due to resource constraints, studies of structural conditions and their effects on providers’ business model options are typically conducted as case studies, keeping several of the structural conditions of interest constant during the investigation (e.g. Bohlin et al., 2003; Yoo et al., 2005; Osterwalder et al., 2005b). These constraints also apply to our study of five different mobile services offered under the same national regulatory policy. The five services studied were a mobile parking service; a general mobile payment service; a mobile portal service; a mobile information retrieval service; and a mobile lottery service. Informants were chosen among the managers of the providers offering the services. Interviews were conducted applying the MAPIT framework. This study is presented in Methlie and Gressgård (2006).

MAIN FINDINGS

All investigated services were based on service concepts known either from physical distribution forms (e.g. using coins to pay for parking) or from existing electronic networks (e.g. credit card payments). The mobile services most often added a distribution channel to existing service offerings, and thus, relied heavily on the infrastructure of the existing services. This limits the creation of radically new value propositions in which the unique intrinsic attributes of mobile services are utilised. Also, with multi-channel service offerings, the potential economies of scale of mobile services could not be fully utilised.

Lack of standardisation requires more specialised technological knowledge, and hierarchical governance forms are often the only alternative for radically new services such as those studied in this project. In all cases, this led to focus on technological rather than market knowledge by the service providers, and difficulties in integrating collaborative partners with market knowledge in the value creation process.

With multi-channel service offerings, the mobile services had to adapt revenue models of the other channels. This limits the providers’ opportunities for creating innovative business models. Also, few of the investigated services could be characterised as platforms for complementary services, offering few opportunities for collaborating partners to create new streams of revenue.
In general, structural conditions like influence and technology seemed to restrict the variety of business model options available to service providers. This inhibits innovation in business models and results in services that could not be characterised as offering unique or mobile specific values. The indications from the case studies were further confirmed in quantitative survey studies (reported below) which showed that surprisingly little of the variation in service attributes could be ascribed to the choice of business model options, and thus, must be explained by structural determinants.

We have revealed some constraints on business model choices in the study of the five services. Also, we have seen that opportunities in the environment, such as technology, were explored by the service providers to a limited extent. Summing up the five MAPIT components of structural conditions:

1. Dominant players (I) in the existing service infrastructure constrain the choice of new value propositions and open governance forms.

2. Wireless technology (T) has not been utilised to create mobile specific value propositions.

3. Lack of standardisation (T) leads to closed governance forms and constrains the inclusion of collaborative partners to provide complementarities in the value propositions.

4. Knowledge (M) was dominated by wireless infrastructure knowledge while knowledge on value creation and markets seemed to be lacking.

5. Scale economy potential (A) influenced the revenue model by promising cost effectiveness which, however, could not be released due to low demand. This is also the reason that almost all services in this study employed an undifferentiated market strategy.

6. Differentiation potential (P) was not explored by the service providers.

4. BUSINESS MODEL – SERVICE ATTRIBUTE RELATIONSHIP STUDY

Most of the research on business models has been carried out in the context of e-business, “how the firm plans to make money long-term using the Internet” (Afuah and Tucci, 2003), stressing that the new economy or the Internet require new forms of doing business. Chesbrough and Rosenbloom (2002) emphasise the connections a business model provides between technical potential and the realisation of economic value. The business model unlocks the latent value from a technology.

According to Magretta (2002), the strength of a business model is that it tells a story about how an enterprise works, focusing on four fundamental questions: Who are our customers? What do the customers value? How do we make money? What is the underlying logic that explains how we can deliver value at an appropriate cost? An early attempt at defining the concept was Timmer’s (1998) suggestion that a “business model is defined as the organisation (or architecture) of product, service and information flows, and the sources of revenues and benefits for suppliers and customers” (at 31). In a recent review of the business model literature, Osterwalder et al. (2005a: 17–18) suggest that a business model is:

a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a definition of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.

Like Osterwalder et al. (2005a), we find the business model concept as a tool or framework most interesting.

Recently, several authors have applied the business model concept to mobile commerce and mobile data services contexts (Campanovo and Pigneur, 2003; Faber et al., 2003; Bouwman, 2003). With some variations in propositions, these authors mainly suggest four dimensions of business models: the product innovation (the product-related value proposition); the customer relationship (the customer related value proposition); the infrastructure; and the financial dimensions (the revenue dimension). As shown in figure 1, our business model...
dimensions correspond to the dimensions suggested in these studies.

