

# A Analysis of Mobile Payment Business Models

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**Abstract**— Considering the significant growth in mobile phone usage by customers and its highly accessibility, this tool can be considered as the most suitable tool in payment category. For Implementation of a mobile payment system, So many factors are involved such as: bank, operator and service provider. As effective Interaction of roles and optimize efficient parameters for implementing a mobile payment solution, it is necessary to present a suitable business model. In this Article, we surveyed 5 different business models in the field of mobile payment, with considering their advantages and disadvantages, and then as such we compared them with using MCDM evaluation method. Since, one of the most effective parameter to select a suitable business model is the banks /operator's structure of every country, the proposed Business model in this article is localized based on Iran banks /operator's framework. The results of MCDM method shows that the collaboration model is the most suitable mobile payment business model for Iran.

**Keywords**-Mobile payment, business model, MCDM evaluation method

## I. INTRODUCTION

In recent decades, electronic commerce has been face with new evolution in different aspects. Since electronic payment can be considered as an engine of this phenomenon, it seems that more attention will be needed for enhancement of it in this trade.

Nowadays high costs of banking transactions made the e-commerce and m-commerce as essential tools for routine financial operations. In this way, using computer as a reliable tool and mobile phones as a ubiquity tool, make electronic payments public.

We can refer to mobile payment which is the equivalent of electronic payment in e-commerce, as one of the critical service which can be conducted through mobile devices. With this service, customers can accomplish banking transactions through mobile phones. So many roles such as: bank, operator and mobile payment service provider are involved in implementing mobile payment system. Each of these roles has security, cost, functionality and benefit issues. Obviously, the close interaction between roles can lead to the success of the mobile payment system. In order to any role can achieve own purpose, it is necessary to design a suitable mobile payment business model. Creating or selecting a useful mobile payment business model would be a complex

problem as it mostly depends on balancing multiple or even conflictive stakeholders requirements.

Today there are different mobile payment business models which used by organization around the world. In this paper we aim to propose a suitable mobile payment business model witch support different m-commerce scenarios, provide banking transaction security and provide a win-win service for each role. We have surveyed 5 different business models in this study and have determined strength and weakness points of them.

This paper is organized as follow: a literature review on related work have done in section two, in section three five distinct mobile payment business model have been discussed, a description summery on MCDM method have been done in section four, in section five we determined mobile payment evaluation criteria, by applying ELECTRE method with specified criteria, a comparison between business models have been done in section six and finally in section seven we have discussed and propose future researches in this area.

## II. LITERATURE REVIEW

There are several studies have been done on mobile payment. Key pousttchi et al. [1] proposed a framework to mobile payment business model. They claim that this framework could be apply to categorization of any given mobile payment business model. The framework consists of six partial models: market model, value proposition model, implementation model, capital model, distribution and communication model, and threat model. Some researches, have named mobile payment as ubiquitous payment [2] and they have categorized mobile payment business models to four modes: carrier's operator independently, mobile network operator centric, financial institutions centric and third party operating. Some researches claim that there is a lack of user's perspective in existing models for mobile payment system and proposed a new model from the user's point of view [3]. Y. Chou et al. [4] have evaluated the performance of different payment systems by using hierarchy process. Jan Ondrus et al. [5] propose a multi-actor multi-criteria framework to facilitate the assessment of mobile payments for the Swiss public transport industry[6]. Simon Fong et al. [7] Looks into the mobile commerce from the perspective of scenarios and user acceptance. A research

produced by smart card alliance contactless payment council [8]. The council considered four different business models for mobile payments deployment. Gulfem et al. [9] proposed a MCDM approach to evaluate the mobile phone options in result to the user's preferences order.

### III. BRIEF OVERVIEW ON THE MOBILE PAYMENT BUSINESS MODELS

This section provides an overview of various mobile payment business models. Mobile payment business models according to task division and resource sharing between roles can be divided into 5 categories: (A) Operator centric, (B) Bank centric, (C) operator centric with bank interface, (D) Peer-To-Peer, (E) Collaboration.

#### A. Operator centric business model

In this model, operator is responsible for production and management of mobile payment system; however financial institutions are not participated in payment process. In this model payment can be realized by two ways; prepaid card or via telecommunication phone bills, so macro payments doesn't support in this model.

