December 2003

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16th Bled eCommerce Conference

eTransformation

Bled, Slovenia, June 9 - 11, 2003

Network Formation for Provision of Mobile Information and Entertainment Services[1]

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Abstract

The mobile telecommunications industry is undergoing rapid change, which is increasing the interdependency of firms in the sector. This trend increases the likelihood that mobile information and entertainment services will be delivered through inter-organizational networks of firms. These networks are the topic of this research. In this research we examine network formation and the influence of business models on this process. Using data from five case studies of mobile service networks, we examine in particular the influence of both revenue models and network membership benefits on network formation. The results demonstrate a link between business models and network formation. We find that at this time the benefits of network membership appear to have a greater influence on network formation than do revenue models. In conclusion we discuss the implications of these findings for research on both network formation and business models, as well as managerial implications.

[1] The research reported in this paper is part of the BITA (Business models for Innovative Telematics Applications) project. In the BITA project the Telematica Instituut co-operates with Delft University of Technology and TNO-STB. We acknowledge the efforts of our colleagues who worked on this part of the project, including Sander Hille and Edward Faber of the Telematica Instituut; and Richard Hawkins, Pieter Ballon and Wouter Hoff of TNO-STB; and Harry Bouwman of Delft University of Technology. The BITA project and its objectives are documented at the Telematica Instituut Web site: http://bita.telin.nl.

1. Introduction

"We no longer know what we know about
the formation of interorganizational networks."

~Christine Oliver 1990~

One of the most frequently cited reasons for firms coming together to form cooperative relations is the increasing interdependence of critical resources (Gulati and Gargiulo 1999). Currently, the rapid change in mobile telecommunication technologies, which in turn creates opportunities for new services, is increasing the interdependency of firms in the mobile sector. Traditional critical resources such as mobile network infrastructure and handsets are now joined by assets such as innovative content, middleware and location-based technologies. Furthermore, the resource interdependencies are intensified by, among other things, capital and human resource constraints compounded by time-to-market pressures. The result is that the provision of information and entertainment services to mobile devices is often accomplished through inter-organizational networks of firms.

While increasing interdependencies may drive network formation in general, each network will also be shaped by various relationship-specific factors (Oliver 1990). In order to react to the increasing time-to-market pressures mobile firms are faced with the need to quickly identify innovative sources of content. Furthermore, the provision of such content will likely require a diverse set of firms with various media and technology skills to make service provision possible. Naturally these services must consider what customers want as well as how much they are willing to pay. For these reasons, networks formed for the provision of mobile information and entertainment services present a unique opportunity for the study of network formation. In doing so, we aim to build upon the work of researchers such as O'Farrell & Wood (1999) and Madhok and Tallman (1998), who integrate the customer and value creation, respectively, into theories of inter-organizational relations.

In particular, the research reported on here addresses the following questions: How are interfirm networks for mobile services provision formed? More specifically, what is the role of the business model in the service network formation? We begin with a discussion of the literature on interorganizational networks and network formation. Next we introduce a model which proposes that specific elements of a business model such as the revenue model and the benefits of network membership, are drivers of network formation. In section three we present case studies of five mobile information and entertainment service networks as well as the results of the analysis. In section four we discuss our conclusions, theoretical and managerial implications, and make recommendations for future research in this area.

2. Service Network Formation & Business Models

The formation of networks for the provision of mobile information and entertainment services occurs in a context where organizations are increasingly reaching beyond their borders to establish cooperative relations (Castells 1996; Wigand, Picot et al. 1997). In the following sections we discuss the research on inter-organizational networks and provide a definition of interfirm service networks, the focus of our research. Next we offer a model that connects network formation to the business models for mobile services. Finally, we outline our method for testing this model.

2.1 Network Definitions

Inter-organizational networks, relations between firms that extend beyond the dyad or triad, come in many forms, such as business groups (Granovetter 1994), cooperative and governance networks (Wigand, Picot et al. 1997), constellations (Jones, Hesterly et al. 1998), network enterprises (Castells 1996), trade associations (Oliver 1990,), and strategic networks (Gulati, Nohria et al. 2000). These various forms can be differentiated based on the patterns of interaction in exchange among the members, as well as the flows of resources between them (Jones, Hesterley et al. 1997).

Networks can also be differentiated based on characteristics of the members. If we consider a limited set of organizations, *firms*, this creates a more narrow set of network relations: the *interfirm network*. Sydow and Windeler (1998) define an interfirm network as an institutional arrangement among distinct but related for-profit organizations which is characterized by (1) a special kind of (network) relationship, (2) a certain degree of reflexivity, and (3) a logic of exchange that operates differently from that of markets and hierarchies. The network relationship is typically complex and reciprocal and reflexivity implies problem solutions often require inter-firm coordination. The logic of exchange is one that combines cooperative and competitive elements, dependency and autonomy as well as trust and control.

A network must also have limits that define its membership. One such limit is the goal of the network, with network membership being established by each individual firm's contribution to the attainment of this goal (Jones, Hesterly et al. 1998). By this approach, a service network will be limited to those firms actively involved in the provision of the service.

Thus, based on the general interfirm network definition of Sydow and Windeler (1998) we propose the following definition: *An interfirm service network incorporates network relations, reflexivity and the logic of network exchange into an organizational form whose goal is the provision of a specific service.* Interfirm service networks differ from inter-organizational service networks in that the entities are for-profit. They differ from the more general strategic networks in the specificity of their goal and hence their scope. An interfirm service network will also differ based on the special nature of services vis-à-vis physical products. In particular, the production of services differs in terms of employee discretion, the object of transformation, tangibility of the product and the extent of customer involvement in the production process (Cook, Goh et al. 1999). This involvement of the customer in the service production process, also known as 'customer-supplier duality' (Sampson 2000), increases the likelihood that customers are also members of an interfirm service network.

