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Identifying and Ranking Factors affecting the Successful Implementation of ERP by using Fuzzy Delphi and Fuzzy Analytical Hierarchy Process

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Abstract
The enterprise resource planning system is business process management software used to integrate the existing organizational information and used for the concentrated control and management of all facets of the operations. To successfully implement the enterprise resource planning systems, it seems necessary to identify and pay attention to the effective factors of its implementation. This study aims to identify and rank these factors by using fuzzy Delphi and fuzzy analytic hierarchy process. Based on the experts' opinions, the effective factors in terms of the experts' opinions are identified in the first step. These factors are then ranked based on the opinions of the experts of the tile and ceramic industry in Yazd. Eight main factors are identified and their priorities are the users, experts, organization, software, technical-technologies, cultural, managerial and economical dimensions, respectively.

Keywords: Enterprise Resource Planning, Fuzzy Delphi, Fuzzy Hierarchy Process.

Jel Classification: M15

Introduction

In the today's competitive world, the planning systems and the integrated databases constitute the essential components of the large enterprises. This requirement increases as the enterprises become larger. Enterprise resource planning is one of the most comprehensive

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information systems which have been recently employed. The capacity of ERP systems in integrating the processes and the information of different operating fields through a concentrated database led this system to be introduced as a prerequisite of success in the 21st century. The ERP providers argue that their product has been examined several times and created based on frequent experiences. Finally, they will provide excellent solutions for different sectors of the industry. This reality is sustainable in many enterprises; however, the experiences reveal that these products are not much more useful in many other enterprises. Since the emergence of ERP, the success factors of ERP have been considered as the main challenges of the researchers .

In the competitive markets, enterprise resource planning helps in enhancing the capabilities in response to the environmental changes. The enterprises seeking for quick changes in the market tend to achieve some advantages such as better communications with the customers, improved time cycle, higher quality, higher volume of sales, higher earnings, shorter time periods for developing the products and higher market shares. Because of the increasing pressure to implement the information systems based on cooperation between the business partners, it can be concluded that the successful employment of ERP might increase the efficiency of the supply chains. Therefore, identifying the effective factors of successful implementation of ERP has received increasing attention (Arabi et al, 2011). Since the introduction of ERP in 1990s, its application has been much debated in different fields in Iran. These studies have examined the organizational issues solved by this system and the advantages and disadvantages. Many studies have also reported a list of factors impacting the successful implementation of enterprise resource planning. The software, enterprise and management factors are among the most important factors (Francoise et al, 2009).

The prior literature has shown that these factors have different rankings and classifications based on the diverse nature of the statistical populations. It must be mentioned that a fair insight about the effective factors of ERP implementation is achieved by more investigations in each country setting. Therefore, it seems necessary to conduct a study to enhance the insights of the managers, employees, researchers and experts of the enterprise resource planning.

The remaining of the paper is organized as follows. The second section reviews the prior literature and the literature on the ERP system. The methodology is described in the third section. The findings are discussed in the fourth section and the suggestions are provided as the final section of the study.

Theoretical Framework

Enterprise Resource Planning

Enterprise resource planning is a solution based on information technology, whichis used to manage the enterprise resources by an integrated high speed system with high quality to conduct the planning and operating process of the enterprise. Finally, ERP is an integrated system seeking for the more effective management of all resources and integrating the tasks and departments of an enterprise based on a computerized system by which it could meet the specific requirements. This is accomplished by a software package which makes it possible to share information and communicate with different sections of the enterprise. This software constitutes of several modules with different tasks. Most ERP software packages are so flexible that the buyers are able to install and employ some or all of the required modules.

ERP is a technology or system used for the more effective management of all resources in an enterprise. The resources are managed by the automation or integration of all processes and promoting the organizational efficiency (Berchet and Habchi, 2005, 588-605).

The Factors Affecting on the Successful Implementation of ERP

A complete listing of all success factors has been provided based on the prior studies and the main index and the subsidiary indexes are categorized as follows and a summary of the definitions is provided in the table below.

