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An Assessment of Readiness Factors for Implementing ERP Based on Agility (Extension of Mckinsey 7s Model)

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Abstract

Studies conducted by many researchers indicate high failure rate of projects of implementing ERP systems. Furthermore, organizations should be agile to be able to respond to market changes fast and effectively to survive in competitive environment. ERP and agility are two important tools for achieving competitive advantages. The main goal of the present study was to identify and prioritize organizational readiness factors for implementing ERP based on organizational agility. In this study, along with extension of McKinsey 7S model (strategy, structure, systems, skills, style, staff, shared values) to 9S (7S+ self-evaluation and supportive factors) model, agility criteria were weighted and rated using group AHP with fuzzy logic approach; so that accountability, speed and flexibility have obtained the maximum score. The nine organizational readiness factors were ranked using integrated FAHP and TOPSIS method based on five criteria of agility. The framework was proposed to a real case of Shiraz distribution cooperative firms. Results showed that among the nine organizational dimensions based on agility, the two added to McKinsey dimensions (self-evaluation and supportive factors) are ranked in the first and fourth places. The proposed framework help the enterprises "to implement ERP system with agility approach" concentrate on change management and develop strategies based on their own priority.

Keywords: Organizational readiness, ERP, organizational agility, McKinsey model

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Introduction

Business environment has been increasingly complicated and market medium has shifted from domestic markets to global ones. Management under constant pressure results in improved competition through decreasing performance costs and promoting supplies. Organization should be, therefore, more responsive to costumers and competition. Globalization, technology and encountering uncertainty in all sections empower the organization to adapt with unexpected changes to achieve and retain competitive advantages. The idea of adapting to unexpected changes has resulted in the evolution of agility concept (Ganguly et al., 2009). Achieving agility requires responding in aspects such as strategies, technologies, behavioral individuals and managers' perspectives, and commercial processes. Therefore, all organizational sections need agility support for responding to market changes (MollaHosseini and Mostafavi, 2007).

Moreover, large global organizations seek for high flexibility and agility to solve the problems and have attempted to approach to organizational systems to meet internal and external changes in their business. Advent of Enterprise Resources Planning (ERP) was one the most impressive technological innovation during recent decade. The main goal in performing an ERP system is to integrate business processes and operations for improving organization business. However, all the enterprises have not been successful in executing ERP. Lay out projects of ERP systems are very complicated and one of the first steps to implement such systems is to assess organization readiness for implementing ERP systems. Framework proposed for evaluation of system implementing readiness in this research is based on McKinsey model. In this model, various organizational dimensions are identified and modeled in the context of seven major dimensions (Hanafizadeh et al., 2010).

In the present study, along with developing McKinsey 7S model, the nine dimensions of the organization are prioritized based on five agility factors throughout perspective of managers in Iran. Organizational readiness factors for establishing ERP and also agility criteria are identified via literature review. Then, integrated fuzzy AHP and TOPSIS model is used to evaluate and degree the organizational readiness factors based on agility criteria.

Factors and models for organizational readiness assessment

Organizational readiness assessment is a method by using of which, different dimensions of the organization is assessed and readiness of each organizational section for adopting ERP system is evaluated. Since implementing ERP system is a large key project in organizations, it is necessary to use this tool to assess organizational readiness to implement ERP system. In this method organizational readiness to implement ERP system is determined using managerial and organizational, human force, structural, process, technical, infrastructural and cultural dimensions. Using outputs of this tool, it

is impossible to identify the defects and limitations for implementing the system and set the plan to address those (Hanafizadeh et al., 2010).

