

Business model choices for value creation of mobile services

Leif B. Methlie and Per E. Pedersen

Leif B. Methlie is Professor, NHH, Bergen, Norway.
Per E. Pedersen is Professor, Agder University College, Grimstad, Norway.

Abstract

Purpose – *This paper aims to explore the link between business model decisions and customer value creation for mobile services.*

Design/methodology/approach – *An empirical survey was conducted of 54 service provider professionals across six mobile services.*

Findings – *The paper reveals that there is a categorization of mobile services according to extrinsic and intrinsic effects on end-user values. Mobile specificity is found to be the most influential business model option. The research model was found to be adequate for empirical studies.*

Research limitations/implications – *This is an explorative study.*

Practical implications – *The findings of this study can be used by service providers of mobile services to choose options that improve the customer value of a service.*

Originality/value – *This paper is a new economic study of the link between a business model and performance based on end-user values. It is of value for service providers and researchers.*

Keywords *Mobile communication systems, Business planning, Service levels, Value analysis, Customer services quality*

Paper type *Research paper*

1. Introduction

Recent analyst reports suggest that open, collaborative business models are required to obtain variety in service offerings and, consequently, adoption of service platforms as well as end-user services. The reports most often refer to the Nordic experience with the so-called content provider access (CPA) models for SMS and MMS services (Strand Consult, 2001; Northstream, 2002). This open model, however, has not been equally successful in providing mobile internet services in these countries. On the other hand, closed, vertically integrated business models have been successful when mobile internet services have been introduced in other countries, as for instance, the semi-walled garden model of DoCoMo's I-mode services in Japan and the model applied by Vodafone to provide their "Live!" services. Thus, both successful and less successful business models can be found whether they are closed or open. More knowledge is therefore required on how business model choices affect service attributes and ultimately, service adoption.

Explanations of mobile service successes span from focusing specific factors, such as the lack of revenue model (Bohlin *et al.*, 2003), combining technological, strategic, and behavioral factors (Henten *et al.*, 2003; Pedersen, 2001), to general systemic models (Vesa, 2003). It is well documented that in general, the choice of specific business model options affects the intrinsic and extrinsic attributes of a product, and this further affects performance (Nicholls-Nixon and Wood, 2003; Zahra and Nielsen, 2002; Sengupta, 1998; Stuart, 2000). However, the choice between specific options and the performance effects of choosing these options under various structural conditions have been given less attention in the literature.

The purpose of this paper is to explore the relationship between business model options and performance for mobile services. Academic research on business models has provided conceptual frameworks that allow describing the business logic of a specific firm, and taxonomies for classifying types of business models. Very few empirical studies of performance implications of business model choices are documented. Malone *et al.* (2006) conducted a large-scale empirical study relating business performance to a business model taxonomy consisting of 16 business types, and Amit and Zott (2001) looked at how a model of e-business value drivers affects performance. Both these studies estimate performance by financial measures. In innovative markets like mobile services, however, performance is best understood as the customer value perceived by end-users. Customer value is here defined as the benefits perceived by the user exceeding the cost to acquire the service, also known as the consumer surplus. It is determined by the attributes of the service offered. Thus, for an individual firm the question is to choose business model options that affect the service attributes in order to maximize the customer value of the offering. In the next section, we review recent literature and empirical studies on business models for mobile services, and on mobile service attributes. In section 3, a model of the relationship between business model options and service attributes is presented, and a set of hypotheses is put forward. The hypotheses are tested in an empirical study of 54 service provider professionals' perceptions of the relationship between business model choices and service attributes for six different services. The results are reported in section 5, and implications for industry and research are discussed in section 6.

2. Theory

The term "business model" has been used to describe new ways of doing business, particularly in traditional electronic commerce. While the term is extensively used, there is no widely agreed-upon definition of what constitute this concept. An early definition was given by Timmers (1998) who defines what a business model is while other researchers (Weill and Vitale, 2001; Amit and Zott, 2001) in addition define what elements are to be found in a business model. Methlie and Pedersen (2002) included three operational dimensions in their business model concept: integration (horizontal and vertical), collaboration, and revenues. A thorough review of the literature on the ontology of business models has been made by Ostewalder *et al.* (2005). They propose an e-business framework with four dimensions (pillars): the products and services a firm offers, the customer segments and relationship, the infrastructure and network of partners, and the financial aspects. Recently, several authors have applied the business model concept to mobile commerce and mobile data services (Campanovo and Pigneur, 2003; Faber *et al.*, 2003; Bouwman, 2003). With some variations these authors end up with the same four dimensions as Ostewalder *et al.* (2005). Most of the research referred above is descriptive on conceptual frameworks. Little is done on econometrics of business models. We are aware of only two econometric studies that links business models to performance (Amit and Zott, 2001; Malone *et al.*, 2006).

In this paper we define a research model that links business model choices to service attributes in order to estimate the customer values of mobile services. In our discussion we define a business model as consisting of three dimensions:

1. *Service strategy*. This includes service value proposition corresponding to the positioning option often used in the marketing literature (e.g. Ghosh 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. We suggest two options: mobile-specificity (uniqueness) and proposition breadth (scope). For the market focus options, we apply the focused versus undifferentiated options suggested by Porter (1985).
2. *Governance form*. This refers to the ways in which flows of information, resources and goods are controlled by the parties of the value-creating business network (the infrastructure). It includes the options traditionally found in new institutional economics and organization theory: market, relational, and hierarchy (e.g. Ghosh and John, 1999). However, governance form is a complex element. Relational governance, for instance,

includes so many options that it may be treated as a separate element of a provider's business model (Pedersen, 2001). In this paper, relational or market governance forms imply open access for service providers to the platform offering the ultimate service to the end-users, while a hierarchical form means that access to the service platform is closed and regulated by the platform operator. The operator controls the bundling of services.

3. *Revenue model.* This 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, and to the particular service (Gressgård and Stensaker, 2006). Here we shall differentiate between content-based and transport-based revenue models.

Service attributes of network services emerge from two different sources. Intrinsic attributes refer to the inherent attributes of the service itself, whereas extrinsic attributes emerge from networks that provide and use network services. This involves an extension of the traditional typology of intrinsic and extrinsic sources of value, and underlines how network services are different from traditional products and services where extrinsic attributes often originate from supplier services and consumer investments (Mathwick *et al.*, 2001). Intrinsic and extrinsic attributes represent the sources of value unique to network services (Lee and O'Connor, 2003).