The primary advantage of this model to operators is the control over revenue streams and employ the existing infrastructure of telecommunication bills to credit customer's mobile payments is an additional advantage to operators however, risk of theft and fraud is attended to the operator [8]. In other words operators move away from their core competencies. Fig.1 shows the operator centric business model.

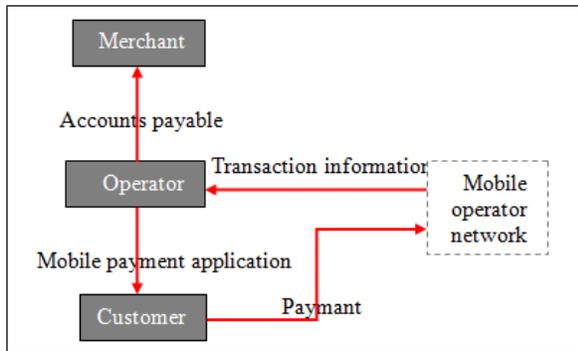


Figure 1. Operator centric business model[8]

NTTDOCOMO is a known mobile payment system that follows operator centric business model.

#### B. Bank centric model

Bank is responsible for production and management of mobile payment system and operators are not participated in payment process in this model. As shown in Fig.2 Payments have been done through the bank accounts. The advantages of this model to banks are: reduce cash/check handling, increase customers loyalty and revenue stream for micro payments but on the other hand, banks have limited experience in application developments for mobile devices [8]. In this model, banks revenues mainly provide from

transaction fees and operators revenues provide from data transmission fees.

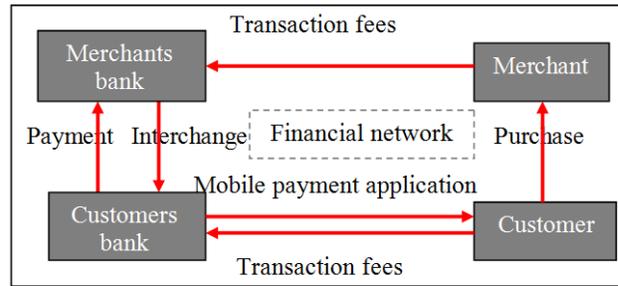


Figure 2. Bank centric business model[8]

There is an additional benefit to operators in this model when banks use SIM-based application technology for their mobile application. In this case bank should pay rental fees to operators because of operators' SIM toolkit ownership.

One of the known systems that use this business model is pay box.

#### C. Operator centric with bank interface model

In fact this model has the main features of operator centric and bank centric model but it has been solved the problems of two previous models. Unlike the operator centric model, in this model both micro and macro payments has been supported. Micro payments have been done through M-wallet or telecommunication bill and macro payments have been done through bank accounts. The additional features of this model in compare of two previous models is a unique user interface for communicate with several accounts in several banks. In this model as operator centric model the most risk and benefit have been attended to the operator. In this model Banks have obtained more revenues in compare of operator centric model. Figure3 shows the operator centric with bank interface business model.

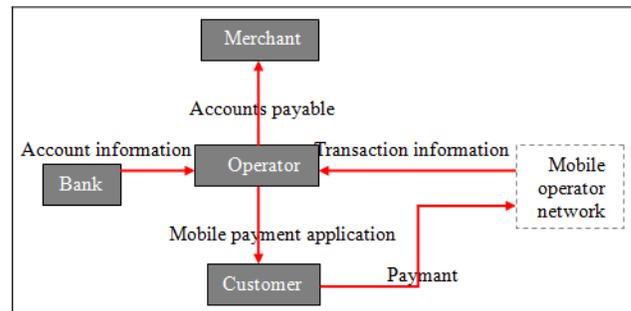


Figure 3. Operator centric with bank interface business model

#### D. Peer-To-Peer model

This model is different from other models discussed before. A third party launches mobile payment system with using banks and operators infrastructure. The third party is independent from banks and operators. In fact, customer opens an account in third party's system and payments done in two ways the first one through the customer's account in third party's system and the second one through customer's bank account. Exchanging money between these accounts is

possible. This model supports both micro and macro payments.

The advantage of this model to third party is the revenue capture from transaction fees, but on the other hand, the risk of fraud and fictions, attentive to the third party [8]. Fig.4 shows the Peer to Peer business model.

