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# Providing a Model of the Relationship between Software, Hardware, and Organizational Factors in the Success of Implementing a Comprehensive Customer Relationship Management (CRM) System Using Fuzzy Mapping Function (FCM) Case Study: International Transportation of Iranian Forwarder

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| ARTICLE INFO | ABSTRACT |
|---|---|
| | Introduction: with the emergence of e-commerce and new economic conditions, developing stronger communications with customers has become more important. The aim of this study was to provide a model of the relationship between software, hardware, and organizational factors in the success of implementing a comprehensive customer relationship management (CRM) system using fuzzy mapping function (FCM). This study was a case study in international transportation of Iranian forwarder. |
| | Method: the method of this study was descriptive and a questionnaire was used as a measuring tool. The population of this research was included CEO, managers and experts of various departments of international shipping and shipping companies, customers of international shipping companies and shipping companies, managers and ICT experts who have at least a bachelor's degree and upper and have five years of work experience in this area. 110 participated in this study. In this research, FCM fuzzy mapping technique was used to investigate and calculate the impact of factors on the achievement and success of implementing a comprehensive customer relationship management system in international shipping companies. This was the first method used in the international shipping and shipping industry. |
| | Findings: Based on the results of this study, it can be said that among the predictive variables, the variable of human resources and education of individuals, could predict with the confidence level of 0.99, and 0.53 of the criterion variable, and the software variable, with the confidence level of 0.95, and 0.38 of criterion variable and using FCM fuzzy mapping technique, it was observed that among four factors affecting the success of the implementation of the customer relationship management system in international shipping and shipping companies , various factors affect each other with different coefficients. Finally, the factor of human resources and training of people with a coefficient of 0.89 had the most impact on customer relationship management. |

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**Introduction**

In new business processes, customer satisfaction is an important and vital part of the organization's goals, and senior executives know well that their success in achieving the goals of the organization depends on customer satisfaction (Heirati, 2007). On the other hand, it cannot be said that all customers are equally involved with the success of the organization. Therefore, the satisfaction of key customers will be more sensitive. In this way, it is necessary for the organization to implement a system for attracting and maintaining customers and increasing their loyalty. A system that can manage well the relationships of organization and costumers today, these systems are known for customer relationship management systems, and software called CRM has come to the market that can make the organization more capable of satisfying customers. (Hajikarimi, 1391).

In fact, customer relationship management is introduced based on the long-term relationship with customers, and the understanding of their needs and responsiveness through diverse products and services through multiple channels, which is due to the recent advances in information technology. (Eskandari, 2010). In relation to customer relationship management (CRM), it's important to note that CRM is not a product or service offered by an organization but an organization's business strategy. In other words, it does not itself serve as an information technology, but uses information technology to achieve its goals.

This suggests that the need to deploy CRM in an organization has been the design of a business strategy. The stage of redesigning the organization processes based on the goals of CRM will have the best result for the organization (Amiri, 1390). To implement this system, it is necessary to use special software systems that may need to be completed according to the requirements of each organization. CRM has evolved in recent years on the basis of two fundamental changes in views and needs:

• Global competition made the comparison of goods and services more sophisticated. As a result, companies shifted from a centralized product perspective to a customer.

• The ability of information technology has focused on the integration of all customer information at the organization level, and has created new opportunities and important needs for customers' contact. Until recently, it was not possible to manage complex information about the customer, as customer information was usually kept at about 20 sections of the company. But with the advancement of network and Internet technologies, CRMs have been able to find their place in the world.

One of the challenges faced by most of the growing organizations is the lack of a customer relationship management strategy at the organization level; implementing a customer relationship management system is not an easy task, and it involves learning new managerial skills and fundamental changes in organizational and organizational culture. (Hesami, 2010). Therefore, we need to scrutinize it so that we can figure out what factors can succeed in implementing it.

