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# Developing Personal Network Business Models

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## Abstract

*The aim of the paper is to examine the issue of business modeling in relation to personal networks, PNs. The paper builds on research performed on business models in the EU IST MAGNET<sup>1</sup> project (My personal Adaptive Global NET). The paper presents the Personal Network concept and briefly reports on the 'state of the art' in the field of business modeling. Furthermore, the paper suggests three generic business models for PNs: a service oriented model, a self-organized model, and a combination model. Finally, examples of relevant services and applications in relation to three different cases are presented and analyzed in light of business modeling of PN.*

## 1. Introduction

The point of departure is that it is not enough to develop good products and services based on sound technology solutions, and it is not either enough to be able to foresee that there is likely to be a market for the products and services developed. It is also important that the entities producing and delivering the products and services are organized in ways actually getting them to the users and that price setting allows for markets to develop – i.e. there must be viable business models. 'Competition today is not between products, it's between business models', says the American business guru Gary Hamel.<sup>2</sup> This point was made at the peak of the dot-com mania before the turn of the century but still applies in a modified version: It is not

enough to have a good product – a good business model is also necessary.

In the area of Personal Networks, this is the aim of the business modeling part of the EU MAGNET project on which this paper builds. First, there is an introduction to the Personal Network concept. Second, there is a brief overview of the business model term. Third, generic business models for different Personal Network categories are described. And fourth, three illustrative bases are analyzed.

## 2. Personal Networks

The concept of Personal Networks is based on a multitude of different communication environments, which are interconnected through different networks and technologies. The realization of the Personal Network concept is believed to create an ever-increasing demand for more bandwidth in relation to connectivity and, furthermore, an almost exponential growth in the deployment of wireless devices and equipment. In addition, the convergence of different technologies, services, applications and devices also implies that future business models have to support/function within a very heterogenous and flexible environment.

### 2.1. The PN concept

The overall concept of Personal Networks is related to personal communication environments, consisting of a multitude of entities, which all can interconnect via different networks, i.e. infrastructure or ad-hoc based. Personal Networks should facilitate a collaborative communication environment within a distributed network, which supports the users in their professional as well as private activities without being obtrusive and at the same time safeguarding privacy and security.

<sup>1</sup> MAGNET (2004-2005): An EU-funded worldwide R&D project within Mobile & Wireless Communication beyond 3G. The MAGNET project has been extended into the MAGNET Beyond project (2006-mid 2008).

<sup>2</sup> Gary Hamel in CIO Magazine, Oct. 15, 1999

The Personal Network concept has a very strong emphasis on user-centricity, personalization, adaptation, interoperability, personal networking and the interconnection of heterogeneous networks. The overall goal within the MAGNET and MAGNET Beyond projects is to enable commercially viable Personal Networks that are affordable, user-friendly and beneficial to all kinds of users in all aspects of their everyday life. These systems are defined as Personal Networks and constitute a category of distributed systems with very specific characteristics (Niemegeers & Groot, 2002).

A Personal Network can be described as a communicating cluster of local and foreign devices, possibly shared with others and connected through various communication means. The Personal Area Network is the basic component in a Personal Network, which physically is associated with the 'owner' of a specific Personal Network. The Personal Area Network has a limited geographical coverage area (i.e. up to 10-20 meters), whereas the Personal Network has unlimited geographical coverage, interconnecting devices into the Personal Network regardless of their geographical locations based on ad-hoc or infrastructure based networks.

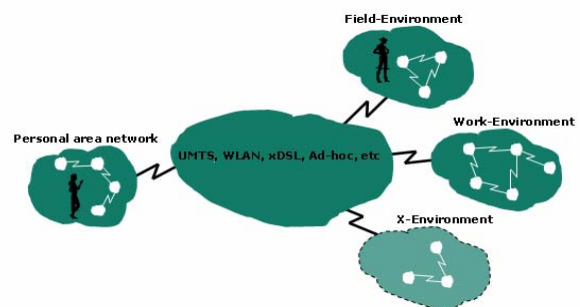
The main components of a Personal Network are:

- A personal area network consisting of personal devices in the close physical vicinity of the user, including devices moving around with the end-user.
- Remote personal devices, which could be grouped into cooperating clusters or communication environments and connected to a personal area network via infrastructure or ad-hoc based networks.
- Local foreign devices or clusters thereof, which are owned by other parties and could be either a reserved or shared medium. Connected to the personal area network via infrastructure or ad-hoc based networks.
- Remote foreign devices or clusters thereof, which are connected to a personal area network via infrastructure or ad-hoc based networks, and which again can be shared with many users or be reserved for the personal network.
- Communication infrastructures, in principle infrastructure or ad-hoc based networks which can

be public (e.g. cellular or Internet) or private (licensed or unlicensed), e.g. WLAN.

