# T.C. DOGUS UNIVERSITY
**INSTITUTE OF SCIENCE AND TECHNOLOGY**
**ENGINEERING AND TECHNOLOGY MANAGEMENT MASTER PROGRAM**


# TECHNOLOGY ROADMAP FOR KUVEYT TURK MOBILE BANKING

**M.S. Thesis**


**Zeynep ERDOĞAN**
**201199002**

**Advisor: Assoc.Prof.Dr. Şule ÖNSEL EKİCİ**



**Istanbul, May 2014**

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And finally, thanks to my husband Abdullah Erdoğan. He always gave me his support the whole period of project submission.

Istanbul, May 2014 Zeynep ERDOĞAN

**ABSTRACT**

Mobile Banking refers to provision and availability of banking and financial services with the help of mobile telecommunication devices. The scope of offered services may include facilities to conduct bank and stock market transactions, to administer accounts and to access customized information (Tiwari, R. , Buse, S. and Herstatt, 2007a). In other words, mobile banking offers the possibility to use e-banking (electronic banking or internet banking) services via a mobile phone. However, the major difference between an electronic and mobile transaction, highlighted by the prefixes “e” and “m”, is that electronic banking offers “anytime access”, while mobile banking offers “anytime and anywhere access” for business transactions. Therefore, customers using mobile banking have a greater flexibility than users of electronic banking.

Almost all the banks are giving service from lots of channels like ATMs, online via internet, call centers, kiosks, etc. Banking industry requires high availability, systems continuity and minimum downtime on services. Especially for distribution channels the business computing needs have reached maximum levels of availability. So that the mobile is also becoming most popular channel for banks. Therefore nowadays finding the technology roadmap for mobile banking is very important.

It is important for banks evaluating various options keeping in mind that business and technology objectives which each bank wishes to achieve. The aim of this thesis is giving a general overview of the mobile telecommunication sector. In addition, it will be a review of different mobile technologies. As a result, a technology roadmap is given to reach high quality in the latest technology.

In this thesis, priority matrix is used for planning the technology roadmap. With this method, prioritization between constituents can be done successfully. The aim of the technology roadmap provides a plan in order to reach short-term and long-term goals by giving specific technology solutions. The current plans for a new product or process, or an emerging technology is involved in the roadmap. Developing a roadmap has three major benefits. First, technology roadmap helps reaching a consensus to a set of needs and the

technologies required to satisfy those needs. Secondly, it provides a mechanism to forecast technology developments and finally it provides a framework to plan and coordinate technology developments.

## ÖZET

Mobil Bankacılık, bankacılık ve finansal hizmetlerin telekomünikasyon cihazları ile hizmet vermesi anlamına gelir. Sunulan hizmetler ise; banka ve borsa işlemlerinin yürütülmesi, hesapların yönetilmesi ve özel bilgilere erişilmesidir (Tiwari, R. , Buse, S. and Herstatt, 2007a). Diğer bir deyişle, mobil bankacılık, mobil telefonu üzerinden e - bankacılık (Elektronik Bankacılık veya İnternet Bankacılığı ) hizmetleri kullanma imkânı sunar. Elektronik ve mobil işlemlerinin ticari işlemlerdeki en büyük farklı ise e – Bankacılığın (elektronik bankacılık) her zaman erişim sunarken; Mobil Bankacılığın her zaman ve her yerden erişim sunmasıdır. Bu nedenle, mobil bankacılığı kullanan müşterilerin elektronik bankacılık kullanıcılara oranla daha büyük esneklik payı vardır.

Hemen hemen tüm bankaların atm, kiosk, internet şube ve call center hizmetleri vardır. Bankacılık sektörü, sağladığı hizmetlerde yüksek erişilebilirlik, sistem sürekliliği ve hizmet kesintisinin minimum olmasını hedefler. Özellikle dağıtım kanalları için otomasyon ihtiyacı maksimum seviyededir. İşte bu yüzden bankalar için mobil en popüler kanallardan biri olmuştur. Bundan dolayı Mobil bankacılık için teknoloji yol haritası oluşturmak çok önemlidir.

Bankalar için, ulaşılmak istenen iş ve teknoloji hedeflerini düşünerek, farklı seçenekleri değerlendirmek önemlidir. Bu tez, mobil iletişim sektörünün bankacılığa olan etkisine genel bir bakış açısı sağlar. Bununla birlikte farklı Mobil Teknolojileri incelenir ve tanıtılır. Bunun bir sonucu olarak teknoloji yol haritası en son teknolojideki yüksek kaliteye ulaşmayı sağlar.

Bu tezde, teknoloji yol haritası oluşturmak için öncelik matrisi kullanılmıştır. Bu yöntemle, bileşenler arasında önceliklendirme başarıyla yapılabilir. Teknoloji yol haritasının amacı, alternatif teknoloji çözümlerini sunarak, kısa vadeli ve uzun vadeli hedeflere ulaşmak için bir plan sağlar. Teknoloji yol haritası, yeni bir ürün veya süreç ya da gelişmekte olan yeni teknolojiler ile ilgilenmektedir. Teknoloji yol haritası kullanmak temelde üç büyük fayda sağlar. Birincisi teknoloji yol haritası, ihtiyaçları ve bu ihtiyaçları karşılamak için gerekli teknolojileri mutabakata varılarak belirler. İkincisi, teknolojik yenilik ve gelişmeleri

tahmin edebilmek için bir mekanizma sağlar ve son olarak teknoloji gelişmeleri planlamak ve koordine etmek için bir çerçeve sağlar.

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# 1. INTRODUCTION

## 1.1 Mobile Banking

Mobile banking is a system that allows customers of a financial institution to conduct a number of financial transactions through a mobile device such as a mobile phone or personal digital assistant (http://en.wikipedia.org/wiki/Mobile_banking, 04.03.2014). It is also defined as the provision of banking and related financial services such as savings, funds transfer, and stock market transactions among others on mobile devices (Tiwari and Buse, 2007b). Accessing banking services on a mobile device give customers a high degree of freedom. Not only does it put them in charge, it also enables them to do their banking independently of their location and time. In traditional banking, a customer needs to be present at one of the branches of a bank and has to take into account the opening hours the bank has established. In the 1990s banking for customers using modems was introduced in the Netherlands and it allowed customers to do their banking from home using a personal computer. Customers were put in charge of their own banking activities. Mobile banking gives the customer another degree of freedom, namely geographical independence.

Another approach, mobile banking is a way for the customer to perform banking actions on his or her cell phone or other mobile device. It is a quite popular method of banking that fits in well with a busy, technologically oriented lifestyle. It might also be referred to as M-banking or SMS banking. The amount of banking you are able to do on your cell phone varies depending on the banking corporation you use. Some banks offer only the option of text alerts, which are messages sent to your cell phone that alert you to activity on your account such as deposits, withdrawals, and ATM or credit card use. This is the most basic type of mobile banking. A more related type of mobile banking allows the user to log into his or her account from a cell phone, and then use the phone to make payments, check balances, transfer money between accounts, notify the bank of a lost or stolen credit card, stop payment on a check, receive a new PIN, or view a monthly statement, among other transactions. This type of banking is meant to be more convenient for the consumer than

having to physically go into a bank, log on from their home computer, or make a phone call. While all of this is true, some are concerned about the security of mobile banking.

Mobile phones are the predominant communication device that people and businesses globally use on a daily basis. People who use mobile phones are becoming more knowledgeable about innovative e-finance services (Ratten, 2009). Mobile technology does not only provide voice communication but also provides a broad digital world where there may be many vertical e-services. In this digital world, both the identity and the security of data transmission is very critical for the success of these e-services.

Mobile Banking is a form of branchless banking refers to the connection between a mobile phone and a personnel or business bank account. Mobile banking allows customers to use their mobile phone as another channel for their banking services, such as deposits, withdrawals, account transfer, bill payment, and balance inquiry. Most mobile banking applications are additive in that they provide a new delivery channel to existing bank customers. Transformative models integrate unbanked populations into the formal financial sector. Moreover, mobile banking has a number of additional features that increase its accessibility. People can send money via text message and be paid directly via their mobile phone (Ratten, 2009).

The amount of banking you are able to do on your cell phone varies depending on the banking institution you use. Some banks offer only the option of text alerts, which are messages sent to your cell phone that alert you to activity on your account such as deposits, withdrawals, and ATM or credit card use. This is the most basic type of mobile banking.

A more involved type of mobile banking allows the user to log into his or her account from a cell phone, and then use the phone to make payments, check balances, transfer money between accounts, notify the bank of a lost or stolen credit card, stop payment on a check, receive a new PIN, or view a monthly statement, among other transactions. This type of banking is meant to be more convenient for the consumer than having to physically go into a bank, log on from their home computer, or make a phone call. While all of this is true, some are concerned about the security of mobile banking.

Bank customers addressing the widespread use of mobile devices are as an opportunity to connect with. Several types of products can be offered, for example a way to transfer funds using a mobile device, or as a virtual wallet. A clear distinction can be made between mobile payment and mobile banking. Hu X. , Li and Hu Q. (2008) define mobile payment and banking as 'using mobile phones to pay for services (bus, train, movies, entertainments), goods (retails stores, coffee shops, restaurants, vending machines, online stores), bills (electric, gas, credit cards, phone), and transfer funds (bank to mobile, bank to bank, mobile to mobile)'. It is important to note the difference between mobile payment and mobile banking.

For these reasons, banks, attrition to reduce the boost customer retention, greater loyalty offerings to deliver new virtual solutions to create, operating costs, reduce the discretionary income to increase production and different sizes of the mobile channel's comprehensive utilization want to achieve.

### 1.1.1. Advantages of Mobile Banking for the Customer

Mobile banking has several benefits for the customer. It enables customers to perform their banking activities anywhere, any time and at a lower cost (Esmaili 2011; Suoranta 2003). As stated previously, they do not have to travel to a branch anymore. Furthermore it gives the customer access to the information relevant to them, be it a request for the current account balance or an overview of recent transactions. Traditionally one would have to call or visit the bank to find the latest account balance, or the status of a transaction. Finally, it puts customers in the driver's seat of their own banking; they can initiate transfers or buy and sell stock orders.

As compared to other banking channels, mobile banking offers convenient benefits in terms of mobility, which are not availed by traditional offline banking and non-mobile internet banking. It is postulated that there is a significant positive relationship between relative advantages and adoption of mobile banking technology.

According to Becirovic, Bajramovic and Ahmatovic (2011); mobile banking services have the following advantages for customer:

- People save time, because they do not have to go directly to the bank in order to conduct their financial needs. Moreover, they do not need to search for parking space, which is very important today due to the lack of parking space in all major cities. On the other hand, people in rural areas often do not have access to a bank, so with mobile banking they are able to conduct financial transactions without going to the bank in a town. This also increases security for people from rural areas, because they do not have to take their cash with them.
- As already mentioned, people do not need to go directly to the bank, so they are also saving money for fuel, parking etc.
- Mobile banking enables people to conduct financial transactions 24 hours a day and seven days in a week. So, they can ignore office hours of the bank.
- Mobile banking offers people accurate information about their account and their transaction history. So, they can plan their financial needs.

### 1.1.2. Advantages of Mobile Banking for the Financial Institution

Mobile banking is an efficient tool, which can be used to payment transactions, facilitate financial transactions as well as crediting transactions. Mobile banking in order to enable a wide use in all kinds of mobile phones are easy to use and can be applied to. And of course, And of course, for all mobile phone subscribers must be cheap. In this way, mobile banking can have a large agreement. However, challenges have to be considered, such as technological acceptance, trust, traditional ways of conducting financial transactions and the large use of cash in developing countries. Even then, mobile banking is able to upgrade economic development by simplify financial transactions. Nevertheless, it has to be noted that mobile banking will not replace classic banking.

From the provisional side, empirical studies show that there is a keen competition between mobile operators and financial institutions. For mobile operators, mobile banking services can help to attract and retain users and generate new revenue streams. For financial institutions, they are an opportunity to reach users who may have been previously

unreachable due to lack of retail infrastructure. So, over the long haul it will be interesting to see which side will dominate. However, an agreement between all market players should be the best in order to offer a large range of mobile banking services (Becirovic, Bajramovic and Ahmatovic, 2011).

### 1.2 Mobile Banking in Turkey

Banks in Turkey started experimenting with mobile banking long before the convergence revolution. Today, nearly every major savings bank in Turkey offers at least some or all of the three basic mobile channels: SMS messaging, Web sites formatted specifically for mobile devices, and applications developed for certain mobile platforms, such as the i-Phone, Android, or BlackBerry.

In Turkey, Garanti Bank is first bank in 2005 to provide mobile banking services through SMS banking. Garanti Bank has provided money transfer from a mobile phone. It was also the first in the world.

The Turks love their mobile phones and new mobile services are rapidly adopted. It was against this background that Garanti saw the opportunity to offer greater convenience and superior levels of customer service through a new mobile banking service. With over 74 million populations, Turkey is an attractive market for new innovative products and services. As of 2011, gross national income per capita is 16,730 USD and over 17 percent of population is within the age range of 15-24 while it is 12 percent for most European countries (http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes, 12.04.2014).

Garanti Bank, in September 2007, mobile phone, WAP, using their online banking channels can be about 90% of transactions carried the first bank in Turkey. Garanti Bank's mobile banking solution interface and user-friendly online branch that looks like. Garanti Bank, there are four different display solutions tried on more than 4000 different mobile devices and mobile phones on the market may be the most widely used.

İş Bank mobile banking services on a downloaded application was followed by Garanti Bank. Mobile device should be enabled Java and the screen resolution of mobile device should be 128*60 in order to use this service. (http://www.isbank.com.tr/interaktif/i-interaktif-iscep.html, 2007). Both banks' mobile banking services, Wireless Application Protocols (WAP) and General Packet Radio Service (GPRS) must be installed on mobile device settings.