2.2 Network Formation and Business Models

There is still much to be discovered about interfirm networks and recent investigations explore a variety of issues such as how and why they are formed (Sydow, van Well et al. 1998), their optimal configuration (Jackson and Wolinsky 1996), how they operate (Jones, Hesterly et al. 1997), implications of members' characteristics and vice versa (Brown and Hendry 1998; Hite and Hesterly 2001), the performance of the network (Sydow and Windeler 1998), the implications of network membership for firms (Gulati, Nohria et al. 2000), and how and why networks change (Jones, Hesterly et al. 1998; Hite and Hesterly 2001). The context of the mobile industry presents an interesting case for many of these research issues, however given the relative youth of the service networks, it is an ideal time to study the factors influencing their formation.

The research on network formation posits that a range of factors, both exogenous and endogenous to the network itself, drive the formation. Exogenous factors include those such as industry structure (Sydow, van Well et al. 1998) and resource interdependencies (Gulati and Gargiulo 1999), while endogenous factors include explicit entry conditions (Dyer and Nobeoka 2000) and common interests among potential members (Doz, Olk et al. 2000). There is an interplay between these exogenous and endogenous factors creating a recursive process by which networks are formed and change (Sydow, van Well et al. 1998; Gulati and Gargiulo 1999; Gulati, Nohria et al. 2000).

In this research we focus on endogenous factors leading to the formation of interfirm service networks. Similar research on the formation of networks for R&D found that the formation process is either emergent, deriving from common interests and environmental interdependence, or it is engineered, with a triggering entity actively recruiting members (Doz et al. 2000). In the formation of interfirm service networks, with their clearly defined goals, the common interests and interdependencies associated with the emergent process are likely to be defined in the business model for the service.

A business model is the organization (or 'architecture') of product, service and information flows and the sources of revenues and benefits for suppliers and customers (Timmers 1998). As such a business model has limited scope and does not include, for example, the overall marketing strategy or general strategic orientation of the firm. Although the contribution of the business model concept continues as a topic of debate, in a review of the literature Hawkins (2002) found that business models differ from other strategic plans in that they are inherently oriented to the process of *linking* new technological environments to business strategies and that the logic of business model development is linked closely to perceptions of *value* and especially to how new value propositions can be made to the market.

Therefore the business model for a particular service is likely to form the basis for common interests and interdependencies. Furthermore, given the network nature of mobile communications services and the position of the network operator in the industry, it is probable that operators will act as the triggering entity, gathering partners to fulfil roles necessary for provision of the service. Thus, as shown in Figure 1, we propose that the formation of mobile information and entertainment interfirm service networks will be driven by exogenous and endogenous factors. In this article we focus on the endogenous factor of the business model and its 'revenue model' and 'benefits' characteristics in particular.

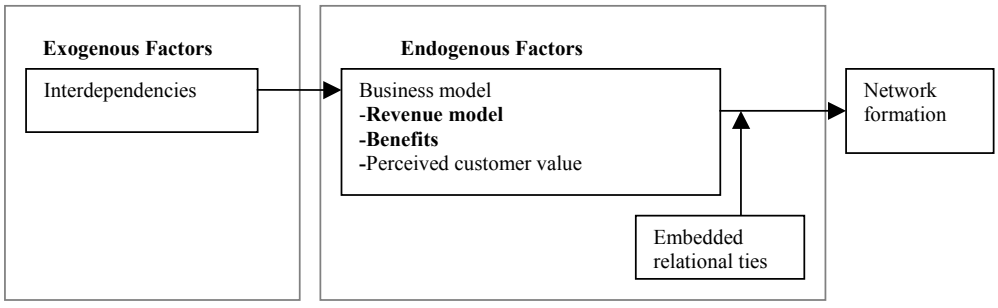

Figure 1: *Drivers of Network Formation*

2.3 Research Method

The networks for mobile services discussed in this research are limited to mobile information and entertainment services. As depicted in Figure 2, *mobile information and*

entertainment services (MIES) (category 2) are a subset of the broader category of *mobile services* (category 1), which are simply services made available to mobile users independent of the type of network (GPS, public switched mobile network, etc.). As defined here, mobile information and entertainment services require a connection to a network, which is in turn connected to the Internet. Currently, the dominant mode of access is through the mobile telecommunications network infrastructure connected to the fixed public switched network.

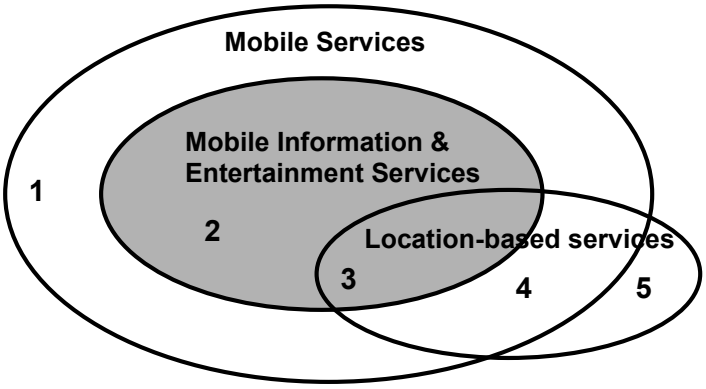

***Figure 2**: Mobile Information & Entertainment Services Domain*

In this research we also consider information and entertainment services that are based on location information. In general *location based services* can be offered through the mobile telecommunications network (category 3), independent of this network (4) and also in a fixed environment (5)[2]. Of interest to this research are services offered in the domain of category 2 (mobile information and entertainment services) and category 3 (location based mobile services) offered over the mobile telecommunications network.