Several intrinsic attributes characterizing mobile services have been mentioned. One of the most often mentioned characteristics is accessibility related to time and space - anytime, anywhere (Balasubramanian *et al.*, 2002; Watson *et al.*, 2002). Others suggest that "being personal" is a unique intrinsic attribute of mobile services (Doyle, 2001; Kannan *et al.*, 2001). Pedersen and Nysveen (2003) suggest usefulness as a theoretical concept determined by accessibility as well as functionality of the content of the service. Another unique intrinsic attribute found important in four studies of mobile service adoption by Nysveen *et al.* (2005a, b) is enjoyment. Intrinsic attributes of a service may also be described by technical specifications, for example related to speed and capacity. Nordman and Liljander (2003) suggest that dial-up speed and configuration settings are important for mobile service quality, another important intrinsic attribute. In addition to these three constructs, compatibility to other services on a specific platform, and innovativeness are added to the bundle of intrinsic attributes of a mobile service.

Being a network service, direct and indirect network effects are important sources of extrinsic attributes. Direct network effects are the effects related to increasing value of a service as the size of the user network increases (Liebowitz and Margolis, 1998). While network size is an important extrinsic attribute of communication services, attributes characterized 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 network 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, like premium SMS, mobile Internet access and 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 can be identified. Here we shall define three attributes: 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).

Recently, perceptions of network effects have also been given considerable attention. Studies of innovations show that adoption likelihood is sensitive to critical mass and anticipation of future network size (Shapiro and Varian, 1999; Lee and O'Connor, 2003; Montaguti *et al.*, 2002). Perceptions and anticipation of direct network effects have also recently achieved considerable attention in information systems, strategy and marketing

literature (Gallaughar and Wang, 2002; Schilling, 2003; Frels *et al.*, 2003). Most of these studies have been conducted in professional markets, suggesting that direct network effects are taken into consideration in professionals' value assessments. In consumer markets, end-users' appreciation of complementary service variety and network size may vary across user segments. For professional consumers, complementary service variety is assessed and appreciated (Frels *et al.*, 2003; Schilling, 2003). For complex or radically new network goods like mobile data services, however, the value of extrinsic attributes characterized by indirect network effects is more difficult to assess.

Network effects are typical of all communication and person-interactive mobile services and have also been used as a basis for understanding value propositions and the choice of governance forms in telecommunication networks. In their study of 125 value-added services Brousseau and Quelin (1996) found that communication services and information services were controlled by applying systematically different governance forms.

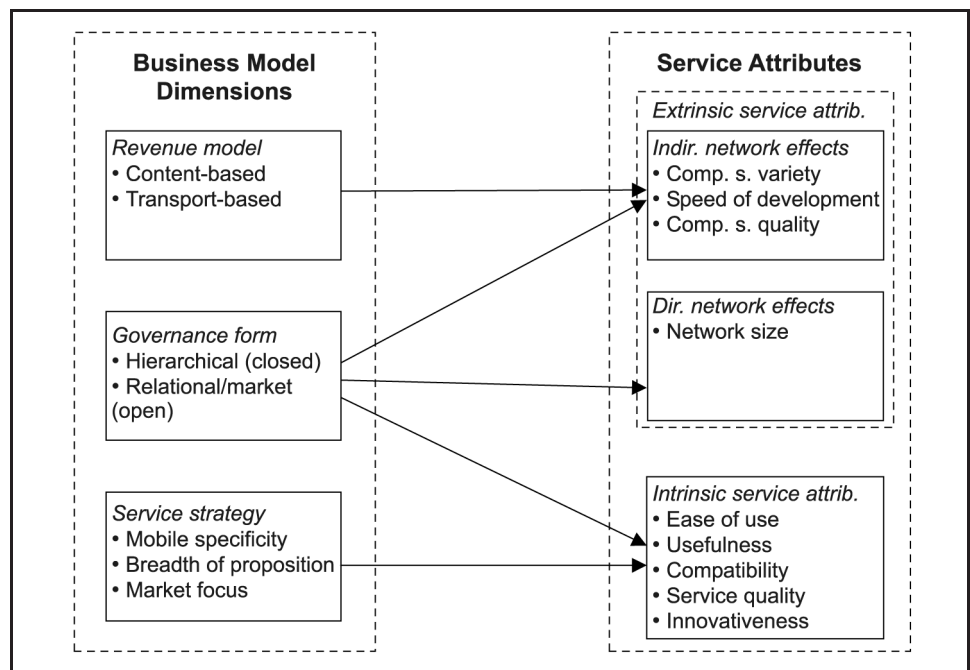
From this selective and brief review of some of the recent research on business models and service attributes in mobile service markets, we suggest a model of the relationships between options of specific business model dimensions and operationalized intrinsic and extrinsic service attributes.

3. Model and hypotheses

In the previous section, we have proposed that customer values are created by the attributes of the service offered by a service provider. The research question put forward in this paper is how choices made in the business model of a service provider affect intrinsic and extrinsic service attributes. Our research model is shown in Figure 1.

In the research model the relationships illustrate the main influences of choices of business model options on service attributes. We suggest that the content- versus transport-based revenue model primarily influence indirect network effects. Choice of a governance form influences all three of the service attribute categories, although the individual elements are affected differently. An open form, for example, is assumed to increase the complementary service variety and speed of development, while a closed form will increase complementary service quality due to better control of the content offered over the platform. The service

Figure 1 Research model



strategy will primarily influence intrinsic attributes. A more comprehensive description of the relationships in our research model is included in the discussion of the proposed hypotheses below.