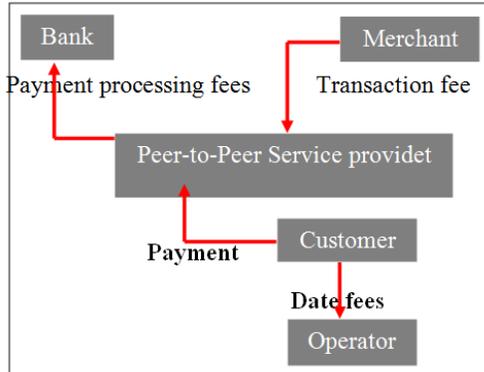


Figure 4. Peer to Peer business model[8]

One of the most famous mobile payment systems that follow this business model is PayPal.

#### E. Collaboration model

The collaboration model consists of the collaboration among banks, operators and a service manager. Service manager is responsible for the managing all of the payment process and organizing collaborations among operators and banks. In this model banks and operators focus on their main functions, and in addition they have transaction fee income. In this model service manager have the most risk and benefit [8]. Figure5 shows the collaboration business model.

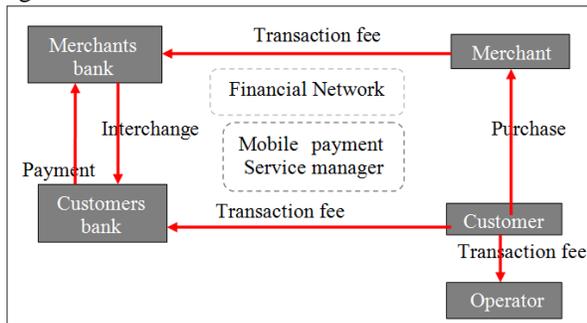


Figure 5. Collaboration business model[8]

SEMOPS is a payment system that follows this business model.

#### IV. BUSINESS MODEL EVALUATION FRAMEWORK

In mobile payment business models with complexities, uncertainties and multi factors that affect the development method, there are several factors that accomplish the business model selection. In mobile payment business model analysis, we should consider multi factors simultaneously and make decisions based on all of the factors.

MCDM is a multi criteria decision making method, including several techniques, which allow rating a range of

criteria, and then ranking them with the opinions of industry experts. The MCDM method has high potential to reduce the cost and time and increase accuracy of decisions and can be a suitable framework for solving the problems.

With this characteristic, decision makers have the possibility to easily examine the problem and scale it in accordance with their requirements [9].

The basic steps used in MCDM consist of the following steps:

- 1) Definition of the problem and its alternative solutions
- 2) Identification of the stakeholder
- 3) Definition of the selection criteria
- 4) Selection of the technique of preference aggregation
- 5) Evaluation of solutions in respect to each selection criterion
- 6) Search for consensual solution

#### V. EVALUATION CRITERIA

Criteria are used to identify the opinions of decision makers for reference in their selection process. This paper has considered seven criteria's to evaluate each mobile payment business model with MCDM method. : (A) Extensibility, (B) supporting the mobile payment scenarios, (C) localization, (D) Profitability, (E) Cost of implementation, (F) Security, (G) Scalability.

##### A. Extensibility

This criterion depends on the capability of main roles in mobile payment business model like operator, bank or third party in extending their network structures.

##### B. Supporting the mobile payment Scenarios

This criterion refers to supportability of each business model for different mobile payment scenario such as person to person mobile payment, web store purchase, mobile advertizing, mobile commerce application, proximity mobile payment and bank routine operation.

##### C. Localization

This criterion refers to condition of mobile network operators and banks of the country which mobile payment system will be implemented in.

##### D. Profitability

By estimating the usage rate of mobile services, the cost which is spends for each transaction (obtained by next criteria) and by specifying transaction fee, the profitability will be computable.

##### E. Cost of implementation

In order to determine the system implementation cost, we will need some information such as required equipment list and its significant degree and also the cost of installation and supporting operations. We need to know that which equipment will provide by whom to specify the Proportion of each role. By this information it will be possible to compute total cost of implementation.

## F. Security

In a business model of mobile payment, bank or mobile network operator will be responsible for providing required security according to which of them has the supervision role in that system.