Using the three dimensional framework for business models outlined above, the relationship between specific options along business model dimensions and performance is studied. This relationship has been given less attention in the literature on the business model concept. Instead, performance affects the choice of options for product, customer, financial and infrastructure business model dimensions and is treated separately in individual research areas such as product innovation, industrial organisation, and strategic marketing research. In the strategy field one acknowledges the chain of causality from structural market conditions through business model choices to performance (Bain, 1951; and Porter, 1991). In this framework, however, performance is usually measured by a firm’s business values such as profitability. Our concept of the business model differs from the industrial organisation approach. Firstly, the business model focuses on customers and how to create value for them. Secondly, the business model aims at capturing the economic value from new technology (Chesbrough and Rosenbloom, 2002). Our research context is the mobile data service industry creating innovative network services in emergent markets... we find perceived customer value to be a better performance indicator than financial business values in this environment.

Our research context is the mobile service industry creating innovative network services in emergent markets... we find perceived customer value to be a better performance indicator than financial business values in this environment.

It is beyond the scope of this paper to integrate and apply the vast literature on the performance effects of business model options on the mobile data services industry. However, it is well documented in this literature that the choice of specific business model options affects the intrinsic and extrinsic attributes of the product or service developed and produced (Nicholls-Nixon and Wood, 2003; Zahra and Nielsen, 2002; Sengupta, 1998; Stuart, 2000).

METHODOLOGICAL APPROACH AND CHALLENGES

The relationship between business model dimensions and performance, measured in terms of perceived customer value, was investigated by introducing an intermediate layer consisting of the service attributes. Service attributes can be valued by the users of the service. Therefore, our approach suggests that performance in the form of service adoption or customer value creation can be obtained by offering services with particular intrinsic and extrinsic attributes. Consequently, a study was designed to investigate the relationship between the three proposed dimensions of the business model illustrated in figure 1 and the intrinsic and extrinsic attributes of a mobile service. Here, extrinsic attributes are categorised either as complementary network attributes or user network attributes referring to indirect and direct network effects respectively.

Many unique intrinsic attributes characterising mobile services have been mentioned. One of the most obvious characteristics is their accessibility related to time and space (Balasubramanian, Peterson and Jarvenpa, 2002; Watson, et al., 2002). Thus, accessibility has been suggested as an element of usefulness (Pedersen and Nyseveen, 2003), mainly determined by the content of a service – its functionality. Another unique intrinsic attribute, enjoyment, was found important in four studies of mobile service adoption by Nyseveen, Pedersen and Thorbjørnsen (2005). Nordman and Liljander (2003) suggest that dial-up speed and configuration settings are important for mobile service quality, another important intrinsic attribute.

Direct network effects are those related to the increasing value of a service as the size of the network of users increases (Liebowitz and Margolis, 1999). While network size is an important extrinsic attribute of communication services, attributes characterised by indirect network effects are more often found in information, transaction or machine interactive services. Indirect network effects originate from direct network effects when the networked good is a platform for complementary services and products (Gupta et al., 1999). Some generic
mobile data services like SMS and MMS offer a platform for complementary services. For information and machine interactive services, such as premium SMS, mobile Internet access or game services, the potential for generating indirect network effects is great. From the concept of indirect network effects, a set of operational extrinsic attributes attached to complementary services offered on a platform may be identified, such as complementary service variety, speed of development, and quality. As for direct network effects, considerable attention has been given to the importance of indirect network effects in explaining consumers’ willingness to pay for network goods. For example, researchers in economics, marketing and information systems have concluded that the availability of complementary goods affects the prices that can be obtained for network goods (Gandal et al., 2000; Basu et al., 2003; Brynjolfsson and Kemerer, 1996).