The revenue model, including revenue valuation and sharing, distinguishes between content- and transport-based revenues. Content-based revenue valuation means that end-users pay per unit of the service content delivered, whereas transport-based valuation means that end-users pay for the amount of airtime online, packet charge or similar volume units. A content-based revenue share indicates that a relatively larger proportion of revenue is redistributed to content providers, whereas a transport-based revenue share indicates that a relatively larger proportion of revenue is redistributed to or retained by network infrastructure or transport providers. As the bandwidth of wireless networks increases, capacity is no longer a constrained resource that must be priced to control capacity utilization. Thus, increasing bandwidth will also increase the demand for complementary services. Customers will gain additional values by the affordable variety, quality, and speed of development of the complementary services offered. We assume that these additional values will be influenced by choice of revenue model in such a way that content-based models will outperform transport-based models. Another issue is that network or platform providers may use access costs as an instrument when regulating service providers' access to the network or platform (Rochet and Tirole, 2002; Foros *et al.*, 2002). We assume that mobile data service markets have a two-sided structure where platform or network providers recognize the need to stimulate innovation in complementary services and that revenue sharing contributes to this. Thus, we propose:

H1a-c.

Content oriented revenue models increase complementary service variety, quality and speed of development.

Literature on governance forms in network markets as well as resource-based theory suggest that complementary service variety and diversity is better obtained using open forms of collaboration (e.g. Schilling, 2003). Zahra and Nielsen (2002) found that relational forms increase development speed. In addition, when involvement and formal coordination are included as moderators, market forms of governance also increase development speed. Service quality on the other hand, may come out of the service integrator's control, or service quality may not be related to perceived quality elements when governance is left to market or relational forms (Dyer and Singh, 1998; Ghosh and John, 1999, p. 137). Thus, we propose:

H2a-b. Relational and market governance forms increase complementary service variety and speed of development.

H2c. Hierarchical governance forms increase complementary service quality.

Governance form is also expected to influence network size and strength. For example, Frels *et al.* (2003) found that professional consumers in business markets are able to assess the direct network effects generated by the strength of the user network of operating systems. Gallagher and Wang (2002) suggested that mindshare is an important proxy used by professional consumers to assess future direct and indirect network effects. Mobile services may, however, differ from operating systems in the relationship between governance form and network size and strength in three ways. First, many mobile services are communication services where the value of network size and strength are dependent of the potential number of communication partners. Second, mobile data services are new services where critical mass and competition between platforms rather than within platforms are still relevant. Finally, mobile data services extend the offerings of existing mobile service providers. When providing mobile data services, providers may utilize their current installed base and use hierarchical governance forms as a momentum for creating value through direct network effects. Thus, for mobile data services, we propose:

H3a. Hierarchical governance forms increase end-user network size.

Governance form is also expected to influence intrinsic attributes. The product innovation literature suggests that innovativeness is promoted both in the complements and platform markets through the use of relational and market governance forms. Also, a study by Srinivasan *et al.* (2002) found that a hierarchy culture is negatively related to technological opportunism whereas an adhocracy culture is positively related to technological opportunism. Because these culture forms are derived from governance forms, the findings support the following hypothesis:

H4a-b. Relational and market forms of governance enable providers to offer more innovative, useful services.

On the other hand, relying on relational and market forms of governance may make service providers lose control of the production and distribution process of their service. Furthermore, compatibility and intrinsic quality may not be obtained by relying on standards that may be interpreted differently by partners of a collaborative value network under relational and market forms of governance. For example, Sahay and Riley (2003) found that vertical integration leads to increasing focus on customer interface standards, but they found no support for their hypothesis that vertical integration leads to less focus on compatibility standards. Thus, based on transaction cost theory, we suggest:

H5a-c. Hierarchical governance forms increase the ease of use, compatibility and intrinsic quality of services.

We suggest that the potential for creating higher value among end-users is greater when the service offerings are mobile specific. This means that the services are designed to meet the unique gratifications expected from mobile services. In section 2 we suggested accessibility with respect to time and space and personalization to be among these gratifications. Mobile specific value propositions including these gratifications are likely to result in services perceived as being more useful, easier to use and of better service quality than value propositions that do not. Value propositions that are mobile specific often include service functionality that may only be accessed using a mobile terminal, and differentiate mobile specific service offerings from services that may be accessed using a diversity of access terminals. We propose that the greater value of mobile specific value propositions will be reflected in the perceived usefulness, ease of use, and quality of the mobile service. Consequently, we propose:

H6a-c. Mobile-specific value propositions increase ease of use, usefulness and intrinsic service quality.

Mobile specificity may require a focused service strategy, but research also shows that a multitude of gratifications are expected from mobile data services (Leung and Wei, 2000; Nysveen *et al.*, 2005b). However, trying to fulfill a multitude of gratifications may result in more complex services with little mobile specific usefulness or low service quality. Thus, we suggest:

H7a-c. Value propositions with greater breadth reduce ease of use, usefulness and intrinsic service quality.

All hypotheses on the relationship between business model dimensions and service attributes have been formulated as direct relationships. However, it is likely that these relationships are moderated by service categories implying that the choice of a business model that may be optimal for one service category may not be optimal for all categories. For example, Brousseau and Quelin (1996) found that an information-intensive service is based on its intrinsic quality when there are no network externalities. Since intrinsic quality is so important to the customer value of this service category, Brousseau and Quelin (1996) suggest a hierarchical governance form should be chosen to ensure the quality of services that are not characterized by network effects. In this paper, however, we have decided not to propose specific hypotheses on how relationships between business model choices and

service attributes are moderated by service category, and suggest investigating these moderated relationships as exploratory research questions.

The model is based on rationalistic assumptions suggesting that end-users adopt mobile data services because of high perceived and anticipated values. Value perceptions reflect the value assessments that are made from current intrinsic and extrinsic service attributes whereas anticipated value reflects expectations of further development of these attributes. In this paper value assessments are made by the service providers on service attributes.

4. Method

To test the hypotheses, a research design was developed including six services and 54 subjects. The subjects were recruited among service provider professionals of the two leading Norwegian carriers and among other leading providers of mobile data services in Norway. The subjects were recruited based on their knowledge of the applied business models of the mobile data services selected for this study. Three categories containing two services each were chosen. These categories were presumed to differ in how intrinsic and extrinsic attributes contribute to perceived value, and thus, according to our hypotheses – in variations in business model choices. For typical communication services such as person to person MMS and SMS chat services customer value was presumed to be particularly influenced by direct network effects related to network size, whereas for services such as MMS content services and POS payment services customer value was presumed to be particularly influenced by indirect network effects related to service complementarity. Finally, the for services such as Java games and cash card charging services customer value was presumed to be particularly influenced by intrinsic attributes, that is, attributes contained in the service itself, such as ease of use, usefulness, and service quality.