Table1. Factors affecting on the successful implementation of ERP

Dimension	Factors	Source
Managerial	Financial support of top management	Umble,etal.,2003 Arnoldina, P., 2010.
	Spiritual support of top management	Umble,etal.,2003 Arnoldina, 2010.
	The delegation by top management	E.J.Umble et al.,2003.
	Communication management	Botta-Genoulaz,et all.,2005 Olivier Françoise,etall,2009 Ful-Hoon, N. F., & Delgado,2006.
	Performance evaluation	E.J.Umble et al.,2003.
	Planning and strategic vision	E.J. Umble et al.,2003.
	Financial management	N. Garc´ıa-S´anchez, I. E. P´erez-Bernal,2007
	Leadership of the management	E.J. Umble et al.2003
Cultural	Teamwork and participative	C. Berchet , G. Habchi,2005 A.Noudoostbeni,etall,2010
	Adapting to change	Fthian et al, 2006 E.J. Umble et al.,2003
	Commitment of the personnel	R.Chauhan,etal,2012 P.garg,2010
Organizational	Financial performance background	E.J.Umble et al.,2003.
	Background of firm performance on the market	E.J.Umble et al.,2003.
	Reputation and credit among the customers	E.J.Umble et al.,2003.
	Number of the personnel	E.j Umble,etal-2003
	Prediction ability and planning	Saremi et al, 2007 Olhager, Selldin ,2003

		J.K. Pinto D.P. Slevin,2000
Economical	Implementation costs	S.Finney, M.Corbett,,2007 Dr. Bernard Wong, .Tein,2007
	Technical support	S.Finney, M.Corbett,2007 Dr. Bernard Wong, .Tein,2007
	Consultant costs	S.Finney, M.Corbett,2007 Dr. Bernard Wong,D.Tein,2007
	Hardware costs	S.Finney, M.Corbett,2007 Dr. Bernard Wong, .Tein,2007
Expert	Working experience and background	G. Juell-Skielse, 2006
	Technical knowledge	G. Shanks,etal,2000 S. A. Kronbichler,2009
	Ability to update the system	G. Juell-Skielse, 2006
	Ability to provide after sale services and technical support	Sarker and Lee, 2003 Wang et al., 2005 Olivier Françoise,etal,2009
	Ability to provide consultant services before implementation	Olivier Françoise,etal,2009
	Implementation duration	Themistocleous et al., 2001 A.Wong,2005
	Reputation and credit	Syed R. Ph.D,2012 E.J. Umble,2003
Users	Experience of the user	Freydouni, 2007 R.PLANT,L.WILLCOCKS,2007
	Commitment of the user	Umble,etall-2003 C. Ehie , M.Madsen,2005
	Training level	Umble,etall-2003
	Interest of the user	Umble,etall-2003 O.Franc¸oise,etall,2009
	Motivation of the user	Umble,etall-2003 Trimmer etall., 2002
	Having working spirit in using software	Umble,etall-2003
	Participation of the user	Arabi-2012 O.Franc¸oise,etal,2009
	Team skills	Umble, et all-2003
Technical-technological	Presence of the needed hardwares	G. Juell-Skielse, 2006
	Presence of the needed	J.Motwani,etal,2005

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	fundamentals	
Software	Programming language	J.Motwani,2005
	Type of the operating system	Umble,etall-2003
	Type of the databse	Y.Moon,2007
	Supporting Iran currency (rials)	T. C. LOH and .C.L.KOH,2004
	Supporting farsi	C.Bercheta, G.Habchi,2005
	Supporting farsi	o.Françoise,2009
	Life cycle of the product	T. C. LOH and .C.L.KOH,2004 Z.Iskander,L.Abderrazak,2013
	Supporting different currencies and financial transactions	Umble, et all-2003 S.Finney, M.Corbett,2007
	Definition of information system	Umble, et all-2003 S.Finney, M.Corbett,2007
	Testability	Umble, et all-2003 F.Fui-Hoon Nah,etall,2001 S.Finney, M.Corbett,2007
	General efficiency level	Umble, et all-2003 F.Fui-Hoon Nah et al 2003, S.Finney et al 2007,
	Availability	Umble, et all-2003 E.Hustad and D.H. Olsen,2012
	Application	Umble, et all-2003 M.Al-Mashari,2003
	Ease of learning	Umble, et all-2003 z.Iskander ,L. Abderrazak,2013
	Efficiency	Umble, et all-2003 S.Finney, M.Corbett, ,2007
	Ability to be remeberd	Umble, et all-2003 T. C. LOH , S. C. L. KOH, ,2004
	Preventing error	Umble, et all-2003
	Confronting with error	Umble, et all-2003
	Integration ability	Umble,et all-2003 C. Bercheta, G. Habchi,2005
	Security	Umble, et all-2003 O. Françoise,etall, ,2009