Within this context, we identified five mobile information and entertainment service networks. The services were offered to end-users in three European countries: in the Netherlands, Germany and Sweden. To understand the service network composition and the reasons behind network formation, interviews were held during the summer and fall of 2002. For each service, depending on the network size, interviews were held at between two and five firms. At each firm, the interviewees were typically managers in charge of the relationship with the external partners associated with the particular service. Data from interviews were supplemented with information from company websites, industry reports and academic literature. Table 1 provides an overview of the service network cases.

[2] Location-bound services are ICT services that are valuable to users in the context of fixed locations, like buildings, living quarters or spaces related to public infrastructure.

***Table 1**: Overview of MIES Network Case Studies*

	General MIES		***Location-based MIES***		
Service	**i-mode MyBabes**	**i-mode Radio 538**	**i-mode Finder**	**LBS directory[3]**	**Botfighter**
Content	Erotic pictures and games	Ringtones	Find-the-nearest	Find-the-nearest	Multi-actor Game
# interviews (# firms)	2 (2)	3 (3)	6 (3)	6 (4)	5 (5)
Country	The Netherlands	The Netherlands	Germany	confidential	Sweden
Network	GPRS	GPRS	GPRS	GSM and GPRS	GSM and GPRS
Device	i-Mode handset (NEC)	i-Mode handset (NEC)	i-Mode handset (NEC)	Any mobile Phone	Any mobile Phone Website
Interface	cHTML	cHTML	cHTML	WAP and SMS	SMS

The five services are end-user services, and this allowed us to determine the scope of the networks through consideration of a firm's contribution to the provision of the end-user service. This method of defining network scope is appropriate for studying service networks, particularly given the possible inclusion of the customer as a network member[4]. In studying the networks we found that a range of common activities or roles are required to provide the services and in different networks the activities or roles were assumed by different actors. Thus, a standardized language was developed for describing network roles (see appendix 1) and is used in the accompanying actor/role diagrams.

3. Mobile Information and Entertainment Services

As the European mobile market moves rapidly toward implementing 3rd generation network technologies (3G), firms are facing pressures to quickly develop knowledge related to the provision of advanced information and entertainment services. To help prepare for the new technologies and build markets for content, firms are currently offering end-user services on second generation (2G) and 2.5G networks. In the following sections, we describe five such services and the networks created for their provision. We begin with a brief description of the i-mode service, as three of the services are offered via this platform. Next, we provide a synopsis of each service and the actors and roles required for its provision. In the analysis section, we describe elements of the business models and their implications for network formation.

[3] This title is fictitious to keep the case anonymous.

[4] This method of defining network scope differs from strategic networks where scope is frequently determined by a variety of inter-organizational relations including alliances, joint ventures and inter-locking directorates, which in turn may have a variety of goals including joint production, marketing and R&D.

3.1 Service Networks: Case Studies

The three European i-mode services are 'myBabes', 'Radio538 ringtunes' and 'Finder'. These services are based on the Japanese i-mode model, launched by NTT DoCoMo in 1999. Through an agreement deriving from the 15% ownership stake of NTT DoCoMo in KPN Mobile, the latter licenses the i-mode concept for the Dutch market and - by their daughter company E-Plus - for the German market. I-mode services are offered through an operator-run portal and are implemented through a business model that aims to establish a uniform set of governance mechanisms across a broad range of operator-content provider relations[5].

3.1.1 myBabes

Service and network description. A monthly subscription to myBabes allows a customer unlimited access to a variety of genres of erotic content at the myBabes site. There customers can view photos in different categories (topless, bikini, etc.), access games (Stripjack and HotOrNot) and store their favorite photos in a photo album for easy reference. The interfirm service network that provisions this service, depicted in Figure 3, includes the actors KPN Mobile, iMedia and raw content suppliers. iMedia is a media firm, which purchases content through market-based transactions with Internet firms and then modifies the content to meet the standards for the i-mode service.

