T.C. DOĞUŞ ÜNİVERSİTESİ

INSTITUTE OF SCIENCE AND TECHNOLOGY

DEPARTMENT: ENGINEERING AND TECHNOLOGY MANAGEMENT

KUVEYT TÜRK PAYMENT SYSTEMS TECHNOLOGY ROADMAP

Thesis

Ayşe TURAN

201199015

Thesis Supervisor: Lect. Dr. Burcu KULELİ PAK

Istanbul, July 2014

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(Istanbul, July 2014) Ayşe TURAN

ABSTRACT

With the spread of computers and internet, we have witnessed a technologic revolution in financial markets. Payment systems became one of the profitable market in both Turkey and the world thanks to the information technology (IT). The remarkable evolutions have been made on payment systems due to the development of information technology in the world. In Addition, rapid developments in technological products are confronting traditional banks with major challenges. Competition in Turkey payment system market has also increased in these days. Therefore, most banks in turkey aim to increase their profitability and customer numbers by following technology trends and making investments on research and development (R&D). Some of technology trends have been applied to Kuveyt Turk Payment Systems. However, some have not been applied to payment systems in Kuveyt Turk yet. Aim of thesis study is;

- to observe current structure of Kuveyt Turk Payment Systems,
- to find key gaps and opportunities in the current payment environment both Turkey and the world,
- to help capturing these opportunities for future of Kuveyt Turk Payment Systems,
- to help determining potential strategies and tactics to shape the future of the Kuveyt Turk Payment System,
- to develop technology road map by making using of SWOT and QSPM that are used as strategic planning tools.

Keywords: Kuveyt Türk, Payment Systems

ÖZET

Bilgisayar ve internetin yaygınlaşmasıyla mali pazarlarda teknolojik devrimlere tanık oluyoruz. Ödeme sistemleri bilgi teknolojilerindeki gelişmeler sayesinde hem dünyada hem Türkiye'de en önemli kar getiren pazarlardan biri olmuştur. Dünyadaki bilgi teknolojileri gelişimi ödeme sistemlerinde birçok yenilikleri getirmiştir. Buna ek olarak teknoloji ürünlerindeki hızlı gelişmeler geleneksel bankaları büyük değişimler yapmaya zorluyor. Türkiye' deki ödeme sistemleri pazarındaki rekabet her gecen gün artmaktadır. Bunun beraberinde Türkiye pazarında çoğu bankalar araştırma ve geliştirmeye yatırım yaparak ve teknolojik trendleri takip ederek müşteri sayısını ve karlılığını artırmayı hedeflemektedir. Kuveyt Turk' te teknolojik trendlerin bir kısmını mevcut bünyesinde uygulamış olup bir kısmını henüz uygulamamıştır. Bu çalışmanın amacı;

- Kuveyt Türk ödeme sistemlerinin mevcut yapısını incelemek,
- Türkiye ve dünyadaki mevcut ödeme sistemlerinin fırsatlarını ve tehditlerini belirlemek,
- Kuveyt Türk ödeme sistemlerinin olası fırsatları yakalamasına yardım etmek,
- Kuveyt Türk ödeme sistemlerinin geleceğinin şekillenmesine katkıda bulunmak için olası strateji ve tatikleri belirlemek,
- Stratejik planlama aracı olarak kullanılan SWOT ve QSPM den faydalanarak teknoloji yol haritasını geliştirmek.

Anahtar Kelimeler: Kuveyt Türk, Ödeme Sistemleri

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LIST OF ABBREVIATIONS

3DES	The triple data encryption standard
ACH	Automated Clearing House
ADC	Alternative Delivery Channel
AHP	Analytical Hierarchy Process
AS	Attractiveness Scores
ATM	Atomated Teller Machines
BCG	Boston Consulting Group
BLU	Back light unit
BOA	Business Oriented Architecture
CBRT	Central Bank of the Republic of Turkey
CEO	Chief Executive Officer
CI	Consistency Index
CP	Competitive Position
CR	Consistency Ratio
EEPROM	Electrical Erasable Programmable ROM
EFT	Electronic Funds Transfer
FP	Financial Position
FTP	File Transfer Protocol
GSM	Global System Mobile
ICC (BKM)	Interbank Card Centre system (Bankalararası Kart Merkezi)
ICH (BTOM)	Interbank Clearing Houses (Bankalararası Takas Odaları Merkezi) Centre
ICHs	Interbank Clearing Houses
IP	Industry Position
ISE	Istanbul Stock Exchange
ISO / IEC 14443	International Organization for standardization / International Electro technical Commission

IT	Information Technology
KTPS	Kuveyt Turk Payment Systems
LCD	Liquid Crystal Display
LVPS	Large-value Payment Systems
MICR	Magnetic ink character recognition
NFC	NFC (Near Field Communication)
P2P	Peer To Peer
PC	Personal Computer
PIN	Personal Identification Number
POS	Point Of Sale
QSPM	Quantitative Strategic Planning Matrix
R&D	Research and Development
RAM	Random Access Memory
RFID	Radio-Frequency Identification
RI	Random Index
ROM	Read-Only Memory
RTGS	Real-Time Gross Settlement System
SIM	Subscriber Identity Modules
SP	Stability Position
SPACE	Strategic Position and Action Evaluation
STAS	Sum Total Attractiveness Scores
SWOT	Strength-Weakness-Opportunities-Threats
TAS	Total Attractiveness Scores
TCS	Takasbank Clearing System
TI	Technology intelligence
TICNET	Turkish Interbank Clearing Network
TIC-RTGS	Turkish Interbank Clearing and real-time gross settlement system
T-Plan	Fast-Start technology Road Mapping
TRDP	Technology Roadmap Development Process

TRM	Technology Road Mapping
TRY	Turkish Lira
URL	Uniform Resource Locator

1. INTRODUCTION

Payment systems are the mechanisms that enable the smooth transfer of funds between buyers and sellers, and/or between banks. In the modern society, no economic activities are possible without the transfer of money. In this sense, it can be said that payment systems are one of the most significant social infrastructures.

A payment system consists of a set of instruments, banking procedures and, typically, interbank funds transfer systems that ensure the circulation of money. A typical payment system interconnects the banks, central bank, and real-time computer networks. Payment system enables them to exchange payments. Payment systems are a vital part of the economic and financial infrastructure. Their efficient functions allow transactions to be completed safely, securely and on time makes a key contribution to economic performance.

Payment systems show the remarkable changes in the past two decades. In the early years of 20th century, the payments among the banks used to be made by exchanging paper payment instructions, which is called the “paper-based payment system”. However, as the number of payments increased dramatically, it became very difficult to process paper work with paper instructions and manual handling. Therefore, people tried to utilize information technology (IT) with regard to the payment system. This leads developing the payment systems using the computers and networks. That is why most payment systems became electronic within a short period.

Therefore, this paper proceeds following steps. The first step is the review of payment systems literature. The structure and general properties of payment systems in the world are explained. Then, the structure and features of payment systems in Turkey market are discussed. Later, current and future technology trends in payment systems in both turkey and globe are observed. Furthermore, the general structure of Kuveyt Turk Payment systems is assessed. Moreover, SWOT analysis that helps managers or policy makers are developed for Kuveyt Turk payment system. Developing strategy planning and road mapping based on SWOT applications are also significant part of this thesis that are

mainly published in literature and articles. Finally, technology road map is developed by making using of SWOT and QSPM that are used as strategic planning tools.

1.1 Participants in a Payment System

The participants in a payment system are listed as follows;

- **Banks:** Banks that have a license to take deposits and effect payments intermediates between users and payment systems.
- **The settlement agent:** It sends/receives amount transfers between Automated Clearing House members. RTGS is a real-time gross settlement system that transfers and settles payments.
- **Central bank:** The task of central bank is to improve the function of payment systems and to protect the financial system.
- **Money market**: The money market is an important participant of payment systems. An efficient market offers a variety of instruments that include cash and non-cash payments. So that, it is vital for the operation of a payment system (Gogoski, 2012).

1.2 Types of Payment Systems

Different types of payment systems are available. These can be categorized into two groups: Large Value and Retail Payment Systems.

1.2.1 Large-value Payment Systems (LVPS)

It is also named ‘‘Wholesale Payment Systems". These payments are used for large amounts and require urgent or timely settlement. Therefore, payments needs to meet secure, safety and efficiency standards. In general, payments processed through an LVPS have ;

- Payments involve large amounts.
- Payments are involved exchange among payment participants (so-called wholesale payments).

- Payments should be on the time. Transaction should be done as soon as possible (BIS, 2005).

1.2.2 Retail Payments

Retail payments require transactions between two customers, between customers and businesses, or between two businesses. Retail payment systems generally have higher transaction volumes and lower average dollar values than Large-value Payment Systems (LVPS) (FFIEC, 2010).

1.2.3 Retail Payment Instruments

The range of payment instruments available in any particular country necessarily reflects country's essential factors. These factors are;

- technological developments,
- competition or corporation among institutions issued by payment services,
- globalization of payments services,
- the usage cost of payment services,
- the existence of alternative payment services,
- country's economic developments.

Today, the range of non-cash payment instruments has risen in the world. So that, we categorize payment instruments into two groups. These are cash payments and non-cash payments (Tarhan, 2013).

1.2.3.1.1 Cash payments

Cash is the common used method for small payments because it involves no credit and no promises. People can usually purchase goods and services easily as it is widely

accepted. On the other hand, although most people still carry cash for its convenience and flexibility, it is risky as it can cause theft and other problems. In addition, received cash from sellers can be re-used for other transactions (Tarhan, 2013).

1.2.3.1.2 Non-cash payments

1.2.3.1.2.1 Payment Cards

A payment card is typically a plastic card with either a magnetic stripe or a computer chip. It stores the cardholders' info, card number and expiration date. The most familiar types of payment cards include credit, debit, and prepaid cards. Simple transaction workflow for debit and credit cards are given in Figure 1-1. According to A First Data White Paper payment cards transaction flow follows steps below.

1. When any card for payment is selected by customers, the cardholder data is inserted into the merchant's point-of-sale (POS) terminal/software or an e-commerce website.
2. The card information data is sent to an acquirer/payment processor for authentication.
3. The acquirer/processor sends the data to the payment brand. Payment brand can be Visa, MasterCard or American Express that cardholder is issued.
4. The issuing bank/processor checks that the card is not lost or stolen. The account also has the available balance to pay for the transaction.
5. The cardholders' bank creates an authorization number and sends it to the card brand.
6. The card brand transmits the authorization code to the acquirer/processor.
7. The acquirer/processor resends the authorization code back to the merchant.
8. The merchant completes the sale transaction (A First Data White Paper, 2010).

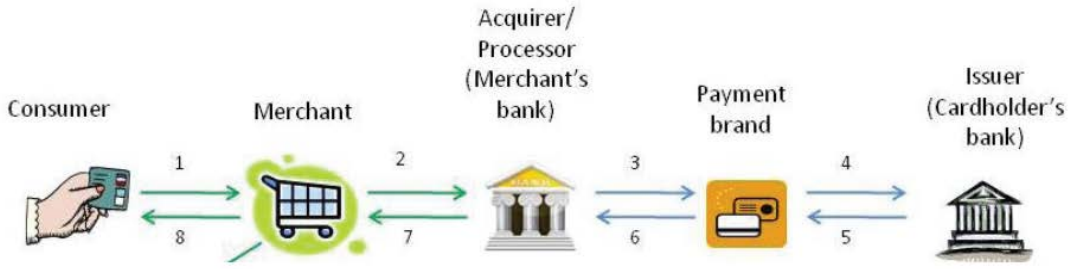

Figure 1-1 Simple Transaction Flow for Credit and Debit

1.2.3.1.2.1.1 Credit Cards

The concept of a card is rely upon back to the 1920s in the United States. Then, "BankAmericard" was established in 1958. In this way, the modern concept of the credit card involved. It was issued by a third-party bank and used by sellers and merchants. Then, they started to be used by other retailers. Finally, Master Charge was established by a group of banks. Master Charge were separated into MasterCardVisa and MasterCard. They are still separated and commercial companies (A First Data White Paper, 2010).

Credit cards enable a cashless payment. Many cards offers instalments without charging any interest charges nowadays. Therefore, it makes credit cards popular. Their numbers tremendously increase (BIS, 2007).

1.2.3.1.2.1.2 Prepaid Cards

Prepaid cards evolved as an alternative to credit cards and debit cards at the end of the 1990s. Prepaid cards are used to make payment for goods and services where the issuer does not need the costs for opening and managing a payment account. In addition, customers also use the amount that they originally load. It allows withdrawing cash from automated teller machines (ATMs). In addition, some of them enables the person-to-person money transfers (Prior and Santoma, 2008).

The prepaid payment needs of:

- teenagers with online access, disposable income, but no credit card,
- consumers who don't want to use their credit/debit card on the Internet,
- users to control their cash flow.

Prepaid cards can be associated with one of the payment brands, such as Visa, Master Card. In this way, it allows their use at any merchants that Visa, Master Card accept payment. On the other hand, they can be used at specific point such as gift cards for a specific retailer. The prepaid cards are used as reloadable cards, transit cards and payroll cards (A Smart Card Alliance Transportation Council White Paper, 2011).

1.2.3.1.2.1.3 Debit Cards

Debit cards have evolved in two forms; PIN-based debit and Signature-based. In Turkey, payment systems only have PIN-based debit feature. So that the customer account is debited immediately.

- Signature-based; Signature-based debit transactions are also named "offline debit". The account of customer is debited approximately 2 days after transaction process. They are like a credit card transaction. The process has two messages. These are authorization, clearing and settlement (A First Data White Paper, 2010).

Offline debit card transaction flow is depicted in Figure 1-2. It follows below rules;

1. A customer uses debit card b of bank B at point of sale (POS) during shopping process. The customer signs the slip instead of using a PIN (Personal Identification Number).
2. POS a sends the transaction message to Bank A's processor (acquirer).

3. Bank A's processor sends the transaction message to the offline debit network that both Bank A and Bank B are members.

4. The offline debit network sends the transaction message to Bank B's processor.

5. Bank B's processor sends the transaction message to Bank B.

6. – 9. Bank B authorizes the transaction. The transaction is reversely resent to in order of Bank B's processor, the offline debit network, Bank A's processor, and the terminal, POS a.

10. The costumer signs the slip and the transaction is completed (Fumiko et al., 2003).

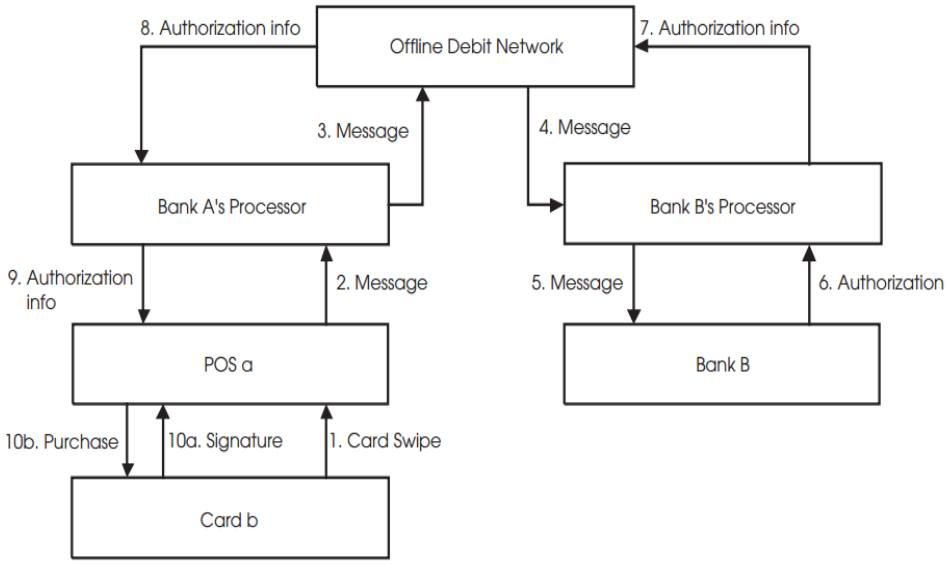

Figure 1-2 Offline debit card transaction

- PIN-based; PIN-based debit are also named "online debit". It needs the customer to enter a personal identification number (PIN) at the point of sale (POS). Later, the transaction is run like MasterCard, Visa. The account of customer is immediately checked (A First Data White Paper, 2010).

Online debit card transaction flow is also depicted in Figure 1-3. It follows below rules;

1. A costumer uses debit card b (debit card of Bank B), at POS. The costumer needs to enter a PIN instead of signing slip.

2. POS a sends the transaction message to Bank A's processor (acquiring services)

3. Bank A's processor sends the transaction message to the online debit network (switch).

4. The online debit network sends the transaction message to Bank B's processor.

5. Bank B's processor sends the transaction message to Bank B.

6. – 9. Bank B authorizes the transaction message. It is reversely resent to in order of Bank B's processor, the network (switch), Bank A's processor, and the terminal, POS a.

