AN EMPIRICAL EVALUATION OF M-PAYMENT BUSINESS MODELS USING ANALYTIC HIERARCHY PROCESS AND SENSITIVITY ANALYSIS

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ABSTRACT

Mobile payment is the core concept in today's m-commerce. There are different mobile payments business models but we cannot see the dominant model in the existing market. This work surveyed different factors from literature which support the sustainability of these models and were used for empirical evaluation. The literature does not report any empirical investigation about the relative importance of selection parameters and performance of each model based on this relativity. This study analyzed quantitatively current m-payment business models using AHP which is a quantitative method for decision making in case of multiple criteria and conflicting objectives, and on the basis of this analysis, the reported models and factors was prioritized according to their relative performance values. Similarly Sensitivity Analysis was done in order to find out different views about final prioritized list under varying conditions.
Keywords: Mobile payments, m-payment business models, MCDM evaluation method.

1. Introduction

New forms of mobile technologies are rapidly transforming the marketplace. As today's business market is extremely dynamic and most organizations are searching new and innovative ways in order to optimize their business processes and other parameters for their added values. In this regard m-payment and m-shopping are useful tools for many organizations to achieve their objectives in the current digital world.

The aim of this research is to do empirical evaluation of the reported factors which supports the selection of m-payment business models and also to that of each business model.

Objectives:

- Identify relative importance of each factor and model.
- Facilitate decision making and policy changing.
- To understand different components of m-payment business model

Research Questions

In order to achieve the above objectives we investigated the following questions.

Q**1**. What is the relative importance of reported m-payment service and organizational related factors in the selection of an m-payment business model?

Q2**.** Which business model is more appropriate on the basis of these factors reported in Q1?

Q3. Which factors are more sensitive in term of relative importance with respect to each m-payment business model?

2. Literature Review

(Pousttchi et al, 2007) proposed a framework for mobile payment business models. They claim that this framework can be applied for categorization of any given mobile payment business models. (Lu Yan et al, 2008), have named mobile payment as ubiquitous payment and categorized mobile payment business models into four modes: i.e. carrier's operator independently, mobile network operator centric, financial institutions centric and third party operating, also the research have surveyed the disadvantages of these models and has recommended some strategies to solve them. (Chou et al, 2004) evaluated the performance of different payment systems using Analytic Hierarchy Process. (Ondrus et al, 2006) proposed a multi-actor multi-criteria framework to facilitate the assessment of mobile payment technologies for the Swiss public transport industry, also in the other research. (Sharma, 2010) provide a framework which derived evaluation criteria for m-commerce business models.

3. Hypotheses/Objectives

This study aims to test following hypothesis

H1: What is relative importance of each factor, which is used for the selection of m-payment business model?

H2: What is prioritized form of different m-payment business model based on the relative importance of these factors?

