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Chapter XXVII
A Business Planning Framework for WiMAX Applications

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ABSTRACT

Mobile networking refers to wireless technologies which provide communications between devices. Applications for mobile networking have a broad scope as they can be applied to many situations in either industrial or commercial sectors. The challenge for firms is to better match market-induced variability to the organizational issues and systems necessary for technological innovation. This chapter develops a business planning framework for mobile networking applications. This framework recognises the fluidity of the situation when trying to anticipate and model emerging wireless applications. The business planning framework outlined in this chapter is a generic model which can be used by companies to assess the business case for applications utilizing mobile networking technologies.

INTRODUCTION TO WIMAX APPLICATIONS IN THE MOBILE NETWORKING SECTOR

WiMax is a wireless standard that was developed to provide a wireless alternative to cable and DSL for broadband access (WiMax-Forum, 2004). The focus here is assessing the potential business case for WiMAX applications in the mobile networking sector. Mobile networking refers to wireless technologies which provide communications between devices, for example, a laptop maybe connected wirelessly to a printer via radio using the Bluetooth standard. The WiMAX standard allows for both point-to-point and point-to-multipoint configurations – the latter being suitable for mobile networking applications.

Point-to-multipoint microwave networks have been previously deployed as proprietary networks (Vaughan-Nichols, 2004), until the development

of the Institute of Electrical and Electronics Engineers (IEEE) 802.16 set of standards known as WiMAX (Worldwide Interoperability for Microwave Access). These global standards improve matters in two ways: compatibility of components within a communications system and customer interface standards. The availability of global standards for mobile networking technologies enables high technology firms to focus resources on specific aspects of a WiMAX communication system.

The Business Case for WiMAX Applications

The purpose of the chapter is to examine the forecasting elements for emerging broadband wireless access applications. The chapter examines the elements involved in deploying a new product or service to determine whether or not a business proposal will create value. Value management is an approach to management based on the principle that business decisions are based on the premise that *"they must manage a firm's resources with the ultimate objective of increasing the firm's market value"* (Hawawini and Viallet, 2007, p. 521).

The availability of global standards such as WiMAX is a means for achieving greater adoption. This has been shown with the Wi-Fi (wireless LAN) networking standard where high user adoption rates have been experienced within a relatively short time period. However, significant ROI (return on investment) is not yet clear for WiMAX (Koffman and Roman, 2002) as the network and equipment costs are still high. The breadth of factors which need to be addressed during business planning for broadband wireless access is shown in Table 1.

The ROI components present in Table 1 illustrate the high infrastructure costs involved with investment in both core and access networks with Gunasekaran and Harmantzis (2005) quoting backhaul costs of T3 as $2000 per month and OC3 of $5000 per month. This chapter develops an approach to examining the business case for WiMAX applications and develops a business planning framework. The business planning framework outlined in this chapter is a generic model which can be used by companies to assess the business case for applications utilizing mobile networking technologies.

Table 1. ROI components for broadband wireless access

ROI Components	Key Factors	Key Variables
Revenues		
Applications	Voice/ data/ Internet	Supporting interfaces
Subscription take-up rate	Market Potential	Demographics; capacity per subscriber
Pricing Package	Installation charges and monthly subscription charges	WiMAX billing/tariff structures
Costs		
Spectrum Licence fees	National availability of spectrum	National regulatory situation
Planning costs	Radio planning; business case	Tower site acquisition; frequency allocation and environment (multi-path)
Equipment costs	Backhaul and base station costs	Network topology ; wireless access configuration
Deployment costs	Installation charges	Ease of interconnectivity
Operating costs	Upgrades; maintenance etc..	Equipment interoperability

KEY COMPONENTS OF THE BUSINESS PLANNING FRAMEWORK

The business planning framework for mobile networking technologies which has been developed is shown in Figure 1. The framework comprises two sides which need to be in alignment. The left-hand side identifies the elements to assess the market potential of mobile networking applications. The right-hand side of the framework identifies the elements to assess the business case of mobile networking applications.

This approach differs from other forecasting approaches by utilising an open-systems view of innovation management. This means that the business planning framework supports generic approaches to planning innovation for emerging broadband wireless applications. Each element within the framework is a generic one and does not constrain the other elements in terms of their structure.