10. The transaction is completed.
(Fumiko et al., 2003)

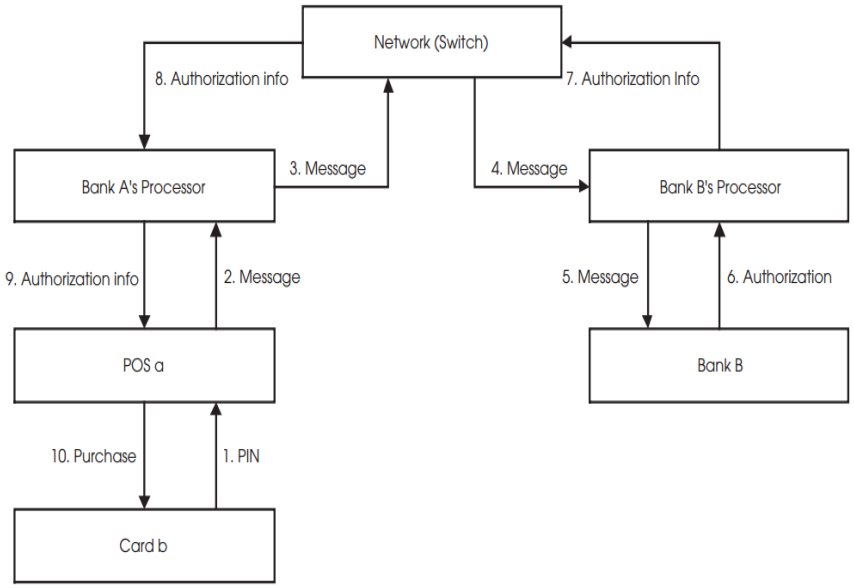

Figure 1-3 Online debit card transaction

1.2.3.1.2.1.4 Credit, Prepaid and Debit Cards Comparison Chart

Following Table 1-1 shows similarities and differences of credit cards, prepaid cards and debit cards based on their feature.

Table 1-1 Credit, Prepaid and Debit Cards Comparison Chart

	Credit Cards	**Prepaid Cards**	**Debit Cards**
What it is?	A credit card is a loan.	Prepaid cards take many forms, such as gift cards, travel cards, teen cards. Visa, MasterCard brand or a bank can issue it.	A debit card is linked to a bank account. It is issued by a bank.
How it works?	Funds are borrowed from bank by using a credit card, credit must be paid back until the end of statement period.	Prepaid cards, which generally allow consumers to spend only the money deposited onto associated with the card.	When debit card is used, the money spent is taken directly from customers account.
Have a limit?	The limit is loan balance defined by bank.	Limit is the amount that customers originally load.	The limit is available balance of customers' bank account.
Interest?	If a credit card bill is not paid in full, interest is charged on outstanding balance.	No interest is charged, Because there already has to be money	No interest is charged because no money is borrowed.

1.2.3.1.2.1.5 E-Cash

E-cash was developed to allow secure electronic cash to be used on the Internet. It also mediates online trading between buyers and sellers. E-cash is a payment protocol for digital money on the Internet. It is developed by named DigiCash Company in Amsterdam (Srivastava and Mansell, 1998).

E-cash payment can be by means of software or token based. Transactions through internet are normally encrypted.

- As, shown in Figure1-4, when Customer wants to purchase goods or services, customers will transfer the E-cash from his/her bank account to his/her online system. Then, e-cash can be sent to the merchant in exchange with the merchants products or services.

- Whenever Merchant receives e-cash payment from customer, merchant will receive confirmation info from the bank. Then, the bank will authenticate the cash transaction.

In that time, customer account will be debited by bank. Later, the merchant will send the products. Amount will be deposited to merchant bank account (Razali, 2002).

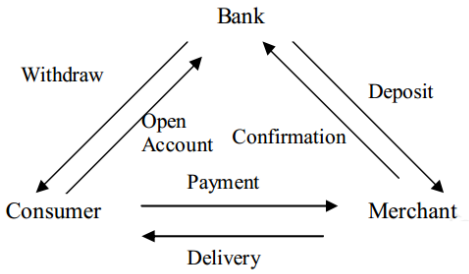

Figure 1-4 E-cash process in general

2. PAYMENT SYSTEMS IN TURKEY

2.1 Introduction

Central Bank of the Republic of Turkey (CBRT) is responsible for payment systems in Turkey. According to the Central Bank Law, tasks of central banks are "to regulate the volume and circulation of the Turkish lira, to establish payment, securities transfer and settlement systems, to enact regulations to ensure the uninterrupted operation and oversight of the existing or future systems, and to determine the methods and instruments, including the electronic environment for payments." (BIS, 2007).

2.2 General Overview

In Turkey, the payment systems are:

- TCS: the Takasbank Clearing System;
- ICH (BTOM - Bankalararası Takas Odaları Merkezi): is the system of the Interbank Clearing Houses Centre;
- ICC (BKM - Bankalararası Kart Merkezi): is the Interbank Card Centre system;
- TIC-RTGS (Turkish Interbank Clearing and real-time gross settlement system): is a real-time gross settlement system that transfers and settles payments in Turkish Liras (BIS, 2007).

2.3 Large-value Payment Systems

2.3.1 The real-time gross settlement system: TIC-RTGS

"TIC-RTGS is Turkey's real-time gross settlement system. The system is owned, operated, regulated and overseen by the Central Bank. TIC-RTGS was developed between October 1989 and March 1992 with live operations starting in April 1992. Driven by the changing demands of the banking sector and developments both in the payment systems area and in technology, a project was started in 1997 to develop the second-generation

system, which started live operations in April 2000." CBRT is Central Bank of the Republic of Turkey (CPSS, 2012).

2.3.2 The Takasbank Clearing System (TCS)

The Takasbank Clearing System (TCS) handles large-value payments. It makes operations for clearance and settlements on the Istanbul Stock Exchange (ISE). TCS includes both cash and securities settlement (BIS, 2007).

2.4 Retail Payment

2.4.1 Retail payment systems

2.4.1.1 Interbank Card Centre (BKM)

The Interbank Card Centre (BKM) was set by 13 major public and private Turkish banks in 1990. The BKM system started operations in 1993. The BKM's services include online credit card authorization, standalone credit card authorization and ATM and POS services for debit cards. It also offers solutions for card payment issues. In addition, it makes enhancements for rules and standards (BIS, 2007).

BKM's main fields of activity are;

- to provide the authorization operation between the banks,
- to develop the procedures for the banks in the credit card and debit card sector,
- to establish the rules and regulations,
- to make efforts to standardize provision process,
- to get in touch with the international organizations,
- to inform and alert the members in these organizations for ongoing bank operations and regulations,

- to provide a transaction in a more secure, simple and fast.
  (BKM History Page, 2014)

2.4.1.2 Interbank Clearing Houses Centre (BTOM)

According to payment systems in Turkey prepared by the Central Bank of the Republic of Turkey and the Committee on Payment and Settlement Systems of the central banks of the Group of Ten countries ; “The Cheque Law defines the Interbank Clearing Houses Centre (BTOM) as a legal entity and empowers the Central Bank of the Republic of Turkey (CBRT) to supervise and control the cheque clearing process nationwide. The Cheque Law and the CBRT’s by-law on the BTOM govern the establishment and functioning of the interbank clearinghouses (ICHs), which operate as branches of the BTOM. The CBRT issues directives and regulates the functioning of all clearing houses.” (BIS, 2007).

2.4.2 Retail payment instruments

2.4.2.1 Cash

Although people tend to use alternative payment methods in recent years, cash is the dominant retail payment medium in Turkey. People mostly use cash for their everyday payment requirements. However, the use of cash to pay wages, salaries is declining. Most corporate companies pay their personal salaries through the banks. Pensions are paid through state banks including Ziraat, Halkbank and Vakıfbank.

The Central Bank has authority for banknotes with the status of legal tender. Six zeros were removed from the Turkish Lira (TRY) on 1 January 2005. Currency was renamed as the new Turkish lira . The subunit, which is one 100th of a new Turkish lira is called the new kurus. Banknotes has denominations of TRY 5, 10, 20, 50, 100 and 200 (BIS, 2007).

Cash withdrawals are made mainly from bank branches or cash dispensers. Banks encourage the use of ATMs for cash withdrawals and their usage. Table 2-1 shows increase in ATM Number year by year in Turkey.

Table 2-1 Atm number year by year (BKM POS ATM Card Number Page, 2014)

PERIOD	ATM NUMBER
2009 December	23.800,00
2010 December	27.649,00
2011 December	32.462,00
2012 December	36.334,00
2013 December	42.011,00
2014 February	42.368,00

2.4.2.2 Payment Cards

2.4.2.2.1 Credit Cards

In 1968, Turkish people were first introduced to DinersClubCards. Diners Club cards were charge cards that required paying the whole balance on last payment date. It was given to only rich people as a prestige, so that the numbers of Diners Club were few. In addition, it could only be used in Turkey. There was a mechanical device called Imprinter. The number of shops that had the Imprinter devices was very few. Provision was taken by telephone. Credit cards that belong to Visa, Master Card branded banks started to enter into the market after 1980. Visa opened an office in Turkey in 1984. It increased the development of Turkish credit card market. In 1990, Interbank Card Center (BKM) was established (Aysan and Yıldız, 2005).

In 1993, first electronic POS terminal was used in that year. Euro Pay/MasterCard opened its first office in Turkey. POS number in Turkey is given in Table 2-2.

Table 2-2 POS number year by year (BKM POS ATM Card Number Page, 2014)

PERIOD	POS NUMBER
2009 December	1.738.728,00
2010 December	1.823.530,00
2011 December	1.976.843,00
2012 December	2.134.444,00
2013 December	2.293.695,00
2014 February	2.283.888,00

Increase in POS number has also triggered increase in credit card number in Turkey. As Table 2-3 is shown, there is a great increase in credit card number in Turkey according to BKM reports .According to reports that are published by BKM, total credit card number is 57.019.319 on February 2014.

Table 2-3 Credit card number year by year (BKM POS ATM Card Number Page, 2014)

PERIOD	CREDIT CARD NUMBER
2009 December	44.392.614,00
2010 December	46.956.124,00
2011 December	51.360.809,00
2012 December	54.342.148,00
2013 December	56.835.221,00
2014 February	57.019.319,00

2.4.2.2.2 Debit Cards

Debit cards are used to withdraw cash by debiting the holder's account at ATMs if there is sufficient balance. Since 1994, they are also used for retail purchases direct from the cardholders account through POS terminals. Card holders could purchase goods or services such as clothing luxury goods, food, electronics, drugs and sanitary products, furniture and car rentals via POS terminals that accept debit cards.

BKM published an advertising campaign on October 2004 to increase the use of debit cards and to convince cardholder to use debit cards instead of using cash when they do shopping. After the completion of the BKM-managed ATM Sharing Project in 2009, debit card of cardholder issued by any bank could withdraw money from any ATM terminals of other bank in return for being charge commission. Cardholders have also a chance to use any debit card at any ATM points for balance inquiry.

The latest development in debit card services allows consumers to withdraw cash at any selected retail stores via POS terminals. These developments have increased the usage of debit cards. On the February 2014, the total number of debit cards was 101.236.891 million.

Table 2-4 shows that there are about 1.26 debit cards per person if we consider Turkish population is about 80 million.

Table 2-4 Debit card number year by year (BKM POS ATM Card Number Page, 2014)

PERIOD	DEBIT CARD NUMBER
2009 December	64.661.947,00
2010 December	69.916.462,00
2011 December	81.879.926,00
2012 December	91.263.042,00
2013 December	100.164.954,00
2014 February	101.236.891,00

2.4.2.2.3 Prepaid Cards

There is no credit check and no bank account required by using prepaid cards. People just load one with funds, and then people can use it for all the things such as shopping, bill payments, or everyday purchases.

The most frequently used prepaid cards areas are;

- Some banks issue prepaid card in Turkey;
    - Akbank (Akbank Cep-T Page, 2014)
    - Is bank (Is bank MaxiPara Page, 2014)
    - Bank Asya (Bank Asya DIT Pratik Master Card Page, 2014)
    - Turkish Bank (Turkish Bank Rodpa Club Express Card Page, 2014)
- Disposable phone cards issued by Turkish Telekom for making calls from public telephones.
- Mobile operators issue reloadable cellular phone cards.
- Reloadable payment cards used at ticket gates of toll roads.
- Reloadable public transportation tickets issued by municipalities (BIS, 2007).

3. TECHONOLOGY TRENDS IN PAYMENT SYSTEMS

There is a vision of the future where no one needs pockets to hold cards, cash, password and username. In today's world, everybody has number of cards in his pocket for selling things, traveling and many facilities for his need. So that, people have to pick many cards. The bankcard industry globally is utilizing new technologies to avoid these kinds of problems instead of holding credit, debit, and prepaid cards in the pocket.

3.1 Smart Card

Smart cards are devices that securely store and process data. They are portable and durable. They are also as tiny computers having their own memories and processors. Therefore, the integrated circuit on a bank credit card is a smart card. "Subscriber identity modules (SIM) used inside our cellular phones are smart cards that store subscriber information to use the phones properly. A smart card includes a microprocessor, read-only memory (ROM), random access memory (RAM) and electrical erasable programmable ROM (EEPROM). Operating system of the card is stored in ROM. Similar to the main memories of our desktop PCs, applications run on RAM. Finally, EEPROM stores applications and data while the card is unpowered" (Saritas and Kardas, 2014).

Based on the usage type, smart cards are classified into two groups;

- Contact cards are physically put in a card reader. Card reader is also connected to a main computer.
- Contactless cards are not required put in a card reader. Instead, it communicates with the reader through Radio Frequency (RF) induction technology just by waving contactless cards (A Smart Card Alliance Transportation Council White Paper, 2011).

3.1.1 Features of Smart Card

- They are very portable and durable. So that they are used for many applications, such as identification, authorization, and payment.
- They include memory and a small microprocessor. They run preprogrammed tasks.
- It allows the data on the card to be either encrypted or decrypted. The data on the card encrypts through the triple data encryption standard (3DES).
- The microprocessor of the smart card has own encryption keys and encryption algorithms.
- The amount of memory on the cards changes based on the application. The amount of memory between 2 and 4 kb need to store financial data, personal data, and transaction history (Pelletier et al., 2012).

3.1.2 Smart card applications in the world

The main applications that smart cards are used;

- **The telecommunications industry**; They are used with prepaid phone cards or they are used with SIM cards inserted in mobile phones.
- **The banking industry;** They are used with credit and debit cards. For example; Euro pay, MasterCard and Visa cards include smart cards.
- **The identification industry;** They are used with electronic passports, national ID cards.
- **The transportation industry;** Contact-less cards are used for public transport.
- **Loyalty applications;** They are used for the accumulation of free miles for each transaction (Sauveron, 2009).

3.1.3 Smart card applications in Turkey

SoftTech associated with “Türkiye İş Bank” are targeting to take a key role in smart card market in both Europe and Turkey. So that it offers a variety of services by means of product called “Kart Ekspres”. It also has a capability of consultation services to other companies due to experience. Kart Ekspres has developed with multi-layer service oriented architecture and integrated with third party software, Kiosk, ATM, and POS. Well-designed user Interfaces manage communication between layers and components that new features can easily be added to Kart Ekspres. So that it can integrate with other existing, application is easier and by low cost. In other means, Companies can deploy Kart Express applications without giving up other existing systems. Users need to carry smart cards in their pocket to use smart card applications. Users are forced to carry separate card for each application. MIFARE smart card technology, which supports many applications on it, offers important solutions to that problem. SoftTech, takes a step forward MIFARE smart card technology, and includes smart cards that are used with smart card applications with other cards in our lives. For example, smart cards being used at workplace entrance, at the same time, can be used debit card at point of sale or KGS card on high ways. Furthermore, smart card with multi task can be used as student ID card. E-Cash that is charge on Smart cards allows doing shopping securely; (especially e-wallet applications). Kart Express offers quick, secure and easy credit charge on smart cards through Credit Charge Applications. That application enables to match bank accounts with smart cards and transfers Money between bank accounts and smart cards conversely. Demand features are added through card format application. For example, the same card can be used as both e-wallet and storage of personnel information due to card format application (Softtech Smart Card Application Page, 2014).

“The Smart Card Technology, which has been under development since the early 2000s in METU, was put into effect as a project at the start of the 2002 - 2003 academic year when all students and staff were provided with Smart Card identification cards. Within the scope of the project, as planned, the Smart Card was put into use first as the e-wallet for the cafeteria, then as an e-ID application at seven department buildings, two PC rooms,

and two campus gate entry barriers in 2005. With the second stage of the Smart Card application, started at the end of 2006, the e-wallet application of the smart card has been extensively widespread within the campus. Later stages of the project is being devised and shaped according the needs and the requirements of the METU members" (METU Smart Card Application Page, 2014).

Students of Mustafa Kemal University can do variety of transactions through in campus BANK24 JET card (smart card) issued by Halk Bank.

- They can withdraw money, deposit money, inquiry balance and view transactions by means of e-cash feature of BANK24 JET at point of sales that Visa is accepted. Students can make use of all banking services.
- BANK24 JET card can be used as KGS entrance card on the highways.
- It can be used as student identification card, doing shopping at campus restaurant, and identification control before exams. Students can demand student documents like transcripts through BANK24 JET card at student affair office (Mustafa Kemal University Smart Card application Page, 2014).

3.2 E-Wallet

The electronic wallet (E-wallet) is like a today's wallet. It holds information of the several cards, e-checks, e-cash, username, passwords and PINs in a mobile phone instead of carrying wallet. In addition, the e-wallet enables security features that is not available to traditional wallet. Identification and authorization are needed for every credit card transaction. People protect their e-wallet file with a password. People enter the wallet's password before they can access the information on any of the cards, e-checks, e-cash, username, passwords and PINs in that wallet. If an e-wallet does not require a password, anyone can access e-wallet that contains important personal information (Upadhayaya, 2012).

Simplicity of transactions is so important during shopping process. In this way, customers and merchants do shopping process by exchanging electronic money. As a result, it facilitates to do shopping from mobile phone. It also enables price comparison-shopping (Taghiloo et al., 2010).

3.2.1 E-Wallet security

E-wallet protects personal information as follows;

- A password is need to be entering before accessing any cards information in e- wallet.
- It encrypts the information of cards, e-checks, e-cash, username, passwords in e-wallet (Upadhayaya, 2012).