Garanti and İş Bank provides the main services are as follows: Account Information (mini-statements and accounts check the history and account activity or set thresholds now you alerts), money transfers, payments, card transactions (credit card information, abstract, credit card debt payment), exchange transactions, investment transactions (stock trading and B type liquid funds), ATM and branch locations and content services (eg, market updates, credit about the types of news, general information, credit cards) as well as general information.

Fortis Turkey, in May 2008 launched mobile banking services and these services from the address mobil.fortis.com.tr. DenizBank outside of these two banks, Yapi Kredi, VakıfBank, Akbank and provide mobile information services such as the Halk Bank and DenizBank, Yapi Kredi and VakıfBank too, money transfer, to offer bill payment services.

Information and Communication Technologies Authority (ICTA) 2012 2 by as of quarter at least 10.6 million mobile internet users, which makes this figure has doubled compared to last year. According to Mobilike (10.04.2014) August 2012 received from the Banks Association of Turkey in Turkey according to statistical information that is made with the number of customers using mobile banking grew by 68% compared to 2011. Besides that:

- Mobile platforms, the total number of credit and credit card applications grew 292% compared to 2011
- Mobile money transfer platform, the total number of transactions made from 118%
- Mobile platform made from 140% total money transfer transaction volume
- Mobile platforms bill payments made from 217% in TL terms of number of transactions, the transaction is based on 192%

- Investment transactions made from mobile platforms, the process on the basis of 248%
- The exchange rate of the mobile platform sales grew by 641%.

Instantly download all types of mobile applications and effective use of Turkish consumers as banks at a time to make better and more useful applications are pushing.

### 1.3 Mobile Banking in Kuveyt Türk

Kuveyt Turk was established in 1989 in the status of Private Financial Institution for the purpose of operating in accordance with the principles set by the Cabinet Decree No. 831/7506 of 16.12.1983. Operations of Private Financial Institutions were conducted by Cabinet Decrees on the one hand and communiqués of the Central Bank and the Undersecretaries of Treasury on the other hand until such operations were included within the scope of the Banking Law in 1999. In December 1999, Kuveyt Turk became subject to the Banking Law No. 4389, just like other Private Financial Institutions. The title was changed to be Kuveyt Turk Participation Bank Inc. in May 2006.

Regarding the capital of Kuveyt Turk, 62% is owned by Kuwait Finance House, 9% by the Public Institution for Social Security, 9% by the Islamic Development Bank, 18% by General Directorate for Foundations and 2% by other shareholders.

Being the largest shareholder of Kuveyt Turk with a share of 62%, Kuwait Finance House is not only a giant financial institution in Kuwait but also among the leading interest-free financial houses in the world thanks to its total fund of billions of dollars and the modern banking services it offers.

Since its foundation, Kuveyt Turk has adopted as its principles to be attentive in interest free banking system, research in the field of investment, offer modern, stable, reliable, high-quality and quick service to savers and businessmen, and provide its staff with continuous training for the purpose of increasing their productivity. Kuveyt Turk is proud of being capable of bringing quick and high-quality service to savers and investors through its branches and correspondents at home and abroad by any modern technological means.

Kuveyt Turk, which both turns the savings of its profit-sharing clients into reliable and profitable investments and creates new areas of employment by funding reel sector and thus makes significant contributions to the national economy owing to its investments and participations in the sectors of textile, metal and real estate, was awarded gold, silver and bronze medals on different dates by public institutions and professional associations such as the Undersecretaries of Treasury and Foreign Trade, Istanbul Chamber of Commerce and Istanbul Ready-Made Clothing Exporters' Association due to its achievements in the field of export.

In line with the vision of being an international participation bank, Kuveyt Turk has opened foreign branches and representative offices as well.

As an age of technology and computer, 21st century compels especially financial institutions to work harder. In this regard, Kuveyt Turk has set up the necessary information and technology infrastructure. It renders all banking services through e-banking and alternative distribution channels in the best possible way. In addition to Visa and Mastercard credit cards, services such as POS, ATM, Internet Banking, Call Center, Interactive Voice Response System and SMS Banking are rendered uninterruptedly. Kuveyt Turk feels right proud of being the first participation bank to have offered these innovations to its clients since 2000.

Kuveyt Turk Participation Bank Inc. , which aims at incorporating into modern business management techniques and concept of management and service with its young and dynamic service staff almost all of whom are university graduates and experts in their fields, is the leader among the participation banks in Turkey thanks to its reliable capital structure and economic power. (http://www.kuveytturk.com.tr/history.aspx , 11.04.2014).

Kuveyt Türk pioneer of innovative and always is on a mission to bring himself further. With the latest technology to increase the ease of use target customer is considering. In this context, Kuveyt Türk Mobile Banking application gives access to various Kuveyt Türk products and services like online market information, applications, and contact information for branches and ATM. Mobile banking is available on IOS, Android, and Windows Phone 8 mobile operating systems working on more than 400.000 devices (Figure 1.1). This application allows the user to send or request money, top-up prepaid mobile lines, pay

credit card bills, instantly transfer money and find nearest branch, follow the financial news instantaneously.

The use of mobile devices and mobile Internet access is widespread nowadays. Kuveyt Turk, mobile phones and via mobile devices offering mobile banking services in this area aims to become one of the leading institutions. Mobile banking channel from the new phone will be released in the coming years given the same service that is targeted.


Figure 1.1 Kuveyt Türk mobile branch application

Banks, who led Technology Corporation has been. After inclusion of internet banking, mobile banking to our lives and mobile services has become a part of our lives. Up to a year from now nobody know the meaning of a term than 3G mobile life have moved to a completely different dimension, banking shares also took it seriously. Because social networking web pages in 3G technology, mobile phones or PDAs can be controlled has become. Understanding of bank branches with 3G mobile users in the past and Mobile Banking to increase the number of intensive efforts are going.

On the other hand, Kuveyt Türk is released a new application in 2014. The name of this application is Gold Send (Figure 1.2). Gold Send mobile application is enabled all people to send certified Kuveyt Turk gram gold via their card to their loved ones. In this process, the person who wants to send gold downloads the Gold Send application from the market

enters his and the receiver's name, surname and mobile phone number and then choose the gram gold amount he wants to send. After that, he enters his credit card information to our secure web environment. As soon as the transaction completes, the gold receiver gets an SMS including a reference number. Finally, he can take the gold from any Kuveyt Turk ATM in Turkey by entering his mobile phone number and the reference number whenever he wants.


Figure 1.2 Gold send application

## 2. TECHNOLOGY ROADMAP

Technology Roadmap is a plan that implemented to a new product or process or to a new or emerging technology. It helps to reach consensus about a set of needs and the technologies required to meet those needs and provides a mechanism to help forecast technology developments and inventions.

Technology roadmap is a flexible technique that is widely used within industry to support strategic and long-range planning. The approach provides a structured (and often graphical) means for exploring and communicating the relationships between evolving and developing markets, products and technologies over time. It is proposed that the roadmap technique can help companies survive in turbulent environments by providing a focus for scanning the environment and a means of tracking the performance of individual, including potentially disruptive, technologies. Technology roadmaps are deceptively simple in terms of format, but their development poses significant challenges (Phaal, Farrukh and Probert, 2001b).

In this section, technology roadmap is defined and a general characteristic of the road map is revealed. Then the technology road map process, the process of forming the relationship between stage and stages are explained and technology roadmap methods and techniques used in the process are examined. Finally, information is given about the architecture and technology roadmap is made on a general evaluation.

Technology roadmap is an extended look at the future of a chosen field of inquiry composed from the collective knowledge and imagination of the brightest drivers of change in that field. Roadmaps communicate visions, attract resources from business and government, stimulate investigations, and monitor progress. They become the inventory of possibilities for a particular field (Galvin, 1998).

Technology roadmap must be recognized as a linchpin management tool that can help support integration with other needed strategic and operational management processes, it does not stand alone. And, bottom line, it is 'roadmapping' that delivers results; the focus

cannot be on just the 'roadmaps’ (Radnor and Probert, 2004). Technology roadmap is a plan that matches short term or long term goals with specific technology solutions to help meet those goals (Garcia and Bray, 1997).

The Technology Roadmap originated at Motorola in the late 1970s and early 1980s under the advocacy of then CEO Robert Galvin. The first paper on Motorola's use and approach appeared in a Research Management Journal in 1987 (Willyard and McClees, 1987). There had been a growing need for Motorola to reduce the product development cycle time to meet customer demand, while the complexity of products increased (Probert and Radnor, 2003). In the early 1990s the roadmapping approach became more popular and a very good example of this is the Semiconductor Roadmap, a 200 page dynamic document still being updated and followed (Galvin, 2004; Edenfeld, Kahng, Rodgers and Zorian, 2004). By late 1990s several European firms followed the Motorola practice of using roadmaps and EIRMA (European Industrial Research Management Association) documented the roadmapping process from the experiences of 25 corporations. The roadmapping approach applied in engineering technology has found application in science (Galvin, 1998).

Technology is an important strategic asset for many companies is the strategy and planning processes to include technological issues is a growing need. However, the establishment and the connections between technology resources and corporate communications objectives presents a challenge for many organizations is continuous. Technology roadmap technology strategy and planning is a technique that has the potential to support. This type of map can take various specific forms, but it usually connects future products and technological developments to market needs may include a time-based chart. This method is successfully applied in the industrial context has a number; However, the method may be difficult to start and maintain consistently.

Technology roadmaps be addressed in various forms but the most common approach in Figure 2.1 as seen by spinning is proposed generic architecture (Phaal, Farrukh and Probert, 2004). Schematic technology roadmap is shown in Figure 2.1

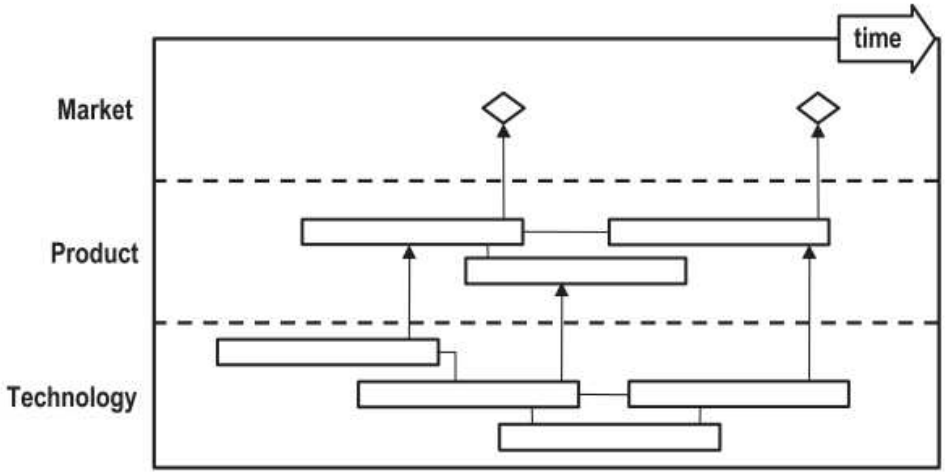


Figure 2.1 Schematic technology roadmap (Phaal, Farrukh and Probert, 2004)

The general architecture of a multi-layered structured and captured the important aspects that should be shared information about the business, enables the identification of strategic issues and actions agreed. 'Know-why' (purpose) alignment, the 'know-how' (delivery), 'know-how' (sources) and 'know-how' (time) market pull and technology push a balance between obtaining provides. Generic technology roadmap is shown in Figure 2.2.

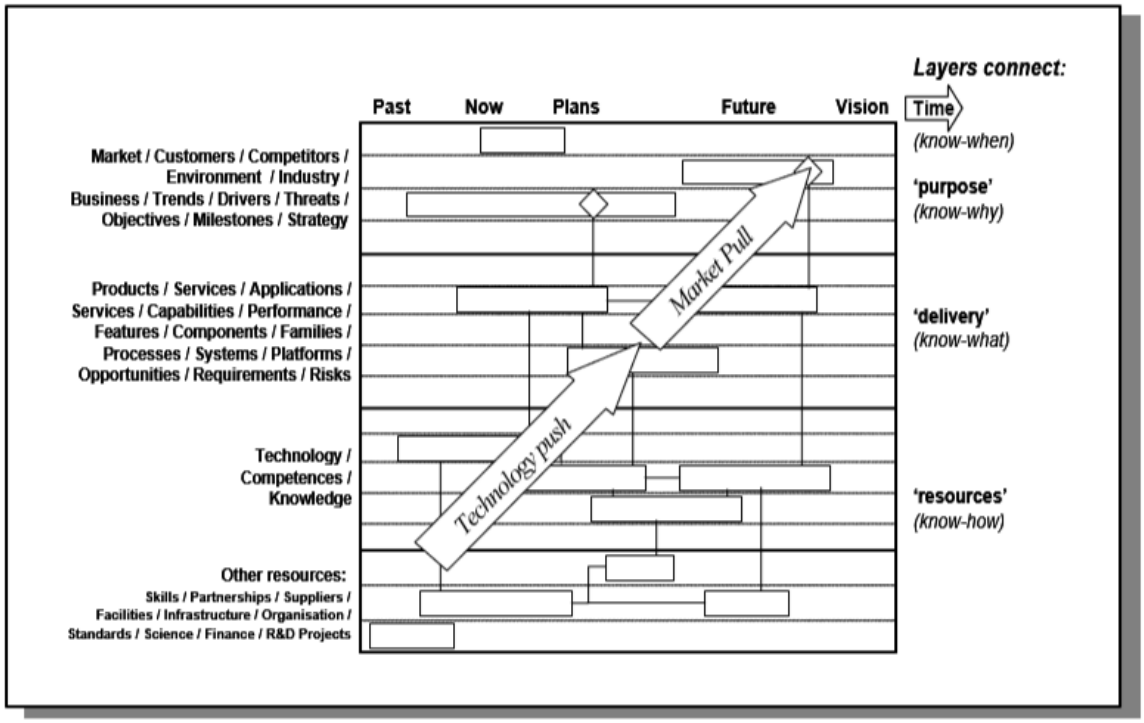


Figure 2.2 Generic technology roadmap (Phaal, Farrukh and Probert, 2004

## 2.1 Technology Roadmap Benefits

The technology roadmap outlines the major initiatives for standardizing the IT environment and increasing IT's efficiency and effectiveness over the next five years. The initiatives were determined by various sources including business-side IT roadmaps, executive management planning meetings, client planning sessions, and client year-end reviews. The three major initiatives identified are enterprise architecture, security and privacy programs, and fiscal discipline. Technology roadmap has been used for a quarter of a century and has been widely adopted in the last decade. It is yet to experience the full potential of roadmapping and to establish theoretical foundation, formal benchmarks, and evaluate criteria (Mary Tom , 2010).