The process of identifying the factors affecting the success of CRM implementation should be based on several criteria and components. Therefore, in this study, a set of criteria has first been identified based on the literature of the current research, then Delphi technique has been refined and screened for the identified criteria set. Since the implementation of a customer relationship management system can increase customer satisfaction, loyalty and attraction, resulting in more sales and productivity, identifying the key factors affecting the success of implementing a customer relationship management system can play a decisive role. In the establishment of this system, managers of the organizations should pay attention to these factors. (Khorshid; Zabihi, 2010)

By reviewing the studies and researches in order to identify the key and effective factors in the success of implementing a comprehensive customer relationship management system, it was found that the researchers identified and investigated various factors and dimensions in the field of successful implementation of the customer relationship management system. Some researchers in general and some others have studied these factors in more detail. By identifying and analyzing the dimensions proposed by each of the researchers, finally, customer relationship management can be assumed as a multi-dimensional concept that four elements of people (employees, focus on preferred customers), culture (customer-centric organization) process (knowledge management) Technology (technology) is more important (Dehdashti et al., 2009). Although the use of each of these factors varies from organization to organization, for example in an organization, human factors are the most effective factor in the success of the implementation of the customer relationship management system (Dehmareh et al., 2011), but in another organization, the technology factor can be as the key factor should be used (Karamati and Nikzad, 2010).

With the increasing advancement of science in the world, all sectors are also in need of progress. Therefore, it is not possible to saturate the subject matter. But, of course, you can think of innovative ways.

The high position of the transportation and shipping industry in the global economy as well as in the Iranian economy reveals the need for diverse and comprehensive research. The exceptional feature of international shipping companies and shipping companies, both quantitatively and qualitatively, has highlighted their position on addressing the issues and bottlenecks of these companies, as well as examining solutions to problems and improving quality. Considering the high volume of transportation industry services, which according to the statistics office of the Organization of Shipping and Shipping in 1394 was 97.603.556 tons, and also due to the higher acceleration of the increase of value added transport compared to the increase of GDP (Transportation Economy, November 2010 - Hajarzadeh), and especially considering that international shipping companies and shipping companies form the bulk of transport companies, the results of this research can be important. . Also, an organization in any of the above mentioned factors may not be prepared to implement customer relationship management system (Hadizadeh, Haj Moghani, 2010).

The results of this research can be important. The innovation of the present research can be described in two aspects:

1 - The study of the factors affecting the success of customer relationship management system in the service sector, taking into account the comprehensive parameters considered in this research, is not to be seen in previous studies.

2 - In this study, in addition to identifying effective factors, we will calculate the impact of factors using structural equations and fuzzy mapping function (FCM). The use of these methods has not been taken into consideration by previous researchers in the field of research in this study.

Understanding and measuring customer perceptions and expectations is an essential component that can be used to improve the quality of international shipping and shipping organizations. Given the heavy competition in the transportation industry, international and shipping agencies today are looking to find ways to compete more effectively in emerging markets, and intra-organizational services play an indisputable role in the direction of competition between Organizations. The innovation aspect of this research is to identify the effective factors in the implementation of CRM in international shipping and shipping companies, using experts 'and clients' viewpoints, as well as the necessary fields for successful deployment of systems. CRM is a shipping and shipping company that is taking place for the first time.

This study was conducted as a survey and the method of data collection was using a questionnaire. The aim of this study was to provide a model of the relationship between software, hardware, and organizational factors in the success of implementing a comprehensive customer relationship management (CRM) system using fuzzy mapping function (FCM). This study was a case study in international transportation of Iranian forwarder.

The second innovation used in this study is the use of the FCM method to measure the impact of effective factors on the success of the implementation of the customer relationship management system in international shipping and shipping companies, as you know, the FCM method is used to measure the impact of effective factors on the successful implementation of the customer relationship management system at international shipping and shipping companies for the first time. The following goals will be available if customer relationship management system is successful implementated in international shipping and shipping companies.