The Personal Network concept is built and developed around the concept of interconnecting Personal Area Networks and other communication environments or networks. A specific Personal Network consists of a Personal Area Network and other communication environments and networks, which physically can be located anywhere. The core Personal Area Network will be related to the end-user of a specific Personal Network, meaning that every user will have their own Personal Network, which consists of a core Personal Area Network and other communication environments or networks, which again consist of a number of devices. Interconnecting and integrating Personal Area Network devices with devices in other communication environments and networks via wired or wireless networks will allow the end-user to reach a multitude of services and applications, including services and applications offered by other Personal Area Networks.

Figure 1: Personal Network illustration



Personal Networks comprise potentially “*all of a person’s devices capable of network connection whether in his or her wireless vicinity, at home or in the office*” (MAGNET Technical Annex, 2003, page 6). Personal Networks are, to a large extent, configured in an ad-hoc fashion, as the opportunity and demand arise to support personal applications – building on a significant amount of peer-to-peer and internetworking between different wired and wireless technologies. Some access schemes will be free of charge, while others will be chargeable, as they are made available through infrastructure based networks. Figure 1 illustrates a generic setup of a Personal Network and some communication environments, which can be interconnected through different ad-hoc or infrastructure based networks.

## 2.2. The strength of the PN concept

The fact that the Personal Network concept is very much focused on Personal Area Networks, peer-to-peer and self-organized networks has important consequences for business modeling. Generally, business modeling is a supply side exercise. User needs, targeted market segments and value propositions must be part of the modeling exercise. However, business modeling mostly deals with the relationships between the players on the supply side in order to determine how they can service the needs on the demand side. In the case of Personal Networks, the demand side has to be directly involved in the creation of business models. The reason is that user groups can set up parts of the network infrastructure and construct and deliver the services themselves and will often only need to interconnect and work together with commercial network providers for parts of the network and service delivery assignments. Personal Networks will, therefore, often consist of combinations of service delivery relations (i.e. from a business enterprise/operator to an end-user) and self-organized networks and applications (i.e. ad-hoc or peer-to-peer based). This does, however, not apply in all cases. A whole package of personal network resources and services may be delivered by commercial enterprises, but the possibility of user groups organizing parts of the communication processes and applications by themselves makes the involvement of the demand side necessary in the development of business models.

## 2.3. Virtual Home Environment

Basically the concept of Personal Networks is closely related to, for instance, the Virtual Home Environment<sup>3</sup> model promoted by 3GPP, which focuses on a Personal Service Environment (PSE) and portability across networks and between terminals. This is very much a further development of the mobile environment as we know it today where, e.g., different application, service and network providers/operators will provide different services to the end users. The new features in PSE are related to personalization of user interfaces and the delivered services, meaning that these always will be customized to the single users and their needs and preferences. The main differences between the VHE/PSE approach and the Personal Network concept is that the Personal Network concept is focused on Personal Area Networks and peer-to-peer organized networks.

<sup>3</sup> <http://www.umtsworld.com/technology/vhe.htm>

## 3. State of the art

The business model concept has increasingly gained prominence in business research during the past 10 years. Though business models, of course, have existed as long as businesses themselves, the business model concept was developed in relation to the implementation of Internet-based e-commerce. At first, focus was primarily on taxonomies of different kinds of e-commerce operations (Rappa, 2001; Timmers, 1999) but emphasis shifted towards a description and analysis of the different aspects of business models, for instance the value propositions and value networks (Afuah & Tucci, 2001; Chesbrough & Rosenbloom, 2000). Business strategy, on the other hand, has been a topic in business research for a much longer time (Chandler, 1962; Porter, 1980) and the relationship between the concepts of business models and strategy is a continuous discussion. In 2003 (Seddon & Lewis, 2003) published a helpful paper distinguishing between strategy, as 'grounded firmly in the real world', and business models, as 'abstractions of firms "real-world" strategies' [p. 236]. This means that a business model can be applied by a number of different companies in the same business area, for instance mobile network operators, while their more specific strategies will differ.