Technology roadmap development in targeted areas of science and technology provides a framework to predict. A technology investment decision due to future uncertainties and ambiguities around the judge is risky. There are two important steps in technology investment decisions. This investment in research and development to create technology solutions and applications to be transferred to the research, is investing in the development of new products and services. Technology roadmaps show what trends are happening in the overall industry in terms of technology, and then allow you to map your company's products and releases to them. They are an excellent way to show how your company is taking advantage of up and coming new opportunities created by technology.

Technology roadmap process is the output of the technology roadmap. Technology roadmap, select help determine product needs and develop technology alternatives to satisfy a number of technologies driven planning process needs one. This organized and appropriate technology is needed to take investment decisions and to leverage this investment to provide critical technology-planning information to develop a framework. The technology roadmap also coordinated the development of one or more technologies can help. This coordination provides leveraged investment resources.

To summarize the benefits of technology roadmap benefits:

• Facilitate the integration of new technology into the business

• Support for company strategy and planning processes

• Present a framework to help plan and coordinate technology developments at any level

• Identify new business opportunities for exploiting technology

• Provide top level information on the technological direction of the business

• Provide a mechanism to help experts forecast technology developments in target areas

• Support communication and co-operation within the business

• Identify gaps in market and technical knowledge

• Support sourcing decisions, resource allocation, risk management and exploitation decisions

• Help develop consensus among decision makers about a set of technology needs

• High-level integrated planning and control a common reference / framework

## 2.2 Technology Roadmap Purpose

Technology roadmap approach is very flexible and the terms 'product' or 'business' roadmap may be more appropriate for many potential uses. Examination of a set of approximately 40 roadmaps has revealed a range of different aims, clustered into the following eight broad areas, based on observed structure and content (Phaal, Farrukh and Probert, 2001a).

Product Planning:

This is usually more than one generation of the product, including the placement of manufactured products related technologies into the technology roadmap by far the most common type, is required. Examples of technology and product development roadmaps planned to connect shows how to use. Product planning is shown in Figure 2.3.

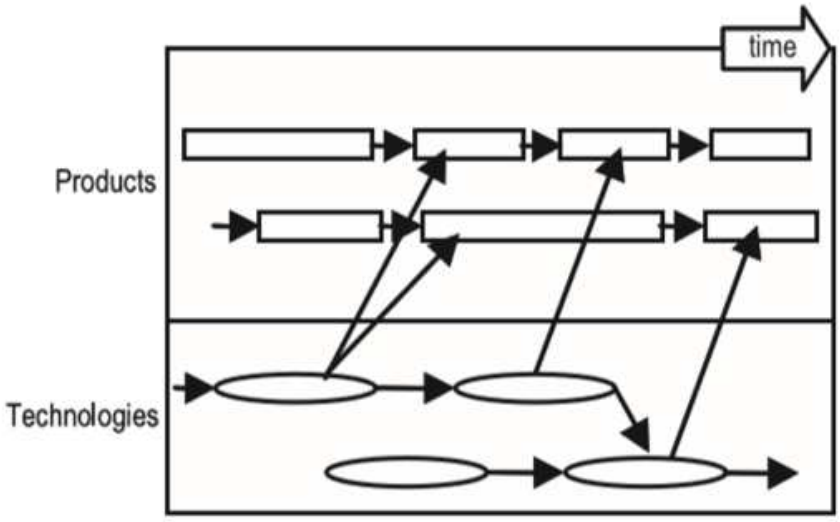


Figure 2.3 Product planning (Phaal, Farrukh and Probert, 2004)

Service / Capability Planning:

It is similar to product planning. Service capability planning is more suited to service-based enterprises, focusing on how organizational capabilities that support technology. This roadmap focuses on organizational capabilities as the bridge between technology and the business, rather than products. Service/capability planning is shown in Figure 2.4.

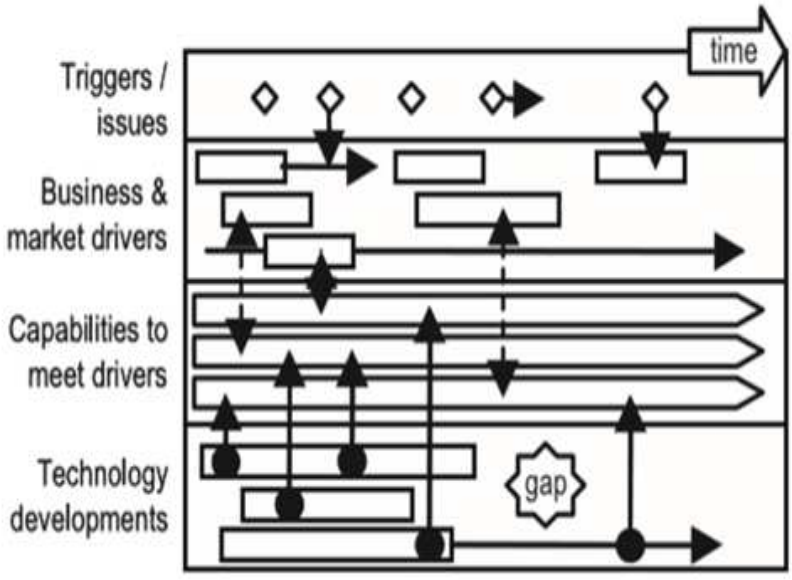


Figure 2.4 Service/Capability planning (Phaal, Farrukh and Probert, 2004)

Strategic Planning:

Usually at the level of different business opportunities or threats for supporting evaluation provides a strategic dimension. The roadmap focuses on the development of a vision of the future business, business, in terms of markets, technologies, products, culture, skills, etc. Explained by comparing the current position and the future vision, and strategic options to bridge the gaps identified were examined. Strategic planning is shown in Figure 2.5.

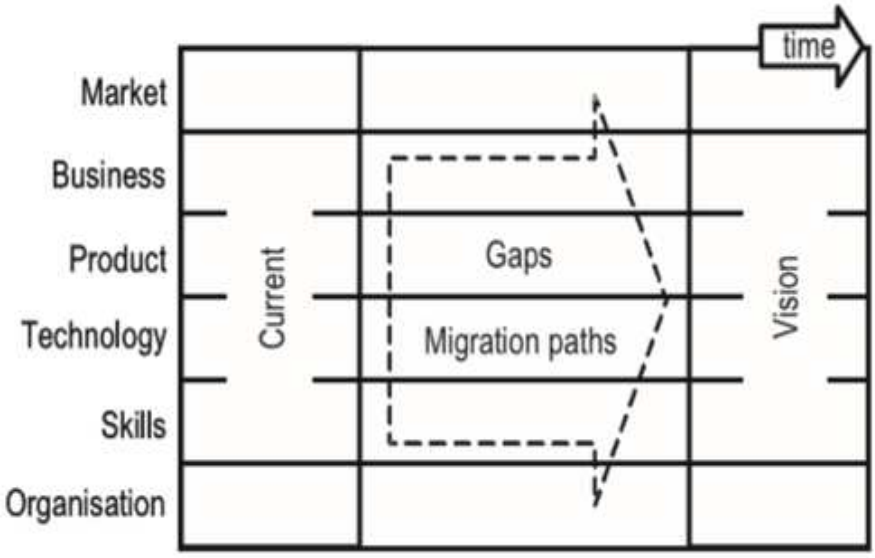


Figure 2.5 Strategic planning (Phaal, Farrukh and Probert, 2004)

Long-range Planning:

Planning time horizon expands, and often industry or national level prediction is performed. Technology improvements 'knowledge-driven continuous corporate' (a nugget) are likely to gravitate toward information systems focuses on showing. Long-range planning is shown in Figure 2.6.

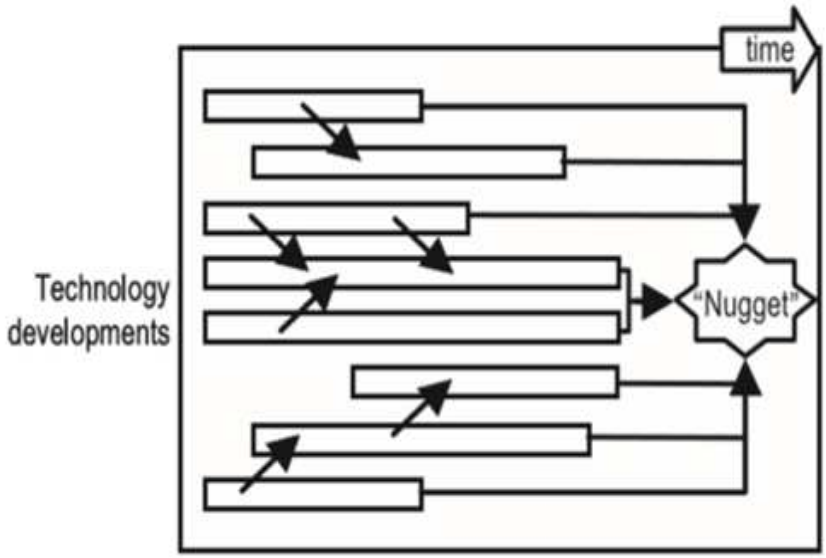


Figure 2.6 Long-range planning (Phaal, Farrukh and Probert, 2004)

Knowledge Asset Planning:

Information assets with business objectives and knowledge management initiatives are created with the alignment method. Skills, technologies and competencies required to meet future market demands critical information assets and enables users to visualize connections. Knowledge asset planning is shown in Figure 2.7.

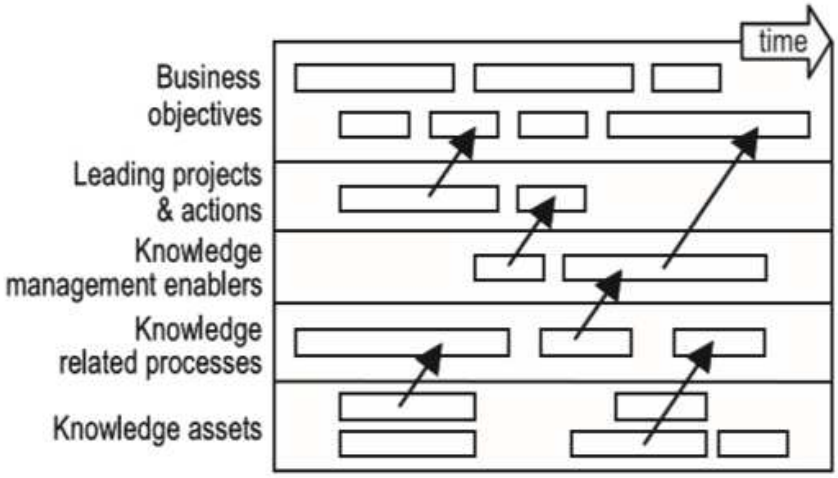


Figure 2.7 Knowledge asset planning (Phaal, Farrukh and Probert, 2004)

Program planning:

Implementation of strategy and more directly relates to project planning like R&D program. Program planning is shown in Figure 2.8.

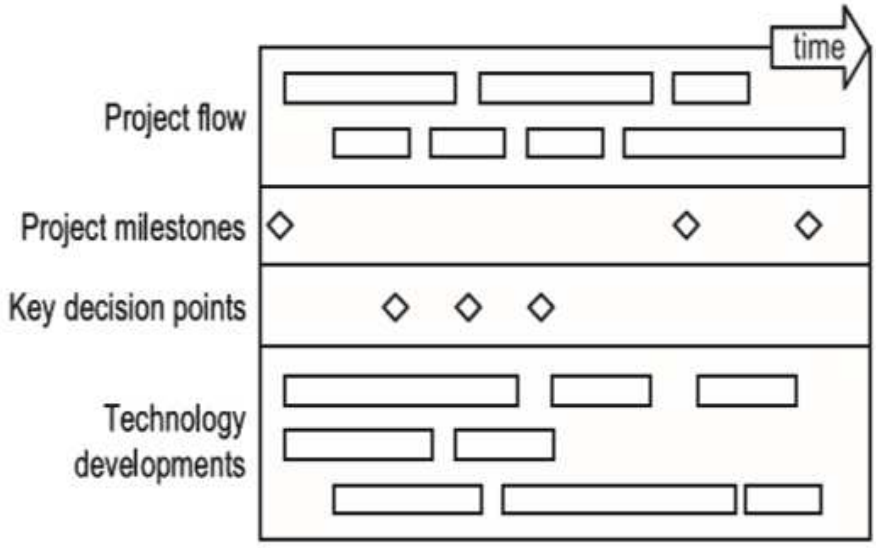


Figure 2.8 Program planning (Phaal, Farrukh and Probert, 2004)

Process Planning:

It supports the management of knowledge, focusing on a particular process area. Process planning is shown in Figure 2.9.