This framework recognises the fluidity of the situation when trying to anticipate and model next-generation wireless applications. Previously broadband wireless access was considered an alternate solution to broadband access offered via DSL or cable due to the prominence of the established network operators providing local loop services. This does not take into account the drivers and market development for next-generation wireless applications. The key developments for users were identified as working assumptions for fourth-generation mobile project (Bria et al, 2001) including: telepresence (in place of meetings); information anywhere, anytime; intermachine communication; security and one-stop shopping. Many consumer electronic applications in the mobile networking sector arise due to user demands for the convenience of wireless connectivity.

The business planning framework outlined in Figure 1 is a generic model which identifies key components by which business proposals can be examined and the potential value identified.

Key Components of Market Potential

The business planning framework recognises that firms must assess market potential to maximise return on investment (ROI). This requires analysis of collected information concerning market structures and market offerings in a systematic manner. An approach to assessing the market potential for broadband access services is to focus on the different demographics and the WiMAX billing/tariff structures as illustrated by a couple of

Figure 1. The business planning framework for mobile networking technologies

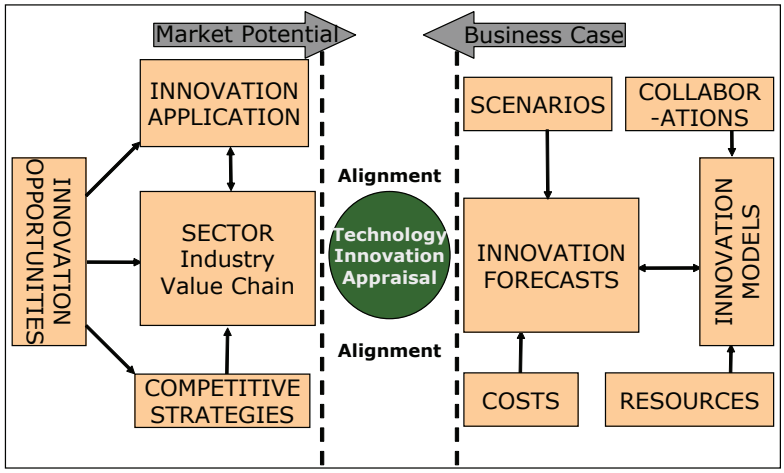


Table 2. Modelling the market potential of broadband wireless access

Model Assumptions	Residential Example: Low Usage	Residential Example: High Usage
Customers	Residential	Small office
Customer capacity requirement	2MB/s to 5MB/s	5MB/s to 10MB/s
Geographic coverage	Depends on allocated frequency and radio planning	Depends on allocated frequency and radio planning
Customer density	Number of homes in area	Number of offices in area
Initial Take-up estimates	20%	30%
Target Population	30%	40%

example scenarios in Table 2. The models shown are extensions on existing models for broadband wireless access (Petkovic and De Coster, 2000) including capacities forecasted for fourth and fifth generation mobile systems (Ohmori et al, 2000 and Ghosh et al, 2005) rather than capacities currently reported (Ballon, 2007).

Revenues are essentially based on subscription take-up rates multiplied by the pricing package. The nature of the customers will be the key variable as residential users will have very different requirements and pricing levels to corporate users. Hence, demographics are a key factor in determining the business viability of any telecoms network (Ballon, 2007).

Pricing components of a broadband wireless access service usually comprise two elements (Petkovic and De Coster, 2000): installation charges and monthly subscription charges. The installation charges need to cover the logistical and personnel costs and may include equipment costs. The monthly subscription charges are likely to consist of a mix of flat-rate or packaged WiMAX billing/tariff structures depending on the type of customer.

Innovation Opportunities

The successful commercialisation of products encompassing new technologies requires a high level of market sensing (Anderson and Narus, 2004, p41). This refers to the ability of firms to anticipate the desires of customers and trends in markets. The fast moving high technology sector of mobile networking is one where establishing market sensing is not easy to do. Many of the protocols and standards are only recently established and are yet to be deployed in the marketplace, for example, mobile WiMAX could support data transfer at vehicular speeds (Vaughan-Nichols, 2004).