3.2.2 Benefits of e-wallet

- It manages account from our mobile phone.
- It is secure because of being encrypted the information.
- It helps to transfer money from E-wallet to E-wallet without sharing personal account information.
- It facilitates payment and transfer process by instead of carrying heavy or banknotes and coins.
- It is easy to use globally because there is no link with the bank account during the payment process.
- It helps to send and receive payments anywhere in the world.
- It saves time and makes it simpler, faster. For example, the user has to queue to buy a ticket, pay, go through a ticket control system. Then they hold on to the ticket for inspection. All these steps are done in one single action with the e-wallet (Sahut, 2008).

3.2.3 E-wallet applications in the world

3.2.3.1 Microsoft E-wallet

One of the most popular example of an E-wallet on the world market is Microsoft Wallet. Microsoft Passport is needed to be installed to obtain Microsoft Wallet. After setting up a Passport, a Microsoft E-wallet can be used for payment transactions. They also eliminate reentering personal information on the forms, resulting in higher speed and efficiency for online shoppers. Microsoft Passport consists of several services including, a single sign-in, and wallet and kids passport services. A single sign-in service allows the customer to use a single name and password at a growing number of participating e-commerce sites. The shopper make fast, easy and secure online purchases with a wallet service. Kid's passport service helps to protect and control children's online privacy (Microsoft E-Wallet Page, 2014).

3.2.3.2 Google Wallet

"A first meaningful and promising concept available for the public has been developed by Google, called Google Wallet. It was officially presented for the first time in May 2011 and launched in September 2011. Google Wallet is primarily built upon an application for Google's own operating system Android and is available at the Android market free of charge. Currently however, only a single NFC phone is supported, that is Google's Nexus S 4G smartphone. In addition, the number of supported credit cards and the number of available payment locations is still limited at present. Google Wallet currently offers two types of payment instruments: owners of a Citi MasterCard credit card can directly link their banking account to Google Wallet. As of 2005, MasterCard has already begun to roll out a proprietary NFC based payment system called Pay Pass. This system originally was designed for credit cards with small built " (Burkard.Simon, 2012).

3.2.4 E-wallet applications in Turkey

3.2.4.1 Vodafone Cep Cüzdan

Vodafone offers “Vodafone Cep Cüzdan “service. Not only, users can doing shopping by Vodafone Cep Cüzdan, but also they can do financial transactions by downloading application on smart phone from iPhone/Android markets.

Vodafone Cep Cüzdan has following functions ;

- **Money Transfer:** Users can transfer money to all GSM operators and can receive money from all Vodafone users**.**
- **Charging Lira:** Users can charge Lira to All Vodafone prepaid lines**.**
- **My Cards:** Users can save in “Vodafone Cep Cüzdan” by taking the photo of physical credit card or debit card. Therefore, that people can do shopping by means of mobile phone.
- **Save and Send:** Users can transfer balance or receive balance due to cards.
- **Transaction History:** Users can view all card transactions that are done with debit or credit card (Vodafone Cep Cuzdan Page, 2014).

3.2.4.2 Turkcell Cüzdan

It allows you to charge TL coin, to purchase package, and transfer Money by “Turkcell Cüzdan”. Users can buy products from e-commerce site, do contactless payment and do shopping on the net securely.

Turkcell Cüzdan offers functions below to users;

- Doing shopping on the net securely. Users do not need card information during payment process through Turkcell Cüzdan.
    - There is “Pay Turkcell Cüzdan” among payment options.
    - After GSM Number is entered, then credit card is selected.

  - After being approved information that sent on the phone, shopping is completed by being entered password of selected card.
- Users can charge TL coin to any Turkcell number.
- Users can transfer money to anyone.
  - It is enough to know phone number whom people you will transfer money.
- Users can learn personalized discount coupons and bonus cards easily.
- Contactless payment can be done through NFC Technology .to make use of NFC technology.
  - User should have either mobile Phone with NFC featured or SimCard with Turkcell SIMPlus 256 K. (SimCard based SimCard)
  - SimCard can store credit card information, public transportation card and entrance card of work securely.
- Users can pay their bills through "Turkcell Cuzdan" without going to bill payment shop. Users need to enter credit card /debit card with MasterCard logo of Garanti Bank or GarantiParam to pay their bill by means of credit card (Turkcell Cuzdan Page, 2014).

Some banks such as Akbank, Garanti are cooperating with Turkcell. Therefore, Turkcell Cuzdan users can do shopping by using banks cards (Akbank Turkcell Cuzdan Page, 2014; Garanti Mobil Cuzdan Page, 2014).

3.3 NFC (Near Field Communication)

NFC technology is a wireless communication technology and integrated with mobile phones. It is enough to exchange data a few centimeters apart. NFC payment products are available in the U.S. since 2011. Now they are available in other countries market. An NFC-enabled mobile phone includes a chip. It enables the phone to store a payment application and the account information of customers securely an NFC enabled phone contacts with the account information of customers to the POS terminal via radio frequency, using the ISO/IEC 14443 (International Organization for Standardization/International Electro technical Commission) standard protocol. NFC

enable mobile contactless credit and debit payments can be done at POS readers (A Smart Card Alliance Transportation Council White Paper, 2011).

Mobile Phone can be used as contactless card by means of NFC. It has a shorter range than Bluetooth and Wi-Fi. NFC compatible mobile phone also provides Radio-Frequency Identification (RFID) tags or readers. It provides great opportunities for trend technologies. For example, when an RFID tag is inserted in a poster. The customer with mobile phone can receive information by just zooming on poster (Ondrus and Pigneur, 2007).

3.3.1 Benefits of NFC Payment

- Contactless readers require less maintenance. So that, it provides cost savings to merchants.
- Payment credentials such as personal information, passwords, username are stored securely in the NFC-enabled mobile device.
- It is more secure than current magnetic stripe technology and reduces fraud.
- It reduces the frequency that cards are passed to the clerk to perform a transaction, simplifying the transaction.
- It increases consumer convenience by providing e-wallet in mobile phone instead of need for carrying cash and coins.
- It enables customers to use a single device to support multiple payment options.
- It helps to increase electronic payment penetration into traditional cash markets (A Smart Card Alliance Transportation Council White Paper, 2011).

3.3.2 NFC applications in the world

As, NFC offers cheap, fast acceptance and marketability, it is used in various applications. Some of applications that NFC are used;

Mobile Payment: NFC payment provides fast, secure and simple payment at the Point of Sale (POS). For example, a customer pays either by cash or with a debit card today at the supermarket checkout. When people pay by cash, the customer needs to carry cash money with him. Then, the proper amount of invoiced money is required to be counted and to be exchanged at the POS. This results in time-consuming activity. When the customer pays with debit card, it is more efficient, however it is a time consuming activity too. Because the appropriate card needs to be picked out of the wallet, it needs to be contacted in the terminal with the correct style. On the other hand, a single action is enough for NFC payment. The payment process is done by just waving the NFC-capable phone over the reader device.

Medical Applications: It is used for health monitoring and recording of health status of patients by using NFC.

P2P Data Transfer: It can be used for easy money transfer between persons. In addition, it transmits or receives other forms of data.

Movie, Concert and Hotel Ticketing: It is used for ticketing in public transport systems. It can be applied ticket reservation, ticket selling and admission control (Burkard Simon, 2012).

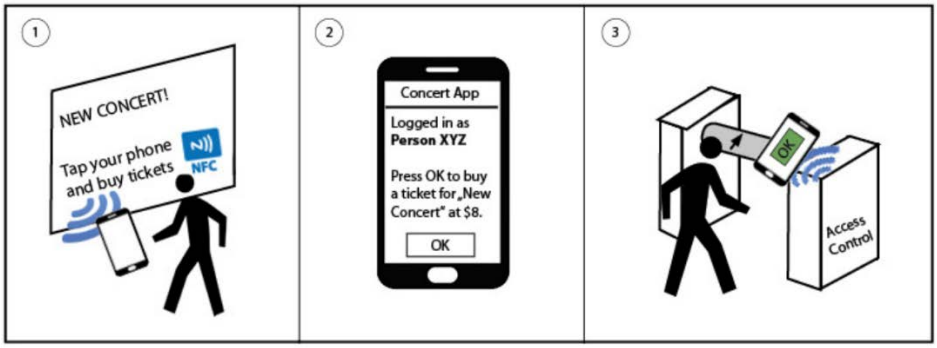

Figure 3-1 A typical NFC application scenario

As, Figure 3-1 is shown, a typical NFC application scenario includes following steps. A customer zooms in the upcoming concert poster with his NFC enabled phone (1). A screen is open on his phone displaying details of the concert. As the customer registers with an account and is log in, he can immediately buy a ticket (2). The ticket Information is securely stored on his phone. Finally, the access control gates that provides NFC reader enable the customer to enter concert (3).

Product Information System: Clothes are equipped with a NFC tag. It allows shop assistants to check availability of products. It also offers the required information about the products immediately to the customer (Burkard Simon, 2012).

3.3.3 NFC applications in Turkey

3.3.3.1 Mobile Payment

BKM has been running on NFC since 2008. It enables the usage of NFC based products to Turkey market. As a result, Turkey market offers NFC based markets. It allows developing the technology needed to NFC solutions.

Turkcell launched its Cep-T Cüzdan NFC mobile wallet service in May 2011. Rival mobile network operator Avea also has a NFC service, launched in December 2010 in conjunction with Garanti Bank, and is working to expand the service.

Some banks, Halkbank, Vakifbank and Garanti allowes NFC credit and debit card payments using BKM technology (Garanti Payment System Page, 2014; HalkBank Investment Page, 2014; Is bank MaxiMobil Page, 2014; BKM NFC Forum Page, 2014).

3.3.3.2 Transportation Projects (Konya Transportation Project)

In Konya, local and foreign credit cards, bankcards and prepaid cards are used for payment in buses and streetcars. It allows paying through NFC compatible mobile phones, contactless cards with smart card feature.

Konya Metropolitan Municipality made coloration with Interbank Card Center to carry out the Transportation Project. Residents of Konya and 2 million domestic tourists and 500,000 foreign tourists can make use of this opportunity by doing payment with NFC compatible mobile phones, contactless cards with smart card feature.

Nine banks in Turkey made collaboration with BKM to be used their card for public transportation in Konya. It is also the same tariff named “Elkart” used as Konya’s local transportation card (BKM Transportation Projects Page, 2014).

3.4 Biometric Payment System

We need to carry many kinds of cards such as, the credit or debit cards for shopping, bus card for traveling, and student card for library and university campus entrance in our lives. Therefore, a person has to take many cards and has to memorize their username, passwords or PIN. The biometric payment system solves this problem. Biometric payment system is simple, reliable, secure and easy to use without remembering any password or PIN (Kumar and Ryu, 2009).

Today, many businesses are using different kind of biometrics, such as fingerprint readers, iris scans and face recognition. Biometrics are also used for user identification and authorization by using several algorithms. So that, biometrics payment system has a great acceptance (Clodfelter, 2010).

3.4.1 Fingerprint scanning

Fingerprint identification collects fingerprint template using a sensing device for authentication. The captured image has data points. It also saved as a biometric algorithm. Algorithm software includes 40 or more data points and store for future authentication. Fingerprint authentication is used for identity verification in Malaysia and Singapore. Citibank set a fingerprint authentication payment service on Wednesday 9th November 2006. It allows making payments for credit card customers by touching of the finger (Kumar and Ryu, 2009).

3.4.2 Other biometric types and applications in the world

3.4.2.1 Face recognition

Face recognition technology analyzes facial features such as eyes, nose, and mouth. Face recognition is used for some passport control systems around the world (Clodfelter, 2010).

3.4.2.2 Hand geometry and palm print scanning

Hand geometry analyzes the size of the whole hand, its palm, and fingers. Hand geometry are used for employee access control, and they are used for bank branches for safe deposit box access (Clodfelter, 2010).

“Italian bank UniCredit has begun market tests of a new biometric payment system that uses palm scanning technology from Fujitsu, reports Finextra.” (Tracey, 2013).

3.4.2.3 Iris scanning

Iris scanning measures the iris features. The iris features can require users to look into a camera to complete the analysis. A digital camera takes an image of the eye. The irises do not change after a person birth. Once the image is stored on a hard drive. It can uses for identification. It is used for identification at airports in several European and Middle Eastern countries (Clodfelter, 2010).

3.4.2.4 Voice recognition

Voice recognition measures the distinct pronunciation of an individual's voice. This technique is used for telephone services (Clodfelter, 2010).

"Online consumer bank ING Direct Canada is working with IBM to simplify account access across mobile devices and social media channels, using voice recognition. The ING Direct biometric implementation supports its Orange Snapshot initiative that gives mobile consumers a simplified view of all their accounts, as well as bill payment and money transfers. The bank has begun experimenting with voice recognition capabilities on its mobile apps that will allow clients to conduct simple banking transactions by speaking rather than typing. It is also exploring the use of biometrics within mobile apps for purposes such as client login" (Tracey, 2013).

3.4.3 Biometric applications in Turkey

Today, some banks and GSM operators use biometric applications to offer a quick, secure and fast payment to their users.

"Isbank deployed biometrics at the ATM, which also started working with Hitachi in early

2011 to further develop biometric finger vein scanner technology to the point where it could be added easily to existing sites. After starting a deployment programme in late 2011, Isbank announced in February 2012 it had successfully deployed around 3,400 Hitachi finger vein scanners in ATMs and branches across Turkey, allowing customers to withdraw cash without a card. Isbank works with MIG International to install the authentication scanners in around 2,400 NCR and Wincor Nixdorf ATMs, allowing customers to withdraw cash without cards and human intervention" (Gold, June 2012).

Some banks such as Garanti, Yapı Kredi launched voice signature system. Therefore, that call center recognizes a calling customer by analyzing customer's biometric voice. Due to this, speech recognition provides much safer and faster processing by eliminating steps for customer's identity validation process, such as, place of birth, date of birth, tariff information. Furthermore, speech recognition predicts why customer call bank by using some algorithms. It directs customer to related subjects among complex menus (Garanti News Page, 2014; Yapı Kredi Call Center Page, 2014).

VeriFone has developed first biometric point of sale of Turkey for Is Bank. According to project, cardholder of Is Bank can do a quick, secure and fast payment by scanning their finger on POS that Is bank and VeriFone developed (Is Bank Activity Report Page, 2014).

- People who want to do shopping at biometric People need to go to Is Bank branch to match finger vain map with customer account information.
- Is bank is planning to launch the largest biometric point-of-sale network in the world (Tracey, 2013).

4. KUVEYT TURK PAYMENT SYSTEMS

4.1 Generel Overview

“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” (Kuveyt Turk History Page, 2014).

Kuveyt Turk Quality Policy aims;

- to increase service quality,
- to provide continuous education, knowledge and experience of working employees in Kuveyt Turk,
- to develop new products and services through alternative service channels.
  (Kuveyt Turk Vision Mission Page, 2014)

4.2 Kuveyt Turk Payment System Management

Kuveyt Turk Payment System helps customer to solve customer problems when customer face with any problem about its cards. Furthermore, it operates clearance and accounting reconciliation of credit cards, provides reports and being managed of POS services.

- Manager of payment system creates and manages comprehensive communication among units by developing effective politics.

- Manager of payment system assesses personnel performance in payment systems and defines education need of personnel's who are working with him.

Kuveyt Turk Payment System Management includes four units;

- Credit Card Operations
- Credit Cards Data Entry and Inquiry
- Security and Fraud
- Alternative Delivery Channel (ADC) Operations

4.2.1 Credit Cards Data Entry and Inquiry

When a customer applies for a credit card at any Kuveyt Turk branch, she/he fills form. Then, the form is sent to Credit Cards Data Entry and Inquiry unit by means of electronic system in payment systems to verify customer information, so that phone number that the customer types on the application form is called. Customer's workplace is also called to get information about customer. Official documents of customers like passport, identity card and sign samples are observed whether they are fake or not. After being a verified customer, customer data is sent to credit card operations units to being prepared card-printing data.

4.2.2 Credit Card Operations

Card printing data is prepared by credit card operations personnel, and sent to card printing company through FTP channel. Then, Kuveyt Turk operation personnel receives card data through FTP after being executed card data by company and transfer data on kredikart.exe on BankSoft system. On the other hand, printed card on plastic are sent to customer through courier.

Tasks of credit card operation unit are listed below;

- Card printing data is daily viewed by operation personnel from kredikart.exe,
- Address of current card customers are refreshed,
- Due cards and cards will be renewed are identified and observed through reports,
- Cards will not be renewed are cancelled,
- New credit and debit cards information is sent to Interbank Card Centre (BKM) through FTP,
- Credit and debit cards problems that are received by branch, call center channels are solved.

4.2.3 Security and Fraud

There is a system called “SABAS” that are provided by Credit Record Office (KKB - Kredi Kayıt Bürosu). Security and Fraud Unit personnel are responsible for SABAS system to prevent fraud applications of cards. Therefore, fraud personnel match applications that is received by branch with applications on SABAS. If it matches, personnel can take necessary action, and control SABAS warning messages. Furthermore, as shown in Table 4-1, Kuveyt Turk faces fraud events from time to time.

Tasks of security and fraud unit are also listed below;

- Some suspicious applications are sent to Fraud Unit and they are observed by fraud personnel. So that, fraud personnel have an option whether to approve or reject card.
- Debit/credit card transactions are monitored online through Fraud programs. Instant caution are taken for some transactions with risk. Sometimes customers are called by phone to confirm transactions.
- Some actions are taken against croakers by collaborating with other banks continuously.