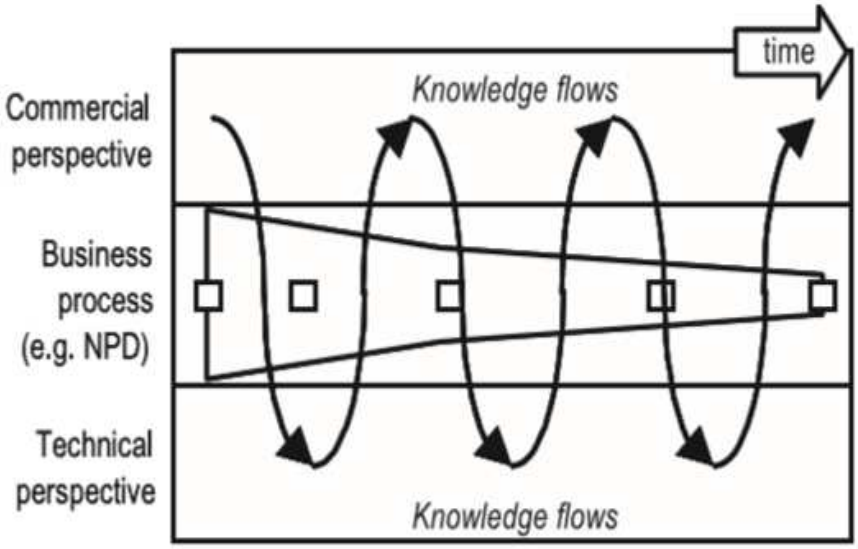


Figure 2.9 Process planning (Phaal, Farrukh and Probert, 2004)

Integration Planning:

It is combined different technologies in products and systems, or (usually without indicating clearly the time dimension) Integration in terms of how to create new technologies and / or technology evolution. Focusing on ‘technology flow’, showing how technology feeds into test and demonstration systems, to support scientific missions. Integration planning is shown in Figure 2.10.

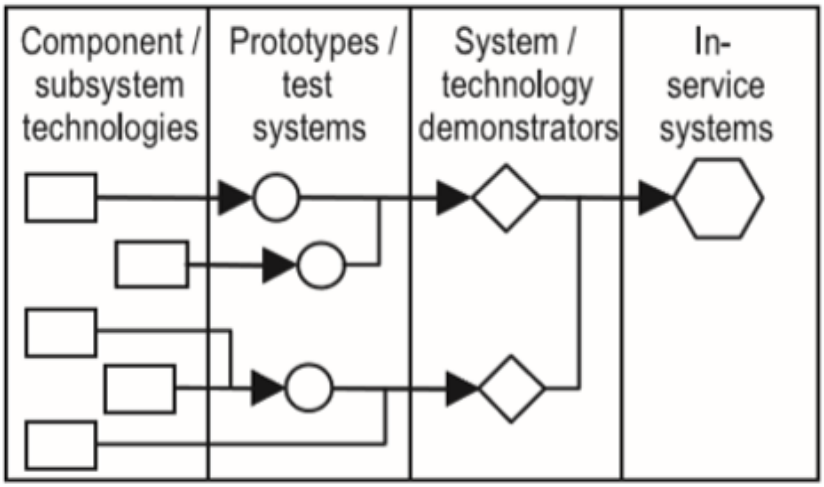


Figure 2.10 Integration planning (Phaal, Farrukh and Probert, 2004

## 2.3 Technology Roadmap Format

Multiple Layers:

The most common formats of technology roadmaps, technology, product and market consist of a number of the layers. Street map of each layer evolution in products, services and business systems that facilitate the integration of technology, together with inter-layer dependency is data to be explored. Multiple layers is shown in Figure 2.11.

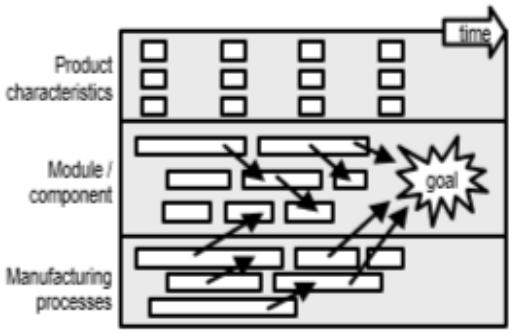


Figure 2.11 Multiple layers (Phaal, Farrukh and Probert, 2004)

Bars:

Many road maps for each layer or sub layer 'bar' are expressed as a range. This communication, road maps and road maps to support integration software facilitates the development of the required output, has the advantage of simplifying and unifying. Bars is shown in Figure 2.12.

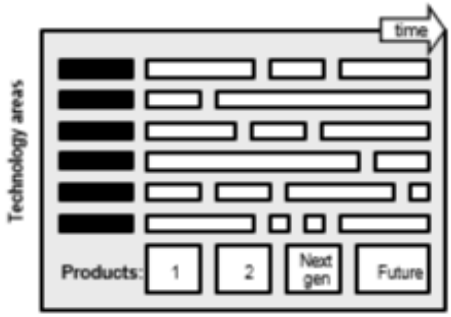


Figure 2.12 Bars (Phaal, Farrukh and Probert, 2004)

Tables:

In some cases, all the way or road map layers in the map as a table (i.e. time vs. performance) unless otherwise stated. Such an approach, in particular performance may be determined easily, or during certain time period's activities are clustered according to the situation. A table is shown in Figure 2.13.

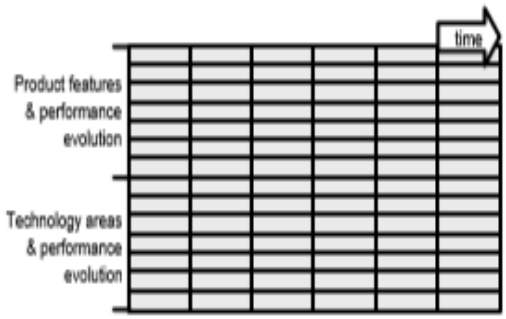


Figure 2.13 Tables (Phaal, Farrukh and Probert, 2004)

Graphs:

For each sub-layer is a typical - where measurable performance product or technology, roadmap can be expressed as a simple graph or plot. This type of chart is sometimes an 'experience curve' is called, and closely 'S-curve' is related to technology. A graph is shown in Figure 2.14.

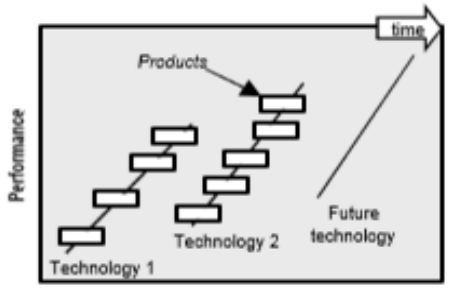


Figure 2.14 Graphs (Phaal, Farrukh and Probert, 2004)

Pictorial Representations:

Some of the integration of technology roadmaps and plans to communicate more creative use pictorial representation. Sometimes the metaphor of a ‘tree’ is used to support goals such as. A pictorial representation is shown in Figure 2.15.

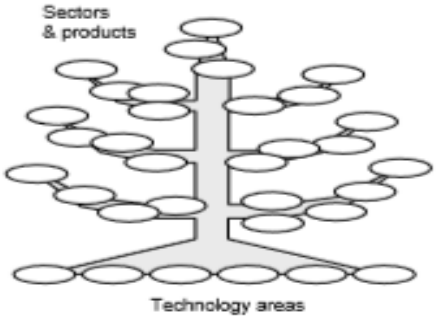


Figure 2.15 Pictorial representations (Phaal, Farrukh and Probert, 2004)

Flow Charts:

Pictorial representation of a specific target type is typically used to associate the flow chart, actions and results. Flow Chart is shown in Figure 2.16.

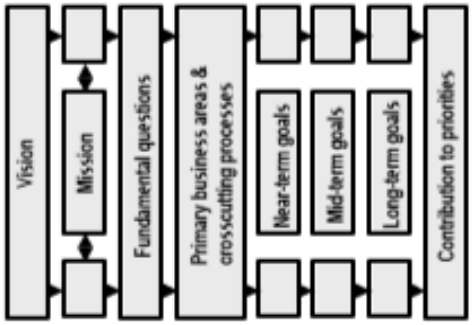


Figure 2.16 Flow charts (Phaal, Farrukh and Probert, 2004)

Single Layer:

This forms a single layer of multi-level roadmap, focusing on the 'A' is a subset of type. Although more complex, such a drawback, the connection between the layers is generally shown.

Text:

Some road maps text-based reports often associated with them that are contained in the more traditional graphical maps describing the same problem, entirely or mostly text-based.

## 2.4 Technology Roadmap Process

Most of the work in process technology roadmap self- reported description of a particular company has the most experience, or whether there are two main aspects of the process of determining the overall technology roadmap. The first issue related to software development technology roadmap. So often, Technology roadmap would be finished on paper and in person, in this case, these events unfold is difficult to update technology roadmaps. In fact, the difficulty in maintaining roadmaps often they are cited as a major barrier to effective use. To solve the problem, the current technology roadmap efforts heavy use of computer-based graphics techniques, structures for conveying information to users and developers to provide. As a result, roadmaps often PowerPoint or Visio drawings are, but still manipulate and maintain. Actually, a simple word processor, spreadsheet and graphics packages technology roadmap initial development to the users satisfaction can give is difficult, but more sophisticated software would be helpful if the process forward should be taken. Petrick and Echols (2004) are created software-based technology roadmap efforts of companies investing in R & D and new product development planning how to address transformation.

Brown and O'Hara (2001) as the different maps on the external drive, or specific technology developments such as common components for re-use requirements is accepted, a flexible software tool components , capture, manage and maintain the best way and let suggesting reuse. Technology roadmap software uses the expected values together with the above-mentioned discussions, practical needs for professional Technology roadmap software is starting to come out. Technology roadmap software, a survey 65% of respondents Technology roadmap special Technology roadmap software tools, techniques and methods can help overcome the problems caused by the lack of stated (Lupini, 2002). In order to respond to current needs, commercial technology roadmap software systems are starting to appear. For example, digital technology projects technology roadmap Honeywell technology, components, subassemblies and products to capture the timing of these developments to support the Geneva Vision software uses Strategist. This software enhancement, storage, dissemination, and can help to support the maintenance of the road map. Also providing corporate planning, product groups, in a common format is

documented and stored in a database will force the individual road maps. Existing software solutions takes the form, since ' software cost ' and ' ease of use ' included two factors most is whether or not a firm will affect the results of the survey to use unlike a lot of time and cost is technology roadmap software to accept.

The second issue of privatization of the road map, a particular environment technology roadmap approach involves applying appropriate. Companies struggle with the application of technology roadmap and business institutions in the context of one of the reasons usually based on specific needs of the roadmap is that there are many specific forms. (Phaal,Farrukh and Probert, 2001b).

Most of the studies describing the technology roadmap flexibility of approach, although only limited efforts have been directed to privatization issues. A few studies planning, architecture and processes in terms of process technology roadmap can be customized to have tried to determine the factors. But still, many technology roadmap current research approaches and concrete principles for privatization of companies missing question-how to customize gives a direct answer.

### 2.5 Technology Roadmap Steps

According to Partnitzke (2013) developing a roadmap has these steps:

- Develop a clear and unambiguous understanding of the current state
- Define the desired end state
- Conduct a Gap Analysis exercise
- Prioritize the findings from the Gap Analysis exercise into a series of gap closure strategies
- Discover the optimum sequence of actions (recognizing predecessor – successor relationships)
- Develop and Publish the Road Map

On the other hand, developing a roadmap has three major uses. The technology road mapping phases are shown in Figure 2.17. It helps reach a consensus about a set of needs and the technologies required to satisfy those needs; it provides a mechanism to help

forecast technology developments and it provides a framework to help plan and coordinate technology developments (Garcia and Bray, 1997).

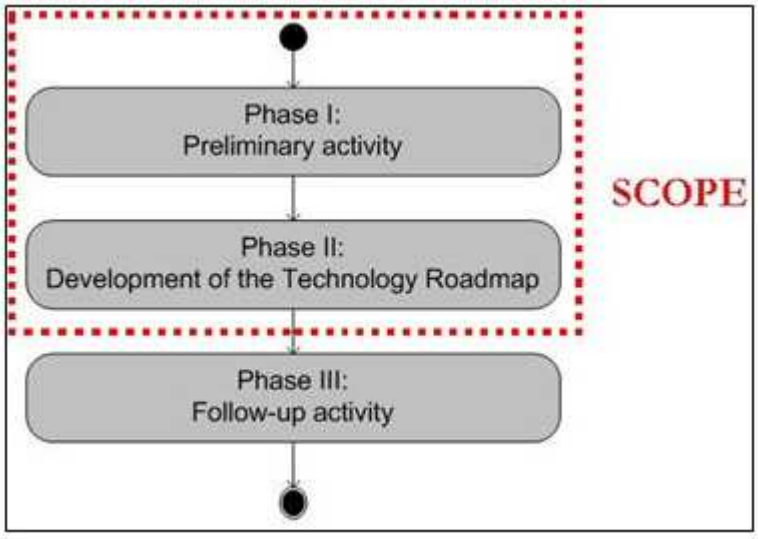


Figure 2.17 Technology roadmapping phases
(http://en.wikipedia.org/wiki/Technology_roadmap, 14.04.2014)

## 2.6 Technology Roadmap Implementation

Technology Roadmap process identifies and selects an acceptable alternative to be maintains to achieve the targeted goals. Processing though the chosen path is a complex activity due to the ambiguities and uncertainties and interested. As the roadmap is developed by input from experts, the primary step in implementation is communication the mission across functional areas of the organization. In substance a technology roadmap identifies specific research and development tasks that have to be taking on and thus becomes the source of projects whose materialization is the implementation of the roadmap.