Wi-Fi has been shown to be a cost-effective broadband wireless access solution for rural and remote areas (Zhang and Wolff, 2004). The success of Wi-Fi was explained by three factors (Galperin, 2005):

1. Provides wireless access as well as for backhaul traffic;
2 Widespread industry support for the standard and
3 The lack of regulatory overhead.

The growth in diversity of mobile devices is yet to occur and includes Smartphones, PDAs, Portable Media Centers, retail point-of-sale systems, Global Positioning System-based devices and industrial robots. This increasing number of user devices are challenging to support as they each have different interface requirements. The end users are seeking to gain improved usability through wireless connectivity. WiMAX

has been added to the list of approved 3G radio access technologies in the International Mobile Telecommunications 2000 (IMT-2000) standard as defined by the International Telecommunication Union (ITU).

It is unclear how attractive the services offered by third-generation mobile (3G) networks will be compared to Wireless-LANs such as Wi-Fi (Lehr and McKnight, 2003). From the end-user's perspective value for the end-user is the means to express in monetary terms the functionality or performance of a market offering in a given customer application (Anderson and Narus, 2004). For example, a home cordless base station will connect a mobile phone to the public telephone network in order to reduce cost of calls and remove the need for dedicated home wireless terminals as cordless phones.

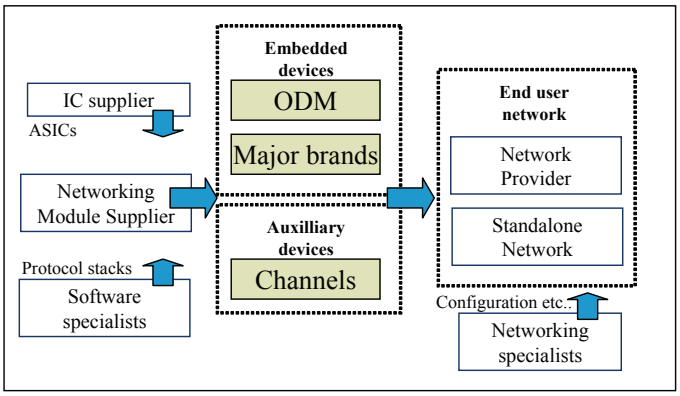
Consumer applications utilising wireless connectivity are increasing including multimedia communication to PC peripheral devices including Digital Still Cameras; Camcorders, MP3 players and mobile phones. Applications for mobile networking have a broad scope as they can be applied to many situations in either industrial or commercial sectors. The take-up will depend on the perceived benefits of future applications and whether the differences in quality of service will overcome higher user charges. For example, the quality of service for a voice-over-IP which can be offered over Wi-Fi connecting to an IP network versus the high quality of a voice service over 3G networks (Laroia et al, 2004 and WiMax-Forum, 2007).

The Mobile Networking Industry Value Chain

The approach taken in the business planning framework is to establish the focus and scope of business activities (Afuah and Bahram, 1995), with respect to the positioning of the firm in the industry value chain. The industry value chain for the mobile networking sector is shown in Figure 2. It comprises many high technology companies which have specialist expertise and manufacturing capabilities.

The industry value chain for the mobile networking sector comprises three elements from upstream to downstream as follows: vendors, technology providers and the end user network as shown in Table 3. Firms have developed their mobile networking expertise in-house or externally, for example, acquiring specialist technology companies with audio recognition software that improves the audio performance of any voice-based product or system. Many firms use specialists to provide network monitoring equipment aimed at data acquisition for the purposes of remote monitoring including the monitoring

Figure 2. Industry value chain for mobile networking products



of equipment operation at unmanned sites or as automated disaster prevention systems.

The shortening of product lifecycles increases pressures on the management of product innovation activities to reduce time-to-market. Specialising within the industry value chain firms is a means for achieving this for high technology firms operating in highly uncertain markets such as mobile networking where the applications are still emerging (Bria et al, 2001).