Regarding mobile and other wireless business operations, research has mainly concentrated on the services to be offered to different market segments and the accompanying value propositions and, furthermore, the interplay between different kinds of market players to be involved in the value network delivering the services, i.e. network and service providers, content providers and aggregators, etc., (Bohlin et al., 2003; Camponovo, 2002). Lately, this type of approach has been summarized in an understanding of business models as encompassing a service design, a technology design, an organization design, and a financial design (Faber et al., 2003). A similar approach with slightly differing wording has been proposed in a publication by IPTS on 'The Future of Mobile Communications in the EU: Assessing the Potentials of 4G' (Casal et al., 2004). Basically, the implication of this approach is that when designing a business model, one should include the services offered, the technologies used, the organization of the actors in the value network, and the financial aspects, including charging models and revenue distribution. This is the model adopted by WP1/task 4 of the MAGNET project in combination with the view that business models are abstractions of more specific business strategies.

A number of research and development projects are found in fields close to the MAGNET concept of PNs. Some of the work in these projects is summarized in (Casal et al., 2004). Of special relevance in a European context is the work performed in Eurescom, an organization whose members are European network operators, and the Virtual Home Environment (VHE) project of 3GPP. Eurescom has been using the term Beyond 3G (B3G), focusing on the interoperability of heterogeneous networks, identifying four main drivers in the development of B3G: Personalization, seamless access, QoS, and intelligent billing (Casal et al., 2004). The VHE project has been dealing with the issue of building a platform for ‘a system concept for personal service environment portability across boundaries and between terminals’ (3GPP, 2002). The specificity of the PN concept as developed by the MAGNET project is related to its focus on ad-hoc networking and peer-to-peer communications. Furthermore, the PN concept puts much emphasis on the many different kinds of PNs, which will be developed in the coming years. Services for the general public will be part of many PN services, but PNs will also include many group specific features and applications, which mean that many different contributing entities will participate – including traditional commercial communications operators, but also many non-commercial organizations.

#### 4. Generic business models

At a generic level, the communication patterns and business models within PNs can be divided into three main categories: 1) service delivery models where a service provider delivers a specific set of services or applications; 2) self-organized models where different individuals and entities create communities for exchanging information and files etc.; and 3) a combination of these two models (Henten & Saugstrup, 2004).

Formerly, the internal company networks and even the attached end-user equipment used to be owned by monopoly providers. However, this has changed. Business users will mostly manage their own internal networks, but the borderline between self-organization and outsourcing is constantly shifting. A combination of self-organized structures and services delivery structures offered by commercial providers will, therefore, be a common situation – especially when different kinds of network resources are combined. A person having his or her own Personal Area Network (PAN) may, communicate with another person’s PAN by means of Bluetooth or other PAN technologies

when they meet. When at the home base (i.e. residential or business), the communication devices of the users may connect through a WLAN, which is managed by the users themselves. Other WLANs, owned by network and service providers, may be used when located in a stationary manner outside the home base, and the services of commercial cellular mobile or new wireless network providers may be used when on the move.

These kinds of combinations do not, in principle, present any major problems business-wise. When using the self-organized structures, the users do not pay for the applications and facilities they use. However, when using the services delivered by commercial providers, there will be a business relationship with payments to the service providers. Technologically, such combinations already exist. However, in the future such combinations of different network facilities and business arrangements will become far more diverse and complex. The strength of the PN concept is that it is geared for accommodating these diverse and complex situations.

Seen from the point of view of commercial network and service providers, users can be sub-divided into different market segments to which services must be adapted in order to win the market. Formerly, telecommunications operators would only offer a small range of products. Market segmentation for telephony would in its build-up phase relate to different social strata and their ability to pay for services. However, with the expansion of the variety of services offered, segmentations of the market have increasingly been seen as important. Different kinds of customers may demand different kinds of services, and customers in different situations may as well have different requirements. This is increasingly the exercise that network and service providers are facing – i.e. to sort out the extent to which different groups of customers can be serviced with specifically designed services without raising the costs of producing these specific services too much.