According to Tom (2010) there are a number of factors required for the deployment of the roadmap and these include:

- Well defined scope and objective
- Collaborative team

- Shared understanding
- Management support
- Availability of required resources.

There are several sets of elements used to define the scope, context and the chosen alternative and as the work progresses these defining elements changing. As the roadmap is a dynamic document, it is criteria to update it and keep it alive (Strauss and Radnor, 2004). Unlike in a project execution, it is essential to evaluate, redefine and make necessary modifications to the roadmap and the implementation plan. Market and technology developments as factors related to variation depending on the vision itself may need revision. Execution of plans and road maps in place for the timely replacement of the establishment of processes and systems is critical to the success.

# 3. MOBILE BANKING TECHNOLOGY

The first mobile banking features were simply a port of online capabilities like check balances, transfer balances and bill payment. 2013 was a big year for mobile banking, driven by trends such as increased smart phone adoption and the popularity of mobile check deposit. Looking into 2014, mobile banking more and adaptation can be seen in various areas.

A new generation of mobile banking and internet banking are the most similar. An application or a standalone application or a browser to run it more advanced and requires a smartphone. Smart phones as well as advanced data processing and connectivity can be defined as an operating system and advanced functionality, however, is more like a real PC.

## 3.1 Mobile Wallet

There are numerous terms nowadays in use for mobile wallets, with some meaningful differences or even perplexing content. Below is a short list of some of the most widely used terms, and their definitions and qualifications:

• *Mobile Purse*:
Usually, the micro prepaid card is understood as a tool for equivalent.

• *Digital Wallet*:
Digital wallets wallet has a secure way to manage and initiate the payment of identity and pay to use the tools, the service is providing access. This service is a device of the holder, for example, a mobile phone (Mobile Wallet) or resides on a PC or can be hosted remotely on a server, but what is already under the control of the owner. Remote digital wallet accessible from any device, any advantage.

• *Virtual Wallet*:
Model of "software as a service" and offered a 'cloud service' wallet, which refers to activities.

• *Mobile Money*:
Deposit or draw money to buy goods, or to pay bills, transfer money between bank accounts or financial transactions on a mobile phone for use.

Mobile wallet may stay on a phone or on a remote network / secure servers. It may be only accessed via mobile device, but it can also be managed and ‘used’ with it. Most importantly, the wallet is controlled by the users.

A mobile wallet contains a wide range of valuables, and the user scenarios can be rich and variable. The content will most likely vary rapidly. The reason for rapid variation is the online connectivity and location based services: The holder of a wallet with rich content not necessarily in monetary terms, but in value-related terms – can give permission to loyalty schemes to send offers or coupons (http://www.mobeyforum.org/, 14.02.2014).

The advent of the mobile wallet feature phones to all stakeholders, including financial institutions also new requirements, the setting is really personal, trusted device, and the user confidence will increase mobile phone addiction. Financial institutions, mobile banking and payments as part of the new demands on the user's experience with a trusted, must be as painless as possible.

### 3.2 Qr Code

QR Code is invented by the division of Toyota, Denso Wave Incorporated in 1994 in Japan. QR stands for Quick Response, a code for a quick reaction, because the idea is the code to be decoded at high speed. A barcode is a machine-readable optical label that contains information about the item to which it is attached. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte / binary, and kanji) to efficiently store data; extensions may also be used (http://en.wikipedia.org/wiki/QR_code,

10.02.2014) . Actually QR is a 2-D matrix code that contains information. According to Denso, The QR Code's unique design gives it many unique advantages and benefits, including:

Fast directional scanning: Position-detection patterns in three corners of a symbol allow the QR Code to be read from any angle within 360 degrees, eliminating the need to align the scanner with the code symbol. The position-detection patterns also eliminate any background interference, ensuring stable high-speed reading.

High-capacity data storage: A single QR Code symbol can contain up to 7,089 numerals over 200 times the amount of data as a traditional 1-D barcode.

Small size: A QR Code can hold the same amount of data contained in a 1-D barcode in only one tenth the space.

Error correction: Depending on the error correction level chosen, a QR Code symbol can be decoded even if up to 30% of the data is dirty or damaged.

Many types of data: The QR Code can handle numerals, alphabetic characters, symbols, Japanese, Chinese or Korean characters and binary data.

Distortion compensation: A QR Code symbol can be read even if its image is on a curved or otherwise distorted surface.

Link ability (Structured Append): A QR Code symbol can be divided into up to 16 smaller symbols to fit long, narrow spaces. The smaller symbols are read as a single cod, regardless of the order in which they are scanned.

Direct Marking: The QR Code's high degree of readability under low contrast conditions allows printing, laser etching or dot pin marking (DPM) of a symbol directly onto a part or product.

Storage of large amounts and different types of data: QR Codes can contain much more information than conventional 1-D barcodes. Codes can encode four types of data – numeric, alphanumeric, binary and Kanji.

The combination between the traditional print media and the online world can be processed much quicker by the use of two-dimensional barcodes. This publication introduced the field of barcodes and pointed out some practical examples. Which kind of code will be established finally is not crucial at all. Furthermore mobile phones are turning more and more into personal digital assistants with much more functionalities than phoning quick transfer of data will be necessity of future. Due to the fact that Internet access via mobile devices will increase considerably in future, the link between print media and World Wide Web will be the next big step towards the digitalization of human society.

### 3.3 Mobile Payments

Several studies have shown that a mobile payment is being used by less than 10% of mobile banking customers. Mobile users become more comfortable with technology, instead of using an application that users rent and utilities such as sending your share of cash gifts fit for situations such as writing a check, and expected further growth.

Debit and credit cards were the technology in banking industry that revolutionized payment for goods and services in the twentieth century. Now, those payment methods are no longer convenient enough for many shoppers and are being replaced by mobile payment apps that serve the same function. Forrester predicts an explosion in the mobile payments market, growing from $12.8 billion in 2012 to $90 billion in 2017.

Payment apps are increasingly accepted at many mainstream stores. To use a mobile payment app, the user’s credit or debit card information is loaded into the app. Instead of searching through a wallet full of cards, the consumer selects a card to use from the menu on their smart phone and then touches the phone to an in-store reader. The payment is processed like a regular credit or debit card transaction.

Many mobile payment providers and the traders who make use of them create special offers targeted directly at their mobile payment customers. In addition to the simplicity of having the ability to pay with their smart phone, mobile payment users have easy access to great deals at the moment they need them.

### 3.4 Mobile Signature

Mobile Signature is a service that enables you to conveniently obtain and use the electronic certificate which stands for your identity card in the electronic environment.

Mobile signature services are easy to use, since they don’t require any software installation. The certificate is activated Over-The-Air once the user has subscribed to the service. Signature requests then automatically pop-up on the user’s phone each time he requests access to secure services. Once the user has entered his PIN, the signature is sent to the service provider, who checks its validity and grants access to the service.

Most digital signatures rely on public key cryptography to work, and a basic understanding of the principles of these systems is required to understand how digital signatures work. Consider the case of two people, Ayşe and Ali. Ali wants Ayşe (and other people, for that matter) to be able to send secret messages to him. To do this, Ali generates a key pair consisting of two related "keys". One key, called the public key, can easily be computed from the other, called the secret or private key; but it is impractical, even for a well-funded organization, to compute the private key from the public key. Ali keeps his private key secret, and publishes his public key (on his webpage, for example, or by sending it to a key server).

The whole system depends on the fact that anyone can transform a message using a public key, but the private key is needed to reverse that transformation. Now consider a different scenario, where Ali wants to send a message to Ayşe that he wants to prove came from him (but doesn't care whether anybody else reads it). In this case, Ali sends an unscrambled copy of the message to Ayşe, along with a copy of the message scrambled with his private

(not public) key. Ayşe (or any other recipient) can then check whether the message really came from Ali by unscrambling the scrambled message with Ali's public key and comparing it with the unscrambled version. If they match, the message was really from Ali, because the private key was needed to create the signature and no one but Ali has it. The scrambled copy is a digital signature because anyone can use Ali's public key to verify that Ali created it.

Often, Ali applies a cryptographically strong hash function to the message and encrypts the resulting message digest instead of the entire message, which makes the signature significantly shorter than the message and saves considerable time (since hashing is generally much faster, byte for byte, than public-key encryption). In this case, the scheme may be susceptible to a birthday attack (http://www.knowledgerush.com/kr/encyclopedia/Digital_signature/, 12.03.2014).

### 3.5 Voice Recognition

Voice recognition and speech recognition often used interchangeably; there are more than two words. In the technical sense, the voice recognition is definitely what the speaker said, not individual sounds, is about trying to recognize. This biometric way, often used for security applications is the specific individual identification process. It has a distinct style of speech, such as computer get an audio sample and for different characteristics can be analyzed.

The term "voice recognition" is sometimes used to refer to recognition systems that must be trained to a particular speaker as in the case for most desktop recognition software. Even many recognition systems have obtained good response but this performance degrades when noise is introduced due to environment and acoustic difference between different speakers. Conventional voice recognition system using feature extraction will face problem when test speaker's pitch frequency/speaking rate is very different from that of the speaker's data used during training. Voice recognition is a difficult problem, largely because of the many sources of variability associated with the signal. Sounders proposed a voice discrimination system based on zero cross rate (Saunders, 1996).

By the method of voice recognition mobile banking transactions can be done quickly. Your voice will be your password.

### 3.6 Image Banking

According to Grier (2009) remote deposit capture (RDC) is a service that allows bank customers to scan or capture images of check deposits and present them electronically to the bank of first deposit without having to physically deliver the paper check to the bank. RDC established banking relationships with the market generally consists of large commercial customers, some banks provide services to small businesses and consumers began. For a broad market is focused on making services more convenient and affordable RDC recent innovations have facilitated this expansion. For example, the cost of check scanners own equipment cheaply or at no charge (for example, credit card terminals) to get accustomed to small traders interested in RDC, has been a common obstacle. Mobile remote deposit capture offering increased convenience and an option, as an integral part of the service offered to banks to use a familiar channel.

In general, for an enhanced customer experience more rapid availability of funds. If necessary, rather than a browser anywhere, using your cell phone to check image capture, remote deposit capture portable makes it available.

The benefits to customers are; checking deposits can be made as soon as the check is received, eliminating the risk of forgetting or losing them. In addition, mobile remote deposit capture provides a service that is “always on,” easy to use, convenient and with an unlimited deposit window for customers who are not located near a branch or scanner. And finally, give customers valuable time back in their busy daily lives where they are not removed from their businesses or forced to stand in line at the branch or ATM to deposit checks.

### 3.7 MobiPass

According to Steel and Tao (2006), following the success in mobile business, a trusted environment must be established via a practical approach. Mobile computer users as a

business model oriented, reliable approach to build a network by the end user must be directly and easily adoptable and easy to apply fine-grained access control with a user interface must provide. For example, complex security protocols should not be exposed directly to the end user. In mobilepass architecture, it is considered both technical factors and human factors and utilized the well-known passport concept combined with a preference wizard to allow users to easily set their customized rules to decide which service they want to use and which transaction entities they want to interact with in a flexible and understandable way.

Traditional mainframe and personal computers anywhere from where the most important difference in the calculation, and network environment is unpredictable and constantly changing. The biggest challenge is that the mobile entity does not know which entity is trustworthy, including previously un-encountered entities. However, here, mobile users often want to interact with them and have an idea about the services that users would want to claim. So here is a predictable, reliable, unreliable form to convert the dynamic migration mechanism to provide authentication and authorization, use the concept of well-known and proven passport. The new architecture is based on extending digital certificate technologies.

The infrastructures of the architecture make use of a number of existing technologies such as digital certificates, certificate authorities (CAs) and asymmetric key encryption. Mobile computing infrastructure available technologies are the building blocks again have some virtues, as a large number of devices are already in the field. If the architecture is to build on top of existing and well-proven technologies, it can be easily adopted and implemented.

Mobile Policy describes the specific services and their history and other information relevant to this particular service based on a flexible and extensible approach to evaluate mobile assets provide. This mobile is how people will interact with each other and for this service which is used to depict the description of a service-oriented schema. Mobile Policy feature completely different services are based on the service information that is needed to explain this policy will be having different Mobile.

# 4. MOBILE BANKING TECHNOLOGY ROADMAP

The technology roadmap provides a consensus view or vision of the future technology landscape available to decision makers. The roadmapping process provides a way to identify, evaluate, and select strategic alternatives that can be used to achieve a desired technology objective. This is usually driven in a technology road map by evaluating the relative business value and the technical complexity, plotting the results in a quadrant graph using a Prioritization Matrix. Common challenges for a company's information technology (IT) department is how to prioritize IT projects that can deliver the greatest benefits to the business. A criteria-weight matrix can be an effective tool in prioritizing IT projects.

There are a number of approaches to prioritization that are useful. A set of business processes whose relative weight is scored by the business in the top quadrant. The technical team has scored each candidate set of processes in the lower quadrant independent of the business in terms of feasibility. AHP technique is used for calculating the priority matrix weight and Delphi survey is used for scoring the criteria of prioritization matrix. These methods are especially useful because when a group meets the people who shout loudest, or those with higher status in the organization get their ideas heard more than others.

## 4.1 Prioritization Matrix

A prioritization matrix is a simple tool that provides a way to sort a diverse set of items into an order of importance. It also identifies their relative importance by deriving a numerical value for the priority of each item (Gosenheimer, 2012). Matrix according to the criteria identified as important by the project (or project requests) provides a tool for. If these projects on hold or discontinued may be the most important to focus on the first, which provides a partition to see clearly.