A questionnaire was designed and distributed by mail to the subjects agreeing to participate. It included measurement scales for the 15 operational constructs included in the model of section 3. In addition, the questionnaire included measures used to control the respondents' abilities to assign the individual services to the a priori defined service categories presented above. The extent to which respondents consider direct network effect as characteristic for the value of the services was measured with acceptable reliability and validity ($\alpha = 0.81$) with two items collected from the measure of direct network effects used by Sahay and Riley (2003). For indirect network effects ($\alpha = 0.91$), items were adapted from the same study by Sahay and Riley (2003). To measure to which extent intrinsic attributes ($\alpha = 0.74$) were characteristic of the value of the services, two items were defined. These items reflect the perceptions of the importance of the "service itself" relative to the importance of the direct and indirect network effects in creating service value.

As illustrated in Table I, manipulation checks showed that our subjects perceived the six services as belonging to our three a priori service categories.

The 15 operational constructs of the model illustrated in Figure 1 was measured as follows: The measure of the content versus transport orientation of the revenue model ($\alpha = 0.68$) included two items focusing content versus transport related revenue sources using revenue and price as the reflective terms of the scale. In addition, an item was designed focusing content- versus transport-based revenue sharing (Bouwman, 2003).

Heide (1994) suggests governance forms are second order forms that must be identified through underlying mechanisms and processes. He applied a process view focusing on relationship initiation, maintenance and termination. Two items in our governance form scale ($\alpha = 0.61$) were adapted from his relationship maintenance dimensions. Hierarchical versus relational or market oriented elements are taken from the role specification, the manner in which decisions and functions are assigned to the partners in a relationship, and from the monitoring or control procedures. The final item was an adaptation of one of the most widely applied items of a scale measuring relational governance developed by Boyle *et al.* (1992).

Nysveen *et al.* (2005a, b) suggest three characteristics typical of mobile-specific value propositions. These characteristics may be used to develop formative scales measuring mobile specificity in the same way as has been attempted for mobile-specific service quality

Table I Analysis of variance, manipulation check variables

Variable	Group	n	Mean	St. dev.	F	Sig.
Direct network effects	MMS person to person and SMS chat service	16	4.19	0.73	7.79	0.00
	MMS content and POS payment service	18	3.42	0.90		
	Java games and cash card charging service	20	2.85	1.27		
	Total	54	3.44	1.13		
Indirect network effects	MMS person to person and SMS chat service	16	3.50	0.97	3.74	0.03
	MMS content and POS payment service	18	3.92	0.67		
	Java games and cash card charging service	20	3.00	1.32		
	Total	54	3.45	1.09		
Intrinsic attributes	MMS person to person and SMS chat service	16	2.75	0.97	7.28	0.00
	MMS content and POS payment service	18	3.44	0.84		
	Java games and cash card charging service	20	3.93	0.95		
	Total	54	3.42	1.02		

(Nordman and Liljander, 2003). However, we choose to use a reflective scale ($\alpha = 0.85$) designed from these characteristics without explicitly including descriptions of these unique characterizations in the items. Instead, the items included components like “unique characteristics of mobile services”, “can only be successful if deployed as a mobile service”, and “the service is unique because it uses the mobile as its platform”. The main reasons for applying reflective measures were to allow the scales to be used in structural analyses and to design additive scales with acceptable distribution characteristics and validity. Consequently, reflective scales have been designed for all constructs.

To measure breadth of the value proposition ($\alpha = 0.84$) we applied one of the differentiation items used by Nayyar (1993), and adapted from this item we designed an additional item with a slight variation in wording. Furthermore, one of the items measuring breadth of the product range (Nayyar, 1993) was used, and again, an additional item with slight variation in the wording was designed as a fourth indicator.

The market focus concept is based on one of Porter’s dimensions of competitive strategy – focused versus undifferentiated market strategy (Porter, 1985). Our scale ($\alpha = 0.75$) used a generic item tapping this dimension that has been used by several other authors with good results (e.g. Slater and Narver, 1994). In addition, two items from Nayyar (1993) designed to measure segmented or focused market strategy were adapted to our setting and used as two additional reflective items. Finally, a reversed item covering broad market strategy was adapted from Slater and Olson (2000).

A measure very similar to the reflective measure of Cronin *et al.* (2000) was developed for both intrinsic service quality ($\alpha = 0.85$) and complementary service quality ($\alpha = 0.94$). The items were designed as three bipolar adjectives covering reflective dimensions of service quality. Our measure of complementary service variety ($\alpha = 0.82$) was adapted from the measure of the size of the complements network used by Frels *et al.* (2003) with good results. However, our measure focuses somewhat more directly on complementary service variety. It was designed with three items reflecting the dimensions of complementarity as consisting of “other services”, “different services” and a “variety of services” partly adapted from Shankar and Bayus (2002). Authors have also studied the increase in available complementary services and products as a function of an increase in the sales of the platform product (Sahay and Riley, 2003). We consider these elements as a related to the

speed of development in complementary services. Reframing one of the items used by Sahay and Riley (2003), and adding and adapting two items related to the current and future expectations of the increase in availability of complementary services from Frels *et al.* (2003), we designed a reflective measure ($\alpha = 0.86$) of speed of development in complementary services.

Shankar and Bayus (2002) suggest that direct network effects are a function of network size defined as the installed base and network strength, which is defined as the marginal impact of a unit increase in network size on demand. Focusing network size only here, our measure of network size ($\alpha = 0.75$) was based on similar ideas and included two items reflecting perceived size of the user base. Similar items have been used by, e.g. Frels *et al.* (2003).