The scope of activities that a firm provides within the industry value chain is part of the strategic focus of a firm (Afuah and Bahram, 1995). The companies specialize within the industry value chain for mobile networking products which comprises a number of high technology firms each developing technologies and products for deployment in international markets. The advantages of this approach (of having a devolved value chain), is that firms are utilising reduced transaction costs and economies of scale (WiMax forum, 2004). This is particularly relevant for mobile networking applications where solutions encompass a variety of technological approaches in terms of wireless encoding, data communication and networking protocols.

The other benefits of having the value chain being provided by different organisations is that the business is more flexible as, unlike a large corporation, the corporate structure is more easily changed (Floricel and Miller, 2003). The organisation is also more responsive to changes in market conditions as each of the various firms in the network is monitoring the market (Stuart, 2000).

Table 3. Summary of the elements of the mobile networking industry value chain

Upstream Elements	
IC (Integrated Circuit) Suppliers (including ASICs – application specific ICs)	ASICs and other specialised ICs are a key part of mobile networking products and the companies with the design capability for this may not necessarily manufacture the ICs themselves
Networking Module Suppliers	Firms that provide the hardware components including the circuit board, antennas, transceivers and base process units
Software Specialists	Firms that provide the software necessary to handle the end user application (or interface to an existing application) plus the communications and networking functionality required
Midstream Elements	
Original Device Manufacturers (ODMs)	Firms who supply electronics equipment that they require to become wireless enabled
Major Brands	The major electronics companies – typically global consumer electronics companies with an established market brand
Channels (to market)	These are the distribution channels providing mobile user devices to consumers (e.g. high street retailers)
Downstream Elements	
Network Providers	These are typically large service providers (including mobile phone operators)
Standalone Networks	Firms providing industrial networks (e.g. in oil refineries)
Networking Specialists	These are typically consultants with expertise in the configuration, installation and operational aspects of communication networks (including technical and other performance issues)

Innovation Application

Market driven management starts with the definition of the target customers and their applications. This concurs with the view taken here since a firm's focus on specified target customers will define the parameters of the product/ service offering. Consumer products are characterized by large volume and very tight cost pressures on the producer. To achieve a comparative advantage requires technology firms to develop their technology understanding prior to volume market launch. They then utilize their market knowledge to launch desirable product configurations (Orihata and Watanabe, 2000).

The chosen innovation applications are often dependent on a firm's legacy, its core competences, and its reasons for moving into the mobile networking sector and recent product development activities. This focus on specific applications is necessary to establish the functionality provided by the mobile networking products and optimise the mobile networking solution to the end application.

WiMAX uptake may benefit from the increasing number of mobile user devices which are available both for industrial purposes (such as handheld terminals) and for consumer electronics. Healthcare is an area where we are likely to see a proliferation of "always-on", battery-powered devices both in the home and in hospitals. Home networking is an area which has been recognised but has not yet seen great diffusion. This will entail linking devices together and exchanging information so that a high level of automation is achieved, hence, driving the potential demand for WiMAX.

Competitive Strategies

The strategic orientation of a firm in highly uncertain markets requires three areas of focus according to Gatignon and Xuereb (1997): customer; competitors and technological. The approach taken in the business planning framework is to evaluate a firm's competitive performance in the mobile networking sector on the three aspects of: resources; market position and financial performance. These factors were identified by Hunt (1999) in the work developing the RA (resource-advantage) theory of competition. The reasons for adopting this theoretical framework is that it combines the literature on the resource-based view (RBV) of the firm as well as the literature on strategic positioning or market based view (MBV).

As technology advances it becomes increasingly difficult for firms to have sufficient resources of sufficient breadth and depth in the required technological areas. This necessitates the need to create a business model involving collaboration as technology firms are driven by resource limitations. The importance of business models is that they can assist firms in their quest for developing competitive advantage on an ongoing basis.

As technology becomes more common, competition may shift away from technology to other areas (Friar and Horwich cited in Lemos and Porto, 1998). WiMAX as a mobile networking application enables equipment providers to have a much closer relationship with the end users of their broadband wireless access service. There is the opportunity for technology firms to gain insights into user aspects which enable them to improve their future product offering in terms of interactive design and other user-centred design aspects. This knowledge can provide a firm with competitive intelligence that should enable the firm to maintain a competitive advantage (Lemos and Porto, 1998).