Organizational readiness factors

Saremi et al., (2007) classified organizational readiness factors for ERP implementation in to five categories:

1. Cultural factor: presence of team working culture within the organization, capacity for changing, personnel participation in ERP project and active presence of the project pioneers

2. Organizational power factor: organizational ability to devote suitable and permanent finance for ERP implementation, organization ability in exploiting appropriate consultation, ability to predict and plan to address probable errors and organization ability in holding sufficient and appropriate education

3. Supportive factor: supporting from top management, delegating decision making power to ERP project forces and pioneers and efficient change management

4. Motivational factor: organization feeling in being present in competitive market and organization total knowledge about ERP system

5. Information technology (IT) infrastructure factor: presence of IT engineers in organization, presence of appropriate hardware and communication infrastructures in organization, reviewing and reengineering the processes and avoiding over-customization of ERP

Model proposed

Razmi et al., (2009) in this study, after evaluating success key factors presented in literature of ERP systems, 15 factors were selected categorized in to five general groups as project, scope and goals, systems and processes, culture and structure, and human resource. The model assesses organizational readiness in three dimensions including organizational readiness, project management readiness and change management readiness. The model was finally applied in an industry and readiness of the organization was assessed regarding implementation of ERP systems.

BEST model

BEST is a framework initiated in the context of a project by European FP in 2002. The goal of this project is to understand dynamics of implementation of IT projects and to help improve organizational readiness. The framework identifies technical, human and organizational aspects playing considerable role in the processes. In the BEST framework, the processes are called dimensions and include business processes, project management processes and organizational IT processes. Moreover, there are six organizational aspects namely strategies and goals, structure, processes, knowledge and skills and social dynamics. Therefore an 18-cell matrix (3 dimensions × 6 dimensions) is proposed (Hanafizadeh and Zare ravasan, 2011).

Disosia and Nanayakkara's model

The model developed by Disosia and Nanayakkara in 2006; is another model which, after identifying success key factors, risk factors and ERP implementation traps, proposed 37 factors as the key readiness factors for successful implementation of ERP system. Finally an ERP readiness assessment model with four major technological, human, informational and organizational dimensions was proposed (Hanafizadeh et al. 2010).

McKinsey 7S model

The model was developed based on seven dimensions (strategy, structure, systems, skills, style of management, staff, and shared values) which all are initiated by S letter. These seven dimensions are accompanied by 23 factors, they are: project champion, common understandings, organization-wide commitment to project, centralization, specification, formalization, size of organization, role of IT in organizations, vision and mission, objectives, strategic plan of IT, legacy systems and infrastructure of IT, business process systems, available data and information, the attitude of senior management, organizational commitment, organizational culture, human resource management, project team, education, senior management skills, users skills, personnel skills of IT (Hanafizadeh and Zare ravasan, 2011).

Organizational readiness factors Nazemi and Naderi model (Nazemi and Naderi darreshoori, 2012) - they proposed three factors as organizational readiness factors:

1. Strategic factors: Employees' visions, organizational culture, change management . . .

2. Tactical factors: education for change management, performance . . .

3. Operational factors: ERP infrastructure, employees' participation rate, internal and external experts . . .

Proposed 9S model (extended McKinsey model) - Based on literature review, two dimensions namely supportive factors (Rahmati, 2010; Nasir and Sahibuddin, 2011; Alaskari et al., 2013; Saleh et al., 2013), and self-evaluation (Hauswald et al., 2011; Pinheiro et al., 2013; Boehm et al., 2013; Hidayanto et al., 2013; González-Villar et al., 2014), were identified as major dimensions of ERP, by which McKinsey 7s model is proposed as 9S model (Table 1).

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Table 1 Dimensions of the 9 organizational readinesses for ERP implementation