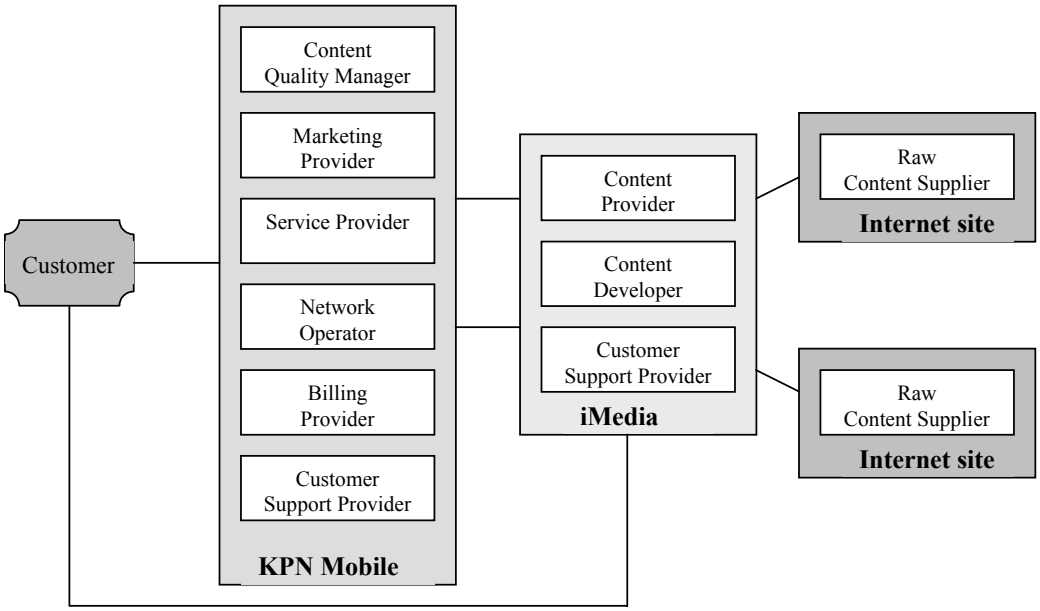

***Figure 3**: myBabes Actors and Roles Diagram*

3.1.2 Radio538

Service and network description. A monthly subscription to the Radio 538 ringtunes service allows customers to download five ringtones from a variety of categories: music,

[5] For a critical analysis of i-mode in Japan see working papers by Funk at http://www.rieb.kobe-u.ac.jp/~funk/ and for an analysis of the introduction and acceptance of i-mode services see Ratliff (2002).

voices and sounds. Radio 538 branded their service as 'ringtunes' to distinguish the service from other 'ringtone' services on the KPN Mobile i-mode portal. The i-mode handset, manufactured by NEC, allows customers to store a total of 13 polyphonic (16-chord) ringtones. The Radio538 service network, depicted in Figure 4, includes KPN Mobile, Radio538, Tutch Mobile Media B.V., Jingle Hell, Faith and BumaStemra. Radio538 is a Dutch media firm that owns and operates a popular radio station. The ringtones are developed by several means that include the participation of the Radio538 DJs, Tutch and Jingle Hell, which turns popular music into ringtones. Permission to use the popular songs for ringtones is obtained through a copyright clearinghouse, BumaStemra, and the software that makes the ringtones available via the i-mode service is provided by Faith.

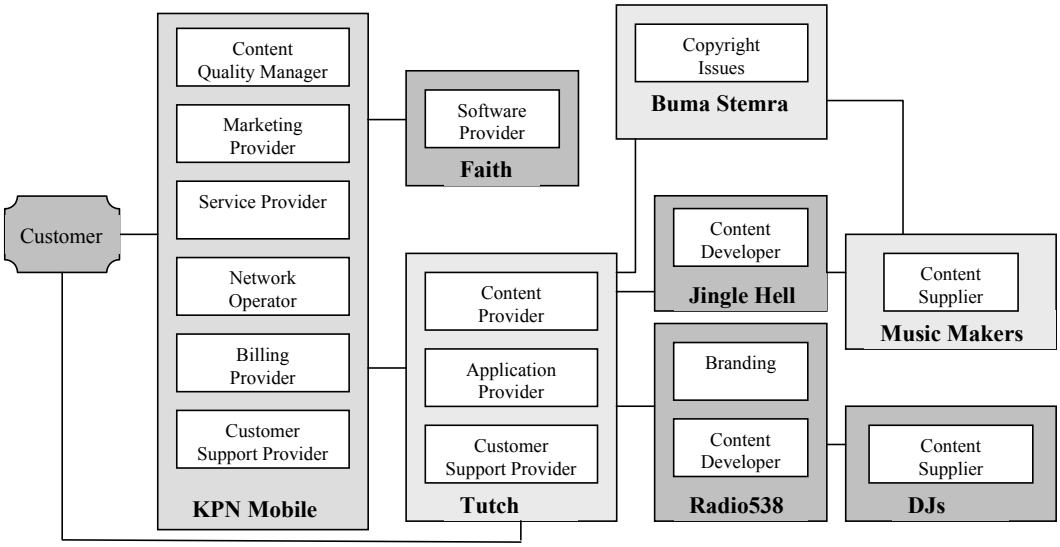

Figure 4: *Radio 538 Ringtune Actors and Roles*

3.1.3 Finder

Service and network description. Finder is a location-based i-mode service offered by E-Plus. The service enables the consumer to find the nearest hotel, restaurant, taxi or ATM. The content and geographical information are updated on a regular basis and stored in databases on the application platform. When a customer sends a request for information to the application platform, its position information is combined with the content and geographical information and the customer receives the desired information. The interfirm service network, depicted in Figure 5, includes the operator E-Plus and Webraska, a worldwide provider of location-based services and telematics software solutions. Webraska also serves as the intermediary between E-Plus and the content providers together with the geographical information provider. Cell Point provides the positioning equipment.