**Methodology**

This research is an applied research. Also this research is divided into two sections: periodic and periodic. The realm of this research includes managers, managers of various departments and experts in shipping companies, customers of international shipping companies and shippers, managers and IT experts in international shipping companies and shipping companies. . In this research, we first investigated the theory of articles and books, then we examined the theoretical subject matter of the research and finally evaluated the effect of the independent variable on the dependent variable. Therefore, our research methodology is survey type and this research is the type of applied research work. The population of this research was included CEO, managers and experts of various departments of international shipping and shipping companies, customers of international shipping companies and shipping companies, managers and ICT experts who have at least a bachelor's degree and upper and have five years of work experience in this area. 110 participated in this study. Methods of data collection in this research were divided into two categories: library and field. For collection of information on literature and research background, library methods were used and data collection was used to confirm or reject the research hypotheses by field method. In this research, a questionnaire was used to collect the research data. The FCM method was also used to assess the impact of each factor on the success of implementing a comprehensive customer relationship

management system. The fuzzy mapping function of FCM has been used to identify the relationships and extent of the impact of the research criteria. To analyze the data obtained, the FCM Mapper Vs.1.2009 and MATLABR2009a software and SPSS software were used.

**Methodology of research modeling**

The methodology used for modeling in this study has four sections for displaying the results of each of these sections at each stage of the process. The sections are: Initial matrix of factors (IMF) is used to create this matrix of Delphi process for data collection and factor classification, Fuzzy matrix of FZMFs, Factor Relationship Matrix (SRMF), and Finite Matrix of Factors (FMF). Figure 1 illustrates the process of modeling graphically.

Steps to build the model

Collection of data from of the Initial matrix of factors (IMF)

Formation of Fuzzy Matrix of (FZMF) Factors experts and development

Evaluating the cause and effect relationship and formulating the power relations matrix (SRMF)

Collecting expert opinions and analyzing information and removing inappropriate communications

Converting the SRMF matrix to the final matrix of factors (FMF) and drawing a model based on it

**Figure 1: Modeling Process**

**Initial Matrix Factors (IMF)**

The IMF matrix is a matrix of $[n \times m]$ in which "n" is the number of identified factors, which are in fact the main decision variables, and "m" is the number of experts who are interviewed and through which the information represents the coefficient or the weight that Oij has collected. Each cell in this matrix assigns each "j" expert to each of the "i" factors according to the experience they have. In this step, as described above, the Delphi method is used to collect

information. In the next step the result of the information obtained in this matrix will be converted into fuzzy sets with a membership degree between 0 and 1. Each of the cells in a row is each part of the *vi* vector. For each factor in the graph, a collection of opinions collected by the experts of a *vi* vector is created. In this study, i = 4 variables were designed in the form of 47 questions; the number of experts in the international forwarding organization is j = 20. According to the data obtained from the initial matrix questionnaire (IMF), it is formed as follows.

**Table 1: Initial Matrix Formation (IMF)**

| Certified people and executives | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Research Factors | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Human resources | 71 | 44 | 80 | 82 | 42 | 80 | 83 | 84 | 81 | 100 | 60 | 80 | 86 | 95 | 84 | 60 | 83 | 97 | 85 | 88 |
| Funds | 80 | 62 | 100 | 61 | 75 | 42 | 50 | 68 | 69 | 65 | 66 | 80 | 85 | 74 | 60 | 62 | 84 | 80 | 91 | 80 |
| Hardware | 63 | 80 | 24 | 66 | 60 | 62 | 85 | 60 | 62 | 25 | 60 | 25 | 82 | 84 | 82 | 64 | 45 | 34 | 65 | 63 |
| Software | 40 | 60 | 100 | 80 | 59 | 60 | 74 | 60 | 47 | 63 | 80 | 30 | 80 | 84 | 60 | 66 | 60 | 75 | 65 | 69 |

**Strength Relationship Matrix Factor (SRMF)**

The SRMF matrix is a [n × n] matrix. The rows and columns of this matrix are identified factors, in which the relationship between them is to be investigated in two or two ways. Each vector component called sij in this matrix indicates the effect of the "i" factor on "j". Sij can assign a value between [1 and 1-]. Each agent is represented by a numerical vector called si, containing n component. Therefore, there are three types of relationships between the two "i" and "j" factors:

Sij>0, This concept indicates the direct (positive) cause and effect of the two "i" and "j" factors. This means that if the "i" factor increases, the ratio of the two factors to the value of the "j" factor also increases.

Sij<0, This concept indicates the inverse (negative) cause and effect relationship between the two "i" and "j". This means that if the value of the "i" factor increases, the ratio of the two factors to the value of the "j" factor decreases.