**In this study, the service attributes were measured using a quantitative instrument which included multiple item scales. The scales were pre-tested and applied in a survey including six mobile data services. Fifty-four subjects were recruited among service provider professionals of the two leading Norwegian mobile operators and among the leading providers of mobile data services in Norway. The subjects were all knowledgeable about the business model of their services. The services were presumed to differ in how intrinsic and extrinsic attributes contribute to perceived value, and thus, according to our hypotheses – to successful business models. The value of person-to-person MMS and SMS chat services were presumed to be particularly influenced by network size, whereas the value of MMS content services and point of sale (POS) payment services were presumed to be particularly influenced by service complementarity. Finally, the value of individual games and cash card charging services were presumed to be particularly influenced by intrinsic service attributes such as ease of use, usefulness and service quality. Details of the methodological approach are presented in Methlie and Pedersen (2007).**

**MAIN FINDINGS**

**The first issue investigated** was whether service provider professionals consider services to belong to categories reflecting differences in the importance of intrinsic and extrinsic attributes in value creation. Our findings strongly support the proposition that service provider professionals categorise services according to service attribute differences, and that they believe the choice of business model options should reflect these differences.

**Other findings from this study** indicate that revenue model options only influence speed of development. This finding is in the opposite direction of what was originally proposed. We found that the form of governance only significantly influenced service usefulness. Furthermore, mobile specific value propositions are the most influential business model dimension, affecting speed of development negatively; and complementary service quality, usefulness, intrinsic service quality and innovativeness positively. The breadth of the value proposition influences network size positively and service quality negatively. Finally, market focus influences complementary service quality positively.

**We also proposed moderated relationships** between business model dimensions and service attributes. These propositions were explored by applying analysis of covariance, including interaction terms of business model dimensions and service category. The analyses revealed that when controlling for service category, the revenue model influences complementary service quality, the governance form influences intrinsic service quality, and mobile specificity influences ease of use.

**Our findings may be summarised in the following conclusions:**

1. **It is possible** to categorise mobile data services according to the importance of extrinsic and intrinsic attributes in creating customer value. Service provider professionals’ categorisation of services corresponded well with this proposed categorisation scheme.

2. **Business model dimensions** seem to explain only a minor part of the variation in service attributes. Thus, variation in service provider professionals’ perceptions of service attributes not explained here may stem from other sources, such as structural determinants or horizontal forms of governance (horizontal collaboration).

3. **Of the business model dimensions investigated,** mobile specificity is by far the most important dimension influencing service attributes.
4. **Governance form does** not seem to consistently influence extrinsic attributes, but has an effect on intrinsic attributes, in particular, service usefulness and quality.

5. **Finally, the relationships** between business model dimensions and service attributes seem to be moderated by service category.

**Figure 2 shows significant** paths of influence from business model options to service attributes.

---

**5. SERVICE ATTRIBUTE – CUSTOMER VALUE RELATIONSHIP STUDY**

One of the most obvious characteristics of mobile services is the lack of constraints related to time and space (Balasubramanian et al., 2002). Channels giving flexible access to information in time and space should therefore be highly valued by customers.

Siau et al. (2001) argued that mobile communication can be personalised to represent information or services appropriate for the individual customer. Furthermore, uniqueness (that customers receive information that is adapted to the time of the day, customer location, and customer roles and preferences) is one of the dimensions of the ‘u-commerce’ construct presented by Watson et al. (2002). It describes the potential for personalisation in mobile commerce and mobile data services in general.

Also, mediating personal services by mobile channels offers the possibility to send relevant and time-sensitive information to loyal customers. Thus, it has been argued that wireless devices are ideal for maintaining customer relationships (Doyle, 2001; Kannan et al., 2001). In addition, mobile services are typically used to coordinate social networks. Information received by one member of a network is often put forward to other members of the network (Doyle 2001). Studies applying uses and gratification theory have also focused on the unique gratifications of mobile channels. A study by Ling (2001) showed that mobile phones are used to express fashion and the presentation of self. Thus, the characteristics of information accessibility, information personalisation and information dissemination are believed to be important characteristics of mobile services (Nysveen et al., 2005).

**Perception and anticipation of** user network attributes have recently achieved considerable attention in the information systems, strategy and marketing literature (Gallaugher and Wang, 2002; Schilling, 2003; Frels et al., 2003). Most of these studies have been conducted in professional end-user markets suggesting that direct network effects are taken into consideration in professional end-users’ value assessments of user network attributes. Few similar studies are found for traditional consumer markets. However, economic theory on network effects assumes that consumers are somehow able to make such assessments and includes network size elements in consumers’ utility functions (e.g. Katz and Shapiro, 1992).