Table 4-1 Fraud events in Kuveyt Turk

PERIOD	FRAUD EVENTS IN KUVEYT TURK
2009 December	12
2010 December	20
2011 December	25
2012 December	109
2013 December	87

4.2.4 Alternative Delivery Channel (ADC) Operations

4.2.4.1 ATM Operations

ATM Operations unit operates new ATM machine installation. Then, 7/24 ATM services are maintained uninterreptly after being installed. ATM machines are monitored for 24 hours a day. If breakdown is occurred at ATM machine, technical help work are carried out to recover breakdown of ATM machine. Safe reconciliation of ATM is done and controlled daily by ATM operation personnel. Daily monthly debit card usage is also monitored and reported.

4.2.4.2 POS Operations

POS applications that are done by merchants are assessed by operation personnel. If documents provided by merchants are enough, POS operations unit operates new POS machine installation. Furthermore, breakdown and change of POS machines are monitored. Accounting of transactions done through POS machines are followed by POs operations personnel. In addition, POS operations unit identifies merchants who uses its POS in efficiently and works on efficient POS usage. POS operations unit also prepares reports for VISA, MC and BKM.

4.3 Payment instruments

Used payment instruments in Kuveyt Turk are cash, credit card and debit cards. Kuveyt Turk does not have prepaid cards. Furthermore, although cheque is used as payment instruments, it is operated under banking operations unit instead of payment system unit.

4.3.1 Cash

Cash withdrawals are made mainly from bank branches or ATM/XTM machines in Kuveyt Turk. Kuveyt Turk encourages the use of ATMs for cash withdrawals and their usage is increasing. As Table 4-3 is shown, ATM number in Kuveyt Turk increased in last three year.

Table 4-2 ATM number in Kuveyt Turk

PERIOD	ATM NUMBER IN KUVEYT TURK
2009 December	125
2010 December	133
2011 December	149
2012 December	199
2013 December	256
2014 February	335

4.3.2 Payment Cards

4.3.2.1 Credit cards

POS number of Kuveyt Turk is quite low with regard to market. The most reason why merchants do’not want to have Kuveyt Turk POS is that, there are no enough Kuveyt Turk cards in the market. In other way, card numbers are directly proportionate to POS numbers. Decrease in POS numbers triggers decrease in card numbers. Table 4-4 shows total POS numbers of kuveyt turk year by year.

Table 4-3 POS number in Kuveyt Turk

PERIOD	TOTAL POS NUMBER IN KUVEYT TURK
2009 December	19.413
2010 December	30.464
2011 December	38.064
2012 December	47.152
2013 December	63.433
2014 February	78.906

As POS number of Kuveyt Turk is not at desired level, card numbers hasn't increased at desired level too. When, total card numbers of Kuveyt Turk (329.085) that is given in Table 4-5 with total card number of all banks (57.019.319, 00) in the market is compared, Kuveyt Turk fall behind in the market.

Table 4-4 Credit Card number in Kuveyt Turk

PERIOD	TOTAL CARD NUMBER IN KUVEYT TURK
2008 December	56.716
2009 December	91.945
2010 December	125.047
2011 December	182.936
2012 December	237.753
2013 December	329.085

There are five types of credit card used for different purposes. These are;

- **Business Card:** It is given to firm owners. Customers can buy products at large amounts through their business cards.
- **İhtiyaç Card:** Newlywed couple, people who renovates the house can demand "ihtiyac kart". In addition, it focuses on customers who have credit need and can be used for education, health and travel. It requires to be used for 3 month.
- **Klasik Card:** It can be given to individual customers. It is used at point of sale where visa member.

- **Palmiye Card:** It is used as payment instruments for commerce that are done between distributor and retail, so that it is no need to pay through cash or cheque. It is given to business companies.
- **Sale Plus:** Contactless feature are used sale under 35 TL (Pay bass). No card fee for first year usage. When customers do shopping through their sale plus, they gain gold bonus by each spending.

4.3.2.2 Debit Cards

Debit cards are typically used to withdraw cash by debiting the holder's account at ATMs for 7 days 24 hours in both domestic and abroad if there is sufficient balance.

Features of Kuveyt Turk debit card are listed below;

- Kuveyt Turk customers can save gold mark at gold account by doing shopping through debit cards at POS.
- There is no annual fee of Kuveyt Turk debit card.
- Customers can withdraw cash between 10 and 100 TL at POS when they do shopping at minimum 10 TL amount.
- When customers do shopping through internet, they can safely do transactions by 3D secure.
- All branches include card-printing machines. In this way, customers can get debit card quickly whenever they desire debit card.

There are about 2.640.000 millions of Kuveyt Turk customers. However, there are about 300 branches of Kuveyt Turk and 335 ATM machines all over Turkey. Debit cards number is quite low, if we consider there are about 101.236.891,00 debit cards in Turkey market. Table 4-6 shows that there are 335.389 debit cards of Kuveyt Turk by 2014 December.

Table 4-5 Debit card number in Kuveyt Turk

PERIOD	TOTAL DEBIT CARD NUMBER IN KUVEYT TURK
2008 December	46304
2009 December	75153
2010 December	115563
2011 December	220752
2012 December	318647
2013 December	335389

4.4 Kuveyt Turk Information Technology

Rapid developments in information technology are confronting traditional banks with major challenges. Therefore, most banks in Turkey have made investments on Research and Development (R&D).

Figure 4-1 shows that market share of Research and Development expenses of first ten banks in 2010 in Turkey. Market share of first three bank (Garanti, Is Bank and ING Bank) nearly involved 85.2% in all market. Kuveyt Turk is also first participation bank that made investment on R&D in 2010.

%	2002	Pay	2004	Pay	2006	Pay	2008	Pay	2010	Pay
1	YAPI VE KREDİ B.	47,5	T. GARANTİ B.	39,9	T. İŞ BANKASI	35,6	T. İŞ BANKASI	76,6	T. GARANTİ B.	43,6
2	T. İŞ BANKASI	31,5	AKBANK	27,8	FİNANSBANK	29,1	T. GARANTİ B.	10,3	T. İŞ BANKASI	25,5
3	T. VAKIFLAR B.	4,0	T. İŞ BANKASI	10,1	T. GARANTİ B.	16,4	FİNANSBANK	6,5	ING BANK	16,1
4	FORTİS BANK	4,0	YAPI VE KREDİ B.	9,5	AKBANK	6,5	ING BANK	1,9	FİNANSBANK	5,4
5	KOÇBANK	3,2	ING BANK	5,7	YAPI VE KREDİ B.	4,1	YAPI VE KREDİ B.	1,8	YAPI VE KREDİ B.	3,9
6	DENİZBANK	2,6	FİNANSBANK	2,2	ING BANK	3,7	T. İHR. KREDİ B.	1,0	T. İHR. KREDİ B.	2,7
7	DEUTSCHE B.	1,8	KOÇBANK	1,3	ŞEKERBANK	2,1	HSBC BANK	0,9	HSBC BANK	1,7
8	FİBABANKA	1,5	ŞEKERBANK	1,0	THE ROYAL B.	0,6	AKBANK	0,6	AKBANK	0,3
9	T.C. ZİRAAT B.	1,0	DENİZBANK	0,6	T. VAKIFLAR B.	0,6	T. HALK B.	0,1	KUVEYT TÜRK K. B.	0,3
10	ŞEKERBANK	0,8	T. EKONOMİ B.	0,5	DENİZBANK	0,5	THE ROYAL B.	0,1	ARAP TÜRK B.	0,1

Figure 4-1 R&D Market share of banks (BDDK Activity Report, 25.04.2014)

The remarkable evolutions and investments have been started on Kuveyt Turk Information Technology (IT) since 2009. So that, Kuveyt Turk has started a conversion project named Business Oriented Architecture (BOA) in 2009. BOA offers latest Microsoft technologies

including .Net Framework 4.5. Furthermore, most banking applications are converted based on BOA architecture today.

4.4.1 Payment Systems in Kuveyt Turk Information Technology

Kuveyt Turk Information Technology is working with a third company called “Banksoft” that provides reliable turnkey solutions to banks for ATM, POS and Credit Card services. As application codes are outsourced, maintenance costs are so high. In addition, new features are wanted to be added to existing applications, it takes so long time to implement these features due to third party company.

When a customer requests a credit or debit card from Kuveyt Turk, teller at branch enters customer’s information on Kuveyt Turk application (BOA). Then, teller sends application form to Kuveyt Turk general head office to verify and inquiry customer information by observing customer documents. After the customer is verified, the customer information is sent to Banksoft side through stored procedure to create credit or debit card.

After the credit or debit card is created, all card operations are operated on Banksoft systems as all card application codes are deployed on Banksoft Systems. Process of credit /debit card application is depicted in Figure 4-2

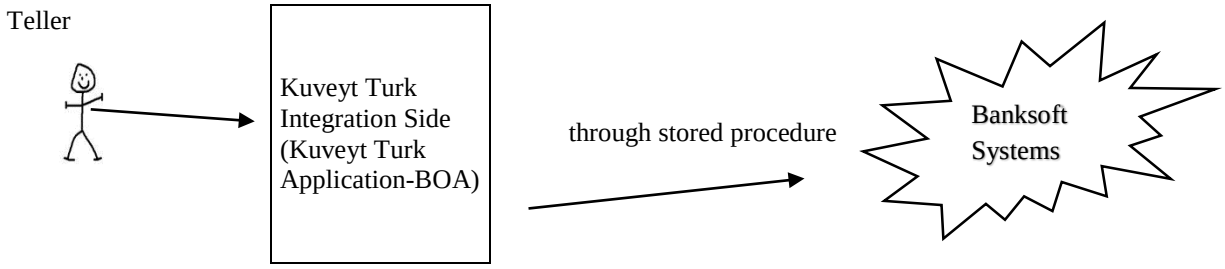

Figure 4-2 Debit and credit card application process

When Kuveyt Turk credit card customers do payment or withdraw cash advance through Kuveyt Turk channels like ATM, Internet, and Mobil that is depicted in Figure 4-3, payment request is sent to Banksoft systems through Kuveyt Turk Web Service (Kuveyt Turk Integration Side) to get provision. There is a web service that provides communication between Kuveyt Turk and Banksoft applications. The web service is coded and maintained by Kuveyt Turk. On the other hand, All card applications are maintained by Banksoft company.

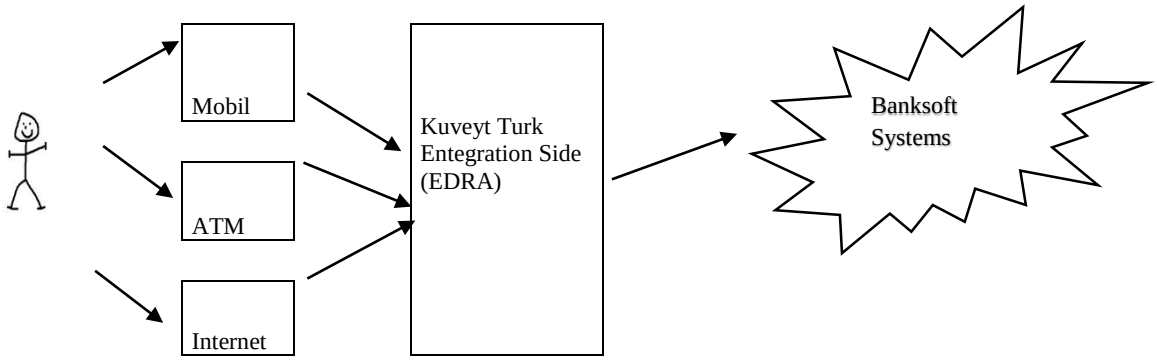

Figure 4-3 Credit card payment or cash advance process

When a Kuveyt Turk credit card customer uses its credit cards at POS for shopping, authorization request is transmited to Banksoft systems through BKM. Banksoft checks authentication and customer limits, and send back response to POS through BKM. In this way, doing-shopping process is realized. Figure 4-4 also shows sale transaction process by a Kuveyt Turk credit card.

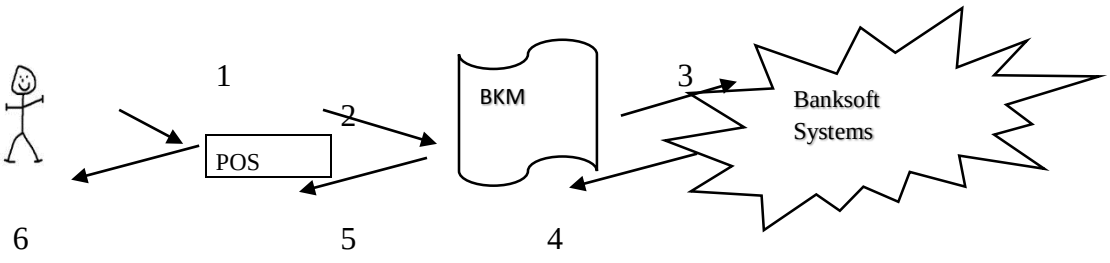

Figure 4-4 Sale transaction process by a Kuveyt Turk credit card.

On the other hand, when debit cards customers uses its card for shopping, authorization request have to be transmitted to Kuveyt Turk Bank to check customers' holder account balance as shown in Figure 4-5

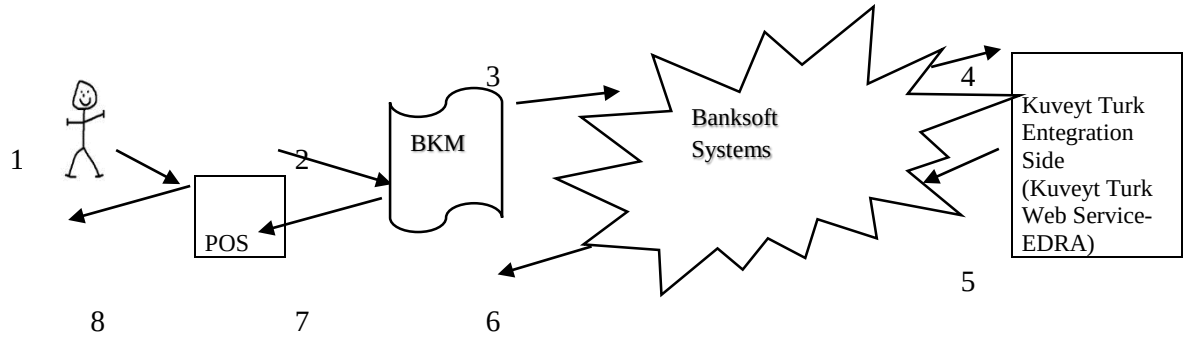

Figure 4-5 Sale transaction process by a Kuveyt Turk debit card

All daily credit card operations, statements, current term transactions on Banksoft systems are sent to Kuveyt Turk to make clearance by a file at the end of day. TraThe end of day process for card operations is depicted in Figure 4-6.

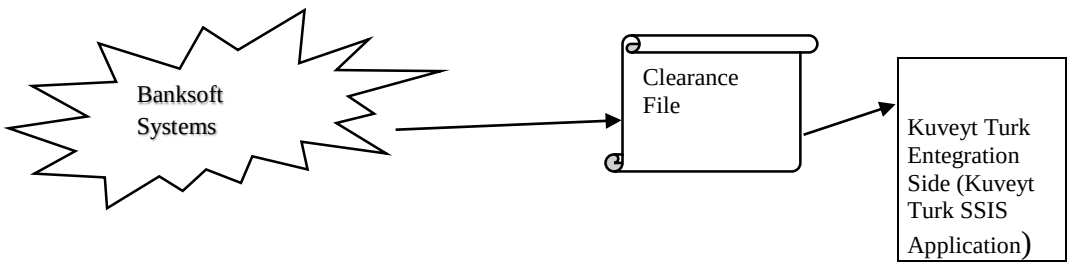

Figure 4-6 Kuveyt Turk credit card process at the end of day.

System analyst and payment systems unit play an important role to develop new enhancements on card payment systems in Kuveyt Turk Information Technology Department. New development process for Kuveyt Turk payment systems that is depicted in Figure 4-7 follows several steps. When a new development is needed, payment systems units (Credit Card Operations, Credit Cards Data Entry and Inquiry, Security and Fraud,

ADC Operations, POS Operations) demand their expectations by assessing case with system analyst. Then, system analyst identifies new need. The new demand by system analyst is informed to analysts of Bank Soft Company. They identify how many days this development will be completed and how much money it will cost. Later, Kuveyt Turk Information Technology management makes decision whether development will be done or not. If they approve development, Banksoft Company will do it. Furthermore, Kuveyt Turk software developers do Banksoft integration, if it is required.