Seen from the viewpoint of different user groups, the primary aim is to get access to communications, applications and information in the most easy and low cost manner. In addition to this, there may also be an issue of information security and ‘ownership’ of information provided to the end-users. These considerations may lead user groups to build up and manage the network and information resources by themselves – in a self-organized manner. Perhaps the systems to be established build on existing internal information and network resources and can, therefore, be constructed and managed efficiently at relatively

low costs. But in other cases, one or more external service and network providers can deliver parts of or the whole network and service package necessary for providing the users with the applications and facilities they need. In such cases, the establishment and management of the networks can be outsourced to commercial providers.

Often, a number of different players will be involved in providing PN services and applications. There can be different kinds of information and application providers, and the multitude of players involved in a PN can be a complicated patchwork. Some of these additional players may be commercial information providers and others may be non-commercial. Many different business models (or modes of organization) are possible. With respect to an overall question regarding the changes induced by PNs in business modeling in the wireless and mobile business areas, the general answer is, consequently, that PNs create the need for much more flexible business models of commercial network and service providers, as these commercial providers have to adapt to a far more diverse and heterogeneous environment. Market segmentation is absolutely necessary but not sufficient, as it is not only a question of designing specialized offers to different user communities but also of adapting to and combining different commercial offers with the self-organized parts of PNs. The business models must include a view on the shifting interfaces between the commercial service delivery parts of the networks and the self-organized parts.

## 5. Cases

Depending on the PN scenario, there may be a large variety of network, content, and service providers involved. In this section, emphasis is on content and service providers. The approach taken is to go through the different cases dealt with in the MAGNET project i.e. Smart@home, MAGNET.Care and Nomadic@work – and discuss which contents and services (and their providers) would seem relevant.

### 5.1. Smart@home

Many different kinds of content and services can be imagined in relation to the Smart@home concept. However, the following are important examples:

- Control of home devices (TV, stereo, PC, etc.)
- Metering of different kinds (heating, security, etc.)

- Access to personal files (from home computers)
- Access to multimedia as when at home
- Shopping relevant information
- Interpersonal communications

*Control of home devices* by means of handheld personal devices is not necessarily something requiring external content or service providers. This is already done today by means of stand-alone systems but could be built into multi-purpose hand-held devices. However, one can imagine external providers offering Smart@home packages including control of home devices. *Metering* does not either necessarily require any external providers – when people are at home; but when not at home, some kind of service provider is required. And, there is a long tradition for telecom operators to offer telemetry services, and they are likely to expand that business area from telemetry for businesses to include also private homes. However, it can also be specialized telemetry providers as we know them today in the security area. *Access to personal files* does not necessarily require more than a connection. *Access to multimedia*, on the other hand, will most often include content providers offering different kinds of content in the multimedia package. Depending on whether the different kinds of content are broadcasted to the user (as in the case of DVB-H) or streamed to the user, there can be differences in the kinds of providers and possibly also the kinds of content provided. *Shopping relevant information* (regarding food, for instance) has two aspects. One aspect deals with information on what there is at home in the fridge and the freezer, and the other aspect deals with offers from the shops/stores. The first aspect is similar to the telemetry question – provided that fridges and freezers are equipped with systems with that kind of information. The second aspect consists of information from stores directly or from information assemblers. This kind of information can be provided in different ways either from individual stores as in the case of ad-hoc networking, for instance, or by centralized systems to which stores feed information. Finally, *interpersonal communications* will often just require a connection (which can be via ad-hoc networking, wireless LANs or mobile networks) but may also require the provision of additional or ‘value-added’ services in the case of more advanced types of communications.

If we move to the business modeling aspect of it and look at the organization of content and service provision, there are different possibilities. It can be that as many as possible functions are self-organized, i.e. for instance that the metering applications are not organized by any service provider but that information is just stored on a home computer and accessed by the

user and, furthermore, that users subscribe to content and 'value added' services from different separate providers. It can also be that a specialized Smart@home provider organizes the whole service package for the user, bills the user, and pays network providers for the network services. However, it can also be network operators which add all the different Smart@home services and content to their service portfolios.

## 5.2. MAGNET.Care

In the case of health services, the variety of content and services provided will depend on the kinds of diseases or problems dealt with. However, the following generic areas could be examined:

- PAN devices related to health issues
- Measurements (metering/telemetry)
- Health related information to the user
- Contact with health care personnel
- Emergency related communications

In the case of *PAN related personal devices*, this is an equipment issue and not anything necessarily demanding an external service provider. If *measurements* of the conditions of the body are to be transmitted to health care personnel, a communication service is required. It can be a mere bit transport service, but it can also be a more 'value added' service, depending on whether the intelligence is in a centralized system or in the personal devices. *Health related information* needs one or a number of content providers. *Contact with health care personnel* can be voice communications and/or text and video communications. These kinds of communications are already today performed on mobile devices, but could be more specialized with respect to different diseases or disabilities. Finally, *emergency situations* may occur, needing some kind of specialized service or merely building on a combination of the abovementioned applications and services.