Usefulness was measured ($\alpha = 0.84$) using three items covering the original dimensions of time saving, improvement and usefulness suggested by Davis (1989). Ease of use was measured ($\alpha = 0.86$) by four items developed from the original items of Davis *et al.* (1989) and adapted to our context. Compatibility (Rogers, 1995) has been investigated in numerous studies of technology adoption (Moore and Benbasat, 1991; Chin and Gopal, 1995). Our measure ($\alpha = 0.57$) was based on adapting the items of Moore and Benbasat (1991) to the mobile context of our services. The innovativeness measure ($\alpha = 0.89$) was designed with three reflective components collected from the product innovativeness literature (innovativeness (Garcia and Calantone, 2002), radicalness (Srinivasan *et al.*, 2002) and newness (Olson *et al.*, 1995), and was presented to the subjects through bipolar adjectives. All scales except compatibility showed reliability acceptable in exploratory research (Hair *et al.*, 1998). The compatibility scale was used in a replicated study using customers as units of observation. The results from this replication showed a reliability of the compatibility scale of $\alpha = 0.70$. Because of the exploratory nature of the study and the convergence and discriminant validity resulting from a factor analysis of the items, we choose to retain the two-item compatibility scale. The wording of all items used in the scales was originally in Norwegian. A translated version of the wording of all items is shown in Tables II and III.

Table II Items

<i>Item statement – independent variables</i>	<i>Scale</i>
The price paid for using “service” is more related to the costs of its content than the costs of network and transport provision The revenue from “service” is generated more from its content than from its network and transport provision A larger share of the revenue generated from “service” is redistributed to content providers than to network and transport providers	Revenue model type
To facilitate open collaboration on providing “service”, few pre-specified functional requirements must be met by our “service” partners Our relationship with partners in offering “service” is better characterized by mutual and open collaboration than by administrative control The contracts with our partners in offering “service” are simple and informal	Governance form
“Service” is a type of service utilizing what is believed to be unique to the mobile phone as a service platform Most of the attributes of “service” can only be realized because it uses the mobile phone as its platform “Service” is special because it based on the unique attributes of the mobile phone	Mobile specificity of value proposition
“Service” is offered to cover one or a small number of the needs of our customers “Service” is part of a broad range of service offerings A variety of needs may be covered by our offerings based on this “service” A variety of features makes “Service” cover a large number of our customers’ needs	Breadth of value proposition
It is important to competitive strategy that the market serviced by “service” is segmented “Service” is offered with features differentiated for each market segment “Service” is offered to cover the needs of customers in one or some particular market “Service” has a broad market appeal	Market focus

Table III Items

<i>Item statement – dependent variables</i>	<i>Scale</i>
Using “service” makes me save time Using “service” improves my efficiency “Service” is useful to me	Usefulness
Learning to use “service” is easy to me It is easy to make “service” do what I want it to My interaction with “service” is clear and understandable It is easy to use “service”	Ease of use
Using “service is compatible with all aspects of my mobile service use “Service” is completely compatible across all my mobile service providers	Compatibility
Low quality/high quality Low standard/high standard Unsatisfactory/highly satisfactory	Intrinsic service quality
Traditional/different Like previous services/radically new Less innovative/innovative	Innovativeness
Today, this “service” is used by a large number of users I know of A large number of users, also beyond those I know of, use “service”	Network size
Using “service” there is a great deal of “complementary services” available “Service” has a large amount of “complementary services” available One of the unique attributes of “service” is the great variety of “complementary services” available	Complementary service variety
The number of “complementary services” has increased considerably the past year The number of other “services” that this “service” can be used together with has been increasing fast recently I expect the number of “complementary services” to increase considerably the next six months	Speed of development
Low quality/high quality Low standard/high standard Unsatisfactory/highly satisfactory	Complementary service quality

Because most of the items used to measure service attributes have been used before, we assume their construct validity to be acceptable. The business model option scales, however, were designed for this study in particular, and further analysis of validity was required. The results of an exploratory factor analysis of these scales proved to be consistent with the hypothesized structure of items. The results are shown in Table IV.

The analysis in Table IV demonstrates that the business model option scales show acceptable convergence and discriminant validity. Thus, our measures may be used for further tests of the proposed hypotheses.

5. Results

All hypotheses were tested applying regression analysis, including all the business model option variables and one dependent variable for each analysis. Both independent and dependent variables were included in the corresponding regressions as the additive scales presented in section 4. Intercorrelations among business model option variables showed that multicollinearity was not a problem. To simplify presentation of the results from these analyses, Table V shows the standardized regression coefficients for each of the independent variables in each of the regression analyses using service attributes as the dependent variables. The hypotheses related to each of the analyses, the explained variance of the individual models, and the levels of significance in tests of the hypotheses are also indicated.

As seen from Table V, explained variances are generally low. However, for speed of development, complementary service quality, usefulness and innovativeness, the model seem to provide acceptable explanatory power. Furthermore, we find that revenue model only directly influences speed of development. This finding is in the opposite direction of that

Table IV Factor analysis, business model option scales

	Components				
	1	2	3	4	5
Revenue model 1	0.048	-0.123	-0.118	<i>0.766</i>	0.022
Revenue model 2	-0.142	-0.106	-0.034	<i>0.810</i>	-0.030
Revenue model 3	-0.079	0.168	0.101	<i>0.637</i>	-0.063
Governance form 1	0.143	-0.161	-0.116	-0.328	<i>0.671</i>
Governance form 2	0.062	-0.307	-0.091	-0.043	<i>0.738</i>
Governance form 3	-0.216	0.092	0.018	0.185	<i>0.743</i>
Mobile specificity 1	0.126	<i>0.836</i>	0.149	0.077	-0.024
Mobile specificity 2	0.218	<i>0.779</i>	0.051	0.055	-0.261
Mobile specificity 3	0.089	<i>0.889</i>	0.018	-0.217	-0.082
Breadth 1	<i>0.700</i>	-0.371	-0.035	-0.335	-0.047
Breadth 2	<i>0.882</i>	0.192	-0.029	-0.054	-0.107
Breadth 3	<i>0.881</i>	0.197	0.050	-0.067	0.159
Breadth 4	<i>0.806</i>	0.183	-0.035	0.064	-0.048
Market focus 1	-0.045	0.097	<i>0.579</i>	-0.331	0.002
Market focus 2	-0.143	0.138	<i>0.875</i>	0.154	-0.160
Market focus 3	0.072	0.257	<i>0.831</i>	0.006	-0.153
Market focus 5	0.081	-0.365	<i>0.674</i>	0.034	0.133

Note: Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization. Values above 0.4 are italicized. Eigenvalues (% of variance): 3.61 (21.2), 2.99 (17.6), 2.12 (12.5), 1.73 (10.2) and 1.36 (8.0)