**A recent study by** Asvanund et al. (2004) revealed that consumers combine both increasing and diminishing return considerations. The findings showed that consumers consider network strength and quality of the file sharing network, not only network size, when assessing the value of participating in a network. For complementary network attributes, end-users’ appreciation of complementary service variety and innovativeness may vary across user segments. In professional business markets, such as business software or server operating systems markets, complementary service variety is assessed and appreciated (Frels et al., 2003). For simple consumer network goods, in which the complementary goods are content goods delivered over a content distribution platform, such as a video game platform, this is also very likely (Schilling, 2003). However, for complex or radically new network goods and services, like...
mobile data services, assessment and valuation of complementary network attributes are much more difficult. In this case, consumers will often have to assess the value of future indirect network effects resulting from adopting the network goods platform. This is an even more difficult task requiring considerable experience and cognitive capacity.

**METHODODOLOGICAL APPROACH AND CHALLENGES**

To investigate the differences in the effect of service attributes on customer value, six individual end-user surveys were conducted. The surveys included a total of 1268 respondents. The six services were the same as those investigated in the business model service attribute relationship study presented in section 4. Multiple item scales of all variables were developed and pre-tested, and all scales proved to be reliable and valid. Details of the methodological approach are presented in Thorbjørnsen et al. (2009). The methodological challenge in this study was: 1) to design measures capturing end-user perceptions of extrinsic attributes that could be easily understood and assessed in a questionnaire; and 2) to separate the categorisation of mobile services and measures of extrinsic attributes without unveiling the hypotheses for the respondents. The second of these challenges was met by allowing the service provider professionals of the study (reported in section 4) to carry out the service categorisation instead of end-users, so that end-users could focus on reporting their extrinsic attribute perceptions only.

**MAIN FINDINGS**

The survey revealed that end-user perceptions of systematic differences in service attributes do not correspond to the hypothesised categorisation. Thus, end-users seem unable to use attribute-based categorisations in the same way as service provider professionals do. This influences their value assessments and may create discrepancies between service providers’ and end-users’ value assessments. Complementary service variety influences perceived value in general, but mostly for end-users with a high level of behavioural control and for services characterised by indirect network effects and intrinsic attributes. Network size influences perceived value in general, but most for services characterised by direct network effects. Thus, end-users implicitly consider extrinsic attributes in their value assessments, but they are not explicitly aware of how their value assessment is undertaken.

Usefulness influences perceived value in general, but particularly for services characterised by direct network effects. Compatibility influences perceived value in general, but particularly for services characterised by indirect network effects. Intrinsic service quality influences perceived value in general. Behavioural control influences perceived value, but particularly for services that are not characterised by direct network effects. In general, intrinsic attributes are more influential than extrinsic attributes and explain more of the variance in customer value. Still, when removing any of the variables representing extrinsic attributes from the models, the model fit significantly dropped. This confirms that models of end-users’ value assessments for mobile services should include extrinsic attributes. The complete model showed good fit and explained from 50 to 65% of the variance in customer value depending on service category. Thus, a robust model of the relationship between intrinsic and extrinsic attributes and customer value has been developed.

6. **INTEGRATED FINDINGS**

In this paper, three studies of mobile data services that have been conducted to explore the chain of causality in business model design are described. This chain covers structural conditions – the opportunities and constraints of the environment; managerial behaviour in choosing among the business model options; and performance measured by perceived customer value. The main studies are summarised in table 1. As is

<table>
<thead>
<tr>
<th>Study</th>
<th>Independent variables</th>
<th>Dependent variables</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure study</td>
<td>Market, actor, product, influence, and technology related determinants</td>
<td>Revenue model, governance form and service strategy dimensions</td>
<td>Case study of 5 mobile data services</td>
</tr>
<tr>
<td>Business model study</td>
<td>Revenue model, governance form and service strategy dimensions</td>
<td>Intrinsic and extrinsic service attributes</td>
<td>Survey/interview of 54 service provider professionals of six services</td>
</tr>
<tr>
<td>Customer value study</td>
<td>Intrinsic and extrinsic service attributes</td>
<td>Customer value</td>
<td>Survey of 1249 end-users of six services</td>
</tr>
</tbody>
</table>

Table 1. Study Summary
shown in table 1, a considerable number of services have been investigated and a considerable number of respondents have participated.