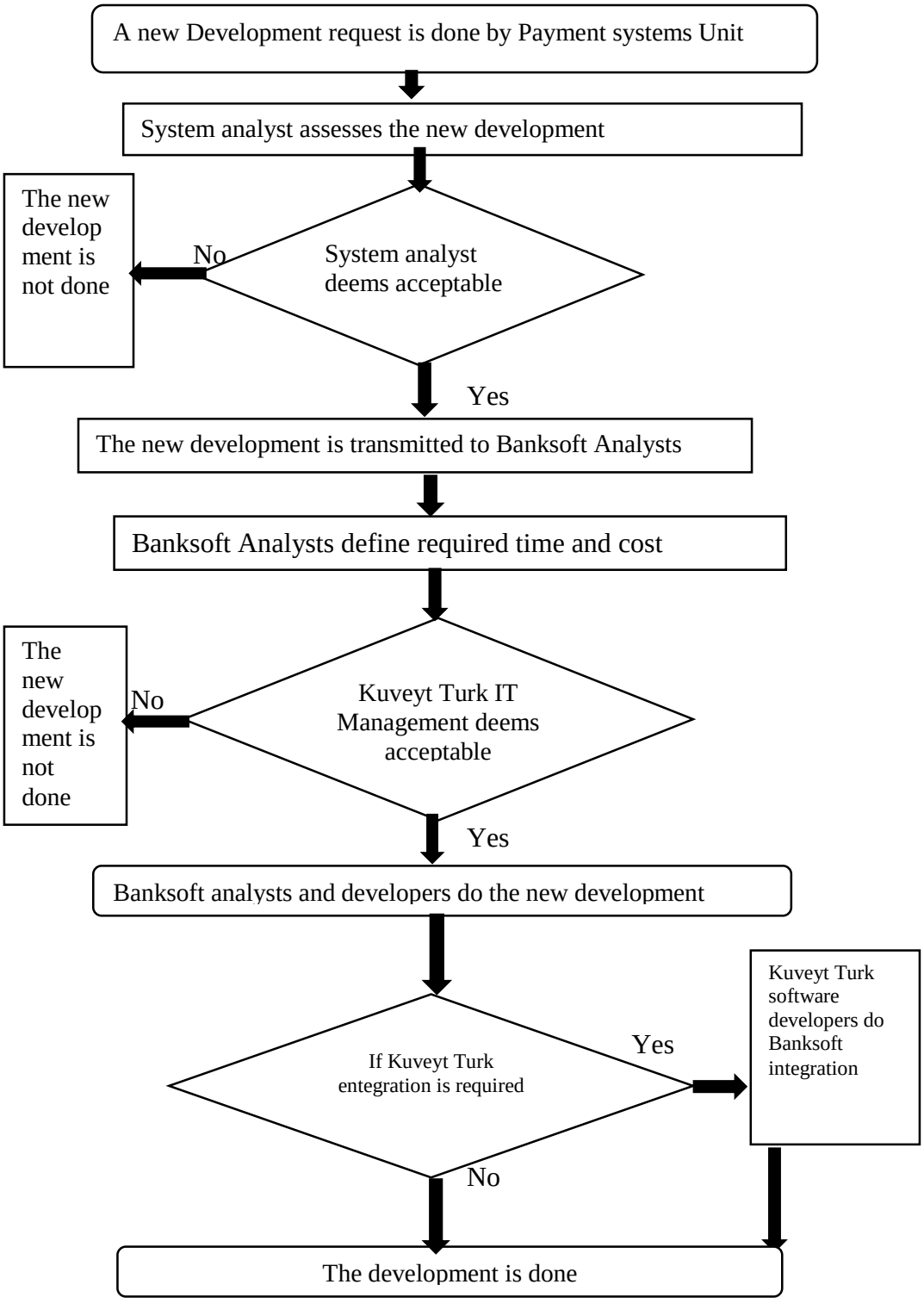

Figure 4-7 A New development process for Kuveyt Turk payment systems

5. TECHNOLOGY ROADMAP LITERATURE REVIEW

The Chief Executive Officer (CEO) of Motorola named Robert Galvin introduced the concept of a technology roadmap in the 1980s. It supports strategic product and technology planning. He described it as “an extended look at the future of a chosen field of inquiry composed from the collective knowledge and imagination of the brightest drives of change in that field” (Jeong and Yoon, 2014).

Technology roadmap is a management tool for the strategic planning of R&D activities and administration. It is used by many different companies to integrate science and technology with business and product planning. Technology roadmaps are long-term action plans (Jeffrey et al., 2012). They are a time-based structured framework to enable strategic plans and development of technology, products, markets (Phaal et al., 2003).

A technology roadmap includes both” bottoms-up” technology research activities and “tops down” market/business drivers. It shows relationship between business planning and product (Martin And Daim, 2012). “Bottoms-up” looks for opportunities and “tops down“ aims for customer defined product. The roadmap can be described in different forms such as, time based chart, graphs, pictorial representations, flow charts, single layer, text etc. (Phaal et al., 2003).

Various forecasting techniques are used to monitor technology trends. The most useful technique is bibliometrics. It refers to as scientific literature analysis and scans data of publications what technologies are developed by companies. Furthermore, another forecasting technique is patent analysis that monitors technology development. In addition, expert analysis that is based on the quality, experience and knowledge of participants is also used. Experts under investigation are asked questions by using various methods. Moreover, technology intelligence is used for many companies and governments. Motorola was firstly set up formal technology intelligence program.

Technology intelligence (TI) links the gap between information and data. It includes three phases; data collection, data warehousing and data exploitation (Martin and Daim, 2012).

Technology roadmap helps organizations;

- to support company strategy and planning processes (Phaal et al., 2003),
- to predict future trends and developments of markets in technology (Jeffrey et al., 2012),
- to enable a connection between technology investment decisions and business planning (Jeong and Yoon, 2014),
- to identify significant technological requirements, product, and technology alternatives and to achieve goals (Jeong and Yoon, 2014),
- to carry out R&D activities by preparing plans about what technologies is need to develop (Geum et al., 2014),
- to have the information, process and tools (Phaal et al., 2003).

5.1. Technology Road Mapping Processes

The process and construction of technology road mapping are flexible. So that many organizations and companies use different approaches to adopt technology road mapping in their business. The application of road mapping process varies a set of situations in terms of company size, sector type and product/service type (Phaal et al., 2003).

Various methods and approaches are published in the literature to construct the technology roadmap. It is required to develop appropriate roadmap type and methodology considering the goal and objective of the roadmap. There is no one single best method to develop technology roadmaps. On the other hand, most of the technology road mapping (TRM) literature point out that first step in the road mapping process is to identify experts experiences, ideas and expectations. Then, workshop(s) should be held that experts attend to make brainstorm and to develop roadmap (Amer and Daim, 2010).

5.1.1. Fast-Start technology road mapping (T-Plan)

The T-Plan focuses on how to start road-mapping process in an organization as soon as possible. It helps technology planning and strategy planning. T-Plan is workshop-based approach. It involves between one and three workshops (Phaal et al., 2003).

The fast-start approach also aims to support the start-up of company-specific TRM processes. It communicates between technology resources and business drivers. It develops a first-cut technology roadmap. It helps to identify important gaps in market, product and technology intelligence by enabling SWOT analysis and includes strategies and tactics (Li et al., 2014).

The T-Plan process includes three stages,

I. Planning: Context, scope, organizational goals, available information and resources, culture are defined by participants.
II. Road mapping workshop(s): It provides detailed step-by- step guidance for workshop(s).
III. Roll-out: It provides guidance of maintaining and extending the process (Phaal et al., 2003).

Experts and stakeholders come together to share their opinions to identify strategic issues and plans in the workshops. The workshop needs to include other activities such as interviews, market research, business research and analysis (Fleuryl et al., 2006).

It focuses on strategic planning and creates a plan to integrate market, product and technology (Lee et al., 2007).

There are two short cases illustrating how T-plan is used and developed below.

Case study 1 - Brazilian Software Company

A Brazilian software company developed roadmap using the "T-Plan" process. They realized four workshops in depicted Table 5-1. The first workshop identified the current market situation. The second workshop was analyzed three different versions of the system (short, medium and long term) and identified market drivers. The third workshop identified the different software process layers such as test, documentation and project management. At the fourth workshop, conflicting activities and process prioritizations were identified (Fleuryl et al., 2006).

Table 5-1 Technology roadmap architecture and process for Brazilian Software Company

Market Trends and Drivers	
Short Term	Plan short term actions, including sales models,
Medium Term	Incorporate portfolio management tools
Long Term	Incorporate innovation management tools
Products and Services	
Short Term	Product Version 2006
Medium Term	Product Version 2008
Long Term	Product Version 2010
Most important software management layers	
Short Term	Project Management: create methodology of implementation and training to be transferred for "service oriented" companies interested in exploring this market opportunity
Medium Term	Requirements: create ASP version of the product and tools to analyze project management success indicators
Long Term	Risks: open source competitor
Most important software development layers	
Short Term	Tests: form a test team and create test methodologies
Medium Term	Programming: adapt current software to ASP version
Long Term	Design: obtain compatibility with horizontal ERP systems

Case study 2 - UK Faraday Partnership

An application of the T-Plan approach including market industry trends & drivers, applications and technology in a UK Faraday Partnership was developed. 30 people including market, application and technology expertise attended the workshop. The workshop agenda followed steps shown in Figure 5-1;

"*Knowledge capture:* four groups (two commercial and two technical groups) mapped knowledge of drivers and technology.

Application functionality and performance (current and future): the same groups mapped requirements and capabilities, followed by feedback and discussion to identify synergies and gaps.

Applications: five groups (different applications) undertook a strategic review of their area, assessed the roadmap content for relevance to the application area, identified research challenges and skills requirements, and prepared an outline communication roadmap for feedback and discussion to identify priorities " (Phaal et al., 2003).

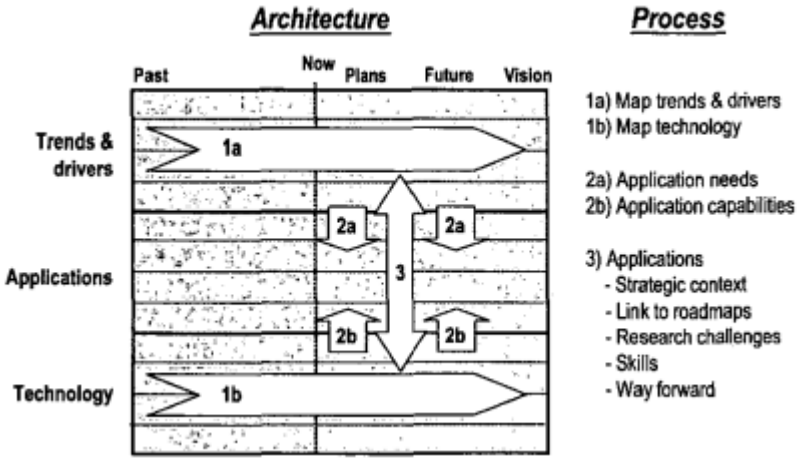

Figure 5-1 Technology roadmap architecture and process for Faraday Partnership

5.1.2. Standard technology road mapping

Standard technology road mapping process contain six phases as shown in Figure 5-2. The first phase is TRM Initiation. It has some activities such as a creating TRM team, technology roadmap schedule. The second phase is subject selection. Customer needs are collected and items to be developed are selected. The third phase is technology needs assessment. It defines specific technology needs. Each item is also divided into its components. The fourth phase is technology development plan. Development goals and strategies are created for each component. Fifth phase is TRM implementation. TRM reporting and dissemination are provided by experts to schedule R&D. Sixth phase is follow-up activity (Guo, 2010).

Phase–module		Inputs	Processes (or techniques)	Outputs
1. TRM initiation		– TRM mission	– TRM process/report design	– TRM team – Process/report design results
2. Subject selection	Requirements analysis module	– Operational needs	– Needs gathering/needs analysis – Operational committee organization	– Item list – Committee list
	Environmental analysis module	– Internal/external information – Committee opinion	– Market/industry/drivers analysis – Business/strategy analysis – SWOT analysis	– Candidate list for critical items
	Technology valuation module	– Evaluation criteria, budget – Committee opinion	– Technology valuation and scoring – Experts committee organization	– Priority list for critical items – Experts list
3. Technology needs assessment	Decomposition analysis module	– BOM, cost sheet, TT	– Decomposition analysis	– Component list for each item
	Portfolio analysis module	– Importance – Development urgency	– Portfolio analysis	– Candidate list for critical components
	Priority analysis module	– Customer needs – Budget constraint	– QFD – Strategy analysis	– Priority list for critical components
4. Technology development plan	Performance measures module	– Component specifications	– Specification analysis	– Performance measures
	Technology evaluation module	– Component specifications – Expert's opinion	– Capability/competitor/gap analysis – Benchmarking	– Current capabilities – Capability gaps
	Risk assessment module	– Patent documents – Expert's opinion	– TRIZ or trend analysis – Patent valuation and risk analysis	– Development targets/strategy – Risky patent list and IP strategy
5. TRM implementation		– Expert's opinion	– TRM reporting and dissemination – R&D scheduling	– Macro/micro TRM – R&D plan and schedule
6. Follow-up activities		– Internal/external information – Expert's opinion	– Environmental scanning – TRM update	– Updated TRM

Figure 5-2 Inputs, processes and outputs for standard technology road mapping process

There are two short cases illustrating how standard technology road mapping is used and developed below.

Case study 1 - Korea Industrial Technology Foundation

TRM developed by Korea Industrial Technology Foundation was processed by 6 phases.

Phase 1: (TRM initiation) TRM team was organized.

Phase 2: (Subject Selection) Customer needs were gathered and items to be improved were selected by doing SWOT analysis. 23 items were selected. Liquid crystal display (LCD) was one of the 23 items. Then, items were prioritized by expert committee.

Phase 3: (Technology Needs Assessment) Specific technology needs were defined for selected items. Each item was decomposed. Back light unit (BLU) was one of LCD components. The technology elements of the components were evaluated using two indexes measuring "technological importance" and "development urgency". All components were set on the portfolio map depicted in Figure 5-3. Then committee defined critical components.

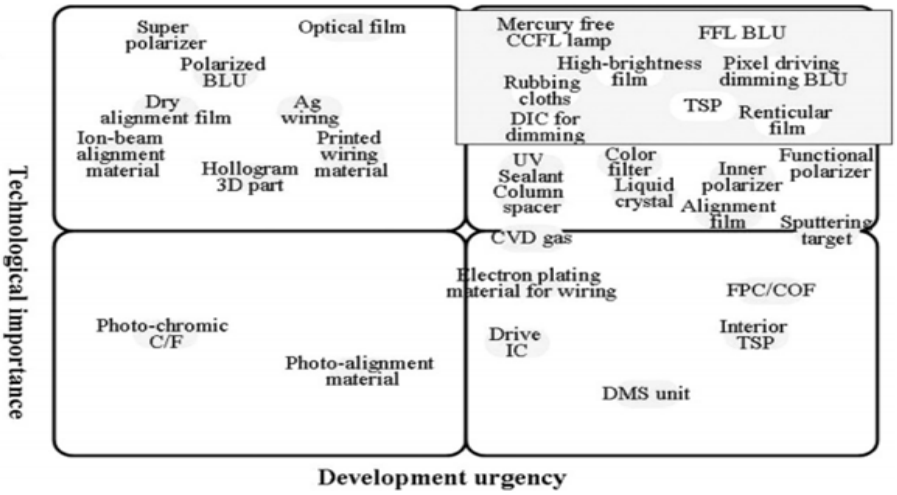

Figure 5-3 Result of portfolio analysis for LCD

Phase 4: (Technology Development Plan) Experts defined which technological attributes were important for each component, and evaluated technological level of a company. The risk assessment was used to identify any obstacles.

Phase 5: (TRM Implementation) TRM reporting and R&D scheduling were carried out.

Phase 6: (Follow –up activities) TRMs were periodically reviewed and reexamined to reflect the existing state of R&D and environmental changes (Lee et al., 2007).

Case study 2 - Telemedical Technologies and Health Care Service Organizations

According to technology roadmap development process (TRDP) for the service sector published by Martin. Hilary (2012), Telemedical Technologies and Health Care Service technology road mapping includes following steps;

Step 1: (drivers) Experts identified business market drivers. Later, they identified features of products/services that would be required to support these drivers such as, reducing pain and suffering, maximizing functional capacity.

Step 2: (objectives) Experts were asked to verify a list of objectives that are based on the organization's strategic planning such as, service should exceed expectations.

Step 3: (service initiatives) Experts were asked to identify their thoughts on priority of each service initiative with respect to each objective such as, enabling remote tracking of vitals.

Step 4: (features) Experts were asked to verify the list of features of each service initiative such as, data transfer rates, environment size and cost.

Step 5: (definition of the desirability metrics for each feature) Experts were asked to define the relative desirability of metrics for each feature.

Step 6: (calculation of technology service value for each technology) It evaluated the relationship between each technology and service initiatives. The results were used to create the final TRM (Martin and Daim, 2012).

5.2. Strategic Planning

Strategic planning is a complicated process including many steps, rules, procedures, stakeholders, collection analyses of quantitative and qualitative data, forecasting and prioritization of strategies (Malik et al., 2013).

Technologic roadmap helps to develop product strategy and enable strategic planning after SWOT analysis. Strategic planning usually combines external opportunities, threats of the firm with an internal strengths and weaknesses. It also makes balance between these key factors (Phaal et al., 2003).

Strategic Planning tools are used to develop TRM. So that;

- TRM outputs depend on a strategy and planning process as shown in Figure 5-4 (Lee et al., 2007),
- Technology road mapping is widely used within industry to support strategic and long-range planning (Phaal et al., 2003),
- TRM supports framework for strategic long term planning and control (Phaal et al., 2003),
- "Roadmaps provide a useful means for integrating multiple perspectives for strategic planning and innovation processes" (Amer and Daim, 2010).

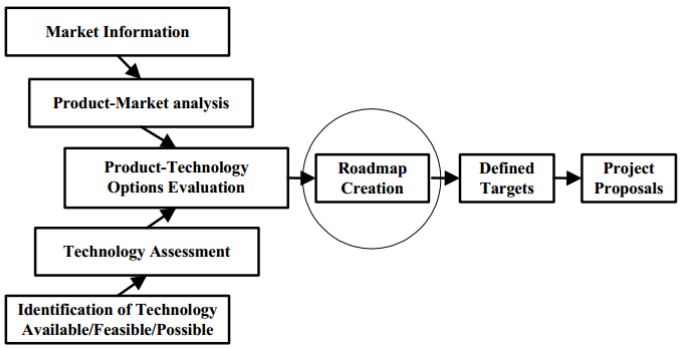

Figure 5-4 Relationship between technology roadmap and strategic planning

5.2.1. Strategic Planning Tools

5.2.1.1. SWOT Matrix

SWOT analysis has been in use since the 1960s. It is a powerful tool to help strategic planning. It is still widely used in the world. It has four principal components: Strengths, Weaknesses, Opportunities, and Threats (SWOT). It is a useful tool to make decision and to analyze the external and internal environment of a company. Companies can develop strategies depending upon their strengths, weaknesses in internal environment of organization and by identifying opportunities and threats in external environment of organization (Shariatmadaria et al., 2013). Furthermore, external environment of organization is observed considering the political, economic, social and technological environment to define opportunities and threats (Dyson, 2002).