Table V Results of regression analyses

Dependent	Hypothesis	R ²	Rev. mod. type	Business model options			
				Gov. form	Mobile specificity	Breadth	Market focus
Comp. s. variety	H1a, H2a	0.04	0.04	0.01	-0.06	0.23	0.11
Speed of dev.	H1b, H2b	0.24	-0.2*	0.03	-0.54***	0.06	0.1
Comp. s. quality	H1c, H2c	0.14	-0.06 ^a	0.04	0.27*	0.14	0.32**
Network size	H3a	0.08	0.03	-0.02	0.23	0.26*	0.07
Ease of use	H5a, H6a, H7a	0.01	0.03	-0.01	0.23	-0.22 ^a	0.06
Usefulness	H4b, H6b, H7b	0.19	0.19	0.28**	0.48***	-0.03	0.14
Compatibility	H5b	0.02	0.17	0.03	0.05	-0.12	-0.2
Intrinsic service quality	H5c, H6c, H7c	0.06	0.15	0.15 ^a	0.29**	-0.25*	-0.15
Innovativeness	H4a	0.27	-0.07	0.11	0.52***	0.09	0.18

Notes: *, ** and *** indicate significance at $p < 0.10$, $p < 0.05$ and $p < 0.01$ levels, respectively; ^a indicates that significance is found for the interaction term of the corresponding business model option variable and service category

proposed in H1c. We find that governance form significantly influences service usefulness, supporting H4b. Furthermore, the mobile specific value proposition is the most influential business model option affecting speed of development negatively, and complementary service quality, usefulness, intrinsic service quality, and innovativeness positively. These findings support five relationships of which only two were hypothesized (H6b and H6c). Breadth of value proposition influences network size positively and service quality negatively, supporting H7c. Finally, market focus influences complementary service quality, but this relationship was not hypothesized. Consequently, only four of the 19 formulated hypotheses were supported.

We proposed that moderated relationships between business model options and service attributes may be investigated as exploratory research questions. These research questions were explored applying analysis of covariance including interaction terms of business model option variables and service category. The analyses revealed additional support for H1b, H5c, and H6a. Thus, when controlling for service category, content orientation of the revenue model influences complementary service quality ($F = 2.61$, $df = 2$, $p = 0.08$), relational orientation of the governance form influences intrinsic service quality ($F = 5.18$, $df = 2$, $p < 0.01$), and mobile specificity influences ease of use ($F = 3.36$, $df = 2$,

$p < 0.05$). Thus, either moderated or universal support was found for seven of the 19 hypotheses. Due to variation in explanatory power all significant findings should be interpreted with care. In particular this is the case for the significant findings of the determinants of intrinsic service quality.

In an exploratory investigation of this kind, both supportive and unsupportive findings are of interest, and our findings may be summarized in the following conclusions: First, it is possible to categorize mobile data services according to the importance of direct network effects, indirect network effects and intrinsic attributes in creating customer value. Service provider professionals' categorization of services corresponded well with this proposed a priori categorization scheme. Second, the business model options suggested and investigated here seem to explain only a minor part of the variation in service attributes. Thus, variation in service provider professionals' perception of service attributes not explained here may stem from other sources, such as structural determinants or horizontal forms of governance (horizontal collaboration). Third, mobile specificity is by far the business model option investigated here with the greatest effect on service attributes. Fourth, governance form does not seem to consistently influence extrinsic attributes, but mainly has an effect on intrinsic attributes, in particular on service usefulness and quality. Finally, the relationships between business model options and service attributes seem to be moderated by service category, suggesting that optimal business model choices may vary across service categories.

6. Implications

In this paper, we have taken the first step toward a systematic study of how business model options effect service attributes, and thus customer value. We define these options on a business model concept that aligns with recent conceptualizations found in the business model literature (see Ostewalder *et al.*, 2005). Furthermore, operationalization of the options is aligned with earlier research in economics and management. Our findings have implications for industry professionals and decision makers. The fact that service providers classify services in categories corresponding to the importance of intrinsic versus extrinsic sources of customer value suggests that they pay attention to network effects during business model design. However, they do not seem to agree on how business model decisions influence service attributes. On this issue, further research is required. In particular, studies based on industrial data of business model dimensions and customer data on service attributes may be used to clarify which of the relationships we have identified are valid and which are false. Still, service provider professionals seem to agree on the importance of the mobile specificity dimension, and partly, on the importance of governance form. Of these two, more attention should be paid to the mobile specificity dimension. Further analysis of our demand side data shows that currently, end-users seem to lack the knowledge or experience required to assess the value of extrinsic attributes of mobile data services. Thus, they pay most attention to intrinsic attributes in their value assessments. Mobile specificity is the most important business model dimension influencing intrinsic attributes, and consequently, service providers should pay most attention to developing and offering services with gratifications that are mobile specific, such as accessibility, personalization and information dissemination (Nysveen *et al.*, 2005a, b). Business model dimensions also seem to affect service attributes differently for different service categories. Thus, one may not be able to identify universally successful business models. It seems that the position taken in the introduction to this paper, that open business models are more successful for some services under some structural conditions and closed models are more successful for other services under other structural conditions, is correct. Even though structural conditions have not been investigated here, the proposed research model provides a basis for discussing conditions for successful business models of different categories of mobile services.

Even though this study is exploratory, and further research is required, the conclusions are promising when it comes to conducting more confirmatory research on the issues raised. First, our research model may be used as a basis for further explorations of the relationship between providers' choice of business model and customers' perception of service value.

Also, the measures developed here, and our principles for categorizing services, may be used in more formal approaches and broader surveys. Finally, the findings suggest that investigating the effects of business model options on performance provides fruitful avenues for further empirical research on value creation in mobile data services.