Research Questions

The first question: What are the factors affecting on the successful implementation of ERP by using fuzzy Delphi technique?
The second question: What is the ranking of the factors affecting on the successful implementation of ERP by using the fuzzy analytic hierarchy process (FAHP)?

Research Methodology

This is a descriptive survey classified as an applied study in terms of the research objectives. The two populations have been considered in this study. To identify the factors by fuzzy Delphi approach, the university experts have been selected based on judgments and the opinions of the experts and professors in this field. To rank the identified factors based on FAHP, the top executives of the tile and ceramic industry of Yazd have been selected as the second population.

Analytic Hierarchy Process

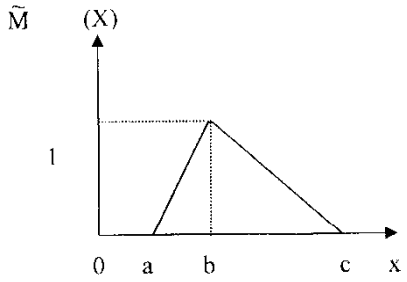
Analytic hierarchy process (AHP) is a technique first introduced by Saaty to allocate the scarce resources and satisfy the planning requirements of the army: This technique has been known as one of the most popular multiple criteria decision making methods (MCDM) and used to solve the unstructured problems in different fields of human interests and needs such as politics, economics, social science and management. AHP is composed of six main steps as follows:

1. Defining the unstructured problems and clearly describing the goals and consequences.
2. Converting the complex problems into a hierarchy structure by the decision criteria.
3. Having a paired comparison of the decision metrics by the comparative scales.
4. Using the eigenvalues of the comparison matrixes to estimate the relative weights of the decision criteria.
5. Checking the consistency ratio of the scales to ensure that the judgments are integrated. Summing the relative weights of the decision criteria to calculate the final weights (Asian et al, 2009).

Fuzzy Set Theory

Fuzzy theory was first introduced by LotfiA.Zadeh in 1965 to solve the problems in which there are no clearly defined metrics. The uncertainty (fuzziness) of the human decisions should be considered; otherwise, the results might be misinterpreted. Fuzzy set theory has been growing in terms of different dimensions and divided into two approaches, including fuzzy sets as the mathematical problems and the linguistic approach. The main logic of the linguistic approach is that the real values are the fuzzy sets and the inference rules are approximate values. The triangular fuzzy numbers are special types of trapezoidal fuzzy numbers which are very famous in fuzzy applications.

Chart 1: Membership of a triangular fuzzy number $\tilde{M} = (a, b, c)$



Source: Lee, A. & et al.,(2008) "A fuzzy AHP and SC approachfor evaluating performance of ITdepartment in the manufacturing industryin Taiwan", Expert Systems withApplications, Vol. 34, pp.96–107.