SWOT matrix helps managers or policy makers develop four types of strategies;

- SO (strengths-opportunities) strategies: It effectively aims to use internal strengths to pursue opportunities of a company.
- WO (weaknesses-opportunities) strategies: It aims to identify internal weaknesses by taking into consideration of external opportunities.
- ST (strengths-threats) strategies: It aims to improve strengths of a company by showing regard to external threats.
- WT (weaknesses-threats) strategies: It identifies tactics to minimize both internal weaknesses and environmental threats (Metin and Çelik, 2012).

The SWOT matrix is used in strategic planning, but it has some limitations. SWOT does not identify a competitive advantage of a company, so it could not be an end (David, 2011).

5.2.1.2. The Boston Consulting Group (BCG) Matrix

Boston Consulting Group (BCG) Matrix was developed by Bruce Henderson for the Boston Consulting Group in 1964. Corporations can analyze their business units or product lines by using BCG Matrix. It helps company managers informing about organizational learning, investment opportunities and cash flows (Torlak and Şanal 2007).

The BCG Matrix shown in Figure 5-5 has four Quadrants. These are;

Quadrant I of the BCG Matrix are called “Question Marks”. Products in Quadrant I operate in high -growth markets. However, they have low relative market shares. As, their cash needs are high, the company must decide whether to maintain investment on these products or sell these products.

Quadrant II are called “Stars”. Products with a high relative market share and a high industry growth rate in Quadrant II is located. Company should maintain investment on these products to strengthen their positions such as advertising, innovation, etc.

Quadrant III are called “Cash Cows”. Products with a high relative market share and a low industry growth rate in Quadrant III is positioned. They produces maximum positive cash with higher profit margins for the company although the market’s growth rate has slowed down. Product development or diversification are needed to maintain strong position.

Quadrant IV are called “Dogs”. Products with a low relative market share and a low industry growth rate in Quadrant IV is also positioned. These products should be divested due to their weak internal and external position (David, 2011).

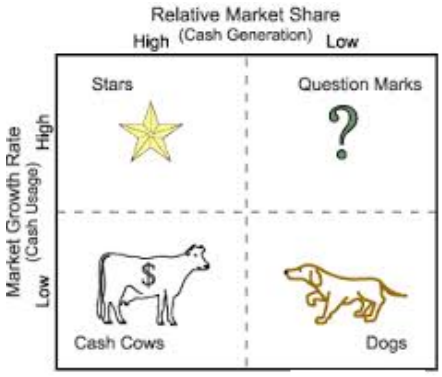

Figure 5-5 BCG Matrix

5.2.1.3. The Strategic Position and Action Evaluation (SPACE) Matrix

SPACE Matrix has four dimensions. It identifies what kind of strategies such as aggressive, conservative, defensive, or competitive should be followed by organization. Various variables can be used on the axes of the SPACE Matrix with respect to the type of organization. SPACE Matrix deals with financial strength, competitive advantage, environmental stability and industry strength to formulate strategies (Tafti et al., 2013).

The SPACE Matrix has two internal dimensions (financial position [FP] and competitive position [CP]) and two external dimensions (stability position [SP] and industry position [IP]) as shown in Figure 5-6.

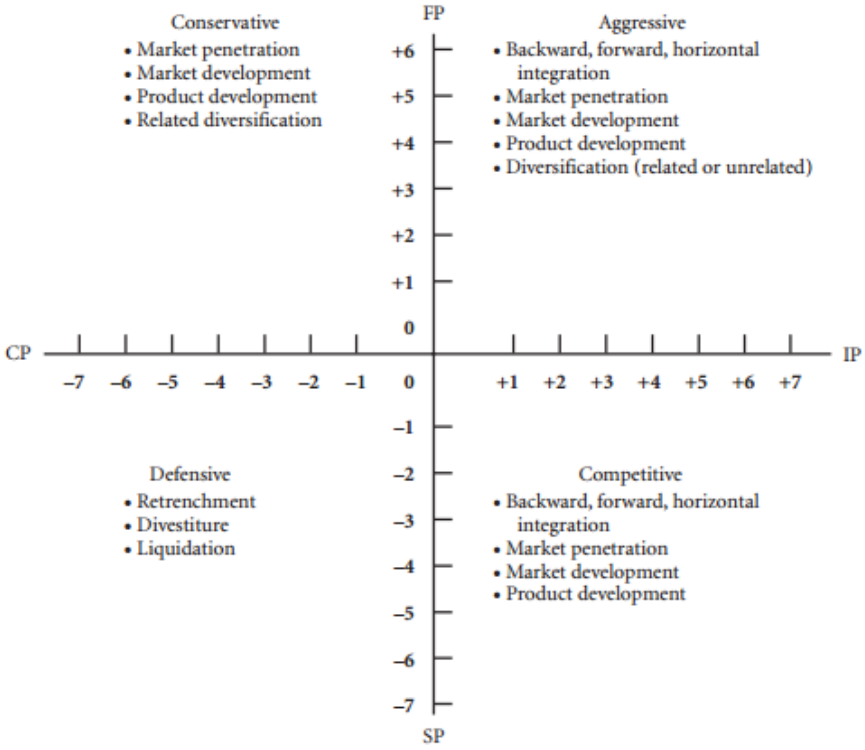

Figure 5-6 Space Matrix

The development steps of SPACE Matrix are as follows:

1. Variables for financial position (FP), competitive position (CP), stability position (SP), and industry position (IP) are defined.

2. Values ranging from +1 (worst) to +7 (best) to each of the variables of FP and IP dimensions are assigned. On the other hand, values from -1 (best) to -7 (worst) to each of the variables of SP and CP dimensions are assigned.

3. Values given to the variables of each dimension are summed and divided by the number of variables to calculate an average for FP, CP, IP, and SP.

4. Average scores for FP, IP, SP, and CP on the axis in the SPACE Matrix is depicted.

5. The two scores on the x-axis is added. Then, result point on X is found. Similarly, the result point on Y is found by adding the two scores on the y-axis. Finally, intersection of the x-y axis is plotted (David, 2011).

5.2.1.4. The Quantitative Strategic Planning Matrix (QSPM)

QSPM tool identifies which strategies are the best. It also helps strategists to prioritize strategies objectively based on external (opportunities, threats) and internal (strength, weakness) key factors (David, 2011).

The Quantitative Strategic Planning Matrix follows below steps to prioritize strategies and draw QSPM matrix shown in Figure 5-7.

Step 1: The company's key factors are defined.

Step 2: The defined key factors are weighted.

Step 3: Alternative strategies are also identified by means of SWOT Matrix such as, Strategy 1, Strategy 2, etc.

Step 4: Attractiveness Scores (AS) are identified by experts to measure how much the key factor affects the strategy. Attractiveness Scores can be assigned to each strategy to define the relative attractiveness of one strategy over others. In addition, dashes are used to indicate that factors do not affect the strategies. According to strategic pattern model designed by Fred R. David (2011), when any factor affects one strategy but not the others, attractiveness scores should be assigned for all strategies. Furthermore, there should be no duplicated scores in a row. So that, attractiveness scores (AS) should be ranged from 1 to the number of strategies being evaluated.

Step 5: The Total Attractiveness Score (TAS) is calculated by multiplying the weight and AS.

Step 6: The sum of TAS indicates the most attractive strategy. In this way, the priority of strategies are found (Setianingrum and Ong, 2012).

		STRATEGIC ALTERNATIVES			
		Strategy 1		Strategy 2	
Key Factors	W	AS	TAS	AS	TAS
Strengths					
1	...	...	...	...	...
2	...	...	...	...	...
Weaknesses					
1	...	...	...	...	...
2	...	...	...	...	...
	1				
Opportunities					
1	...	...	...	...	...
2	...	...	...	...	...
Threats					
1	...	...	...	...	...
2	...	...	...	...	...
	1				

Figure 5-7 The Quantitative Strategic Planning Matrix

Furthermore, weights of key factors in step 2 are obtained by using the **Analytical Hierarchy Process** (AHP) method that was developed by Saaty. Scale of 1-9 is used to make a pairwise comparison of key factors. Then, these comparisons are used to prioritize factors using the method of eigen values described by Saaty. A consistency test is also used to make sure the weights are objectively scored by experts. AHP method includes following steps.

1- A pairwise comparison matrix A is established. the pairwise comparison matrix of factors $A_1, A_2, \ldots, A_n$ is shown as a_{ij}. The value of a_{ij} may vary from 1 to 9. 1 indicates equal importance. 3 indicates moderate importance of one over another. 5 indicates moderate Strong or essential importance. k7 indicates very strong or demonstrated importance. 9 indicates extreme or absolute importance. A pairwise comparison matrix is shown as in formula (1).

$$A = \begin{bmatrix} 1 & a_{12} & \ldots & a_{1n} \\ 1/a_{12} & 1 & \ldots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/a_{1n} & 1/a_{2n} & \ldots & 1 \end{bmatrix}. \qquad (1)$$

2- Key factor weights are calculated. If A is a consistency matrix, eigenvector w can be calculated by the formula (2).

$$(A - \lambda_{\max} I)w = 0 \qquad (2)$$

λmax is the largest eigenvalue of matrix A; w is the vector of weights; and I is the identity matrix.

3- Consistency test is done. The consistency index of a matrix of comparisons is given by the formula (3) (Chang and Huang, 2005).

$$CR = \frac{CI}{RI}$$
$$CI = (\lambda_{\max} - n)/(n-1). \qquad (3)$$

Random Index (RI(n)) values are also given in Table 5-2.

Table 5-2 Random index (RI) values

N	1,00	2,00	3,00	4,00	5,00	6,00	7,00	8,00	9,00	10,00
RI	0.00	0.00	0.52	0.89	1,11	1,25	1,35	1,40	1,45	1,49

4- Geometric mean method is applied. The pairwise comparison of the group is computed by taking geometric mean of pairwise comparison matrixes in a group. Then, weights of key factors of group are calculated by using eigenvector method on the pairwise comparison matrix of the group.

6. METHODOLOGY

Then, Strengths, weaknesses, opportunities and threats of Kuveyt Turk are assessed by means of SWOT. Furthermore, Kuveyt Turk has a vision to be an international bank, which offers new and customer-specific financial solutions. Therefore, it develops various strategies to achieve its vision. As application of technology road mapping is a useful tool to develop strategic planning, it is a useful work to develop strategic planning for Kuveyt Turk Payment systems. There are many strategic planning tools to develop road mapping. Then, QSPM matrix was selected and used to prioritize strategies based on SWOT analysis. Because, BCG Matrix is not applicable for Kuveyt Turk Payment Systems. It handles to manage its portfolio of businesses by examining the relative market share position and the industry growth rate for multidivisional organization. Kuveyt Turk Payment Systems is just a management unit in Kuveyt Turk .It is not a multidivisional organization. This thesis also deals with prioritization of technological trends and its business strategies to gain competitive edge rather than the numerical values of industry growth of Kuveyt Turk Payment systems. Space Matrix is also not applicable. Because it assess that, what kind of strategies such as aggressive, conservative, defensive, or competitive strategies should be followed by organization. It is already known that Kuveyt Turk Payment System has stayed behind in the market. Finally, QSPM Matrix is selected and used to make appropriate decision among strategic alternatives to get the competitive advantages for Kuveyt Turk Payment system. Furthermore, according to strategic pattern model designed by Fred R. David (2011), an effective process for strategic planning is to develop SWOT matrix or BCG matrix and then a QSPM matrix.

No technological road mapping has been conducted in Kuveyt Turk Payment systems so far. At first, it is essential to obtain the required information from different resources. Interviews, visit and phone were made with personnel of Product Development Unit and Payment Systems Unit to define key internal and external factors including strengths, weaknesses, opportunities and threats of Kuveyt Turk.

The development of technology roadmaps is also a quantitative task conducted by experts. Expert knowledge plays a decisive role. Fast-Start technology road mapping process is also a workshop-based approach. So that, a workshop was hold by experts including personnel of Product Development Unit, Payment Systems Unit and Information Technology Unit. This workshop was mainly organized considering the external and internal conditions of Kuveyt Turk and following the strategic pattern model designed by Fred R. David (2011).

Following steps were applied to develop technology roadmap for Kuveyt Turk Payment Systems.

1. SWOT analysis were done. Therefore, key factors including strengths, threats, weaknesses and opportunities of Kuveyt Turk Payment Systems were identified.
2. Strategies were determined based on SWOT analysis.
3. QSPM was implemented
    a. The identified key factors were weighted by means of AHP method.
    b. Attractiveness Scores (AS) were identified by experts
4. Technologies were prioritized.

7. DEVELOPING TECHNOLOGY ROADMAP FOR KUVEYT TURK PAYMENT SYSTEMS

Fast-Start technology road mapping process was applied to develop road map. So that, a workshop, telephone calls and experts visit were done to identify experts' experiences, ideas and expectations. The Integration of SWOT and QSPM in Strategic Planning was implemented to develop a technology roadmap for Kuveyt Turk Payment System.

7.1 SWOT

Visit and phone were made with personnel of Product Development Unit and Payment Systems Unit to define key internal and external factors including strengths, weaknesses, opportunities and threats of Kuveyt Turk. Following internal and external key factors were obtained.

7.1.1 Strengths

The strengths of Kuveyt Turk Payment Systems were determined as below;

S1) The remarkable evolutions have been started on Kuveyt Turk Information Technology (IT) since 2009. So that, Kuveyt Turk has made investments on Research and Development (R&D). Kuveyt Turk has started conversion project named Business Oriented Architecture (BOA) in 2009. BOA includes latest Microsoft technologies. As a result, most banking applications such as loans, accounting, and treasure were converted based on BOA architecture. Kuveyt Turk is planning to sell its banking applications today.

S2) Head of Kuveyt Turk Information Technology is a former Microsoft consultant. He has a great vision to implement the newest technologies. Furthermore, conversion of old Kuveyt Turk applications approximately lasted for 4 years (2009-2013). Kuveyt Turk has recruited personnel who have high ability and knowledge during conversion project. Therefore, Kuveyt Turk has experienced and qualified personnel. In Addition, 3-4 years

ago, third party company named VeriPark had developed Kuveyt Turk Internet Branch, when a new development was needed, the development was done by VeriPark personnel. Kuveyt Turk made a strategic decision to develop internet branch in-house with its own Personnel in 2011. The Internet Branch Project was completed in 2013. Kuveyt Turk Internet Branch is on live now. Similarly, Kuveyt Turk developed XTM that is a digital machine with touch screen and provides both ATM and branch operations in-house. As a result, Kuveyt Turk has a great "know how" to develop big scaled projects.

S3) Kuveyt Turk has grew up tremendously in the last 3-4 years. It has opened approximately 140-150 branches since the last 3-4 years. Now, there are about 300 branches of Kuveyt Turk. Increase in branch number has also triggered increase in customer number. So that, there are about 2.640.000 Kuveyt Turk customers.

S4) All Kuveyt Turk credit cards (Business, Sale Plus, İhtiyaç and Klasik) are like tiny computers having their own memories and processors. Because, all of them are smart card, which it is the integrated kcircuit on a bank credit card, securely store and process data. They are manufactured by Austria Card and Gemato company.

7.1.2 Weaknesses

The weaknesses of Kuveyt Turk Payment Systems were determined as follows;

W1) Kuveyt Turk is collaborating with Banksoft Company for card operations. Banksoft Systems include and maintain all card applications. Kuveyt Turk just offers integration, clearance and accounting for cards. So that, a new development is needed, Banksoft Company does the development in return for money. As a result, the development on card systems becomes so costly and time-consuming. Moreover, Kuveyt Turk could not do technological investments on card systems.

W2) Kuveyt Turk customers encounter many fraud events, because stolen or lost cards are used. Cards can also be copied.

W3) Although, Kuveyt Turk has cards with contactless smart cards featured, there is no agreement with other corporations such as university campus, municipality as other banks do.

W4) Debit card number, credit card number and POS number of Kuveyt Turk are low with regard to the number of other banks.

a) There are 335.389 debit cards of Kuveyt Turk by 2014 February, although we consider there are about 101.236.891 debit cards in Turkey market.

b) Credit card number of Kuveyt Turk is about 320.000. All credit cards that take place in Turkey market are about 57.019.319.

c) POS number of Kuveyt Turk is also quite low with regard to market. There are about 78.906 POS of Kuveyt Turk by 2014 February, total POS number in Turkey market is about 2.283.888.

W5) There are many projects running at the same time in Kuveyt Turk Information Technologies. Kuveyt Turk has allocated more human resources to new projects like mobil branch project, Germany branch project rather than card applications.