Summarising the most important aggregate findings in the three sub-projects, the following list is suggested:

1. The MAPIT framework was found to be adequate for identifying and organising key variables of the environment that impose constraints on, but also reveal opportunities of, business model options for innovative mobile data services.

2. Service attributes are affected by business model choices only to a limited extent. This is the case for extrinsic attributes in particular, whereas for intrinsic service attributes, value proposition design is the most influential business model dimension.

3. End-users have difficulties expressing the importance of extrinsic attributes in creating customer value. Intrinsic attributes are the most important attributes, not only for adoption, but also for value creation. But extrinsic attributes have been revealed to be implicitly evaluated as part of end-users’ value assessments.

Due to limitations in supply side data we had to select different methodological approaches to study the relationships along the chain of causality. This eliminated the possibility of estimating and modelling the conceptual research model shown in figure 1 as a path model.

The case studies of structural conditions revealed that transforming an existing service to a similar mobile data service severely constrained the business model options. In particular, dominant players controlling the existing service market strongly influence value proposition, governance form, and revenue model. Furthermore, the new entrants, although technically knowledgeable, lack adequate competence in the target service market, and do not pursue specific properties of the mobile technology for value creation. Also, they seem to be unable to reap the economies of scale of the technology due to low demand. Other opportunities, such as differentiation potential, were not explored by the service providers.

The two interlinked studies on the relationship between business model choices and perceived customer value can be subject to an integration analysis using aggregate data for all service categories. Regression analysis combining the two studies identifies significant paths of influence from business model options to perceived customer value through service attributes. This form of path analysis is entirely explorative in nature and is restricted to hypothesised relationships only. The significant paths are shown in figure 2. The path model is illustrated at the conceptual level.

End-users have difficulties expressing the importance of extrinsic attributes in creating customer value. Intrinsic attributes are the most important attributes, not only for adoption, but also for value creation. But extrinsic attributes have been revealed to be implicitly evaluated as part of end-users’ value assessments.

From figure 2 we see that the most significant paths are from governance form and mobile specific service strategy to perceived value. In particular, open governance form influences usefulness and intrinsic service quality, and both are significant sources of perceived value. The most influential factor is a service strategy utilising mobile specificity. It positively influences ease of use, usefulness, service quality and innovativeness, and negatively influences speed of development. The negative influence does not seem to be very important because end-users do not seem to highly value speed of development. Mobile specificity influences four service attributes that are important to end-users’ perceived value. Finally, market focus influences complementary service quality, which further influences perceived value. Thus, focused market strategies are the third way that service providers can make business model decisions that enhance end-user value. Details on the statistics are found in Pedersen et al. (2005).
We also see that three important determinants of perceived value are not influenced significantly by service providers’ business model decisions. Thus, necessary complementary service variety must be obtained through other means than those discussed in this paper. The same is the case for network size and compatibility. Suggesting how these attributes may be influenced needs further research. In speculation, however, complementary service variety and compatibility may be obtained by standardisation and open application programming interfaces (APIs), and network effects may be obtained by horizontal collaboration rather than the vertical forms discussed here. Thus, the role of standardisation and open application interfaces, as well as horizontal integration and relational agreements, may be keys to a better understanding of how these aspects influence perceived value.

7. DISCUSSION

As mentioned above, the general theoretical basis of this research is the chain of causality in general theory of strategy (Porter, 1991), and the SCP paradigm in industrial organisation (Bain, 1951). The research model of the chain of causality in business model studies depicts the structural market conditions – business model options – customer values relationships. Looking at the research literature, many empirical studies of the relationships between service attributes and adoption are found. Empirical surveys are almost non-existent for assessing the relationships between structural conditions and business model options, and between options and service attributes. Research on business models is almost entirely devoted to developing taxonomies and conceptual frameworks. There now seems to be general agreement on the framework dimensions. Frameworks and taxonomies help managers to identify relevant variables for better understanding of the firm’s business model but do not inform them of causal relationships that may improve their decisions.