As shown in chart 1, the triangular fuzzy number is shown by (a,b,c) and its membership function is as follows:

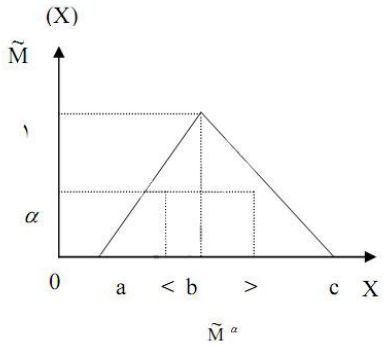
$$\alpha_{\tilde{M}}(X)=\begin{cases}\dfrac{x-a}{b-a} & a\le x\le b\\ \dfrac{c-x}{c-b} & b\le x\le c\end{cases}$$

b is the biggest degree of membership and $f_M(b)=1$and a and c are the lower and upper bounds. A significant issue in fuzzy sets is α -cut, which $\alpha\in[0,1]$ for a fuzzy number of $\tilde{M}$ and any other number and for α -cut and c_α isthe strongest cut and the definitive set is as follows:

$$c_a=\{x|C(x)\ge\alpha\}$$

α -cut of a fuzzy number is the definitive set of $\tilde{M}^\alpha$ which includes all elements of U set which their degrees of membership in $\tilde{M}$ is equal to α .

Chart2. α -cut of a triangular fuzzy number of $\tilde{M}$



Source: Lee, A. & et al.,(2008) "A fuzzy AHP and SC approachfor evaluating performance of ITdepartment in the manufacturing industryin Taiwan", Expert Systems withApplications, Vol. 34, pp.96–107.

By defining the confidence interval at α level, the triangular fuzzy number is defined:

$$\tilde{M}^{\alpha} = \left[a^{\alpha}, c^{a}\right] = \left[(b-a)\alpha + a, -(c-b)a + c\right], \forall \alpha \in [0,1]$$

The interval between two fuzzy numbers might be defined by *vertex*method.

If $\tilde{M}_2 = (a_2, b_2, c_2)$ and $\tilde{M}_1 = (a_1, b_1, c_1)$ are two fuzzy triangular numbers, the interval between them is as follows:

$$d(M_1, M_2) = \sqrt{\frac{1}{3}\left[(a_1 - a_2)^2 + (b_1 - b_2)^2 + (c_1 - c_2)^2\right]}$$

A proper decision model should tolerate the uncertainty and vagueness, because the fuzziness is one of the general characteristic of the decisions. Because the decision makers often provide uncertain responses, it seems unreasonable to convert the qualitative preferences into direct estimates. AHP method which requires the selection of the values in pairwise comparison might not be sufficient. The uncertainty should be also considered in some of the pairwise comparisons. The fuzzy linguistic approach might account for the optimism or pessimism tendencies, because the fuzzy linguistic methods are preferred to be used to measure the utility. As a result, in the pairwise comparison environment, fuzzy AHP is prioritized over the traditional AHP method (Yu, 1990,2002).

Using FAHP to weight the criteria

To calculate the weights of the barriers for implementing value added tax, fuzzy analytic hierarchy process is used. Six main steps should be taken in practice:

1. Create the analytic hierarchy process from the decision factors. Each decision maker is asked to describe the relative importance of each pair of decisions at one level in terms of a nine-point scale. The scores of pairwise comparison are collected and the pairwise comparison matrixes are formed for*k* decision makers.
2. Consistency analysis: The priorities of the factors are compared by calculating the values and eigenvectors.

$$A.w = \lambda_{\max}.w$$

Where in;

W is the eigenvector related to matrix A and the consistency index of the matrix is defined to make sure of the judgments in a pairwise comparison. The consistency index (CI) and consistency ratio (CR) are defined as below:

$$CI = \frac{\lambda_{\max} - n}{N - 1}$$

$$CR = \frac{CI}{RI}$$

Where in,

n is the number of the compared items of the matrix and RI is the random index. Saati proposed that the upper bounds of CR for 3×3 matrix is 0.05; and 0.08 for 4×4 matrix and 0.1 for the

larger matrixes. If the consistency is rejected, the decision maker should correct the primary values of the comparison matrix.

3. Create the positive fuzzy matrixes. The scores of the pairwise comparison are converted into linguistic terms represented by positive fuzzy triangular numbers. These values are shown in table 2.