7.1.3 Opportunities

The opportunities of Kuveyt Turk Payment Systems were determined as such;

O1) There are some technological trends in Turkey market.

i) Although, some banks such as Akbank, Garanti are cooperating with Turkcell, and customers of those banks can do shopping through Turkcell Cüzdan. Kuveyt Turk customers could not have a chance to use “Turkcell Cuzdan” at shopping. Similarly, Vodafone offers “Vodafone Cep Cüzdan“ service. Vodafone also makes corporation with some banks such as ING bank, PTT bank. Customers of those

banks can do shopping by Vodafone Cep Cüzdan. In addition, they can do financial transactions through Vodafone Cep Cüzdan. On the other hand, Kuveyt Turk customers could not use “Vodafone Cep Cüzdan “service at shopping, because it has no agreement with mobile network operator such as Vodafone, Turkcell. Therefore, Kuveyt Turk has a chance to implement e-wallet applications for its customer.

ii) Although, some banks such as Halkbank, Is bank, Vakifbank and Ziraat Bank introduce NFC technology to its customers. Kuveyt Turk can introduce NFC technology that is standard, designed for easy, simple and secure communication of two electronic devices to its customers.

O2) Some banks collaborate with corporations such as universities, Tourism and Culture Ministry, public transportation because of their cards with smart card feature. Kuveyt Turk can collaborate with these corporations to increase usage of cards. Therefore, Kuveyt Turk can increase total debit, credit, POS and ATM numbers.

a) Credit card of Is bank with smart card feature has been extensively widespread within the METU campus. Similarly, students of Mustafa Kemal University can do variety of transactions through in campus BANK24 JET card (smart card) issued by Halk Bank.

b) Maximum Card of Is bank can be used as “Muze Card”. Is bank made collaboration with Tourism and Culture Ministry to be used its card at museum entrance.

c) In Konya, the payments for public transportation are made via contactless cards. Users could use Kuveyt Turk credit card with smart card feature for public transportation. Similarly, the payments for public transportation are made via contactless cards in Eskişehir. As Kuveyt Turk could not make collaboration with Eskişehir municipality, Kuveyt Turk customers could not use their credit card for public transportation.

O3) Kuveyt Turk can develop card applications in-house instead of collaborating with Banksoft Company for card operations. Therefore, Kuveyt Turk can minimize development process and cost.

O4) Is bank uses biometric applications. Kuveyt Turk have a chance to deploy biometric applications

a) Card holder of Is Bank can do a quick, secure and fast payment by scanning their finger on Is bank POS.

b) Is bank deployed biometrics at the ATM finger vein scanners in ATMs and branches across Turkey. It allows customers to withdraw cash without a card securely and quickly.

7.1.4 Threats

The threats of Kuveyt Turk Payment Systems were determined as below;

T1) There are so strong rivals such as Garanti, Is Bank and ING Bank in Turkey market. Those banks involved 85.2% market share of Research and Development in all market.

T2) Big competitors in Turkey market already implemented the latest technologic trends such as NFC, e-wallet. So that, they can direct new undiscovered technologies. Consequently, Kuveyt Turk stayed behind big competitors in the market.

7.1.5 Strategies

Below strategies were identified by combining strengths, weaknesses, opportunities and threats of Kuveyt Turk Payment Systems.

7.1.5.1 SO (Strengths-Opportunities) Strategies

SO1) Developing its own card applications in-house: Kuveyt Turk has experienced, qualified personnel and a great "know how" because they developed big scaled projects. Therefore, Kuveyt Turk should develop its own card applications in-house instead of collaborating with Banksoft Company for card operations. Furthermore, as shown in Figure 7-1, when a new development is needed, payment systems units (Credit Card Operations, Credit Cards Data Entry and Inquiry, Security and Fraud, ADC Operations, POS Operations) will demand their expectations by assessing case with the system analyst, then system analyst will identify new need. If the system analyst deems acceptable, Kuveyt Turk software developers will do development. Otherwise, the new development will not be done. Therefore, Kuveyt Turk will save time and money. (S2, S1, O3)

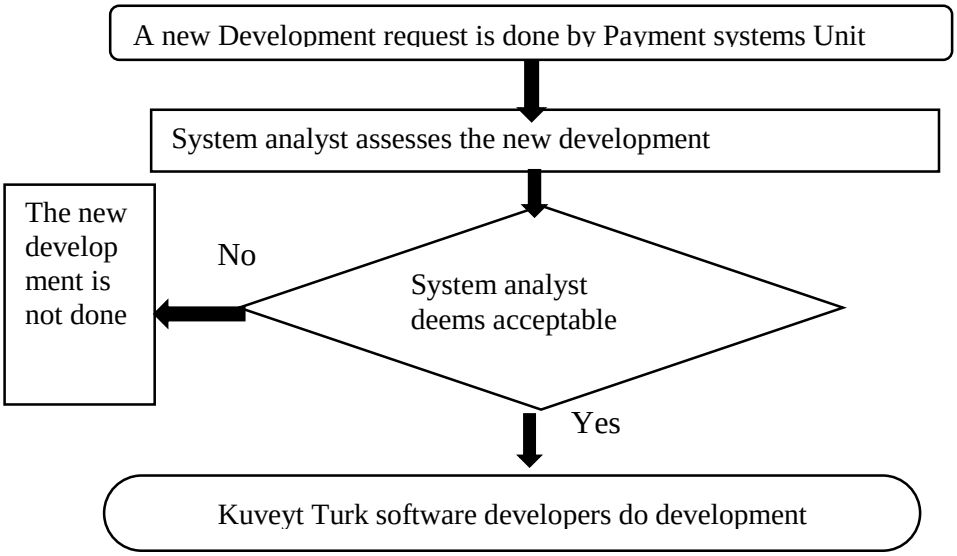

Figure 7-1 A New development process on card systems in Kuveyt Turk information technology

SO2) Implementing technological trends such as NFC, e-wallet: Kuveyt Turk should implement technological trends such as. NFC, e-wallet. It should make collaboration with mobile network operator such as Vodafone, Turkcell to make use of technological trends. (S2, O1)

7.1.5.2 WO (Weaknesses-Opportunities) Strategies

WO1) Making collobration with corporations such as universities, Tourism and Culture Ministry, public transportation: Kuveyt Turk has cards with featured contactless smart cards. As Halk Bank and Is bank do, Kuveyt Turk should collaborate with universities such as Mustafa Kemal University, METU to be used its cards in the campus. Furthermore, Kuveyt Turk should also collaborate with Eskisehir municipality that payments for public transportation are made via contactless cards. Moreover, as Is bank did, Kuveyt Turk should make collaboration with Tourism and Culture Ministry to be used its card at museum entrance. Therefore, Kuveyt Turk credit card number will increase. Increase in card number will also trigger increase in POS number.(W3, W4, O2)

WO2) Using biometric applications to provide a quick, secure and fast payment: Is bank uses biometric applications to provide a quick, secure and fast payment by scanning their finger on Is bank POS and to avoid fraud events. Kuveyt Turk should deploy biometric applications on POS and ATMs to minimize fraud cases. (W2, O4)

7.1.5.3 ST (Strengths-Threats) Strategies

ST1) Maintaining investment on Resource Development (R&D): Although there are so strong rivals such as Garanti, Is Bank and ING Bank in Turkey market, Kuveyt Turk should continue to make necessary investments on Resource Development (R&D) not to lose competitive edge. (S1, T1)

7.1.5.4 WT (Weaknesses-Threats) Strategies

WT1) Allocating more human resources to payment systems team: Kuveyt Turk should allocate more human resources to payment systems team in Kuveyt Turk Information Technology department. In this way, it will focus on new technological trends more. Therefore, Kuveyt Turk will not stay behind big competitors in the market. (W5, T2)

7.2 Evaluating and Prioritizing Strategies

It is required to prioritize strategies based on SWOT analysis to get technology road mapping for Kuveyt Turk Payment system. This evaluation was done by using QSPM matrix. Moreover, Fast-Start is a workshop-based approach and involves workshops, 5 Experts including personnel of Product Development Unit and Payment Systems Unit attended the workshop to share their opinions and prioritize strategies based on SWOT analysis.

QSPM matrix was developed following steps in the workshop;

Step 1: Kuveyt Turk Payment Systems' key external opportunities/threats and internal strengths/weaknesses were listed based on SWOT analysis that had been developed by making interview with experts before.

Step 2: Weights to each external and internal key factor were calculated. Geometric mean and Eigenvector were used to calculate weights. Consistency ratio was also used for consistency degree of experts' judgments

Weights to each external and internal key factor are obtained by using the **AHP method** that was developed by Saaty. Scale of 1-9 was used to make a pairwise comparison matrix. Then, these comparisons were also used to prioritize and calculate weights factors using the method of eigen values described by Saaty. Furthermore, a consistency test was used to make sure the weights are objectively scored by experts. AHP method was implemented by following below steps.

A pairwise comparison matrix A was established. Experts were asked to rank on a scale of 1 (Equal importance), 3 (Moderate importance of one over another), 5 (Strong or essential importance), 7 (Very strong or demonstrated importance), 9 (Extreme

importance) in order to make relative judgment among external and internal key factors according to Saaty scale. Judgments of each experts are shown on the Appendix 1.

As an example, the pairwise comparison matrix A of expert 1 judgments considering external key factors shown in Table 7-1 was established. Then, eigenvector (W) of the matrix A was computed. Matrix A is given in Table 7-1.

Weights of Each Key factor were calculated. Eigenvector (w) was calculated for each experts Judgments shown on the Appendix 1.

As an example, Eigenvector (W) of the pairwise comparison matrix A was computed. Eigenvector (W) values is given in Table 7-1.

Table 7-1 A pairwise comparison matrix for expert 1 judgments considering external key factors

Matrix A							Eigen vector(W) of Matrix A
	O1	O2	O3	O4	T1	T2	
O1	1,00	0,33	0,20	5,00	3,00	3,00	0,16
O2	3,00	1,00	0,33	7,00	5,00	5,00	0,27
O3	5,00	3,00	1,00	9,00	7,00	7,00	0,40
O4	0,20	0,14	0,11	1,00	0,33	0,33	0,03
T1	0,33	0,20	0,14	3,00	1,00	1,00	0,07
T2	0,33	0,20	0,14	3,00	1,00	1,00	0,07

Consistency Ratio (CR) was calculated. The degree of consistency for both external and internal key factors considering judgments of experts were also measured to make sure the weights are objectively scored by experts.

1- AW values were calculated by multiplying the matrix A and eigenvector (W). AW values are given in Table 7-2.

Table 7-2 AW values of expert 1 judgments considering external key factors

AW
1*0,16+0,33*0,27+0,20*0,40+5*0,03+3*0,07+3*0,07=0,89
3*0,16+1*0,27+0,33*0,40+7*0,03+5*0,07+5*0,07=1,78
5*0,16+3*0,27+1*0,40+9*0,03+7*0,07+7*0,07=3,24
0,20*0,16+0,14*0,27+0,11*0,40+1*0,03+0,33*0,07+0,33*0,07=1,19
0,33*0,16+0,20*0,27+0,14*0,40+3*0,03+1*0,07+1*0,07=0,39
0,33*0,16+0,20*0,27+0,14*0,40+3*0,03+1*0,07+1*0,07=0,39

2- Each Aw value was divided by its own W value. AW/W values is depicted in Table 7-3.

Table 7-3 AW/W values of expert 1 judgments considering external key factors

Eigen vector(W)	AW	AW/W
0,16	0,89	0,89/0,16=5,64
0,27	1,78	1,78/0,27=6,62
0,40	3,24	3,24/0,40=8,04
0,03	0,19	0,19/0,03=7,08
0,07	0,39	0,39/0,07=5,41
0,07	0,39	0,39/0,07=5,41

The average of AW/W values that obtained by dividing was calculated. Obtained value is λmax.

λmax=(5,64+6,62+8,04+7,08+5,41+5,41)/6= 6,368

3- Consistency index (CI) was calculated for the matrix A. Saaty defined the consistency index as follows: CI= λmax.-n/n-1 (Chang and Huang, 2005).

In our case; n = 6 (number of externel of key factors)

CI= λmax.-n/n-1; CI=(6,368-6)/6-1; CI=0,074

4- Then, consistency ratio was calculated for the matrix A. Saaty defined the consistency ratio (CR) as CR=CI/RI. RI(6) value taken from Table 5-2 is 1.25.

CR=0,074/1,25=0,059

Saaty scale obtained by Saaty only accepts a matrix as a consistent one iff CR < 0.1 (Chang and Huang, 2005). In our case, as CR value was smaller than 0.1, the matrix A was accepted.

Similarly, consistency ratios for each expert judgments were also calculated and shown on the Appendix 1. As, all consistency ratios of five expert judgments were smaller than 0.1. All expert judgments were also accepted.

Geometric mean method is applied. The pairwise comparison of the group was calculated by taking geometric mean of 5 expert pairwise comparison matrixes. Therefore, 5 expert judgments were combined to make group decision. Obtained results by means of geometric mean are shown in the Tables 7-4, 7-5. Then, weights of each key factors in group decision were calculated by using eigenvector method on the pairwise comparison matrix of the group. The resulting weights of expert group are also depicted in the Tables 7-4, 7-5.

Table 7-4 Group decision for Internal key factors

	S1	S2	S3	S4	W1	W2	W3	W4	W5	Weight
S1	1,00	1,00	1,66	1,00	1,72	1,38	3,00	2,80	6,21	0,1689
S2	1,00	1,00	1,48	1,12	1,90	1,53	3,27	2,85	5,71	0,1696
S3	0,60	0,68	1,00	0,58	1,00	0,86	2,04	1,93	4,66	0,1140
S4	1,00	0,89	1,72	1,00	1,93	2,37	4,21	3,11	4,66	0,1784
W1	0,58	0,53	1,00	0,52	1,00	0,97	2,04	1,93	4,83	0,1143
W2	0,72	0,65	1,16	0,42	1,04	1,00	2,37	2,37	4,14	0,1185
W3	0,33	0,31	0,49	0,24	0,49	0,42	1,00	1,00	2,37	0,0568
W4	0,36	0,35	0,52	0,32	0,52	0,42	1,00	1,00	1,55	0,0515
W5	0,16	0,18	0,21	0,21	0,21	0,24	0,42	0,64	1,00	0,0280

Table 7-5 Group decision for external key factors

	O1	O2	O3	O4	T1	T2	Weight
O1	1,00	0,33	0,36	1,72	0,72	0,54	0,0872
O2	3,00	1,00	0,72	3,94	2,81	2,26	0,2562
O3	2,81	1,38	1,00	6,21	2,85	2,54	0,3133
O4	0,58	0,25	0,16	1,00	0,38	0,23	0,0486
T1	1,38	0,36	0,35	2,63	1,00	0,80	0,1216
T2	1,84	0,44	0,39	4,36	1,25	1,00	0,1732

Step 3: Kuveyt Turk Payment System's strategies based on SWOT analysis that had been developed by making interview with experts before were also identified.

Step 4: Attractiveness Scores (AS) were determined by experts examining each key external or internal factor. Experts identified attractiveness scores by asking the question "how much the key factor affects the strategy". In this way, Attractiveness Scores were assigned to each strategy to define the relative attractiveness of one strategy over others. As, there are 6 strategies in QSPM matrix shown in Table 7-6, AS were ranged from 1 to 6. When any factor affects one strategy but not the others, AS were assigned for all strategies. There was no duplicated scores in a row. The results of this examination were also given in Table 7-6.

Step 5: Total Attractiveness Scores (TAS) were calculated by multiplying the weights (Step 2) and the Attractiveness Scores (Step 4) in each row. The results of this examination were also shown in Table 7-6.

Step 6: Sum of Total Attractiveness Scores (STAS) were calculated by adding total attractiveness scores in each strategy column in Table 7-6

Table 7-6 QSPM for Kuveyt Turk Payment System

GSPM Matrix		Strategies											
		SO1		SO2		WO1		WO2		ST1		WT1	
Factors	Weight	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS
S1	0,169	5,000	0,844	3,000	0,507	2,000	0,338	1,000	0,169	6,000	1,013	4,000	0,675
S2	0,170	2,000	0,339	4,000	0,678	3,000	0,509	1,000	0,170	6,000	1,018	5,000	0,848
S3	0,114	5,000	0,570	3,000	0,342	4,000	0,456	1,000	0,114	6,000	0,684	2,000	0,228
S4	0,178	5,000	0,892	3,000	0,535	6,000	1,070	1,000	0,178	4,000	0,714	2,000	0,357
W1	0,114	6,000	0,686	3,000	0,343	4,000	0,457	2,000	0,229	5,000	0,571	1,000	0,114
W2	0,119	3,000	0,356	1,000	0,119	2,000	0,237	6,000	0,711	5,000	0,593	4,000	0,474
W3	0,057	5,000	0,284	2,000	0,114	6,000	0,341	1,000	0,057	4,000	0,227	3,000	0,170
W4	0,052	6,000	0,309	4,000	0,206	5,000	0,258	2,000	0,103	3,000	0,155	1,000	0,052
W5	0,028	5,000	0,140	2,000	0,056	3,000	0,084	1,000	0,028	4,000	0,112	6,000	0,168
	1,000												
O1	0,087	3,000	0,262	6,000	0,523	4,000	0,349	1,000	0,087	5,000	0,436	2,000	0,174
O2	0,256	4,000	1,025	2,000	0,512	6,000	1,537	1,000	0,256	5,000	1,281	3,000	0,768
O3	0,313	6,000	1,880	2,000	0,627	3,000	0,940	1,000	0,313	4,000	1,253	5,000	1,566
O4	0,049	3,000	0,146	1,000	0,049	2,000	0,097	6,000	0,292	5,000	0,243	4,000	0,195
T1	0,122	5,000	0,608	2,000	0,243	4,000	0,486	1,000	0,122	6,000	0,729	3,000	0,365
T2	0,173	4,000	0,693	6,000	1,039	3,000	0,519	1,000	0,173	5,000	0,866	2,000	0,346
Total	1,000		9,032		5,892		7,678		3,002		9,895		6,501

AS: Attractiveness Score
TAS: Total Attractiveness Score

As, higher scores indicate more attractive strategies, the priority of strategies was as follows considering the results of QSPM matrix for Kuveyt Turk Payment system.