References

- Amit, R. and Zott, C. (2001), "Value creation in e-business", *Strategic Management Journal*, Vol. 22 No. 3, pp. 493-520.
- Balasubramanian, S., Peterson, R.A. and Jarvenpaa, S.L. (2002), "Exploring the implications of m-commerce for markets and marketing", *Journal of the Academy of Marketing Science*, Vol. 30 No. 4, pp. 348-61.
- Basu, A., Mazumdar, T. and Raj, S.P. (2003), "Indirect network effects on product attributes", *Marketing Science*, Vol. 22 No. 2, pp. 209-21.
- Bohlin, E., Bjorkdahl, J. and Lindmark, S. (2003), "Strategies for making mobile communications work for europe: implications from a comparative study", paper presented at the European Ploci Research Conference (EuroCPR), Barcelona, March 23-25.
- Bouwman, H. (2003), "Designing metrics for business models describing mobile services delivered by networked organizations", paper presented at the 16th Bled Electronic Commerce Conference, Bled, June 9-11.
- Boyle, B., Dwyer, F.R., Robichaux, R.A. and Simpson, J.T. (1992), "Influence strategies in marketing channels – measures and use in different relationship structures", *Journal of Marketing Research*, Vol. 29 No. 4, pp. 462-73.
- Brousseau, E. and Quelin, . (1996), "Asset specificity and organizational arrangements: the case of the new telecommunications services markets", *Industrial and Corporate Change*, Vol. 5 No. 4, pp. 1205-30.
- Brynjolfsson, E. and Kemerer, C.F. (1996), "Network externalities in microcomputer software: an econometric analysis of the spreadsheet market", *Management Science*, Vol. 42 No. 12, pp. 1627-47.
- Campanovo, G. and Pigneur, Y. (2003), "Business model analysis applied to mobile business", paper presented at the 5th International Conference on Enterprise Information Systems, Angers, April 23-26.
- Chin, W.W. and Gopal, A. (1995), "Adoption intention in GSS – relative importance of beliefs", *Data Base for Advances in Information Systems*, Vol. 26 No. 2 and 3, pp. 42-64.
- Cronin, J.J., Brady, M.K. and Hult, G.T.M. (2000), "Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments", *Journal of Retailing*, Vol. 76 No. 2, pp. 193-218.
- Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-40.
- Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", *Management Science*, Vol. 35 No. 8, pp. 982-1002.
- Doyle, S. (2001), "Software review: using short message services as a marketing tool", *Journal of Database Marketing*, Vol. 8 No. 3, pp. 273-7.
- Dyer, J.H. and Singh, H. (1998), "The relational view: cooperative strategy and sources of interorganizational competitive advantage", *Academy of Management Review*, Vol. 23 No. 4, pp. 660-79.
- Faber, E., Ballon, P., Bouwman, H., Haaker, T., Rietkerk, O. and Stern, M. (2003), "Designing business models for mobile ICT services", paper presented at the 16th Bled Electronic Commerce Conference, Bled, June 9-11.
- Foros, Ø., Kind, H.J. and Sørsgard, L. (2002), "Access pricing, quality degradation, and foreclosure in the internet", *Journal of Regulatory Economics*, Vol. 22 No. 1, pp. 59-83.
- Frels, J.K., Shervani, T. and Srivastava, R.K. (2003), "The integrated networks model: explaining resource allocations in network markets", *Journal of Marketing*, Vol. 67 No. 1, pp. 29-45.
- Gallaughier, J.M. and Wang, Y.M. (2002), "Understanding network effects in software markets: evidence from web server pricing", *MIS Quarterly*, Vol. 26 No. 4, pp. 303-27.

- Gandal, N., Kende, M. and Rob, R. (2000), "The dynamics of technological adoption in hardware/software systems: the case of compact disc players", *RAND Journal of Economics*, Vol. 31 No. 1, pp. 43-61.
- Garcia, R. and Calantone, R. (2002), "A critical look at technological innovation typology and innovativeness terminology: a literature review", *Journal of Product Innovation Management*, Vol. 19 No. 2, pp. 110-32.
- Ghosh, M. and John, G. (1999), "Governance value analysis and marketing strategy", *Journal of Marketing*, Vol. 63, pp. 131-45.
- Gressgård, L.J. and Stensaker, I. (2006), "The mobile service industry: strategic challenges and future business models", *International Journal of Mobile Communications*, Vol. 4 No. 5, pp. 509-31.
- Gupta, S., Jain, D.C. and Sawhney, M.B. (1999), "Modeling the evolution of markets with indirect network externalities: an application to digital television", *Marketing Science*, Vol. 18 No. 3, pp. 396-416.
- Hair, J.F., Anderson, R.E., Black, W.C. and Tatham, R.L. (1998), *Multivariate Data Analysis*, Prentice-Hall, New York, NY.
- Heide, J.B. (1994), "Interorganizational governance in marketing channels", *Journal of Marketing*, Vol. 58, January, pp. 71-86.
- Henten, A., Olesen, H., Saugstrup, D. and Tan, S.E. (2003), "New mobile systems and services in Europe, Japan and South-Korea", paper presented at the Stockholm Mobility Roundtable, Stockholm, May 22-23.
- Kannan, P.K., Mei Chang, A.-M. and Whinston, A.B. (2001), "Wireless commerce: marketing issues and possibilities", *Proceedings of the 34th Hawaii International Conference on System Sciences*, pp. 1-6.
- Lee, Y. and O'Connor, G.C. (2003), "New product launch strategy for network effects products", *Journal of the Academy of Marketing Science*, Vol. 31 No. 3, pp. 241-55.
- Leung, L. and Wei, R. (2000), "More than just talk on the move: uses and gratifications of the cellular phone", *Journalism & Mass Communication Quarterly*, Vol. 77 No. 2, pp. 308-20.
- Liebowitz, S. and Margolis, S. (1998), "Network externality", *The New Palgrave Dictionary of Economics and the Law*, Macmillan, London.
- Malone, T.W., Weill, P., Lai, R.K., D'Urso, V.T., Herman, G., Apel, T.G. and Woerner, S. (2006), "Do some business models perform better than others", MIT Sloan Working Paper 4615-06, MIT Sloan School of Management, Cambridge, MA.
- Mathwick, C., Malhotra, N. and Rigdon, E. (2001), "Experiential value: conceptualization, measurement and application in the catalog and internet shopping environment", *Journal of Retailing*, Vol. 77 No. 1, pp. 39-56.
- Methlie, L.B. and Pedersen, P.E. (2002), "A taxonomy of intermediary integration strategies in online markets", paper presented at the 15th Bled Electronic Commerce Conference, Bled, June 17-19.
- Montaguti, E., Kuester, S. and Robertson, T.S. (2002), "Entry strategy for radical product innovations: a conceptual model and propositional inventory", *International Journal of Research in Marketing*, Vol. 19 No. 1, pp. 21-42.
- Moore, G.C. and Benbasat, I. (1991), "Development of an instrument to measure the perceptions of adopting an information technology innovation", *Information Systems Research*, Vol. 2 No. 3, pp. 192-223.
- Nayyar, P.R. (1993), "On the measurement of competitive strategy – evidence from a large United States firm", *Academy of Management Journal*, Vol. 36 No. 6, pp. 1652-69.
- Nicholls-Nixon, C.L. and Wood, C. (2003), "Technology sourcing and output of established firms in a regime of encompassing technological change", *Strategic Management Journal*, Vol. 24 No. 7, pp. 651-66.
- Nordman, J. and Liljander, V. (2003), "Mobile service quality – a study of contributing factors", working paper, Marketing Department, Hanken Swedish School of Economics and Business Administration, Helsinki.
- Northstream (2002), *Den norska SMS-marknaden. Analyst Report*, Northstream AB, Stockholm (in Swedish).