Table2. Random Index

15	14	13	12	11	10	9	8	7	6	5	4	3	N
1/59	1/57	1/56	1/48	1/51	1/19	1/45	1/41	1/32	1/24	1/12	0/90	0/58	Ri

Source: Saaty, T. L. (1994), "How to make a decision: the analytic hierarchy process", Interfaces, Vol. 24, No.6, pp. 19–43.

Table3. Triangular fuzzy numbers

Linguistic variable	Positive triangular fuzzy numbers	Inverse positive triangular fuzzy numbers
Extreme importance	(9و9و9)	(1/9و1/9و1/9)
Moderate importance	(7و8و9)	(1/9و1/8و1/7)
	(6و7و8)	(1/8و1/7و1/6)
Very strong importance	(5و6و7)	(1/7و1/6و1/5)
	(4و5و6)	(1/6و1/5و1/4)
Moderate importance	(3و4و5)	(1/5و1/4و1/3)
	(2و3و4)	(1/4و1/3و1/2)
Strong importance	(1و2و3)	(1/3و1/2و1)
Moderate importance	(1و1و1)	(1و1و1)
Relative importance		
Moderate importance		
Equal importance		

Source: Saaty, T. L. (1994), "How to make a decision: the analytic hierarchy process", Interfaces, Vol. 24, No.6, pp. 19–43.

The positive fuzzy matrix is defined as follows:

$$\tilde{R}^K = \left[\tilde{r}_{ij}\right]^k$$

$\tilde{R}^K$: The positive matrix belongs to k decision maker.
$\tilde{r}_{ij}$: The relative importance between i and j.

$$\forall i = j \ , \quad \tilde{r}_{ij} = \frac{1}{\tilde{r}_{ij}} \ , \qquad \forall_{i,j} = 1,2,....,n$$

4. The fuzzy weights of the decision criteria are calculated by Lambda-Max.

Use α-cut. To achieve $\widetilde{R}_b^k = (\widetilde{r}_{ij})_b^k$, the positive matrix of the decision maker of $\alpha = 1, k$ should be selected. The positive upper and lower bounds matrixes related to the decision maker $\alpha = 0$ should be selected. Based on the matrix, the weight is calculated and then compute AHP of the weight matrix.

$$W_c^k = (w_i)_c^k \quad , \; I = 1,2,3,....,n$$

$$W_b^k = (w_i)_b^k \quad , \quad W_a^k = (w_i)_a^k$$

To minimize the fuzziness (vagueness), two constant values of M_a^k and M_c^k are selected as follows:

$$M_a^k = \min\left\{\frac{W_{ib}^k}{W_{ia}^k}\middle| 1 \le i \le n\right.$$

$$M_c^k = \min\left\{\frac{W_{ib}^k}{W_{ic}^k}\middle| 1 \le i \le n\right.$$

The upper and lower bounds are defined as below:

$$w_{ia}^{*k} = M_a^k . w_{ia}^k$$
$$w_{ic}^{*k} = M_a^k . w_{ic}^k$$

The matrixes of the upper and lower bounds are defined below:

$$w_a^{*k} = (W_i^*)_a^k \qquad i = 1,2,....,n$$
$$w_c^{*k} = (W_i^*)_c^k \qquad i = 1,2,....,n$$

By combining w_b^k, w_a^{*k} and w_c^{*k} m the fuzzy weight matrix can be calculated for k decision maker and is defined as $w_i^k = (w_{ia}^{*k}, w_{ib}^{*k}, w_{ic}^{*k})$ and $i = 1,2,....,n$.

5. The opinions of the decision makers are combined. Using geometric mean, the fuzzy weights are combined:

$$\overline{\widetilde{W}}_i = \left(\prod_{k=1}^{k}\right)^{\frac{1}{k}} \quad , \quad \forall k = 1,2,...,k$$

$\overline{\widetilde{W}}_i$: The combined fuzzy weights of k decision maker is the number of the decision maker.

$\overline{\widetilde{W}}_i^k$: The fuzzy weights of the decision criteria from k decision maker.