Sij = 0, indicating that there is no connection between the two "i" and "j" factors.

**Table 2: Formation of Strength Relationship Matrix Factor (SRMF)**

| Research Factors | Human resources | Funds | Hardware | Software |
|---|---|---|---|---|
| Human resources | 0 | 0.5683 | 0.6035 | 0.5214 |
| Funds | 0.5683 | 0 | 0.4509 | 0.6667 |
| Hardware | 0.6035 | 0.4509 | 0 | 0.3412 |
| Software | 0.5214 | 0.7215 | 0.3412 | 0 |

**Determining the Relationship between the Factors (SRMF)**

The proximity of the two V1 and V2 factors is determined by the similarity index between the two vectors. Determining the power of the relationship between the factors completely depends on the two vectors related to these factors. This number is represented by the parameter 12S. The closeness of the relationship between the two vectors is determined by the distance between the two vectors.

In this domain, another variable is defined as dj. This parameter equals the difference between the "j" of the two elementary elements of the two vectors. This parameter is calculated based on the following equation:

$$d_j = \left| X_1(V_j) - X_2(V_j) \right|$$
$$d_j = \left| X_1(V_j) - (1 - X_2(V_j)) \right|$$

According to this formula, another parameter is defined as AD, whose value is equal to:

$$AD = \frac{\sum_{j=1}^{m} |d_j|}{m}$$

The close relationship and similarity between two vectors are represented by the parameter S, whose value is equal to

S = 1-AD

In the direct relation, when the value of S is equal to 1, it indicates that the two vectors are close and similar, and when the value of S is 0, this state indicates the maximum non-similarity between the two vectors. In the inverse relationship, when the value of S is equal to the number "1", it indicates that the two vectors are completely inverse and similar, and in the case when the value S is "0", this state represents the maximum inequality of inverse between two vectors.

**Final Factor Matrix (FMF)**

Once the SRMF matrix is completed, some of the data inside SRMF matrix maybe be misleading data. That is, all factors that may be unrelated in the preceding matrix can be related to each other, or that the cause and effect relationship may not always exist between the agents. Analyzing the data in the SRMF matrix, the two vectors can communicate with each other according to the adaptation that should be considered. Agents can have an acceptable relationship and appropriateness in the mathematical logic; however, they may be logically unrelated. These inappropriate communications can easily be identified and removed by experts in this area. Regarding the opinion of the respected supervisor, based on the consideration of all the two-way communication between the four variables, the CRM power matrix of the relationship between factors (SRMF) and the final matrix of factors (FMF) was considered to be the same and refrained from removing communications based on the expert's view.

**Table 3: Formation of Final Factor Matrix (FMF)**

| Research Factors | Human resources | Funds | Hardware | Software |
|---|---|---|---|---|
| **Human resources** | 0 | 0.5683 | 0.6035 | 0.5214 |
| **Funds** | 0.5683 | 0 | 0.4509 | 0.6667 |
| **Hardware** | 0.6035 | 0.4509 | 0 | 0.3412 |
| **Software** | 0.5214 | 0.7215 | 0.3412 | 0 |

**Conclusion**

As the results show, the summing up of the four factors influencing CRM is that different factors affect each other with different coefficients:

**CRM variable**

Finally, the human resource factor with the coefficient of 0.89 has the most impact on customer relationship management. In other words, with the increase of each unit of human resources, the variable customer relationship management increases by 0.89 units. The financial resources factor of 0.72 affects customer relationship management. In other words, with the increase of each financial unit, the variable of customer relationship management increases by 0.72 units. The hardware factor of 0.34 per client relationship management affects the increase in each unit of the hardware unit of the variable customer relationship management by 0.34 units. The software operating factor of 0.44 affects customer relationship management. In effect, by increasing the software operating unit, the client relationship management variable increases by 0.44 units.