- Nysveen, H., Pedersen, P.E. and Thorbjørnsen, H. (2005a), "Intentions to use mobile services: antecedents and cross-service comparisons", *Journal of the Academy of Marketing Science*, Vol. 33 No. 3, pp. 1-17.
- Nysveen, H., Pedersen, P.E., Thorbjørnsen, H. and Berthon, P. (2005b), "Mobilizing the brand: the effect of mobile services on brand relationships and main channel use", *Journal of Service Research*, Vol. 7 No. 3, pp. 257-76.
- Ostewalder, A., Pigneur, Y. and Tucci, C.L. (2005), "Clarifying business models: origins, present, and future of the concept", *Communication of the Association for Information Systems*, Vol. 15, May, pp. 2-40.
- Olson, E.M., Walker, O.C. and Reukert, R.W. (1995), "Organizing for effective new product development – the moderating role of product innovativeness", *Journal of Marketing*, Vol. 59 No. 1, pp. 48-62.
- Pedersen, P.E. (2001), "An adoption framework for mobile commerce", in Schmid, B., Stanoevska-Slabeva, K. and Tschammer, V. (Eds), *Towards the E-society*, Kluwer Academic Publishers, Boston, MA, pp. 643-56.
- Pedersen, P.E. and Nysveen, H. (2003), "Usefulness and self-expressiveness: extending TAM to explain the adoption of a mobile parking service", paper presented at the 16th Electronic Commerce Conference, Bled, June 9-11.
- Porter, M.E. (1985), *Competitive Advantage: Creating and Sustaining Superior Performance*, The Free Press, New York, NY.
- Rochet, J.C. and Tirole, J. (2002), "Cooperation among competitors: some economics of payment card associations", *RAND Journal of Economics*, Vol. 33 No. 4, pp. 549-70.
- Rogers, E.M. (1995), *Diffusion of Innovations*, 4th ed., The Free Press, New York, NY.
- Sahay, A. and Riley, D. (2003), "The role of resource access, market considerations, and the nature of innovation in the pursuit of standards in the new product development process", *Journal of Product Innovation Management*, Vol. 20 No. 5, pp. 338-55.
- Schilling, M.A. (2003), "Technological leapfrogging: lessons from the US video game console industry", *California Management Review*, Vol. 45 No. 1, pp. 6-32.
- Sengupta, S. (1998), "Some approaches to complementary product strategy", *Journal of Product Innovation Management*, Vol. 15 No. 4, pp. 352-67.
- Shapiro, C. and Varian, H.R. (1999), *Information Rules: A Strategic Guide to the Network Economy*, Harvard Business School Press, Boston, MA.
- Shankar, V. and Bayus, B.L. (2002), "Network effects and competition. an empirical analysis of the home video game industry", *Strategic Management Journal*, Vol. 24, pp. 375-84.
- Slater, S.F. and Narver, J.C. (1994), "Does competitive environment moderate the market orientation – performance relationship", *Journal of Marketing*, Vol. 58 No. 1, pp. 46-55.
- Slater, S.F. and Olson, E.M. (2000), "Strategy type and performance: the influence of sales force management", *Strategic Management Journal*, Vol. 21, pp. 813-29.
- Srinivasan, R., Lillien, G. and Rangaswamy, A. (2002), "Technological opportunism and radical technology adoption: an application to e-business", *Journal of Marketing*, Vol. 66 No. 3, pp. 47-60.
- Strand Consult (2001), *Show Me the Money: Revenue Models on the Mobile Internet. Analyst Report*, Strand Consult, Copenhagen.
- Stuart, T.E. (2000), "Interorganizational alliances and the performance of firms: a study of growth and innovation rates in a high-technology industry", *Strategic Management Journal*, Vol. 21 No. 8, pp. 791-811.
- Timmers, P. (1998), "Business models for e-commerce", *Electronic Markets*, Vol. 8 No. 2, pp. 3-7.
- Vesa, J. (2003), "The impact of industry structure, product architecture, and ecosystems on the success of mobile data services: a comparison between European and Japanese markets", paper presented at ITS 14th European Regional Conference, Helsinki, Finland, August 23-24.
- Watson, R.T., Pitt, L.F., Berthon, P. and Zinkhan, G.M. (2002), "U-commerce: expanding the universe of marketing", *Journal of the Academy of Marketing Science*, Vol. 30 No. 4, pp. 333-47.

Weill, P. and Vitale, M.R. (2001), *Place to Space: Migrating to E-business Models*, Harvard Business School Press, Boston, MA.

Zahra, S.A. and Nielsen, A.P. (2002), "Sources of capabilities, integration and technology commercialization", *Strategic Management Journal*, Vol. 23, pp. 377-98.

Further reading

Pedersen, P.E. and Methlie, L.B. (2004), "Exploring the relationship between mobile data services business models and end-user adoption", in Lamersdorf, W., Tschammer, V. and Amager, S. (Eds), *Building the E-service Society: E-commerce, E-business, and E-government*, Kluwer, Boston, MA.

Rochet, J. and Tirole, J. (2003), "Platform competition in two-sided markets", *Journal of the European Economic Association*, Vol. 1 No. 4, pp. 990-1029.

Corresponding author

Leif B. Methlie can be contacted at: leif.methlie@nhh.no

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com
Or visit our web site for further details: www.emeraldinsight.com/reprints