6. Use the final classification. Based on the equation developed by Wong et al (2006) a close coefficient is defined for the classification of the decision criteria:

$$CC_1 = \frac{d - (\tilde{\tilde{W}}_i, 0)}{d^*(\tilde{\tilde{W}}_i, 1) + d^-(\tilde{\tilde{W}}_i, 0)} \quad 0 \le CC_i \le 1 \quad ، \quad i = 1,2,....,n$$

Where in;

CCi is the weight of i decision criteria and $d^-(\tilde{\tilde{W}}_i, 0)$ and $d^*(\tilde{\tilde{W}}_i, 0)$ are the interval between two fuzzy numbers.

$$d^-(\tilde{\tilde{W}}_i, 0) = \sqrt{\frac{1}{3}[\ (\overline{W}_{ia} - 0)^2 + (\overline{W}_{ib} - 0)^2 + (\overline{W}_{ic} - 0)^2\ ]}$$

$$d^*(\tilde{\tilde{W}}_i, 0) = \sqrt{\frac{1}{3}[\ (\overline{W}_{ic} - 0)^2 + (\overline{W}_{ib} - 0)^2 + (\overline{W}_{ic} - 0)^2\ ]}$$

The weights of the barriers are determined and judged by the experts. Based on their weights, the barriers of implementing value added tax are identified. By collecting the opinions of the experts through a questionnaire, the pairwise comparisons of the decision criteria are made and the weights of the barriers for implementing value added tax are calculated based on FAHP (table4).

Table4. Fuzzy weights and final ranking of the main dimensions

Dimension	محاسبه درجه بزرگتر بودن هر یک از عناصر بر عناصر دیگر							Selecting minimum	Fuzzy weight
$=S_1$ managerial	s1>s2	s1>s3	s1>s4	s1>s5	s1>s6	s1>s7	s1>s8	0.237	0.051
	0.886	3220.	1	2470.	7240.	0.237	6020.		
cultural $=S_2$	s2>s1	s2>s3	s2>s4	s2>s5	s2>s6	s2>s7	s2>s8	0.323	0.070
	1	0.413	1	0.336	0.838	0.323	0.302		
$=S_3$ Organization	s3>s1	s3>s2	s3>s4	s3>s5	s3>s6	s3>s7	s3>s8	0.912	0.199
	1	1	1	0.938	1	0.912	1		
expert $=S_4$	s4/s1	s4>s2	s4>s3	s4>s5	s4>s6	s4>s7	s4>s8	0	0
	0.318	0.232	0	0	0.007	0	0		
expert $=S_5$	s5>s1	s5>s2	s5>s3	s5>s4	s5>s6	s5>s7	s5>s8	0.972	0.212
	1	1	1	1	1	0.973	1		
$=S_6$ Technical-technological	s6>s1	s6/s2	s6/s3	s6/s4	s6>s5	s6>s7	s6>s8	0.491	0.107
	1	1	0.582	1	0.509	0.491	0.869		
user $=S_7$	s7>s1	s7>s2	s7>s3	s7>s4	s7>s5	s7>s6	s7>s8	1	0.218
	1	1	1	1	1	1	1		
$=S_8$ Software	s8>s1	s8>s2	s8>s3	s8>s4	s8>s5	s8>s6	s8>s7	0.631	0.138
	1	1	0.721	1	0.652	1	0.631		

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Conclusion and Discussion

Using fuzzy Delphi and opinions of the experts, the factors affecting on the successful implementation of ERP are identified:

The managerial factors (financial support of top executives, delegation of authorities by the top executives, performance evaluation, planning, strategic thinking and leadership ability), the cultural factors (teamwork and participative culture and culture of adapting to changes), the organizational factors (firm performance background, reputation and credit of the firm among the customers and the predictive ability and planning capacity), technical-technological factors (the presence of the needed hardware and fundamentals), economic factors (implementation costs, technical support costs, consultant costs and hardware costs), enforcement costs (experience and working background, technical knowledge, the capacity of providing consulting services before enforcement), user factors (commitment, the training level, the working spirit of the user in using software and participation of the user) and software factor (supporting farsi language, defining the system information. General efficiency level, availability, ability to be remembered, preventing error and security).