4. Research Design/Methodology

4.1 Proposed Model

Fig 1 the AHP decision tree which consist of four layers. The top layer shows the objective i.e. evaluation of m-payment models and layer two shows the evaluation criteria which consist of service related and organization related factors
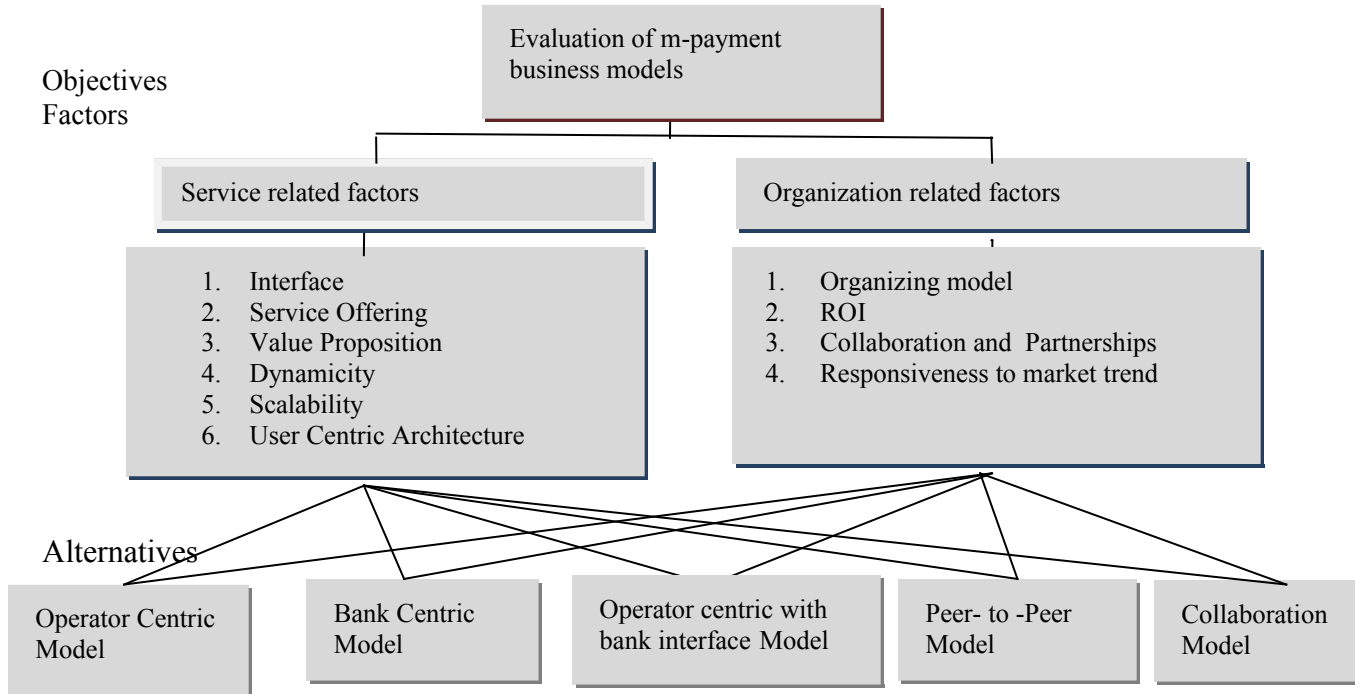
Objectives
Factors

Evaluation of m-payment business models

Service related factors	Organization related factors
1. Interface	1. Organizing model
2. Service Offering	2. ROI
3. Value Proposition	3. Collaboration and Partnerships
4. Dynamicity	4. Responsiveness to market trend
5. Scalability	
6. User Centric Architecture	

Alternatives

Operator Centric Model	Bank Centric Model	Operator centric with bank interface Model	Peer- to -Peer Model	Collaboration Model

Fig 1 AHP Decision tree

4.2 Research Methodology

This research is based on the assumption of interprevitism. i.e. reality is socially constructed, multiple interpretation and realities exist and scientific research is time and context dependent (Sharma, 2010, p-38).

4.3 Sample Selection

Different and well known m-payment companies, service providers and financial institutions throughout the world were searched using internet. Then profiling was done in order to find most relevant people from industry.

4.4 Questionnaire Design

There were total 21+100 comparisons. In order to achieve maximum response rate, a transitive property was used to resize the questionnaire. We compare each criterion with their consecutive criterion only one time and rest of comparisons was determined using transitive property. Fig 2 shows format of the question used for AHP.
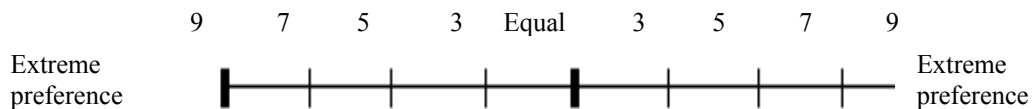
9	7	5	3	Equal	3	5	7	9

Extreme preference   Extreme preference

Fig 2 AHP questionnaire format

5. Data/Model Analysis

5.1 Pair wise comparison matrix

There are ten factors and five alternatives. To calculate total number of comparison we use formula n (n-1)/2, where n represent total number of factors. As we have six service related factors and four organization related factors so 6(6-1)/2+4(4-1)/2=15+6=21.To find supporting intensity level of each factor with respect to each model, there will be 10*10 =100 comparison. Table 2 & Table 3 pair wise comparison of service related factors and organization related factors. The all diagonal elements are 1 which indicate that each factor have similar importance to itself. There is transitive and reciprocal properties exist e.g. if a_{12}=7 then a_{21}=1/7 and so on.