If the users are to be equipped with a coherent system relating to their specific problem, there will probably be a need for a service and content provider coordinating the different functions. Network operators will, of course, be able to deliver the communication transport services, but if the users are to be offered a total package, another kind of service provider is to be involved. This could be the present health care institutions, e.g. hospitals. In this case, it would in most cases be non-commercial services paid for by the

public health care system. But it could also be commercial companies specializing in setting up such health care PN services.

## 5.2. Nomadic@work

Nomadic work is a very generic term and can include many different kinds of work situations. In the MAGNET context, two specific cases are examined, nomadic work among the staff at a broadcast station and nomadic work at a university campus. If concentrating on the first specific case, the following types of content and services are relevant examples in a PN context:

- Access to news from news agencies
- Access to archival information
- Access to other relevant information
- Teleconferencing with colleagues 'at home'
- Communications with the team 'on site'
- Access to information/prioritization of news
- Traveling services (hotels and flights)

It should be mentioned that there can be many other kinds of relevant services and content and, furthermore, that the areas listed here do not include the media product itself – i.e. the production of it, including editing, and the transfer of the product to the central editorial entity.

With respect to *news from news agencies*, this is something that all broadcast stations subscribe to and could retransmit to their employees 'in the field'. This means that it is an issue of retransmitting the relevant news, and that from the point of view of the PN services and content, an external content provider is not necessary. The same applies regarding *access to archival information* and access to other relevant information (for instance information on the players in a football match) from the broadcast station. In this case, there will be no external content provider. In the case of *communications with colleagues* 'at home', teleconferencing facilities could be relevant. This service will be likely to be bought from an external service provider, as long distance communications is involved. *Communicating with the team 'on site'* is another issue, as ad-hoc networking can presumably be used. *Access to information from the editorial board*, on the other hand, requires a communication service from an external service provider. Most of the communication will be made by means of voice teleconferencing. However, it may also be that journalists 'on site' can have access to a 'board' listing the news and stories given priority. Finally, easy access

to *traveling services* of different kinds would make things easier for staff 'on site'. This can be done in different ways – either with direct communications between the traveling and booking agencies and the people 'in the field' or mediated by the broadcast station.

Relating to this case, it seems that most service and content packages will be organized by the broadcast stations themselves. It is imaginable that external providers could offer a total service package or elements thereof, but taking the specificities of the individual broadcasters and their knowledge on communications technologies into consideration, it is likely that a self-organized approach will be the most prevalent.

## 6. Conclusion

Even though many of the different kinds of content and services mentioned above could be delivered in an un-packaged manner with the users having one terminal but subscribing to content and services from different content and service providers, it seems that if these PN scenarios are to be realized, there has to be one entity organizing the content and services for the user. This applies whether it is a commercial relationship with the argument of one-stop-shopping and –billing or it is a self-organized (non-commercial) relationship. There needs to be some kinds of PN 'champion' setting up the content and service environment. If this is not the case, it will probably not be realized as a coherent service environment for the users.

In the case of Smart@home, there could easily be room for commercial providers to offer a total service package to the end-users. In the case of health care service, the most likely scenario is that a service package will be organized by the health care institution (e.g. hospital), and the commercial nature of the service will depend on the degree of commercialization of the health care institution. However, a commercial health care service provider (or even a network operator developing such health care packages) could very well enter the field. With respect to the last case on Nomadic@work in a broadcast station, the likelihood is that the service package will be organized by the broadcast stations themselves. But it is also possible that external service providers can set up the PN service package for the broadcast station. Many different scenarios are thus possible and commercial operators must adapt to these diverse situations.

In the present phase of the MAGNET project called Beyond, the aim of the business modeling part of the project is to extend the analyses presented in this paper into actual business cases allowing for a commercially sound implementation of Personal Networks. Focus is on two cases, care and nomadic work. Roadmaps and strategies for market introduction are examined, and the hitherto primary focus on the value field actors is extended to user acceptance of network solutions, content, services and applications.

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