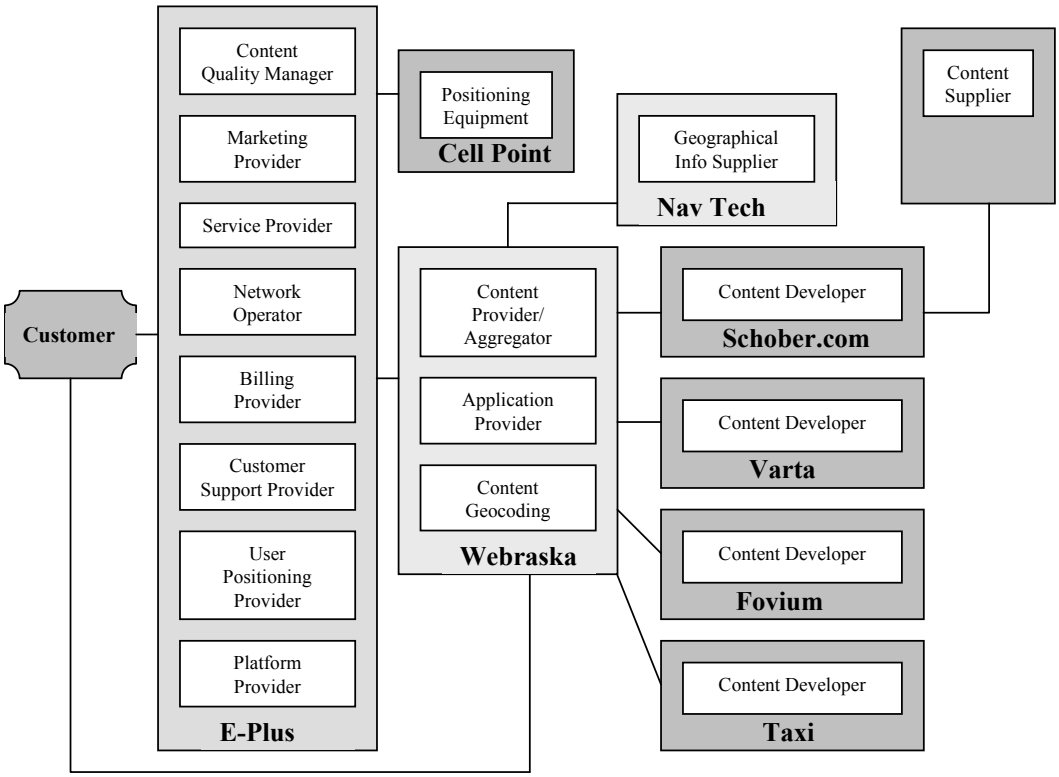

Figure 5: *Finder Service Actors and Roles*

3.1.4 LBS Directory

Service and network description. The LBS directory service is a location based service offered via WAP and SMS. It offers directory-type location information for ATMs, taxis, cinema, hotels, restaurants, events, emergency pharmacies, and fastfood. The service is produced in two steps. In the first step, the content is aggregated, aligned technically (in terms of file formats), geo-coded[6], checked for quality assurance and then transferred at regular intervals to the operator in an ongoing process. The second step consists of the actual provision of the service, i.e. receiving a service request from the user, positioning the user, matching the request with appropriate content and passing the response, with routing information, back to the user. These two levels of implementation are a result of the service design and implementation that was driven by the operator. The interfirm service network, depicted in Figure 6, consists of the operator, which fulfills a majority of the roles, an intermediary, and a group of content providers specifically chosen to provide pre-determined content categories.

[6] Geocoding is the process of associating x,y location coordinates with each item in a database. For example, each restaurant entry in the database will have an accompanying field of x,y location data.