Table 2

	Interface	Service Offering	Value Preposition	Dynamicity	Scalability	User Centric Architecture	E.V
Interface	1	2	1	1/7	1/2	½	0.092
Service offering	1/2	1	1/2	1/2	1/9	1/9	0.047
Value Preposition	1	2	1	1	1/2	½	0.118
Dynamicity	7	2	1	1	1/2	½	0.201
Scalability	2	9	2	2	1	1	0.271
User Centric Architecture	2	2	2	2		1	0.271

Table 3

	Organizing Model	Return On Investment	Collaboration & Partnership	Responsive to market trend	Eigen-vector
Organizing Model	1	1/2	1/9	1/9	0.055
Return On Investment	2	1	1/2	½	0.161
Collaboration & Partnership	9	2	1	1	0.392
Responsive to market trend	9	2	1	1	0.392
					1.000

5.2 Consistency index (CI)

The law of transitivity must be perfectly satisfied in pair wise comparison matrix. If this is not the case then there will be inconsistencies among the values obtained from expert judgments and law of transitivity. If law of transitivity perfectly hold then λ_{max} = n .But unfortunately, the estimate of λ_{max} is not equal to n in most cases. Therefore, we calculate the CI to determine whether or not the law of transitivity is violated. The formula of the CI is CI= $(\lambda_{max}$-1)/ (n-1). When CI = 0, the matrix is entirely consistent, whereas if CI>0 the matrix is inconsistent. Saaty (1980) suggests a range of consistency i.e. If CI>0.1 then the calculated values are inconsistent and the test will fail.

5.3 The priority weights within the hierarchy

First we compared the factors and sub factors to get Overall Preference Matrix (OPM).Then we calculate RVV (relative value weight) by standards methods. The final stage is to construct OPM (option performance matrix) and using the equation to get VFM (value for money) i.e. VFM=OPM*RVV.

5.4 Data collection

The total value for each payment alternative is then derived by taking geometric mean for each expert and then fills the corresponding tables.

5.5 Results

Table 4 shows the performance of alternates with respect to each factor

Table 4 OPM (Option Performance Matrix)

	Interface	Service Offering	Value Preposition	Dynamicity	Scalability	User Centric Architecture	Organizing Model	Return On Investment	Collaboration & Partnership	Responsive to market trend
Bank Centric	0.212	0.038	0.14	0.102	0.12	0.11	0.26	0.19	0.26	0.046
Operator Centric	0.111	0.089	0.13	0.102	0.12	0.11	0.18	0.19	0.14	0.17
Operator centric with bank interface	0.315	0.25	0.28	0.198	0.23	0.33	0.26	0.36	0.26	0.307
Peer to Peer	0.212	0.217	0.13	0.115	0.12	0.11	0.08	0.06	0.08	0.15
Collaboration Model	0.152	0.40	0.33	0.49	0.40	0.33	0.23	0.19	0.26	0.34

Table 5 Final Prioritized Form:

Priority	m-payment Business Models
1	Collaboration model
2	Operator centric using bank interface
3	Operator Centric Model
4	Bank centric Model
5	Peer to Peer model

7. Sensitivity Analysis

Through decreasing or increasing the importance of individual criteria, we observe the consequential changes of the priorities and the position of the alternatives.

6. Limitations

The limitations of this study were the use of set theory. According to this theory the belongings of some property was checked by yes or no. There is lack of some fuzzy approach to narrow the member ship of some property.

7. Conclusions

The results show that Collaboration model is the best model on the basis of general criterion taken from literature and whose significance was specified using the experts

8. Key References

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