With respect to mobile services in particular, there seems to be less agreement on relevant dimensions and attributes. Individual studies emphasise attributes such as accessibility, personalisation, expressiveness and enjoyment, in addition to the more traditional attributes such as ease of use. The findings here show that it is the unique characteristics of mobile services that create value for the users. However, these mobile-specific characteristics do not only relate to properties inherent in the mobile service itself (the intrinsic attributes), but also to the network or platform mediating the service (the extrinsic attributes). Network effects emerge partly from the number of users connected to the platform (the direct network effects), and to the number of vendors offering complementary services on this platform. Few studies have attempted to categorise services based on all these effects and used this categorisation to optimise the business models for various services. One cardinal question remains to be answered: Are the users able to value the extrinsic properties and is the ability of doing this equally distributed among users? Few studies of this have been carried out in the consumer market.

Modelling the relationships from structural market conditions through business model variables to customer values in one single framework, involves several theoretical traditions and perspectives. Empirical studies in industrial organisation using the SCP framework measure performance as the profitability of the firm, innovation rate, etc., limiting the framework to the firm level. Thus, the theoretical foundation of these frameworks is located in strategy and marketing literature. Extending the framework to include customer values and customer behaviour for network services requires combining several theoretical perspectives.

A business model is the choice of certain strategic decision options taken by the provider and represents the conduct of the service provider. Thus, the business model, in order to have a normative value, must contain decision variables. Therefore, all the variance in customer values can not be explained by structure and business model relationships. This represents a challenge for testing the model applied here because a range of decision variables gives a range of possible outcomes.

Transforming theoretical concepts to measurable variables represents a huge problem. Only parts of the research model have been previously operational. This applies to service attributes and adoption relationships, and to parts of the business model such as governance where studies on governance forms based on transaction cost economics have been extensively subject to empirical survey research. Other parts, such as revenue and service strategy have not been made operational to the same extent. Much work has to be done to define measurable variables in these areas. Also, the literature on network
effects lacks consistently operationalised variables, for instance for concepts such as network strength, network growth, etc. The same situation exists for the literature on indirect network effects and concepts such as complementary scope, complementary variety, complementary quality, and complementary compatibility.

**Connecting structural market conditions** to business model choices and to customer value, involves observation and analysis units at different levels. Structural condition studies use the market as the observation unit; business model dimensions are observed at the firm level, and customer value is observed using individuals at the unit of observation. It is not obvious how to unify the theoretical foundation and the unit of analysis in such a framework.

**The modelling difficulties of** making the full model of figure 1 operational also create other methodological problems. Data collection of perceived value requires measures of complex constructs to be easily understood by the respondents. Unfortunately, there is a gap between precise theoretical constructs and practically identifiable indicators that the subjects can understand and respond to. Thus, the methodological challenges are more concerned with defining measurable variables than design and sampling.

**The overall basis for** the research here is the chain of causality in the theory of strategy. In the studies reported, however, the full chain is not integrated. Structural elements have only undergone exploratory investigation. Case studies unveil that the structural elements are many (Henten et al., 2004). In a survey study it is problematic to study all these under systematic variation. Little has previously been done to limit these conditions to those that are of special relevance to mobile services.

**For the business model** options, measurable indicators are developed that are both reliable and valid. The studies show that these indicators are well understood by service providers. It is shown that business model options influence service attributes, but the explained variance is generally low. This implies that there must be other aspects than business model decisions that explain variation in service attributes. Most likely, these aspects are structural. Of the business model variables studied here, value proposition is the business model dimension that most strongly influences the perceived customer value provided by mobile services. Also, governance form and revenue model are influential, but designing mobile specific value propositions is by far the most important. Furthermore, it is found that the relationships between business model variables and service attributes are not universal, but vary systematically by mobile service type.

**Service attributes seem to** be well understood by the service providers and the manipulation checks show that they are able to differentiate between services where customer value is driven by intrinsic and extrinsic attributes, respectively. This is not the case (to the same extent) with end-users – the consumers. They seem to have difficulties in perceiving the meaning and implications of extrinsic attributes, and to estimate the value of the drivers of these attributes. Differences among consumers on these valuations are however observed. Users do implicitly valuate extrinsic attributes, especially network size.

Analyses of service category variation support the assumption of systematic differences in customer values for different categories of services. Here, it is found that usefulness and ease of use are more important for services dominated by intrinsic properties, that network size is more important for communication services, and that the consumers take due consideration of these attribute types in their valuation of a service. Contrary to expectation, variation in complementary services offered on a common platform does not seem to have any impact on the valuation of content based services. Here, compatibility across platforms seems to be much more important.