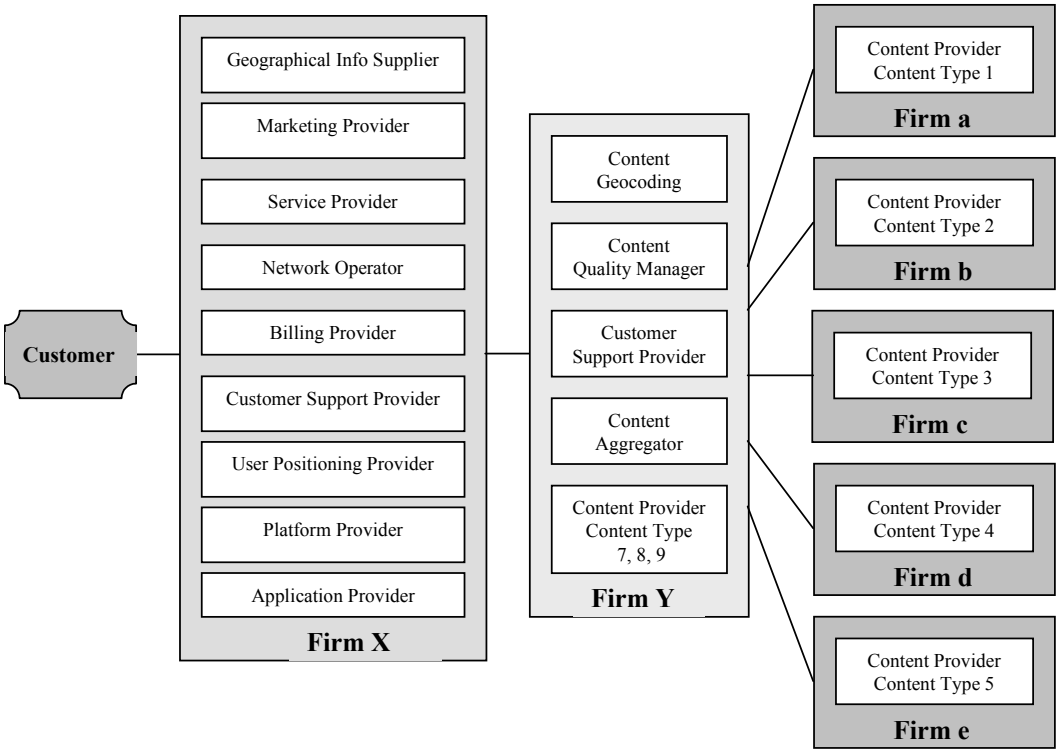

***Figure 6**: LBS Directory Actors and Roles Diagram*

3.1.5 Botfighter[7]

Service and network description. Botfighter is the world's first location-based mobile game that uses mobile positioning information from an operator's network and is played using a standard GSM phone with SMS capabilities. On a website, the player designs a robot, which will be used to carry out a mission. The mission, which is obtained through the phone or website, involves another player, either a friend or one that is randomly assigned. Information concerning the location of the opponent is provided through the robot's radar system (the mobile handset). On the website users can upgrade their robots, buy weapons, view high scores and get information on their current mission. They can also form clans, which gang up on one another. Thus, the website is used for community building and to create an exciting game atmosphere, while the action of the game is carried out on the mobile phone. Botfighter's service network, depicted in Figure 7, consists of Telia, Ericsson, Mobilaris and It's Alive!, Cartesia, Genuity and the end-user, who provide content via the game's website. The service was conceived by It's Alive!, which maintains the game and organizes the website and the geographical information. The game, along with other Telia content, is hosted on a platform by Mobilaris. Ericsson provides the positioning equipment.

[7] The data for this case were collected by Wouter Hoff and are reported in Hoff, W., H.-J. Van De Meeberg and P. Ballon (2002).

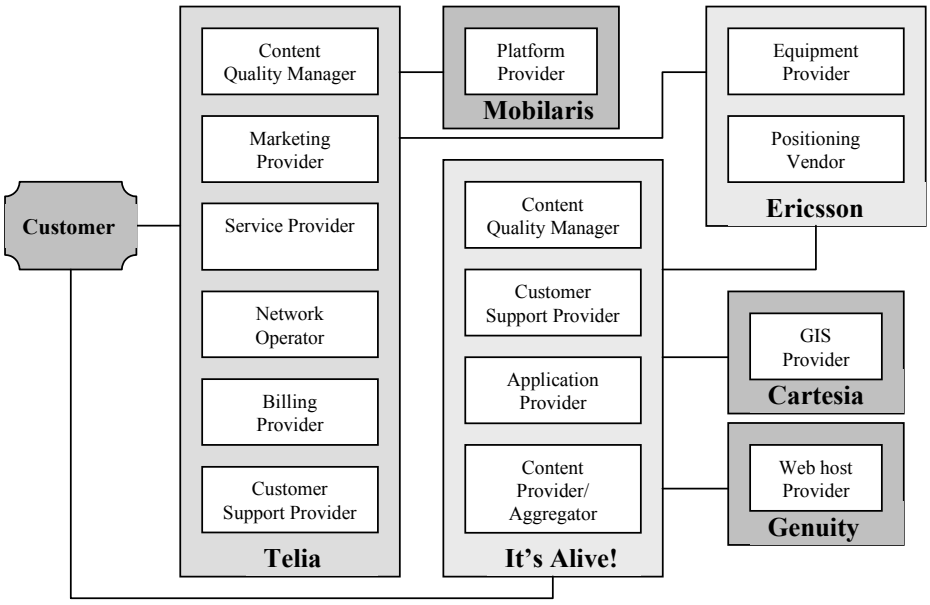

***Figure** 7: Botfighter Actors and Roles Diagram*

3.2 Analysis

In our model, shown in Figure 1, we propose that network formation is partially shaped by the business model, in particular the revenue model and the benefits of network membership. In the following sections we compare the revenue models and benefits of network membership for the five services and explain their implications for network formation.

3.2.1 Revenue Models

The revenue models of the three i-mode services (myBabes, Radio538 Ringtunes and Finder) are based on the standard i-mode revenue sharing plan. The revenue model limits the monthly tariff content providers can charge, creating an incentive for content providers to sign up large numbers of users. In Europe, the limit is Euro 2 per month.

Despite this cap on monthly subscription prices, many content providers are attracted to the i-mode service due to its potential market as well as the operator's billing mechanism. For approved content providers, KPN Mobile/E-plus provides billing and collection service for the price of 14% of the content providers' revenues. From the end-user's perspective, for access to the content provider's site one incurs monthly charges of Euro 2 for the content subscription, Euro 3 for the i-mode subscription, and the normal mobile telephone subscription (varies), in addition to a volume-sensitive data fee of approximately Euro 0,01 per 1 Kb.

Although this standard model between the operator and the content providers is the same among all three services, beyond the content providers the revenue models vary significantly. In the Radio538 and Finder cases, the wide array of actors involved in producing the content have to share some portion of the revenues transferred from the operator to the content provider/aggregator, while in the myBabes case iMedia simply purchases content through market-based transactions with a variety of Internet sites. In the Finder case, Webraska makes individual contractual arrangements with each content provider, who in turn share their revenues with content suppliers. Moreover, both the

Radio538 and Finder cases include additional revenue streams. In the Radio538 case the additional revenue flow exists due to a joint marketing agreement whereby KPN Mobile can use available Radio538 advertising spots, while in the Finder case the additional revenue stream is the Euro 0.30 retained by E-Plus for the positioning information. The Euro 0.30 is collected independent of the number of times the customer uses the location-based service.

The revenue models for the remaining two cases, the LBS service and Botfighter, are quite different from the i-mode cases. For the LBS service the customers pay the operator 50 eurocents per request via WAP or SMS. The operator has a revenue sharing arrangement with the intermediary, who in turn has autonomy to make different contractual arrangements with the various content providers. In the Botfighter case, the end-customer pays Telia per SMS message sent. It's Alive!, the game creator, received an up-front payment and continues to receive a flat monthly fee plus SMS revenue sharing. It's Alive!'s suppliers of geographical information and web hosting are paid a monthly license fee. Ericsson also receives a share of the SMS revenues, while Mobilaris receives a monthly licensing fee for use of its platform.