## G. Scalability

The Scalability of mobile payment system, Depends on mobile network operators, banks and third parties scalability which participated in payment system.

## VI. APPLY MCDM METHOD TO CRITERIAS

As Explained before, MCDM method has six steps. So in this section we will apply these steps to business models and criteria's, to choose the best business model:

### 1) Definition of the problem and its alternative solutions

With mobile industry promotion, mobile phones become as a payment tool, and because of different roles that participate in mobile payment process, different business models used by different companies. As discussed earlier, each business model has advantages and disadvantages for each of the roles and also participation rate of each role different in each business model. So there are five alternative solutions; operator centric, bank centric, operator centric with bank interface, peer to peer and collaboration.

### 2) Identification of the stakeholder

There are various identified roles in the mobile payment business models include: operator, bank, trusted third party or service manager.

### 3) Definition of the selection criteria

In general, criteria's should be comprehensive enough so that gathering the criteria's could provide a relatively complete opinion for user. As discussed earlier, our considered criterion consists of: Extensibility, supporting the mobile payment scenarios, localization, Profitability, Cost of implementation, Security and scalability.

### 4) Selection of the technique of preference aggregation

ELECTRE II is one of the MCDM techniques. This technique allows decision makers to select the best choice with maximum advantage and minimum conflict in the function of various criteria. ELECTRE II creates the possibility to model a decision process by using coordination indexes. These indexes are concordance and discordance. Concordance index measures the preference rate of one object over another, according to the weights assigned to the decision criteria. Discordance index measures the worse rate of one object against one another. In summary concordance and discordance indexes are as decision makers accepting or rejection in selection one object against another.

In order to better understand how results are obtained by using ELECTRE II, we present the algorithm of this method. To help illustrate, we will use a pair of preferences  $a$  and  $b$ . each criterion is assigned a weight  $W_j$  ( $j=1, n$ ;  $n$ =number of criteria). The *concordance index* is defined as follows [10]:

$$C_{a,b} = \sum_{j: g_j(a) \geq g_j(b)} W_j$$

Where  $g_j(a)$  is the score for business model  $a$  under criterion  $j$  and  $w_j$  is the weight assigned to criterion  $j$ .

The *discordance index* is defined as follows:

$$d_{a,b} = \sum_{j: g_j(a) < g_j(b)} g_j(b) - g_j(a)$$

Both index values are then compared with the respective threshold ( $S_c$  and  $S_d$ ) to determine their significance. Concordance and discordance values are considered significant if:

$$C_{a,b} \geq S_c$$

$$d_{a,b} < S_d$$

### 5) Evaluation of solutions in respect to each selection criterion

Parameters that are use in this decision method consist of:

$A = \{A_i | i=1, 2, \dots, n\}$  represents the set of feasible alternatives.

$I = \{C_j | j=1, 2, \dots, m\}$  represents a set of evaluation criteria.

As shown in table1 we have five Alternatives and seven criteria's.

TABLE I. CRITERIA /ALTERNATIVES

Criteria		Alternative	
Extensibility	C1	Operator centric	A1
Supporting scenarios	C2	Bank centric	A2
Localization	C3	Operator centric with bank interface	A3
Profitability	C4	Peer to Peer	A4
Cost of implementation	C5	Collaboration	A5
Security	C6		
Extensibility	C7		

In order to determine the importance and rating performance of each criterion in each business model, we provide a questionnaire form and gave them to 20 operator/bank experts to specify the weight and rating performance of each criterion. Table2 shows the results of collected forms. We have computed the average entries.

TABLE II. WEIGHTS AND PERFORMANCE RATE

criteria	Weight	A1	A2	A3	A4	A5
C1	3.625	3	2.875	3.875	3.25	4.375
C2	3.75	2.5	2.75	3.5	2.625	4.375
C3	3.875	3.125	3.875	4.25	2.125	3.875
C4	3.125	3.625	3.125	4.125	2.875	4.125
C5	2.875	3.875	4.125	3.875	2.625	3.375
C6	5	3.75	4.375	3.875	3	4.5
C7	3.875	3.25	3.25	3.625	3.375	4.75

### 6) Search for consensual solution

As explained before, we used ELECTRE II for mobile payment business model selection, so we should constitute

the concordance and discordance matrixes. Tabel3 shows the concordance matrix.