8. IMPLICATION

The main findings suggest some industry and research implications that are listed below.

1. **Look for opportunities** as well as constraints in the structural conditions.
2. **Identify dominant players** in the existing infrastructure, and partner with them to create value propositions that are beneficial for all parties. A two-sided market requires separate value propositions for both sides.
3. **Technical infrastructure knowledge** is a necessary but insufficient structural condition for launching mobile
data services in a consumer market. Market knowledge is also required.

4. Technology must be transformed to value creation attributes in the value proposition.

5. For services characterised by intrinsic attributes, content-oriented revenue models decrease complementary service quality. Thus, content-based revenue models should be avoided if high complementary service quality is sought.

6. To provide services that are perceived as useful and of good intrinsic quality, providers should use open business models.

7. Mobile specificity of value propositions is by far the most important business model dimension. No other element in providers’ business models affect perceived value more. This element influences perceived value through usefulness, intrinsic service quality, and innovativeness.

8. Providers should follow a focused market strategy to create perceived quality of complementary services. It naturally follows that this is particularly important for bundles of complementary services delivered over a service platform.

9. It is observed in the two business model performance studies that users do not have the same ability as the providers to categorise services according to intrinsic and extrinsic attributes. Providers should therefore focus mainly on marketing the intrinsic attributes of their services, but should also design business models with consideration of extrinsic attributes. Marketing the value of extrinsic attributes of particular services should, however, be made as simple and obvious to end-users as possible.

Again, summarising the implications, service providers are advised to pay particular attention to the mobile specificity of their value propositions. The reason for this is that mobile specificity leads to service characteristics that are highly valued by end-users. In addition, the choices of governance form and market focus are also important determinants of the service providers’ value creation. Other dimensions of the business model also affect service attributes, but some of the attributes affected are of no or little importance to end-users’ value. Identifying such paths of influence from business model decisions through service attributes to perceived value is a key for service providers trying to develop a better understanding of their own value creation process.

The two findings having the greatest implications for further research are the importance of mobile specific value propositions, and the lack of significant paths from business model dimensions through mediating variables to perceived value.

The two findings having the greatest implications for further research are the importance of mobile specific value propositions, and the lack of significant paths from business model dimensions through mediating variables to perceived value. The first finding implies that more research should be conducted on the supply side to uncover how mobile specificity is focused in providers’ innovation processes, how customers are used in the service development process to design mobile specific propositions, what resources are required to develop such propositions, and how mobile specific service development is and should be organised.

The second finding that can be drawn from this research is that the influence of business model variables on service attributes and ultimately customer values is service category dependent. More research is needed on service categorisation. However, this project is a good start and functions well for certain aspects, for instance in differentiating between intrinsic and extrinsic attributes of services. It also identifies how value creation can be stimulated by business model choices. In this respect the studies represent important progress in business model research in general, and in mobile services business models in particular.
REFERENCES


It is in. It doesn’t matter if you need it or not, just that you have it. Fashion and the domestication of the mobile telephone among teens in Norway, Working Paper, Telenor R&D, Oslo, Norway.


Business Model Choices for Value Creation of Mobile Services, Info, 9(5), 70-85


Technology sourcing and output of established firms in a regime of encompassing technological change. Strategic Management Journal, 24, 651-666.


Northstream, 2002.


Clarifying business models: origins, present, and future of the concept. Comm. AIS, 16(1).

Skype’s disruptive potential in the telecom market: a systematic comparison of business models. Working paper, University of Lausanne, Switzerland.

Usefulness and self-expressiveness: extending TAM to explain the adoption of a mobile parking service. Presented at the 16th Electronic Commerce Conference, Bled, Slovenia, June 9-11.

An exploratory study of the relationships between mobile data services business models and customer value, Bergen, Norway. Samfunns- og næringslivsforskning as, SNF Report (13/05).

Towards a Dynamic Theory of Strategy, Strategic Management Journal, 12, 95-117


The role of standardization in innovation and diffusion of mobile broadband services: the case of South Korea. Journal of Strategic Information Systems, 14, 323-353.