**Human factor variable**

Based on the results of customer relationship management, the value of 0.34 affects the improvement of the human resources position in customer relationship management. In other words, by increasing each customer relationship management unit, the human resource position in customer relationship management increases by 0.72 units. Based on the results of financial

management, the effect of 0.24 is to improve the position of manpower in customer relationship management. In other words, by increasing each financial unit, the human resources position in customer relationship management increases by 0.24 units. According to the results, the hardware component with the size of 09, is effective in improving the position of human resources in the management of customer relationship. In other words, by increasing each hardware unit, the human resources position in customer relationship management increases by 0.9 units. Based on the results of software operating factor of 0.65, the improvement of human resources position in customer relationship management is effective. In other words, with the increase of each software operating unit, the position of human resources in customer relationship management increases by 0.65 units.

**Financial factor variable**

Based on the results of customer relationship management, a value of 0.61 affects the improvement of the financial factor. In other words, with the increase of each customer relationship management unit, the position of financial agent in customer relationship management increases by 0.61 units. Based on the results of the human factor, it is as much as 0.59 on the improvement of the financial factor. In other words, with the increase of each unit of the human factor, the position of the financial agent in customer relationship management increases by 0.59 units. Finally, among the four factors affecting the success of the implementation of the customer relationship management system in international shipping and shipping companies, we observed that various factors affect each other with different coefficients and ultimately the factor of manpower and training Persons who have the greatest impact on the success of the implementation. The choice of this factor has been based on the experts' opinions and the final matrix of the factors. In the final matrix, the agents of this factor are the factor that other agents directly or indirectly affect the factor, and according to the expert's opinion, this factor directly affects the success of the implementation of the customer relationship management system in the international shipping and shipping companies of the customer relationship management system in international shipping companies. Therefore, the understanding of customers and their needs, as well as the provision of services in order to meet their needs for the success of implementing a customer relationship management system in international shipping companies and shipping is essential and, on the other hand, organizations capable of developing and introducing new services that are compatible with the

competitive market for the transportation industry require trained and experienced human resources. Meeting customers' needs and expectations is a requirement, but creating customer satisfaction creates a competitive advantage.

## Discussion and conclusion

As you know, the customers of each organization determine the lifespan of each organization, in organizations that are not customer-focused, customers are not satisfied with the reasons for various reasons, such as inappropriate employee interviews, lack of proper service in accordance with customer expectations, dissatisfaction with responsiveness of the company, lack of supervision over the services offered, prices and ... are easily attracted to competing organizations, and the losses and losses of this incident will come only to the organization and its employees.

   In fact, it can be said that client is the only manager of the organization who determines that the employees will stay in an organization and that the organization will continue to work in the competitive market today or to eliminate the competition cycle. So it was necessary to identify the employees of the customer and then reward them according to their customer-driven performance and behavior. Employees often need a suitable leadership and their satisfaction has a significant impact on customer retention. (2006, Lindgreen et al.) After the manpower and training of people, the factor of financial resources has the greatest impact on the success of the implementation of customer relationship management system in international shipping and shipping companies.

In order to successfully implement customer relationship management system in international shipping companies, customer relationship management should be a strategic point of the overall strategy of the organization, and should be matched with other strategies such as human resources and marketing strategy. The role of financial resources is also significant in the success of the implementation of the customer relationship management system in international shipping and shipping companies, since financial resources facilitate the collection and integration of customer information by expert and customer-oriented experts (such as dividing customers based on their value or predicting customer behavior). Also, the appropriate funds will establish an appropriate software system for saving data that should be available to all employees so that they can track customer data such as customer behavior (how often they

refer to the organization), number of customer records (number of shipments carried ), Analyze the debt burden of customers.

As noted, in order to implement an integrated customer relationship management system in international shipping and shipping companies, many factors, including human factors, financial resources, software and hardware factors, are needed. But according to the research, the factor of human resources and training of people has been identified as the most important factor affecting the success of the implementation of customer relationship management system in international and shipping companies. If, as a result, successful international shipping and shipping companies have formed a distinct part in the name of customer service in order to provide more accurate, closer, and closer to customer expectations. Staff in this section should be more carefully selected and have more features and knowledge than other sectors. Due to the fact that a company is capable of both operational and facilities, it certainly will not be able to compete with other competitors without having a customer-oriented employee who fully understands the concept and importance of a customer-oriented organization.

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