1-ST1: Maintaining investments on Resource Development (R&D).

2-SO1: Developing its own card applications in-house.

3-WO1: Collaborating with corporations such as universities, Tourism and Culture Ministry, public transportation.

4-WT1: Allocating more human resources to payment systems team.

5-SO2: Implementing technological trends such as. NFC, e-wallet.

6-WO2: Using biometric applications to provide a quick, secure and fast payment.

7.3 Prioritizing Technologies on QSPM matrix

As TRM outputs depend on QSPM matrix that was used as strategic planning tools, the technology priorities that will be used by Kuveyt Turk Payment system were ordered considering the results of QSPM matrix that was shown in Table 7-6. As a result, Kuveyt Turk should maintain studies on Resource Development (R&D) as first priority. Secondly, Kuveyt Turk should develop in-house Kuveyt Turk Payment System application instead of integrating with Banksoft systems. Then, Kuveyt Turk should make collaboration with corporations to increase the usage of Kuveyt Turk Cards with featured Smart Card. Later, Kuveyt Turk should enable e-wallet application and NFC based contactless payments for Kuveyt Turk Cards. Finally, Kuveyt Turk should use biometric applications to minimize fraud events.

Furthermore, as the roadmap can be described in different forms such as, time based chart, graphs, pictorial representations, flow charts, single layer, text etc. (Phaal et al., 2003), the roadmap for Kuveyt Turk Payment system was described in text.

8. CONCLUSION

Rapid technological developments have changed our life in the last century. Customers want easy user-friendly applications and products, while banks seek more cost-effective technology to cope with increasingly complex challenges. As one of the most profitable areas of banks is payment systems, most banks in Turkey have made technological investments on payment systems. Therefore, this thesis helps Kuveyt Turk to implement required technological needs on payment systems to capture technological trends.

Kuveyt Turk Payment Systems has never experienced technology road mapping approach so far. So that, choosing The Fast-Start approach to be developed technology road map became essential and quick.

SWOT and QSPM used as Strategic Planning tools were implemented to develop a technology roadmap for Kuveyt Turk Payment System. Therefore, strategies were prioritized by expert team who attended to the workshop. The expert team in the workshop identified “Kuveyt Turk should maintain invesment on R&D” as first and most important priority among strategies. It is already known that Kuveyt Turk has made investments on Research and Development (R&D) since 2009. Correspondingly, Kuveyt Turk has grew up tremendously in the last 3-4 years. On the other hand, there are so strong rivals such as Garanti, Is Bank and ING Bank in Turkey market. Those banks involved 85.2% market share of Research and Development in all market. When Kuveyt Turk is compared with big competitors, Kuveyt Turk still stayed behind in the market. As a result, first priority of Kuveyt Turk is to continue making investment on R&D. Expert team also identified “Developing in-house Kuveyt Turk Payment System application instead of integrating with Banksoft systems” as second priority among strategies. This result shows that Kuveyt Turk should start card conversion project as soon as possible. Furthermore, application code of cards in Kuveyt Turk are outsourced. Therefore, that maintenance costs are so high. New features are wanted to be added to existing applications, but it takes so long time to implement these features. As a result, it is planned by managers to start that conversion project within a few months. “Making collaboration

with corporations to increase the usage of Kuveyt Turk Cards with featured Smart Card" is seen as third priority by the expert team. Now, making collaboration with corporations requires development at third party side. As, it is said, development and maintenance costs are so high. So that, after card conversion project is completed, making collaboration with corporations is reasonable to reduce implementation costs. In addition, "Enabling e-wallet application and NFC based contactless payments for Kuveyt Turk Cards" is considered as forth priority. Experts think that enabling these technology trends does not get probability and increase in card numbers as expected. In this way, what strategies are required to capture technological trends are identified by developing technology roadmap. Developed Fast-Start road mapping also plans for technology by linking trending products in the market and business of Kuveyt Turk.

On the other hand, as the Fast-Start approach was quickly implemented to develop technology road map, some limitations were encountered during development phase of the Fast-Start approach. Cost analysis of technology trends such as NFC, e-wallet, Smart card were not done in development phase of the Fast-Start approach due to time constraint. Furthermore, what time and cost are required these technology trends to be implemented could not be considered in that short time. The roadmap can be depicted in time-based chart in the future considering cost. Moreover, BCG matrix can be done for Kuveyt Turk Payments Systems by getting numerical data about relative market share and industry growth rate of technology trends further. Therefore, it would help managers of Kuveyt Turk Payment Systems informing about investment opportunities and cash flows.

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APPENDIXES

Appendix 1

Expert 1 judgments for internal key factors

A										Eigen vector(W)	AW	AW/W
	S1	S2	S3	S4	W1	W2	W3	W4	W5			
S1	1,00	1,00	7,00	3,00	5,00	5,00	5,00	9,00	9,00	0,2485	2,9702	11,9511
S2	1,00	1,00	7,00	3,00	5,00	5,00	5,00	9,00	9,00	0,2485	2,9702	11,9511
S3	0,14	0,14	1,00	0,20	0,33	0,33	0,33	3,00	3,00	0,0469	0,3498	7,4646
S4	0,33	0,33	5,00	1,00	3,00	3,00	3,00	5,00	5,00	0,1418	1,5588	10,9968
W1	0,20	0,20	3,00	0,33	1,00	1,00	1,00	5,00	5,00	0,0924	0,7498	8,1136
W2	0,20	0,20	3,00	0,33	1,00	1,00	1,00	5,00	5,00	0,0924	0,7498	8,1136
W3	0,20	0,20	3,00	0,33	1,00	1,00	1,00	5,00	5,00	0,0924	0,7498	8,1136
W4	0,11	0,11	0,33	0,20	0,20	0,20	0,20	1,00	1,00	0,0185	0,1917	10,3449
W5	0,11	0,11	0,33	0,20	0,20	0,20	0,20	1,00	1,00	0,0185	0,1917	10,3449

n=9	λmax=	9,7105
CI= λmax.-n/n-1	CI=	0,0888
CR=CI/RI	CR=	0,0612
RI=1,45 for n=9	CR= 0.0612< 0.1	Matrix is Consistent

Expert 1 judgments for external key factors

A									
	O1	O2	O3	O4	T1	T2	Eigen vector(W)	AW	AW/W
O1	1,00	0,33	0,20	5,00	3,00	3,00	0,16	0,89	5,64
O2	3,00	1,00	0,33	7,00	5,00	5,00	0,27	1,78	6,62
O3	5,00	3,00	1,00	9,00	7,00	7,00	0,40	3,24	8,04
O4	0,20	0,14	0,11	1,00	0,33	0,33	0,03	0,19	7,08
T1	0,33	0,20	0,14	3,00	1,00	1,00	0,07	0,39	5,41
T2	0,33	0,20	0,14	3,00	1,00	1,00	0,07	0,39	5,41

n=6	λmax=	6,368
CI= λmax.-n/n-1	CI=	0,074
CR=CI/RI	CR=	0,059
RI=1,25 for n=6	CR= 0.059< 0.1	Matrix is Consistent

Expert 2 judgments for internal key factors

A										Eigen vector(W)	AW	AW/W
	S1	S2	S3	S4	W1	W2	W3	W4	W5			
S1	1,00	0,33	3,00	1,00	3,00	5,00	7,00	5,00	7,00	0,1843	1,8781	10,1892
S2	3,00	1,00	5,00	3,00	5,00	7,00	9,00	7,00	9,00	0,2793	3,5057	12,5499
S3	0,33	0,20	1,00	0,33	1,00	3,00	5,00	3,00	5,00	0,1076	0,8911	8,2852
S4	1,00	0,33	3,00	1,00	3,00	5,00	7,00	5,00	7,00	0,1843	1,8781	10,1892
W1	0,33	0,20	1,00	0,33	1,00	3,00	5,00	3,00	5,00	0,1076	0,8911	8,2852
W2	0,20	0,14	0,33	0,20	0,33	1,00	3,00	1,00	3,00	0,0525	0,4088	7,7866
W3	0,14	0,11	0,20	0,14	0,20	0,33	1,00	0,33	1,00	0,0197	0,2012	10,1908
W4	0,20	0,14	0,33	0,20	0,33	1,00	3,00	1,00	1,00	0,0411	0,3617	8,8010
W5	0,14	0,11	0,20	0,14	0,20	0,33	1,00	1,00	1,00	0,0235	0,2286	9,7096

n=9	λmax=	9,5541
CI= λmax.-n/n-1	CI=	0,0693
CR=CI/RI	CR=	0,0478
RI=1,45 for n=9	CR= 0.0478< 0.1	Matrix is Consistent

Expert 2 judgments for external key factors

	A								
	O1	O2	O3	O4	T1	T2	Eigen vector(W)	AW	AW/W
O1	1,00	0,20	0,14	1,00	3,00	0,33	0,07	0,39	5,46
O2	5,00	1,00	0,33	5,00	7,00	3,00	0,27	1,78	6,63
O3	7,00	3,00	1,00	7,00	9,00	5,00	0,40	3,25	8,05
O4	1,00	0,20	0,14	1,00	3,00	0,20	0,07	0,37	5,29
T1	0,33	0,14	0,11	0,33	1,00	0,33	0,03	0,21	7,44
T2	3,00	0,33	0,20	5,00	3,00	1,00	0,16	0,98	6,19

n=6	λmax=	6,510
CI= λmax.-n/n-1	CI=	0,102
CR=CI/RI	CR=	0,082
RI=1,25 for n=6	CR= 0.082< 0.1	Matrix is Consistent

Expert 3 judgments for internal key factors

A												
	S1	S2	S3	S4	W1	W2	W3	W4	W5	Eigen vector(W)	AW	AW/W
S1	1,00	1,00	0,20	0,20	0,33	0,14	0,33	0,14	3,00	0,0359	0,2930	8,1524
S2	1,00	1,00	0,20	0,20	0,33	0,14	0,33	0,14	3,00	0,0359	0,2930	8,1524
S3	5,00	5,00	1,00	1,00	3,00	0,33	3,00	0,33	7,00	0,1452	1,3840	9,5304
S4	5,00	5,00	1,00	1,00	3,00	0,33	3,00	0,33	7,00	0,1452	1,3840	9,5304
W1	3,00	3,00	0,33	0,33	1,00	0,20	1,00	0,20	5,00	0,0796	0,6373	8,0070
W2	7,00	7,00	3,00	3,00	5,00	1,00	5,00	1,00	9,00	0,2320	2,7654	11,9213
W3	3,00	3,00	0,33	0,33	1,00	0,20	1,00	0,20	5,00	0,0796	0,6373	8,0070
W4	7,00	7,00	3,00	3,00	5,00	1,00	5,00	1,00	9,00	0,2320	2,7654	11,9213
W5	0,33	0,33	0,14	0,14	0,20	0,11	0,20	0,11	1,00	0,0146	0,1634	11,2175

n=9	λmax=	9,6044
CI= λmax.-n/n-1	CI=	0,0755
CR=CI/RI	CR=	0,0521
RI=1,45 for n=9	CR= 0.0521< 0.1	Matrix is Consistent

Expert 3 judgments for external key factors

	A								
	O1	O2	O3	O4	T1	T2	Eigen vector(W)	AW	AW/W
O1	1,00	0,14	0,20	3,00	0,33	1,00	0,07	0,38	5,46
O2	7,00	1,00	3,00	9,00	7,00	7,00	0,42	3,49	8,35
O3	5,00	0,33	1,00	7,00	3,00	5,00	0,26	1,74	6,64
O4	0,33	0,11	0,14	1,00	0,20	0,33	0,03	0,19	7,18
T1	3,00	0,14	0,33	5,00	1,00	3,00	0,15	0,85	5,54
T2	1,00	0,14	0,20	3,00	0,33	1,00	0,07	0,38	5,46

n=6	λmax=	6,4387
CI= λmax.-n/n-1	CI=	0,0877
CR=CI/RI	CR=	0,0702
RI=1,25 for n=6	CR= 0.0702< 0.1	Matrix is Consistent

Expert 4 judgments for internal key factors

A												
	S1	S2	S3	S4	W1	W2	W3	W4	W5	Eigen vector(W)	AW	AW/W
S1	1,00	1,00	3,00	0,33	3,00	0,20	3,00	3,00	7,00	0,1335	1,1597	8,6877
S2	1,00	1,00	3,00	0,33	9,00	0,33	5,00	3,00	5,00	0,1715	1,5420	8,9908
S3	0,33	0,33	1,00	0,20	1,00	0,20	1,00	1,00	3,00	0,0500	0,4525	9,0494
S4	3,00	3,00	5,00	1,00	5,00	5,00	7,00	7,00	3,00	0,2418	3,5812	14,8133
W1	0,33	0,11	1,00	0,20	1,00	0,20	1,00	1,00	3,00	0,0486	0,4144	8,5220
W2	5,00	3,00	5,00	0,20	5,00	1,00	5,00	5,00	9,00	0,2368	2,6267	11,0926
W3	0,33	0,20	1,00	0,14	1,00	0,20	1,00	1,00	3,00	0,0488	0,4158	8,5170
W4	0,33	0,33	1,00	0,14	1,00	0,20	1,00	1,00	3,00	0,0497	0,4387	8,8358
W5	0,14	0,20	0,33	0,33	0,33	0,11	0,33	0,33	1,00	0,0193	0,2453	12,6812

n=9	λmax=	10,1322
CI= λmax.-n/n-1	CI=	0,1415
CR=CI/RI	CR=	0,0976
RI=1,45 for n=9	CR= 0.0976< 0.1	Matrix is Consistent

Expert 4 judgments for external key factors

	A								
	O1	O2	O3	O4	T1	T2	Eigen vector(W)	AW	AW/W
O1	1,00	0,14	3,00	3,00	0,33	0,33	0,10	0,91	8,85
O2	7,00	1,00	3,00	9,00	5,00	5,00	0,40	3,33	8,40
O3	0,33	0,33	1,00	7,00	3,00	3,00	0,19	1,38	7,12
O4	0,33	0,11	0,14	1,00	0,20	0,20	0,03	0,19	7,16
T1	3,00	0,20	0,33	5,00	1,00	1,00	0,14	0,86	6,20
T2	3,00	0,20	0,33	5,00	1,00	1,00	0,14	0,86	6,20

n=6	λmax=	7,3205
CI= λmax.-n/n-1	CI=	0,0264
CR=CI/RI	CR=	0,0208
RI=1,25 for n=6	CR= 0.020< 0.1	Matrix is Consistent

Expert 5 judgments for internal key factors

A												
	S1	S2	S3	S4	W1	W2	W3	W4	W5	Eigen vector(W)	AW	AW/W
S1	1,00	3,00	1,00	5,00	1,00	7,00	7,00	9,00	7,00	0,2164	2,3956	11,0720
S2	0,33	1,00	0,33	3,00	0,33	5,00	5,00	7,00	5,00	0,1425	1,2610	8,8504
S3	1,00	3,00	1,00	5,00	1,00	7,00	7,00	9,00	7,00	0,2164	2,3956	11,0720
S4	0,20	0,33	0,20	1,00	0,20	3,00	3,00	5,00	3,00	0,0841	0,6627	7,8811
W1	1,00	3,00	1,00	5,00	1,00	7,00	7,00	9,00	7,00	0,2164	2,3956	11,0720
W2	0,14	0,20	0,14	0,33	0,14	1,00	1,00	3,00	1,00	0,0367	0,3018	8,2157
W3	0,14	0,20	0,14	0,33	0,14	1,00	1,00	3,00	1,00	0,0367	0,3018	8,2157
W4	0,11	0,14	0,11	0,20	0,11	0,33	0,33	1,00	0,33	0,0141	0,1602	11,3402
W5	0,14	0,20	0,14	0,33	0,14	1,00	1,00	3,00	1,00	0,0367	0,3018	8,2157

n=9	λmax=	9,5483
CI= λmax.-n/n-1	CI=	0,0685
CR=CI/RI	CR=	0,0473
RI=1,45 for n=9	CR= 0.0473< 0.1	Matrix is Consistent

Expert 5 judgments for external key factors

	A								
	O1	O2	O3	O4	T1	T2	Eigen vector(W)	AW	AW/W
O1	1,00	3,00	0,33	0,33	0,20	0,14	0,06	0,33	5,38
O2	0,33	1,00	0,20	0,33	0,14	0,11	0,03	0,19	7,29
O3	3,00	5,00	1,00	3,00	0,33	0,20	0,16	0,93	5,96
O4	3,00	3,00	0,33	1,00	0,20	0,14	0,10	0,52	5,48
T1	5,00	7,00	3,00	5,00	1,00	0,33	0,26	1,83	6,93
T2	7,00	9,00	5,00	7,00	3,00	1,00	0,40	3,30	8,33

n=6	λmax=	6,5621
CI= λmax.-n/n-1	CI=	0,1124
CR=CI/RI	CR=	0,0899
RI=1,25 for n=6	CR= 0.089< 0.1	Matrix is Consistent

RESUME

I was born in 13.07.1982 in Maçka in Trabzon. I went to primary school named Ayhan Şahank İlköğretim Okulu in Zeytinburnu in Istanbul .Later, I finished high school named “Zeytinburnu İmam Hatip Lisesi” in 1999. Then, I graduated from Dogus Üniversity Computer engineering in 2005 with 3.61 GPA. I worked company named “Digital Bilgi sistemleri” for 1 year after graduation from the university. Finally, I have worked at Kuveyt Turk Information Technology as an expert software engineer for 7.5 years.