Dimensions of McKinsey	Factors	Resources
Shared values	• Project champion • common understandings • organization-wide commitment to project	Amoako-Gyampah & Salam, 2004; Somers & elson, 2004; Yusuf et al., 2004; Zhang et al., 2005; Law & Ngai, 2007.
Structure	• centralization • specification • formalization • size of organization • role of IT in organizations	Buonanno et al., 2005; Laukkanen et al., 2005; Lee & Xia, 2006;Nah & Delgado, 2006; Remus, 2007; DellaVechia et al., 2007; Leidner & Mackay, 2007; Chien et al., 2007; Rai et al., 2008; Preston et al., 2008; Chun & Mooney, 2009.
Strategy	• vision and mission • objectives • strategic plan of IT	Nah & Delgado, 2006; Oh & Pinsonneault , 2007; Law & Ngai, 2007; Soja, 2008; Ngai et al., 2008; Razmi et al., 2009.
Systems	• legacy systems and infrastructure of IT • business process systems • available data and information	Somers & Nelson, 2004; Ho & Lin, 2004; Yusuf et al., 2004; Motwaniet al., 2005; Ward et al., 2005; Zhanget al., 2005; Vervilleet al., 2005; Peslak, 2006; Soja, 2006; Finney&Corbett, 2007; Yang et al., 2007; Chuang & Shaw, 2008; Ngai et al., 2008.
Style	• The attitude of senior management • Organizational communication • Organizational Culture	Bozarth, 2006; Peslak, 2006; Achanga et al., 2006; Soja, 2006; Al Mudimigh, 2007; Law & Ngai, 2007; Remus, 2007;Finney & Corbett, 2007; Häkkinen & Hilmola, 2008; Ke& Wei, 2008; Chuang & Shaw, 2008; Xu& Ma, 2008;El Sawah et al., 2008; Snider et al., 2009; Karsak & Özogul, 2009; Hanafizadeh et al., 2010.
Staff	• human resource management • project team • education	Kim et al., 2005; Metaxiotis et al., 2005; Verville et al., 2005;Bozarth, 2006; Peslak2006; Soja, 2006; Achanga et al., 2006; Finney & Corbett, 2007; Häkkinen &Hilmola, 2008; Ngai et al., 2008; Xu & Ma, 2008.
Skills	• senior management skills • users skills • personnel skills of IT	Duplaga & Astani, 2003; Lee & Lee, 2004; Razmi et al., 2009.
Supportive factors	• senior managers • middle and key managers • budget	Finney & Corbett, 2007; Dezdar et al., 2009; Rahmati, 2010; Nasir & Sahibuddin, 2011; Alaskari et al., 2013; Saleh et al., 2013.
Self-assessment	• assessment process • participation process • devolution authority • effective communication	Hauswald et al.2011; Pinheiro et al.2013; Boehm et al.2013; Hidayanto et al.2013; González-Villar et al.2014.

The main objective is extension of McKinsey model from 7S to 9S under managers' judgment. The conceptual model is presented in Figure 1.
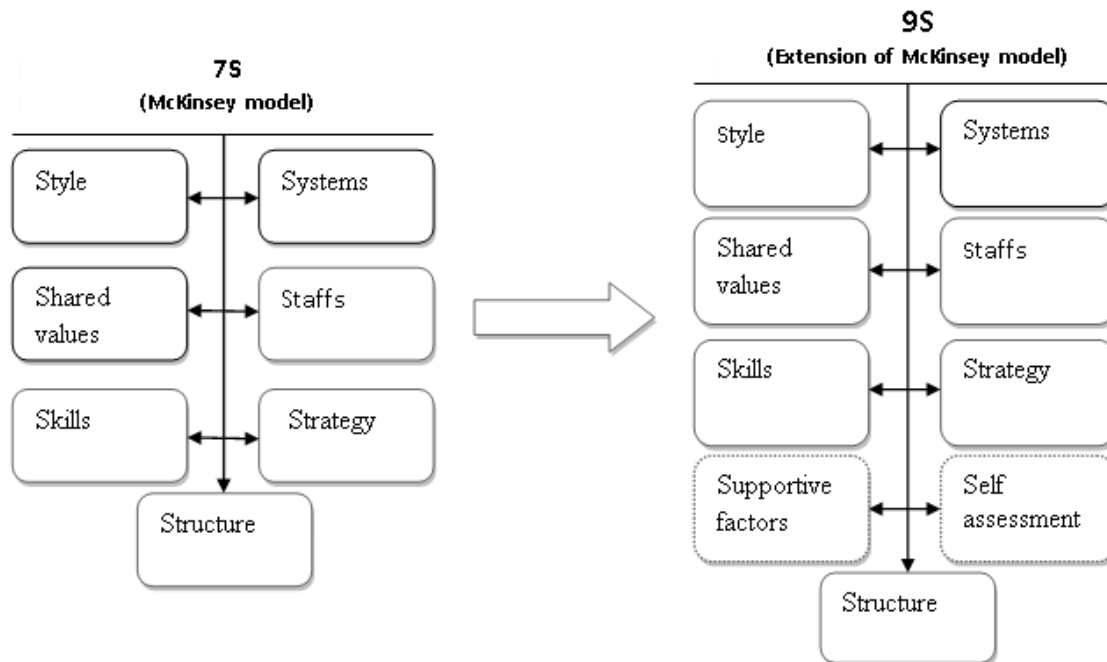
Figure 1 A conceptual model of this research