3.2.2 Benefits of Membership

Although network membership has both positive and negative effects for firms (for a review see Alter and Hage 1993), here we are concerned exclusively with the benefits. Examples of potential benefits include the creation of value, learning and market entry (Gulati & Gargiulo 1999; Gulati, Nohria et al. 2000). Below we examine each service network and assess the potential benefits network membership may present.

In the three *i-mode cases* one benefit of joining this network is the ability to provide content delivered to a high quality handset that would actually be available in the market. This is a significant problem in the mobile industry, with the failure of previous mobile content initiatives partially attributed to the poor quality and late arrival of handsets (Kar, 2002). Recognizing this, for its i-mode service NTT DoCoMo established exclusive relationships with a small set of manufacturers and worked jointly to design the handset and ensure timely delivery. KPN Mobile/E-Plus replicated this strategy in their implementations of the business model.

The original i-mode business model was also designed to attract a broad range of content providers, making the overall service concept attractive. NTT DoCoMo developed a 'content governance' model whereby content providers submit content plans to the operator for approval before being allowed to offer services on the i-mode portal, which also provides access to the operator's billing services. The 'content governance' model also determines the location of content listings on the portal. Each quarter, the operator determines the most popular services - based on customer requests - and moves these listings to the top of the portal. Theoretically this process results in high quality content through competition between content providers for the top portal listings.

The individual i-mode cases also present firm-specific network membership benefits. In the *MyBabes* case, the content provider, iMedia, had already developed a service and a site for KPN Mobile's i-mode service. Although erotic content was expected to generate significant revenues, it did not fit with iMedia's existing portfolio of projects. However, given the investment made in launching their first site and with content readily available, iMedia decided to pursue the project. KPN Mobile was willing to work with iMedia because there were no other proposals for erotic content at that time and the operator expected this would draw more customers to the service.

In the *Radio538 case*, Radio 538's desired profile as an innovative company made offering an i-mode service a good strategic fit. Furthermore, the target market for the radio station, the ringtones and the i-mode service in general are similar. This created advantages for both Radio538 and KPN Mobile, resulting in a joint marketing agreement that leverages Radio538's national radio coverage and brand recognition in the i-mode target market. Also in this service network, the content and application provider Tutch has experience offering these services to other ringtone providers. In fact, Tutch provides ringtones for The Music Factory (TMF) and competes directly with Radio538 by offering ringtones under its own brand on KPN Mobile's i-mode portal. Thus, providing ringtones to Radio538 required little investment and created another revenue stream for Tutch.

In the *Finder* case, the last of the i-mode services, the operator E-Plus delivers location-based content provided by Webraska. Unlike the Dutch operator who felt that the location service technologies were not yet adequately developed, the German operator was willing to launch a location-based service. Thus, this willingness of the operator to provide the location based service created a significant membership advantage for Webraska since location based services are their core business. Similarly, offering the service allows the operator to learn about the technology at the risk of disappointing customers. For the content developers, network membership provides a new channel to reach the customers, even if anticipated revenues are somewhat low.

The remaining two services represent slightly different network configurations and hence present different benefits to their participants. The *LBS directory* service is a result of the initiative of the operator who wanted to launch a true location-based service. They were aiming to provide as many of the service activities as possible in-house in order to learn how to run a location-based service. Furthermore, they wanted an intermediary to shield them from the wide variety of content providers that would be required to provide the service. In this very central role the operator was involved in the development of the service network, the network provision, the user positioning, and branding. The portfolio requirements in terms of content were drawn up jointly by the operator and the intermediary. The intermediary was then responsible for finding suitable content partners in the respective content categories. For the operator the primary motive for establishing the network and hence their benefit of membership was learning. The firm in the intermediary position also reported that the learning benefits were substantial.

The service network for *Botfighter* consists of a variety of firms, many of whom are involved in long term relations with other members. Telia and It's Alive continue to work together after several years. Their contract includes a clause that states the exclusivity of the game to Telia in Sweden for a term that now has exceeded. The contract has been extended with new features, however the base contract remains the same. A second relationship in this network is the one between Telia Mobile and Ericsson. Their relationship is in the form of a joint-venture called Team Positioning, which develops services based on GSM-based positioning. Hence, a major benefit of this network is the establishment long-term relationships between firms that overcome some of the volatility of the sector.

3.2.3 Discussion

Our model posits that characteristics of the business model, namely the revenue model and the benefits of network membership will shape network formation. Above we examined both of these components and we provide the highlights of our analysis here.

In all the cases the revenue models placed a cap on the charge for the end-user, whether it was based on standard SMS charges, as in Botfighter, or by the operator's analysis of what is best for the overall system, as in the i-mode cases. These models are likely to be

seen as both drivers and barriers to network formation. The existence of the networks studied here indicates that some firms are in favor of such caps or that they do not provide a great enough incentive not to join. There are reports from Japan, however, that indicate some content providers are disgruntled about the price caps and bypass them by acting as 'unofficial sites', collecting their own revenues (Takahashi 2002).

In addition to considering the mere existence of networks, we must also consider whether the business model shapes the characteristics of networks. As mentioned earlier networks can be characterized both by the interaction in exchange among the members, as well as the flows of resources between them (Jones, Hesterley et al. 1997). The i-mode revenue model requires that the same terms be provided to all content providers, whether they are a small new entrant or an established entity such as Disney. This lack of differentiation in the implementation of the revenue model encourages arm's length relations in which neither the operator nor the content provider grant exclusivity. This is contrasted by the Botfighter case with its revenue model of licensing fees and revenue sharing implemented through exchange relations that are longer-term and provided temporary exclusivity.