Key Components of the Business Case

A business case assessment should identify the proposal's potential contribution to the overall performance of the firm (Loch, 2000). Business planning involves understanding the drivers of

value both for the firm creating the product/ service and the customer purchasing it (Ryan, 2004, pp. 81). From the firm's perspective the business case should examine whether the value of the future stream of net cash exceeds the initial cash outlay required for a business proposal (Hawawini and Viallet, 2007, p.5).

Business models should not be restricted to pricing and revenue models but should also address the following according to Osterwalder and Pigneur (2002): the value proposition of the proposed product innovation; customer management; infrastructure management and financial aspects. Infrastructure management comprises the following according to Osterwalder and Pigneur (2002): capabilities and resources; value configuration and partnerships. This is reflected in Figure 1 with the "innovation models" allowing for internal resources as well as collaborations.

Innovation Models

Innovation models identifies the approach a firm takes to organising itself for undertaking the development work necessary to develop the new products/ services. Essentially it is a "business model" for the firm's activities relating to innovation which describes the key development activities. Technology core competencies for mobile networking firms are multi-disciplinary. Existing technology firms are unlikely to have developed expertise in all the required areas. To develop mobile networking products and services they need to identify the expertise that should be developed to support the development of the required products (McEvily et al, 2004).

It is necessary to establish the costs of the technological innovation and product development activities which firms have undertaken to develop products in the mobile networking sector. The trend is towards product development using business partnerships with other vendors who have hardware expertise and product portfolios that will enable a firm to realise their technology development strategy. This is increasingly necessary as mobile networking firms encounter a wider range of consumer electronic scenarios including streaming CD-quality audio; digital image transfer and laser printing where bandwidth and power are critical factors.

Collaborations

Business partnerships are a fundamental change and affect the way in which businesses are organised and managed. Companies are able to retain within the organisation only the activities or processes that best meet their competencies and provide optimum value-add. The reduced resources are focused on a given activity (or set of activities) that are revised and refined till a high degree of sophistication and speed is achieved.

The business case framework shown in Figure 1 recognises that it is common practice to utilise business partnerships and collaborations during development work. This is particularly true for end user mobile devices where the shortening of product lifecycles increases pressures for innovation activities to reduce time-to-market. Fast development processes enable firms to exploit the emerging innovation opportunities which arise from the interaction among components once new technologies are in place. These new innovation opportunities were not apparent prior to launch of the new technologies and result from the interactions. This is apparent in mobile networking as more and more user applications are being realised after systems have been deployed in the field.

Innovation strategies that involve other firms requires an organisational commitment to the pursuit of a chosen product development with another organisation. Despite this alliances have been recognized as providing efficiency and greater creativity for new product development. Both of these are key to addressing the issue of sustainability of competitive advantage. Faster renewal of resources and products is achieved which is necessary to counter changes of markets, competitors and technological advancements.

Resources

Ryan (2004, p.272) identified that the financial planning for a business case should comprise three parts:

1. The revenue model which describes how the new business activity will win revenue
2. The expenditure model which describes the necessary expenditures required to achieve the goals specified by the revenue model
3. The financing model which describes how the firm will raise its finance

Forecasts are then created based on the projections made for these three parts. The forecasts should consider the value proposition over the entirety of the value life cycle which according to Osterwalder and Pigneur (2002), comprises: value creation; purchase; consumption, renewal or transfer. The scenario for the provision of broadband wireless access is rather different as user costs are predominantly service access charges (e.g. subscriptions); rather than the equipment purchased. The business case is altered so that the revenue is generated over the lifetime usage of the equipment rather than the initial purchase price. This approach focuses on the service provider providing end users connectivity to the Internet via broadband wireless rather focusing on the mobile user devices.

The two items of interest here are the revenue model and the expenditure model which, according to Ryan (2004, p.272); are dependent on the internal constraints of a firm and external opportunities that the business confronts as shown in Table 4.

Innovation Forecasts

Forecasting essentially requires an understanding of the broad area beforehand (Cuhls, 2003). This more general establishment of the future context is known as foresight and often starts with the identification of the one or the different options for the future. By nature foresight is more qualitative that quantitative and usually precedes detailed forecasting which is more quantitative in nature.