To rank the factors affecting on this step, the opinions of the top executives of tile industry are collected and the weights are determined by using FAHP and pairwise comparison matrix. The results are shown in the table below.

Table5. Weight and ranking of the managerial dimensions

Final matrix	Normalized weight	Rank
Financial support of top management	10.30	2
The delegation of top management	0.231	3
Performance evaluation	**60.31**	**1**
Planning and strategic thinking	0	5
Leadership ability	0.152	4

Table6. Weight and ranking of the cultural dimensions

Final matrix	Normalized weight	Rank
Teamwork and participative culture	0.240278	2
Adapting to changes	**0.759722**	**1**

Table7. Weight and ranking of the organizational dimensions

Final matrix	Normalized weight	Rank
Implementation costs	**0.564573**	**1**
Support costs	0	3
Consulting costs	0.435427	2

Table8. Weight and ranking of the technological dimensions

Final matrix	Normalized weight	Rank
Presence of the needed harwares	**1**	**1**
Presence of the needed fundamentals	0	2

Table9. Weight and ranking of the economic dimensions

Final matrix	Normalized weight	Rank
Implementation costs	0.32189	2
Support cost	0.10086	4
Consultant cost	**0.39471**	**1**
Hardware cost	0.18254	3

Table10. Weight and ranking of the expert dimensions

Final matrix	Normalized weights	Rank
Working experience and background	0.062021564	4
Technical knowledge	**0.364621325**	**1**
Ability to provide after sales services	0.273728443	3
Ability to provide consulting services before implementation	0.299628668	2

Table11. Weight and ranking of the user dimensions

Final matrix	Normalized weights	Rank
Commitment of the user	0.43255	2
Relative training	0	3
Having working spirit	0	3
User participation	**0.56745**	**1**

Table12. Weight and ranking of the software dimensions

Final matrix	Normalized weight	Rank
Supporting Farsi language	**0.232589**	**1**
Definition of the information system	0.166935	4
General efficiency level	0.040628	7
Availability	0.183197	2
Application	0.047573	6
Ability to be remembered	0.184264	3
Preventing error	0.144813	5
Security	0	8

The above tables represent the weights and the rankings calculated finally: the first and the most important index is highlighted. The other items are identified based on their priorities. In terms of the software element, for example, the most significant element is found to be supporting from Farsi language and the remaining items are sorted as below:
Definition of the information system, general efficiency level, availability, ability to be remembered, preventing error and security).
2. Availability
3. Ability to be remembered
4. Defining the system information
5. Preventing error
6.Application
7.General efficiency level
8. Security

Then, it can be concluded that the security has the least significance among the other items.
The table below shows the weights and rankings of the eight identified indexes by Fuzzy Delphi approach. The table below reveals that the user is known as the most important factor and the remaining items are shown in terms of their priority.

Table13. Weight and ranking of general dimensions

Final matrix	Normalized weight	Rank
Managerial	0.052	7
Cultural	0.071	6
Organizational	0.2	3
Economical	0	8
Expert	0.213	2
Technical-technological	0.108	5
User	**0.219**	**1**
Software	0.138	4

Applicable Suggestions

The conclusions of this study indicate that the identified factors of successful implementation of enterprise resource planning are managerial, cultural, organizational, technical-technological, expert, user and software. It must be mentioned that the user is the most important index and the expert and organizational factors are classified as the second and the third significant factors, respectively.

Therefore, the managers are suggested to pay more attention to those factors which are identified to be significant in the successful implementation of ERP. These factors help enterprises in becoming successful and implement ERP software in its optimal manner. By doing so, better services will be provided to the customers. The other significant point is that regardless of the expectations of the researcher and the managers, the economic index and the consultant costs have the highest degree of significance. This is known as a significant point in implementing this system because many enterprises confront with financial and budgetary challenges. The managers of tile and ceramic industry of Yazd are offered to consider these items and the subsidiary indexes for the successful implementation of ERP systems.

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