In explaining both the existence of networks and the interactions in exchange, the benefits of network membership may also play a role. The above synopsis of the benefits of network membership for each case demonstrates how those benefits vary both across cases as well as within cases. Benefits included market entry and leveraging prior investments (myBabes), strategic fit and access to services (Radio538), first-mover advantages (Finder, Botfighter), and learning (Finder, LBS directory and Botfighter). These benefits provide a strong impetus for network formation and may explain variations in the exchange relations among the different networks as well.

4. Conclusions

In this research we examined the phenomenon of network formation and in particular we made a preliminary investigation of the implications of a business model for the existence and characteristics of networks. The investigation occurred within the context of the mobile telecommunications industry, and was specifically concerned with networks formed for the provision of mobile information and entertainment services. Network formation in this context is unique due to the industry's high levels of uncertainty due to technical change, economic fluctuations, and uncertain demand for mobile information and entertainment services.

From our analysis of the five service networks we can conclude that

1. the relationship between revenue models and the existence of networks is unclear as they appear to both help and hinder formation, however they do appear to at least partially explain differences in exchange relations (more arm's length in the i-mode case versus tighter coupling in the other two).
2. the benefits of network membership appear to be a stronger driving force (at least in the short term) than revenue models for the formation of interfirm networks in mobile information and entertainment services.

This research, in which we explicate the relationship between network formation and business models, has implications for research on interfirm networks as well as that on business models. In terms of interfirm network theories, we have described a particular type of interfirm network: the service-specific network. This level of analysis allows the integration of issues such as service-specific business models into interfirm network research. Furthermore, this research has identified the implications of learning benefits of

network membership, as constructed by the business model, for network formation. This finding contributes to the existing literature on learning in interorganizational relations (Alter and Hage 1993; Ebers 1999); also referred to as learning races (Gulati, Nohria et al. 2000).

Moreover, by examining business models in which the formation of a network was required to launch the service, such as those of i-mode and the LBS, we highlight the significance of business models for network formation research. Additionally, the business model of i-mode, which is explicitly concerned with managing what they refer to as an 'ecosystem' of networked firms, highlights the weaknesses of the dyadic approach not only from the perspective of explanatory power, but also from a managerial perspective. If NTT DoCoMo had not adequately perceived the complexity and discipline necessary to manage this network of suppliers (issues such as treating a wide variety of firms as equals), it may have led to an entirely different business model and hence a different network of firms. This is not to say that dyadic relations are not important, only that there is a different level of analysis, the network that transcends them.

This research has provided only a brief glimpse of the wide variety of factors that can be used to explain interfirm service network formation. Future studies should explicitly investigate how business models, and in particular revenue models and problems of network membership, provide disincentives for network formation. Such an approach would provide a more nuanced understanding of the relationships between business models and network formation. Also a more clear understanding of the process of business modeling may also provide valuable insights to the process of network formation and vice versa. Finally, the idiosyncrasies of these findings related to the mobile industry could be teased out by replicating the study in a more stable industry.

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Appendix 1: Roles for Producing MIES

Table 1: *Role Definitions*

Roles	**Definitions**
Functionality related roles	
Service provider	Provides billable service to the end consumer
Network operator	Operates the mobile telecommunications network over which the data (service) is transmitted
Platform provider	Provides the software that defines the general platform on which a variety of services are run
Application provider	Provides the software that makes a service possible and that sits on top of the platform
Web hosting/presence provider	Operates and maintains the server that hosts a website that is an integral part of the service, particularly relevant to the further development of content
Content supply chain roles	
Raw content supplier	Supplies content in a format unusable for the mobile service & terminal
Content developer	Transforms raw content into content appropriate for the service as well as the mobile terminal
Content provider	Provides 'appropriate'/transformed content to the service provider
Content aggregator	Serves as an intermediary between the service provider and the content providers
Hardware roles	
Equipment provider	Provides the hardware (physical components of network)
Handset supplier	Supplies platform or service-specific handsets
Customer relation roles	
Billing provider	Provides billing services to collect revenues from end consumers
Marketing provider	Markets the service
Customer support provider	Point of contact for customer queries regarding the service; responds to customer queries
Content quality manager	Monitors and improves content quality
LBS roles	
Content geo-coding provider	Adds x/y coordinates to the content
User positioning	Provides the position information of the mobile device
Positioning technology vendor	Supplies user positioning equipment
GIS provider	Provides geographical information (and GIS services) necessary to indicate location information of relevant content

Table 2: *Roles Appearance in the Case Studies*

Roles	**myBabes**	**Radio538**	**Finder**	**Botfighter**	**LBS**
Functionality related roles					
Service provider	X	X	X	X	X
Network operator	X	X	X	X	X
Platform provider	X	X	X	X	X
Application provider	X	X	X	X	X
Web hosting/presence provider				X	
Content supply chain roles					
Raw content supplier	X	X	X		
Content developer	X	X	X		
Content provider	X	X	X	X	X
Content aggregator			X	X	X
Hardware roles					
Equipment provider			X	X	
Handset supplier	X	X	X		
Customer relation roles					
Billing provider	X	X	X	X	X
Marketing provider	X	X	X	X	X
Customer support provider	X	X	X	X	X
Content quality manager	X	X	X		X
LBS roles					
Content geo-coding provider			X		X
User positioning provider			X		X
Positioning technology vendor			X	X	
GIS supplier			X	X	