The qualitative approach to financial forecasting has limits (Kesh and Raja, 2005), but can be adopted for specific applications. The approach requires a high level of clarity of terms and establishing a relationship amongst the elements. The relationship could be a hierarchical arrangement which defines the necessary logic behind the elements in a model for financial forecasting (Lemos and Porto, 1998). The experiences of the electronics sector in providing mobile handsets in large volumes to short market windows is unlikely to be the pattern for WiMAX adoption.

A switch to mobile networking applications will not only involve potential forecasting difficulties in terms of market research amongst WiMAX end users (McBurney et al, 2002) but also organisational forecasting problems (Sand-

Table 4. Internal and external factors affecting the business case

The revenue model:	
External revenue drivers:	Markets, competition etc..
Internal revenue drivers:	Capabilities and USPs etc..
The expenditure model:	
External cost drivers:	Supply chain characteristics, labour conditions etc..
Internal cost drivers:	Organisational structures, technologies in place etc..

ers, 1995) amongst the network operators who are not used to this business approach. Resistance to adopting new financial forecasts is likely to occur until such a time that field trials enable forecasts to be evaluated (Sanders, 1995). The difficulties of forecasting broadband wireless access service provision are due to the lack of established applications and that timescales for the forecasted positive net cash flow are lengthy. One approach to overcoming organisational forecasting problems is to develop co-operative strategies (Sanders, 1995).

Scenarios

Financial planning requires quantifying the expected cash flows for the innovation opportunities. As WiMAX mobile networking applications are not yet deployed it is not possible to measure cash inflow from operations. The implication for examining the business case for WiMAX applications is that one of a number of alternative valuation methods will need to be proposed. Scenarios are a method of approaching this by recognising a potential future state which can then be evaluated financially by means of forecasting. Forecasting market demand for new telecommunications services cannot make use of historical market data which makes scenario analysis methods an attractive approach to modelling the dynamics of a marketplace (McBurney et al, 2002).

WiMAX is likely to benefit from both increased capacity demand from the industrial sector as well as the consumer sector which has a large number of consumer devices which are Wi-Fi enabled. Industrial applications range from temperature monitoring, security, industrial monitoring and building automation markets through to medical, automotive, retail (particularly electronic point of sale) and factory automation. It is difficult to assess potential user interest in the case of technology that is novel and largely unknown to the market. While the provision of Internet services is well established, the value to customers of telecoms services being delivered by WiMax is unclear at present. The end user will need to be reassured that emergency delivery of calls is guaranteed and that adequate technical support is available.

Costs

Quantifying the costs of deploying WiMAX mobile networking applications requires understanding the different costs involved. The categorisation of costs was identified earlier (in Table 1) as:

- Spectrum Licence fees
- Planning costs
- Equipment costs
- Deployment costs
- Operating costs – this refers to ongoing network support costs and will not be discussed further here.

Spectrum licence fees are potentially prohibitive costs in terms of the business case. Regulatory constraints are a factor for WiMAX as the availability of radio spectrum is a regulatory constraint. Much of the spectrum needed to deploy WiMAX has already been distributed by governments or dedicated for other purposes by network operators (Vaughan-Nichols, 2004).

Planning costs are not the issue in themselves as it usually involves a radio planning group examining the geographic location and determining performance parameters. The issue is more the implications of the findings of the planners as these will impact the amount of equipment required to be deployed. The performance of the radio transmissions are affected by the radio frequency which in turn affects radio planning, for example, in determining cell capacity (Fong et al, 2004).

Equipment costs vary depending on how closely tied a service provider is to a vendor. Proprietary wireless solutions incur higher equipment costs as equipment vendors have to recover substantial development costs. In contrast, global

standards enable development costs to be spread across the wider community of high technology companies. Further, the overall adoption rate is slower than established standards such as Wi-Fi (wireless LAN), particularly in terms of equipment such as access points and end user devices.

The methodology for forecasting costs for next-generation wireless applications is based on a mixture of three considerations:

1. Historic cost
2. Modelling of equipment
3. Equipment cost decline trends

Historic cost forms the basis on which telecoms networks are costed. The experience of deploying and running a network provides the baseline information for service providers on which they formulate future cost assumptions. In contrast; establishing the amount of equipment to be deployed is based on the anticipated capacity requirements. This provisioning of equipment is in turn is based on forecasts for the take-up of broadband wireless access services.