Prioritization Matrix is a task management software application that is supported on a number of platforms, including Microsoft Windows, Mac OS X, and iOS (http://en.wikipedia.org/wiki/Priority_Matrix, 13.04.2014).

Each section unique criteria and weights values, strategic directions, so that organizational goals, available resources, and determines those based criteria. Projects and then scored according to the criteria given priority. Priority to projects and priorities were discussed after this chapter funds for high priority projects and evaluate the results to determine the allocation of resources. A final step involves assessing when and how to invest the lower priority projects in the future when more resources become available. The essence of time management is to make the most amount of progress toward your goals with the least amount of effort. A key way to do that is to prioritize the tasks and projects you work on individually and collectively as a team. When beginning the task of prioritization, you should have a clear grasp on your objective and the resources available (generally, time is your least scarce resource because it cannot be replaced or replenished).

Creating a prioritization matrix includes five steps. First step will be used to evaluate the importance of each project to determine the factors. Then, for each of the criteria, as well as a specific project that meets the criteria to use when evaluating establish a grading scale. To ensure the consistent use of rating scales, criteria should be applied to describe how they will provide some details. Second step will be sorted in descending order of importance and emphasis is place. When a project scores, scoring criteria for projects to build priority points are multiplied by the weight given to certain criteria remember. After identifying the criteria and given weight; matrix can be created. Examine each project and each of the criteria can evaluate the project.

Always in the process help to create a common understanding of their meaning and criteria and to provide better grip for a few projects with the whole group is a good idea to go through the process. Finally, scores of projects, to compare notes on these results, and everyone agrees on the main list of priority projects to improve the general discussion time. Scores debate begins, as it should yet again be an excellent way to allow room for

adjustment Remember that. Prioritization matrix scoring project itself is just a tool and using good judgments of people forget.

### 4.1.1. Prioritization Matrix Benefits

Prioritization matrix is useful where there are many actions and solutions and the options must be narrowed down. The criteria for the outcome are agreed upon and finally resources are limited.

According to Gosenheimer (2012) a prioritization matrix supports structured decision making in the following ways:

- Helps prioritize complex or unclear issues when there are multiple criteria for determining importance
- Provides a quick and easy, yet consistent, method for evaluating options
- Takes some of the emotion out of the process
- Quantifies the decision with numeric rankings
- Is adaptable for many priority-setting needs (projects, services, personal, etc.)
- When used with a group of people, it facilitates reaching agreement on priorities
- and key issues
- Establishes a platform for conversations about what is important

## 4.2 Criteria Determination for Prioritization Matrix

Each part determines its own unique criteria and weights those criteria based on values, strategic direction, organizational goals, available resources, and so on. Projects are then scored and prioritized based on the criteria. Once projects are prioritized and those priorities are reviewed and discussed, the department can evaluate the results to determine funding and resource allocation for the higher priority projects. A final step involves assessing how and when (or if) to fund the lower priority projects in the future if/when more resources become available.

The group is created with the Kuveyt Türk Mobil Teams for determining the prioritization matrix criteria. Brainstorming is used for processing the prioritization. Brainstorming is a series of procedures (rules) designed to maximize the productivity of groups engaged in idea generation by reducing production loss, popularized by Osborn an advertising executive. The main concern of the development this tool is to increase creativity in organization (Osborn, 1963). Brainstorming is also identified as a technique of a variety tools for generating ideas (Isaksen, 1998) and that many people could produce many ideas compared to working alone (Osborn, 1963).

Brainstorming, group action to improve process performance factors introduced into the brainstorming process of interaction between individuals in a group the way through the group performance plays an important role. Brainstorming combines a relaxed, informal approach to problem solving with lateral thinking. It encourages people to come up with thoughts and ideas that can, at first, seem a bit crazy. Some of these ideas can be crafted into original, creative solutions to a problem, while others can spark even more ideas. This helps to get people unstuck by "jolting" them out of their normal ways of thinking.

As a result of meeting and interviews, 12 criteria are determined. Criteria and descriptions are:

- Customer satisfaction: Customer satisfaction is a measurement of how pleased customers are with a particular product or service. Satisfied customers are likely to make repeat purchases and often refer others.

- Ease of use: Ease of use in general means easy to use for the average user with 3-6 months experience navigating menus (especially the help menu), saving, finding, copying & deleting files, using cut, copy & paste commands.

- Feasibility: Feasibility refers to the state or degree of being effortlessly or conveniently done. In other words it denotes something capable of being achieved with a reasonable amount of attempt, cost or other hardship.

- Fun: Fun is the enjoyment of pleasure, particularly in leisure activities. Fun is an experience - short-term, often unexpected, informal and not cerebral.

- Functionality: In computer programming, a subroutine is a sequence of program instructions that perform a specific task, packaged as a unit. This unit can then be used in programs wherever that particular task should be performed. Subprograms may be defined within programs, or separately in libraries that can be used by multiple programs.

- Performance: Performance measures may address the type or level of program activities conducted (process), the direct products and services delivered by a program (outputs), and/or the results of those products and services (outcomes).

- Potential revenue: The amount of money that a company actually receives during a specific period, including discounts and deductions for returned merchandise.

- Security: Security is the degree of resistance to, or protection from, harm. It applies to any vulnerable and valuable asset, such as a person, dwelling, community, nation, or organization.

- Service costs: The expense associated with having another person perform a valuable task for which specialized expertise may be required.

- Speed to Market: It is the length of time it takes from a product being conceived until its being available for sale. TTM (Time to Market) is important in industries where products are outmoded quickly.

- Technical complexity: Technical complexity involves difficulties in fact finding, technical information, and the systematic identification and analyses of options and their likely consequences.

- User experience: User experience (UX) involves a person's behaviors, attitudes, and emotions about using a particular product, system or service. User experience includes the practical, experiential, affective, meaningful and valuable aspects of human-computer interaction and product ownership.

### 4.3 Weight Determination for Prioritization Matrix

Sometimes in business, when faced with an overwhelming number of pressures, demands and complaints, the most important thing to remember is to focus on business critical issues above all else. If the business is not successful, trying to improve, say, employee morale would be futile. At the same time, when proposing solutions, have to be realistic about how our organization or company works. The primary approach used by AHP practitioners involves calculating the eigenvalues and eigenvector for the matrix using a simple numerical technique. AHP technique is used for calculating the priority matrix weight.

The complexity in today's world is an undoubted fact that is usually characterized by uncertainty, difficulty in predictability and planning, and constant evolution. Strategic decision-making is a prerequisite for sustainability and survivability not only in the business world, but also within the government environment where the stakes are high and decisions influence many stakeholders. The AHP was developed to incorporate all these factors along with experience and intuition into a simplistic approach and has become a widespread tool for various types of organizations. Today AHP is used by corporations listed in Fortune 500,6 branches of government such as defense, transportation, healthcare, and public administration, universities (where the AHP technique is often taught as a course or constitutes a subject for researches and theses), and other institutions (Tsagdis , 2008).

The Analytic Hierarchy Process (AHP) methodology, developed by Thomas Saaty in 1980. According to Saaty (1992), it is considered ideal and consistent with the objective of creating a methodology for selecting the ideal location of warehouses for perishable agricultural products, since it belongs to the family of multi-criteria and multi-attribute

techniques, and also due to the wide options for creating attributes, sub-attributes, and decision alternatives. When multiple objectives are important to a decision maker, it may be difficult to choose between alternatives. Thomas Saaty's analytic hierarchy process (AHP) provides a powerful tool that can be used to make decisions in situations involving multiple objectives.

AHP also requires data based on experience, knowledge and judgment which are subjective for each decision-maker. Since there is no theoretical basis exists for the formation of hierarchies, decision makers, when faced with identical decision situations, can derive different hierarchies, thus different solutions. Also, the rankings produced by the AHP are arbitrary because they are produced by a subjective opinion using a ratio scale and these arbitrary rankings can lead to "rank reversal". If more than one person is working on this method, different opinions about the weight of each criterion can complicate matters. Moreover, flaws exist in the methods for aggregating individual weights into composite weights. Despite these concerns, AHP remains immensely popular in so many decision making problems. We believe that the implementation of AHP yields plausible results in complex group decision making processes (Yavuz and Baycan, 2013).

Pairwise comparisons are fundamental in the use of the AHP. The members of parliament must first establish priorities for their main criteria by judging them in pairs for their relative importance, thus generating a pairwise comparison matrix. Judgments which are represented by numbers from the fundamental scale below are used to make the comparisons. An important aspect of the AHP is the idea of consistency. If one has a scale for a property possessed by some objects and measures that property in them, then their relative weights with respect to that property are fixed. In this case there is no judgmental inconsistency although if one has a physical scale and applies it to objects in pairs and then derives the relative standing of the objects on the scale from the pairwise comparison matrix, it is likely that inaccuracies will have occurred in the act of applying the physical scale and again there would be inconsistency (Saaty, 1987).

For each rational decision, according to their relative importance factors and / or a series of activities is evaluated. Following Saaty's theoretical approach (Saaty and Vargas, 1982)

assume that n such factors must be considered prior to a decision. Denoting these factors by $A_1$ , $A_2$ , $A_3$ .. $A_n$, the comparison of the activities $A_i$, $A_j$ can be depicted by the pair ($A_i$, $A_j$ ) with the n-by-n matrix A = ($a_{ij}$)(i,j =1,2,...n ). Apparently, this matrix consists of non-zero entries since all elements have positive values and all diagonal elements are equal to unity given that they depict self-comparisons. As AHP grounds its success on the fact that it measures the consistency of people's judgments, matrix A is consistent if and only if $a_{ij}\ a_{jk} = a_{ik}$ . Hence, if car A is twice as preferable as car B, B is five times as preferable as car C, then A is 10 times as preferable as C. Returning to the theory, the use of an absolute scale for the measurement of weights of the n activities allows people to compare them by the use of $w_1, w_2,\ldots w_n$ and the construction of a n-by-n matrix W, "whose rows consist of the ratios of the measurements $w_i$ of each of n activities with respect to all others."

$$A = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \cdots & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & \cdots & \frac{w_2}{w_n} \\ \vdots & \vdots & & \vdots \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \cdots & \frac{w_n}{w_n} \end{bmatrix}$$

First of all, 12X12 matrix is created. This matrix is called pairwise comparisons matrix. Pairwise comparison is one way to determine how to evaluate alternatives by providing an easy and reliable means to rate and rake decision making criteria. Pairwise comparison is implemented in two stages. There are determine qualitatively which criteria are more important and assign to each criterion a quantitative weight such that the qualitative rank order is satisfied. Brainstorming technique is used for determine the pairwise comparison matrix values. Result of Pairwise comparison matrix is shown in Table 4.1.

After that norm matrix is created. Norm matrix is calculated as for each of pairwise comparison matrix's columns, do the following: divide each entry in column i of pairwise

comparison matrix by the sum of the entries in column i. Result of norm matrix is shown in Table 4.2.

Table [4.1] Pairwise comparison matrix

| | Customer Satisfaction | Ease of Use | Feasibility | Fun | Functionality | Performance | Potential Revenue | Security | Service Costs | Speed to Market | Technical Complexity | User Experience |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 1,00 | 2,00 | 4,00 | 9,00 | 2,00 | 1,00 | 3,00 | 4,00 | 8,00 | 3,00 | 5,00 | 2,00 |
| **Ease of Use** | 0,50 | 1,00 | 2,00 | 4,00 | 0,50 | 0,33 | 2,00 | 2,00 | 4,00 | 1,00 | 2,00 | 1,00 |
| **Feasibility** | 0,25 | 0,50 | 1,00 | 2,00 | 0,50 | 0,25 | 1,00 | 1,00 | 2,00 | 1,00 | 1,00 | 0,50 |
| **Fun** | 0,11 | 0,25 | 0,50 | 1,00 | 0,20 | 0,11 | 0,33 | 0,50 | 1,00 | 0,33 | 0,50 | 0,20 |
| **Functionality** | 0,50 | 2,00 | 2,00 | 5,00 | 1,00 | 0,50 | 2,00 | 2,00 | 5,00 | 0,50 | 3,00 | 1,00 |
| **Performance** | 1,00 | 3,00 | 4,00 | 9,00 | 2,00 | 1,00 | 4,00 | 5,00 | 9,00 | 4,00 | 5,00 | 2,00 |
| **Potential Revenue** | 0,33 | 0,50 | 1,00 | 3,00 | 0,50 | 0,25 | 1,00 | 1,00 | 3,00 | 1,00 | 2,00 | 0,50 |
| **Security** | 0,25 | 0,50 | 1,00 | 2,00 | 0,50 | 0,20 | 1,00 | 1,00 | 2,00 | 1,00 | 1,00 | 0,50 |
| **Service Costs** | 0,13 | 0,25 | 0,50 | 1,00 | 0,20 | 0,11 | 0,33 | 0,50 | 1,00 | 0,33 | 0,50 | 0,20 |
| **Speed to Market** | 0,33 | 1,00 | 1,00 | 3,00 | 2,00 | 0,25 | 1,00 | 1,00 | 3,00 | 1,00 | 2,00 | 0,50 |
| **Technical Complexity** | 0,20 | 0,50 | 1,00 | 2,00 | 0,33 | 0,20 | 0,50 | 1,00 | 2,00 | 0,50 | 1,00 | 0,50 |
| **User Experience** | 0,50 | 1,00 | 2,00 | 5,00 | 1,00 | 0,50 | 2,00 | 2,00 | 5,00 | 2,00 | 2,00 | 1,00 |