TABLE III. CONCORDANCE MATRIX

<i>con</i>	<i>A1</i>	<i>A2</i>	<i>A3</i>	<i>A4</i>	<i>A5</i>
<i>A1</i>	N	6.75	0	14.875	2.875
<i>A2</i>	15.5	N	7.875	18.625	2.875
<i>A3</i>	23.25	18.25	N	26.125	6.75
<i>A4</i>	11.25	7.5	0	N	0
<i>A5</i>	23.25	19.375	16.25	26.125	N

According to ELECTRE II method, the results shows that the collaboration business model is the best choice and the peer to peer business model is the worst choice for Iran, the comparison results conduce to:

$$A5 > A3 > A2 > A1 > A4$$

Table4 shows the discordance matrix:

TABLE IV. DISCORDANCE MATRIX

<i>con</i>	<i>A1</i>	<i>A2</i>	<i>A3</i>	<i>A4</i>	<i>A5</i>
<i>A1</i>	N	1.875	6.875	0.5	6.875
<i>A2</i>	0.625	N	3.5	0.5	5.750
<i>A3</i>	0	0.750	N	0	3.125
<i>A4</i>	3.750	5	7.250	N	9.5
<i>A5</i>	0.5	0.750	0.875	0	N

According to discordance matrix, the extracted results are same to concordance matrixes results.

## VII. CONCLUSION AND FUTURE WORK

In this paper we have analyzed five different mobile payment business models. In each model the stakeholder scenario, involved roles, strength, weaknesses and instances has been determined. Then by specifying evaluation criteria and applying MCDM method, a comparison between these models has been done. The results show that collaboration model will be the best solution in respect to Iran conditions. Obviously this result can be changed in other places according to their characteristic.

For future work we can use other technique in MCDM like AHP, linear programming for comparison of business models.

Based on results achieved by previous researches, customers don't have enough trust on m-commerce due to

uncertainty of wireless network. Since the technology which is used in payment system has a critical effect on its certainty, it is essential for a country to specify a suitable platform simultaneously with its business model. Determination of a useful platform also will effective on revenue sharing in business model. In future research we plan to work on revenue sharing in various mobile payments business models and compare them based on benefits which is achievable by any role.

## REFERENCES

- [1] key Pousttchi, Max Schiessler, Dietmar G. Wiedemann, "Analyzing the Elements of the Business Model for Mobile Payment Service Provision" ,Sixth International Conference on the Management of Mobile Business ,ICMB 2007, pp.44
- [2] Qiang.tingjie lu Yan, "A Study of Mobile Payment Mode in U-commerce", Wireless communications, networking and mobile computing,2008, pp.1-3
- [3] Zmijewska Agnieszka, Lawrence Elaine, Steele Robert, " Classifying m-payments – a user-centric model" ,Proceedings of the Third International Conference on Mobile Business, ICMB 2005, pp.3-8
- [4] Y. Chou, C.W.Lee and J. chung. " Undersatanding m-commerce payment systems through the analytic hierarchy process", Jornal of business research,pp.1423-1430, 2004.
- [5] Jan ondrus, Y ves pigneur, "Amulti-stakeholder Multi-criteria assessment framework of mobile payments: an Illustration with the swiss public transportation industry", proceedings of the 39<sup>th</sup> hawaii International conference on system scieace, 2006
- [6] Jan ondrus, Y ves pigneur, "An assessment of NFC for future mobile payment systems" , 6<sup>th</sup> international conference on the management of mobile business (ICMB 2007).
- [7] Simon fong, Zhung Yan, "Comparative study on M-commerce application in various scenarios" , 2008 IEEE/WIC/ACM international conference on web intelligence and intelligent agent technology , pp.943-946
- [8] Smart card alliance, "Proximity mobile payments businrss scenarios: research report on stakeholder perspective" , july 2008
- [9] Gulgem Isklar, Gulcin buyukozkan, " Using a multi-criteria decision making approach to evaluate mobile phone alternatives", Computer standards and interfaces 29 , 2007, pp.256-274
- [10] Wen-chih huang, Chieh-Hua Chen, "Using the ELECTRE II method to apply and analyze the differentiation theory", proceedings of the estern asia society for transportation studies, Vol.5, pp. 2237-2249, 2005

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