The business case for broadband wireless access in areas where there is no established access network (e.g. developing countries or rural areas), is likely to differ to the business case for traditional access networks that incurred high costs of core switching equipment and access network deployment. However, backhaul costs are still expensive (Gunasekaran and Harmantzis, 2005). The future IP (Internet protocol), based core network will use a variety of access technologies to connect users (Becher et al, 2001). The costs of communications equipment for the core network are dropping and the components for end user devices are evolving into becoming multifunctional. The IP products in the core network are likely to be provided by other specialist organisations who would supply them to the service provider. For example, application developers, device manufacturers, system integrators and application service providers.

Deployment economics are a key concern for network operators (Koffman and Roman, 2002) as visiting customer homes to install and configure equipment is a resource intensive business. Recent laptops are now fitted with Wi-Fi access cards and users are able to setup and configure a wireless LAN in their home themselves. This reduces the deployment costs and also speeds up roll-out of broadband wireless access on a large-scale. At present most user devices do not have a WiMAX radio interface card fitted. The future trend is likely that radio interfaces in mobile Internet and consumer electronic devices will support several radio interfaces and possibly have the potential to download upgrades (Becher et al, 2001 and Ohmori et al, 2000).

FUTURE TRENDS

Business planning for mobile networking applications needs to consider the perspectives of the equipment providers; the service providers and the end-user. The equipment providers typically incur high development costs and the associated operating expenditure model during production. In contrast, the service providers are concerned with network configuration, deployment economics and operating costs.

There are a number of areas where mobile networking applications will offer new opportunities, including e-Home and in-car information and entertainment systems. Social networking is (Alam and Prasad, 2007): *"A platform where people from all walks of life come together to express themselves by means of sharing videos, pictures, contents, etc.. and it provides the ability to collaborate using peer-to-peer applications and services"*. The trend towards social networking is potentially a global one which could alter the dynamics of capacity utilisation amongst residential users of broadband wireless access.

Financial planning requires quantifying the expected cash flows for these market opportuni-

ties. The business case for WiMAX applications needs to be flexible enough to evaluate mobile user services for which the sales growth rate is undetermined. As WiMAX mobile networking applications are not yet deployed it is not possible to measure cash inflow from current operations.

CONCLUSIONS

The chapter started with a description of the potential of a WiMAX communication system to provide mobile networking services. This utilises the point-to-multipoint configuration of the WiMAX standard to provide a broadband wireless access solution. In the context of value management with its emphasis on creating and delivering value, a business planning framework has been introduced. This comprises two sides which need to be in alignment. With respect to examining the market potential the market requirements are examined along with competitive positioning. With respect to the business case a discussion of innovation models was made that recognises the various dimensions of innovation management and resourcing. Concerning the forecasting of future demand for emerging broadband wireless applications the approach proposed is scenario based that recognises the globalisation of services and applications such as Face Book.

The presented business planning framework for mobile networking technologies provides a means of matching market-induced variability to the organisational issues and systems necessary for technological innovation. The framework draws on principles grounded in financial management, marketing management strategy and innovation management. By utilising an open-systems view of innovation management in the business planning framework it supports generic approaches to planning innovation for emerging broadband wireless applications. Further it recognises the challenges of providing quantitative forecasts when forecasting demand for emerging services for which historical data is not available.

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KEY TERMS

Business Case: Development of a business proposal including the evaluation of resources and finances including the assessment of the likely earning potential of new products or applications.

Business Planning: The process of identifying likely cash flows and examining the sensitivity of these likely cash flows from which targets are established for managing the business development including resourcing.

Forecasting: Preparing predicted customer and market take-up of specific applications which form the basis on which investment criteria are examined.

Mobile Networking: Wireless technologies which provide communications between devices, for example, a laptop maybe connected wirelessly to a printer via radio using the Bluetooth standard.

Scenario Planning: An approach to forecasting which examines likely market situations (or scenarios) based on qualitative research into users and markets which can then be extrapolated into quantitative forecasts.