Table [4.2] Norm matrix

| | Customer Satisfaction | Ease of Use | Feasibility | Fun | Functionality | Performance | Potential Revenue | Security | Service Costs | Speed to Market | Technical Complexity | User Experience |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 0,20 | 0,16 | 0,20 | 0,20 | 0,19 | 0,21 | 0,17 | 0,19 | 0,18 | 0,19 | 0,20 | 0,20 |
| **Ease of Use** | 0,10 | 0,08 | 0,10 | 0,09 | 0,05 | 0,07 | 0,11 | 0,10 | 0,09 | 0,06 | 0,08 | 0,10 |
| **Feasibility** | 0,05 | 0,04 | 0,05 | 0,04 | 0,05 | 0,05 | 0,06 | 0,05 | 0,04 | 0,06 | 0,04 | 0,05 |
| **Fun** | 0,02 | 0,02 | 0,03 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 |
| **Functionality** | 0,10 | 0,16 | 0,10 | 0,11 | 0,09 | 0,11 | 0,11 | 0,10 | 0,11 | 0,03 | 0,12 | 0,10 |
| **Performance** | 0,20 | 0,24 | 0,20 | 0,20 | 0,19 | 0,21 | 0,22 | 0,24 | 0,20 | 0,26 | 0,20 | 0,20 |
| **Potential Revenue** | 0,07 | 0,04 | 0,05 | 0,07 | 0,05 | 0,05 | 0,06 | 0,05 | 0,07 | 0,06 | 0,08 | 0,05 |
| **Security** | 0,05 | 0,04 | 0,05 | 0,04 | 0,05 | 0,04 | 0,06 | 0,05 | 0,04 | 0,06 | 0,04 | 0,05 |
| **Service Costs** | 0,02 | 0,02 | 0,03 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 |
| **Speed to Market** | 0,07 | 0,08 | 0,05 | 0,07 | 0,19 | 0,05 | 0,06 | 0,05 | 0,07 | 0,06 | 0,08 | 0,05 |
| **Technical Complexity** | 0,04 | 0,04 | 0,05 | 0,04 | 0,03 | 0,04 | 0,03 | 0,05 | 0,04 | 0,03 | 0,04 | 0,05 |
| **User Experience** | 0,10 | 0,08 | 0,10 | 0,11 | 0,09 | 0,11 | 0,11 | 0,10 | 0,11 | 0,13 | 0,08 | 0,10 |

Finally, the weight matrix is calculated as for each of norm matrix's columns, do the following: average of the entries in row i of norm matrix. Weight of Prioritization Matrix is shown in Table 4.3.

Table [4.3] Weight of prioritization matrix

| | |
|---|---|
| **Customer Satisfaction** | 0,19 |
| **Ease of Use** | 0,09 |
| **Feasibility** | 0,05 |
| **Fun** | 0,02 |
| **Functionality** | 0,10 |
| **Performance** | 0,21 |
| **Potential Revenue** | 0,06 |
| **Security** | 0,05 |
| **Service Costs** | 0,02 |
| **Speed to Market** | 0,07 |
| **Technical Complexity** | 0,04 |
| **User Experience** | 0,10 |

Group judgment differences can be resolved through a consistency check. When several people propose radically different judgments in certain positions of the matrix these can be tested with other judgments on which there is wide agreement by solving the problem separately for each controversial judgment and measuring the consistency. The judgment yielding the highest consistency in the overall problem is retained. The following consistency comparison for each individual's judgments with those of the scale vector w derived from group judgments has been proposed (Saaty, 1987). The consistency ratio is obtained by comparing the matrix of comparisons with the appropriate one of the following set of numbers, each of which is an average random consistency index (R.I.) derived from a sample of size 100000, of a randomly generated reciprocal matrix using the scale. Value of the Random Index (RI) is shown in Table 4.4.

For this case, the consistency ration is 0,067 which is lower than the bound 0,1 whish has been set as maximum value. The priority of consistency to obtain a coherent explanation of a set of facts must differ by an order of magnitude from the priority of inconsistency which is an error in the measurement of consistency. Thus, on a scale from O-1, inconsistency should not exceed 0.10 by very much. Note that the requirement of 10% should not be made much smaller such as 1% or 0.1%. The reason is that inconsistency itself is important, for without it new knowledge which changes preference order cannot be admitted. Assuming all knowledge to be consistent contradicts experience which requires continued adjustment in understanding. Thus the objective of developing a wide-ranging consistent framework depends on admitting some inconsistency (Saaty, 1987).

Table [4.4] Value of the random index (RI)

| | 100000 matrices | | 500000 matrices | |
|---|---|---|---|---|
| n | RI | std | RI | std |
| 3 | 0.5245 | 0.6970 | 0.5247 | 0.6973 |
| 4 | 0.8815 | 0.6277 | 0.8816 | 0.6277 |
| 5 | 1.1086 | 0.5087 | 1.1086 | 0.5087 |
| 6 | 1.2479 | 0.4071 | 1.2479 | 0.4071 |
| 7 | 1.3417 | 0.3312 | 1.3417 | 0.3310 |
| 8 | 1.4056 | 0.2779 | 1.4057 | 0.2777 |
| 9 | 1.4499 | 0.2383 | 1.4499 | 0.2381 |
| 10 | 1.4854 | 0.2076 | 1.4854 | 0.2074 |
| 11 | 1.5141 | 0.1847 | 1.5140 | 0.1844 |
| 12 | 1.5365 | 0.1670 | 1.5365 | 0.1667 |
| 13 | 1.5551 | 0.1516 | 1.5551 | 0.1514 |
| 14 | 1.5713 | 0.1383 | 1.5713 | 0.1380 |
| 15 | 1.5838 | 0.1279 | 1.5838 | 0.1276 |

### 4.4 Summary of Prioritization Matrix

The basis of this part is to identify the prioritization the mobile banking technologies. Delphi survey and AHP technique are used for calculating the priority matrix. Experts on mobile banking were invited to participate in the Delphi survey. These experts were selected from business units and the IT department. Two round Delphi survey technique was implemented in stages. The Delphi survey is a method for structuring communication among a group of people so that they can collectively deal with a complex problem effectively. This method allows for multiple rounds of communication with a feedback of the group judgment as well as some individual contributions. The participants get an opportunity to revise their views based on the other expert panel member responses. To some extent, the identity of the participants is not revealed to the other participants during the communication (Linstone, 1975). Delphi method is originally based on a panel of experts, systematic, interactive forecasting method is developed as a structured communication techniques. It has been considered a reliable qualitative research method with potential for use in problem solving, decision making, and group consensus reaching in a wide variety of areas (Cochran, 1983). According to Murry and Hammons (1995) Delphi generally is characterized by tree important characteristics:

- Anonymous group interaction and responses.
- Multiple iteration or rounds of questionnaires or other means of data collection with researcher controlled statistical group responses and feedback.
- Presentation of statistical group responses.

Once a working problem is defined, the Delphi procedure begins with identifying and selecting the domain experts who will participate in the Delphi panel. When a pre-determined number of experts agree to participate, the researcher uses multiple iterations or rounds of questionnaires to collect data. The first round questionnaire uses an open-ended format to individual judgments or opinions from each member of the panel about the particular issue or problem under study. Round one is an anonymous brainstorming session. After all the round one questionnaires are returned, the researcher reviews, edits, and compiles the panel's responses, then prepares the round two questionnaires. In the

second round questionnaire, the researcher requests the panel of experts to consider, to rank and/or rate, to edit, and to comment upon the responses developed during round one (Chu and Hwang, 2008).

The basic steps of the Delphi process are outlined in Figure 4.1.

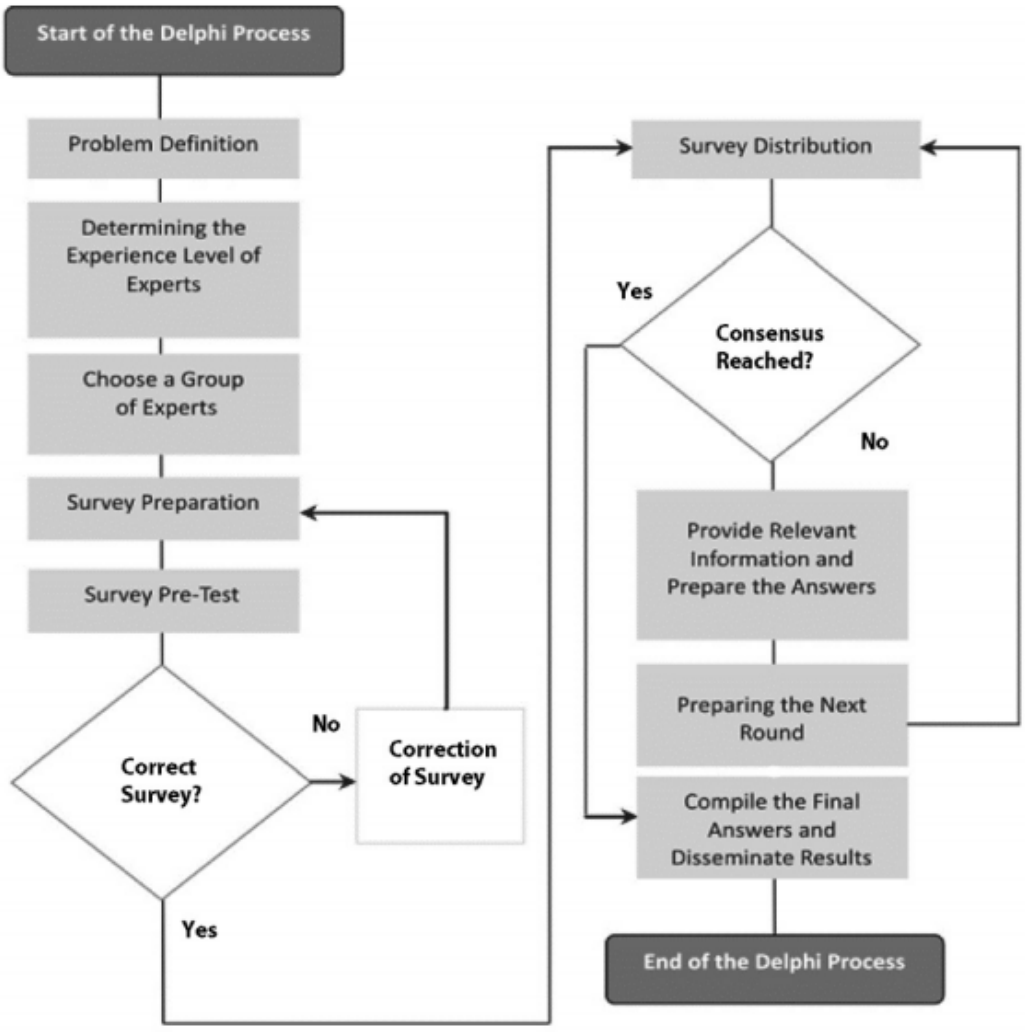


Figure 4.1 Operational structure of the Delphi technique (Ferreira, 2003)

First quarter (Q1) is 25% of replies to the left, to the right area is the point at 75%. Result of first round Q1 is shown in Table 4.5.

Table [4.5] Result of first round Q1

| First Quarter | Mobile Wallet | Qr Code | Mobile Payments | Mobile Signature | Voice Recognition | Image Banking | Mobile Pass |
|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 9 | 8 | 10 | 8 | 8 | 6 | 5 |
| **Ease of Use** | 9 | 9 | 9 | 7 | 8 | 6,75 | 9 |
| **Feasibility** | 8 | 7 | 9 | 8 | 5 | 5 | 6 |
| **Fun** | 9 | 9 | 9 | 9 | 10 | 9 | 6 |
| **Functionality** | 9 | 9 | 9,75 | 8 | 6 | 7 | 6 |
| **Performance** | 5 | 5 | 6 | 7 | 8 | 3 | 5 |
| **Potential Revenue** | 9 | 9 | 9 | 6 | 6 | 7 | 6 |
| **Security** | 7 | 8 | 8 | 4 | 3 | 2 | 3 |
| **Service Costs** | 8,75 | 9 | 9 | 8 | 6 | 5 | 4 |
| **Speed to Market** | 6 | 6 | 6 | 4 | 5 | 6 | 5 |
| **Technical Complexity** | 7,5 | 6 | 6 | 5 | 7 | 3 | 7 |
| **User Experience** | 8,75 | 6,75 | 8 | 7 | 4 | 5 | 6 |

Third quarter is 25% of replies to the right, to the left area is the point at 75%. Result of first round Q3 is shown in Table 4.6.

Table [4.6] Result of first round Q3

| Last Quarter | Mobile Wallet | Qr Code | Mobile Payments | Mobile Signature | Voice Recognition | Image Banking | Mobile Pass |
|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 9 | 8,25 | 10 | 9 | 9 | 7 | 5 |
| **Ease of Use** | 9 | 9 | 9 | 8 | 8 | 7 | 9 |
| **Feasibility** | 8 | 7 | 9 | 8 | 5 | 5 | 6 |
| **Fun** | 9 | 9 | 9 | 9 | 10 | 9 | 6 |
| **Functionality** | 9 | 10 | 10 | 8 | 6 | 7 | 8 |
| **Performance** | 7,5 | 5,25 | 6,25 | 7 | 8 | 3 | 5 |
| **Potential Revenue** | 9 | 9 | 9 | 8 | 6,25 | 7 | 6 |
| **Security** | 7 | 8 | 8 | 5 | 4,25 | 5,25 | 4,25 |
| **Service Costs** | 9 | 10 | 9 | 8 | 6 | 5 | 4 |
| **Speed to Market** | 8,25 | 7 | 6 | 4,25 | 6 | 6,5 | 5 |
| **Technical Complexity** | 9 | 8 | 7 | 5 | 7 | 3 | 7 |
| **User Experience** | 9 | 8 | 8 | 7 | 4,25 | 5 | 6 |

Range (R) is the difference between the third quarter and the first quarter (R = Q3- Q1). This difference is less than consensus, the consensus is high that means. Result of first round R is shown in Table 4.7.

Table [4.7] Result of first round R

| Range | Mobile Wallet | Qr Code | Mobile Payments | Mobile Signature | Voice Recognition | Image Banking | Mobile Pass |
|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 0 | 0,25 | 0 | 1 | 1 | 1 | 0 |
| **Ease of Use** | 0 | 0 | 0 | 1 | 0 | 0,25 | 0 |
| **Feasibility** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fun** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Functionality** | 0 | 1 | 0,25 | 0 | 0 | 0 | 2 |
| **Performance** | 2,5 | 0,25 | 0,25 | 0 | 0 | 0 | 0 |
| **Potential Revenue** | 0 | 0 | 0 | 2 | 0,25 | 0 | 0 |
| **Security** | 0 | 0 | 0 | 1 | 1,25 | 3,25 | 1,25 |
| **Service Costs** | 0,25 | 1 | 0 | 0 | 0 | 0 | 0 |
| **Speed to Market** | 2,25 | 1 | 0 | 0,25 | 1 | 0,5 | 0 |
| **Technical Complexity** | 1,5 | 2 | 1 | 0 | 0 | 0 | 0 |
| **User Experience** | 0,25 | 1,25 | 0 | 0 | 0,25 | 0 | 0 |

Table 4.8 shows the results of the ratings given by the business unit for the second round of questionnaires.

Table [4.8] Result of second round for business unit

| Second Round | Mobile Wallet | Qr Code | Mobile Payments | Mobile Signature | Voice Recognition | Image Banking | Mobile Pass |
|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 9 | 8 | 10 | 8 | 8 | 6 | 5 |
| **Ease of Use** | 10 | 9 | 9 | 8 | 8 | 6 | 9 |
| **Feasibility** | 8 | 7 | 9 | 8 | 5 | 5 | 6 |
| **Fun** | 9 | 9 | 9 | 8 | 9 | 9 | 6 |
| **Functionality** | 9 | 9 | 10 | 8 | 6 | 6 | 7 |
| **Performance** | 7 | 6 | 8 | 7 | 8 | 3 | 5 |
| **Potential Revenue** | 9 | 9 | 9 | 7 | 6 | 7 | 6 |
| **Security** | 7 | 8 | 8 | 4 | 4 | 4 | 3 |
| **Service Costs** | 9 | 10 | 9 | 8 | 6 | 5 | 4 |
| **Speed to Market** | 7 | 7 | 6 | 4 | 5 | 7 | 5 |
| **Technical Complexity** | 8 | 8 | 6 | 5 | 7 | 3 | 7 |
| **User Experience** | 9 | 7 | 8 | 6 | 4 | 5 | 6 |

Table 4.9 shows the results of the ratings given by the IT department for the second round of questionnaires.

Table [4.9] Result of second round for IT department

| Second Round | Mobile Wallet | Qr Code | Mobile Payments | Mobile Signature | Voice Recognition | Image Banking | Mobile Pass |
|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 9 | 8 | 9 | 8 | 8 | 6 | 5 |
| **Ease of Use** | 8 | 9 | 9 | 8 | 8 | 6 | 9 |
| **Feasibility** | 8 | 7 | 9 | 8 | 6 | 5 | 6 |
| **Fun** | 9 | 9 | 9 | 8 | 9 | 8 | 6 |
| **Functionality** | 9 | 9 | 10 | 7 | 6 | 6 | 7 |
| **Performance** | 8 | 6 | 7 | 7 | 8 | 3 | 5 |
| **Potential Revenue** | 7 | 9 | 8 | 7 | 6 | 7 | 6 |
| **Security** | 7 | 8 | 8 | 4 | 4 | 2 | 3 |
| **Service Costs** | 9 | 10 | 9 | 8 | 6 | 5 | 3 |
| **Speed to Market** | 7 | 7 | 6 | 4 | 4 | 7 | 5 |
| **Technical Complexity** | 8 | 8 | 8 | 5 | 7 | 3 | 7 |
| **User Experience** | 8 | 7 | 8 | 6 | 4 | 5 | 6 |

Prioritization matrix is created and priorities are determined. Prioritization matrix for business unit is shown in Table 4.10.

Table [4.10] Result of prioritization matrix for business unit

| | Weight | Mobile Wallet | Qr Code | Mobile Payments | Mobile Signature | Voice Recognition | Image Banking | Mobile Pass |
|---|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 0,19 | 9 | 8 | 10 | 8 | 8 | 6 | 5 |
| **Ease of Use** | 0,09 | 10 | 9 | 9 | 8 | 8 | 6 | 9 |
| **Feasibility** | 0,05 | 8 | 7 | 9 | 8 | 5 | 5 | 6 |
| **Fun** | 0,02 | 9 | 9 | 9 | 8 | 9 | 9 | 6 |
| **Functionality** | 0,10 | 9 | 9 | 10 | 8 | 6 | 6 | 7 |
| **Performance** | 0,21 | 7 | 6 | 8 | 7 | 8 | 3 | 5 |
| **Potential Revenue** | 0,06 | 9 | 9 | 9 | 7 | 6 | 7 | 6 |
| **Security** | 0,05 | 7 | 8 | 8 | 4 | 4 | 4 | 3 |
| **Service Costs** | 0,02 | 9 | 10 | 9 | 8 | 6 | 5 | 4 |
| **Speed to Market** | 0,07 | 7 | 7 | 6 | 4 | 5 | 7 | 5 |
| **Technical Complexity** | 0,04 | 8 | 8 | 6 | 5 | 7 | 3 | 7 |
| **User Experience** | 0,10 | 9 | 7 | 8 | 6 | 4 | 5 | 6 |
| **TOTAL** | | **8,33** | **7,66** | **8,59** | **6,93** | **6,67** | **5,16** | **5,73** |

Prioritization matrix for IT department is shown in Table 4.11.

Table [4.11] Result of prioritization matrix for IT department

| | Weight | Mobile Wallet | Qr Code | Mobile Payments | Mobile Signature | Voice Recognition | Image Banking | Mobile Pass |
|---|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 0,19 | 9 | 8 | 9 | 8 | 8 | 6 | 5 |
| **Ease of Use** | 0,09 | 8 | 9 | 9 | 8 | 8 | 6 | 9 |
| **Feasibility** | 0,05 | 8 | 7 | 9 | 8 | 6 | 5 | 6 |
| **Fun** | 0,02 | 9 | 9 | 9 | 8 | 9 | 8 | 6 |
| **Functionality** | 0,10 | 9 | 9 | 10 | 7 | 6 | 6 | 7 |
| **Performance** | 0,21 | 8 | 6 | 7 | 7 | 8 | 3 | 5 |
| **Potential Revenue** | 0,06 | 7 | 9 | 8 | 7 | 6 | 7 | 6 |
| **Security** | 0,05 | 7 | 8 | 8 | 4 | 4 | 2 | 3 |
| **Service Costs** | 0,02 | 9 | 10 | 9 | 8 | 6 | 5 | 3 |
| **Speed to Market** | 0,07 | 7 | 7 | 6 | 4 | 4 | 7 | 5 |
| **Technical Complexity** | 0,04 | 8 | 8 | 8 | 5 | 7 | 3 | 7 |
| **User Experience** | 0,10 | 8 | 7 | 8 | 6 | 4 | 5 | 6 |
| **TOTAL** | | **8,16** | **7,66** | **8,21** | **6,83** | **6,64** | **5,04** | **5,71** |

Prioritization matrix for all participants is shown in Table 4.12.

Table [4.12] Result of prioritization matrix for all participants

| | Weight | Mobile Wallet | Qr Code | Mobile Payments | Mobile Signature | Voice Recognition | Image Banking | Mobile Pass |
|---|---|---|---|---|---|---|---|---|
| **Customer Satisfaction** | 0,19 | 9 | 8 | 10 | 8 | 8 | 6 | 5 |
| **Ease of Use** | 0,09 | 9 | 9 | 9 | 8 | 8 | 6 | 9 |
| **Feasibility** | 0,05 | 8 | 7 | 9 | 8 | 5 | 5 | 6 |
| **Fun** | 0,02 | 9 | 9 | 9 | 8 | 9 | 9 | 6 |
| **Functionality** | 0,10 | 9 | 9 | 10 | 8 | 6 | 6 | 7 |
| **Performance** | 0,21 | 7 | 6 | 7 | 7 | 8 | 3 | 5 |
| **Potential Revenue** | 0,06 | 9 | 9 | 9 | 7 | 6 | 7 | 6 |
| **Security** | 0,05 | 7 | 8 | 8 | 4 | 4 | 3 | 3 |
| **Service Costs** | 0,02 | 9 | 10 | 9 | 8 | 6 | 5 | 4 |
| **Speed to Market** | 0,07 | 7 | 7 | 6 | 4 | 5 | 7 | 5 |
| **Technical Complexity** | 0,04 | 8 | 8 | 7 | 5 | 7 | 3 | 7 |
| **User Experience** | 0,10 | 9 | 7 | 8 | 6 | 4 | 5 | 6 |
| **TOTAL** | | **8,25** | **7,66** | **8,42** | **6,93** | **6,67** | **5,11** | **5,73** |

Roadmapping need to be fully integrated into the strategic planning and business operations of the organization. Business units are logical units that track and report specific business information. They share processing rules and create them at any level of the organization that makes sense and that reflect the needs of your internal human resources departments. On the other hand IT department's mission is to provide the highest quality technology-based services, in the most cost-effective manner. IT department facilitate the collection, storage, security and integrity of electronic data while ensuring appropriate access. Despite these differences, business unit and IT department to agree with prioritization. Mobile banking technology's total score is changed but prioritization of mobile banking technology is not changed. So that technology roadmap for Kuveyt Türk mobile banking is same for business unit and IT department.

Prioritization matrix is created using Delphi survey and Analytic Hierarchy Process (AHP). Experts on mobile banking were invited to participate in the Delphi survey. These experts were selected from business units and the IT department. For the current research, technology roadmap for Kuveyt Türk mobile banking is shown in Figure 4.2.

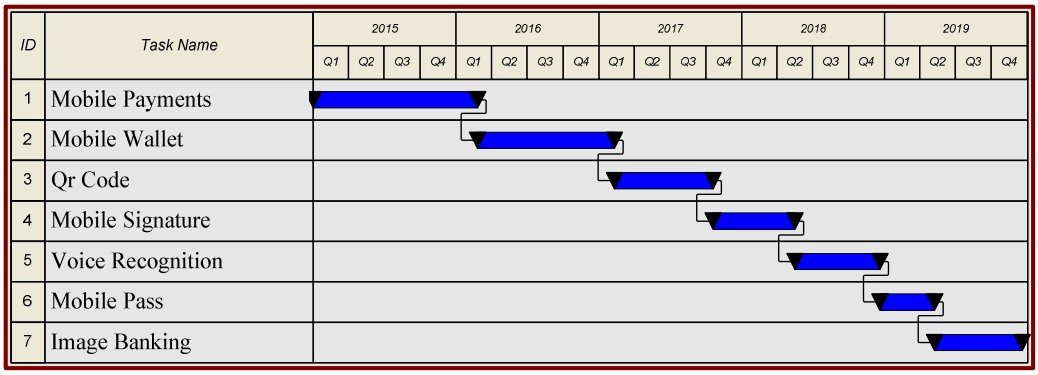


Figure [4.2] Technology roadmap for Kuveyt Türk mobile banking

## 5. CONCLUSION AND FURTHER SUGGESTIONS

The main purpose of this study was to find out the technology roadmap of mobile banking of Kuveyt Türk Participation Bank. Therefore it has tried to clarify the mobile banking acceptance from the consumer perspective by searching on main factors that are able to predict intention to use mobile banking services.

At the end, the mobile banking is an efficient tool, which can be used to facilitate financial transactions, payment transactions as well as crediting transactions. In order to enable a wide use of mobile banking it has to be of easy usage and applicable to all types of mobile phones. And of course, it has to be cheap for all mobile subscribers. In this way, mobile banking can have a large acceptance. However, challenges have to be considered, such as technological acceptance, trust, traditional ways of conducting financial transactions and the massive use of cash in developing countries.

Technology roadmapping is that it provides information to make better technology investment decisions by identifying critical technologies and technology gaps and identifying ways to leverage research and development investments. It can also be used as a marketing tool. Technology roadmapping is critical when the technology investment decision is not straight forward. Technology roadmapping is particularly useful for coordinating the development of multiple technologies, especially across multiple projects.

For Technology roadmap, the global mobile trends followed and were examined in detail. As a result of technologies to be used for Kuveyt Türk Participation Bank are mobile payments, mobile wallet, qr code, mobile signature, voice recognition, mobile pass and image banking. After that, these technologies are prioritized. In this study, the focus and selection of technologies for the purpose of ordered prioritization matrix was used. The matrix allows to create categories such as revenue impact, strategic importance, customer pain level, etc. and then to assign a weighting to each one. Criteria of priority matrix are determined based on expert opinion. Experts on mobile banking were invited to participate in the Delphi survey and AHP technique. These experts were selected from business units and the IT department. Weight of prioritization matrix criteria are decided by AHP technique. Finally Delphi survey are used for scoring the priority matrix criteria.

In the literature of some of the technology roadmap will be updated at regular intervals. However, technology road map for that change in the field of technology as a revision. In later years, Technology roadmap of mobile banking of Kuveyt Türk Participation Bank will be revised depends on local and global market development.

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