Organizational agility and its criteria

Meaning of agile word in dictionary is quick, fast and active motion; and agility means ability to move easily and fast (Ganguly et al., 2009), and to think fast and in a wise manner. In today environment, each organization needs to be able to produce different products with short life, redesign products, to change production methods and to respond efficiently to be called an "agile organization" (Pan and Nagi, 2010). In a more comprehensive saying, agility can be defined as the result of awareness to changes, in a comprehensive manner (recognizing opportunities and challenges) both in internal and external environments with a qualified ability in exploiting the resources to respond flexibly to changes in suitable time in such a way that the organization can afford (Braunscheidel and Suresh, 2009). Similarly, some authors (Swafford et al, 2006; Lin et al, 2006a; Lin et al, 2006b), proposed these items as agility capabilities: responsibility, competency, flexibility, speed.

By means of literature review and holding mind storm sessions, Agarwal et al proposed fifteen variables for agility. The variables include: sensitivity to market, speed, data accuracy, introducing new products, collaborative planning, process integration, applying technological tools, reducing delay time, improved service level, minimizing the cost, costumers' satisfaction, quality improvement, minimizing uncertainty, extending reliability and reducing resistance to change (Agarwal et al., 2007). The main criteria for agility assessment include responsibility and flexibility.

An agile organization is more concerned about changes and uncertainty and unpredictable nature of business environment and tries to represent proper reaction to

these conditions. The agile organization, therefore, needs potential capacities and adaptation to meet these changes and uncertainties in business environment. These capacities include five main elements. Based on this, agility properties are elements forming basic structure of an agile organization (Ren et al., 2003). Agility properties have been widely investigated in literature of this research (Table 2).

Table 2 Agility attributes used as criteria in this research

Agility attributes	Resources
Accountability	Mathiyakalan et al., 2005; Lin et al., 2006a;Lin et al., 2006b; Swafford et al., 2006; Sherehiy et al., 2007; Bottani, 2009; Tseng & Lin 2011;Avazpour et al., 2014.
Competency	Mathiyakalan et al., 2005; Lin et al., 2006a;Lin et al., 2006b; Swafford et al., 2006; Sherehiy et al., 2007; Bottani, 2009; Tseng & Lin, 2011;Avazpour et al., 2014.
Flexibility	Mathiyakalan et al., 2005; Lin et al., 2006a;Lin et al., 2006b; Swafford et al., 2006; Sherehiy et al., 2007; Bottani, 2009; Tseng & Lin, 2011;Avazpour et al., 2014.
Speed	Mathiyakalan et al., 2005; Lin et al., 2006a; Lin et al., 2006b; Swafford et al., 2006; Sherehiy et al., 2007; Bottani, 2009; Tseng & Lin, 2011;Avazpour et al., 2014.
Cost effectiveness	Menor et al., 2001; Tseng & Lin, 2011; Avazpour et al., 2014.

Definition of agility properties as follows:

Accountability: ability to identify the changes and quick respond to them (Sherehiy et al., 2007).

Competency: a wide collection of abilities defined as basis for effectiveness, efficiency and performance of activities of an enterprise (Sherehiy et al., 2007). or includes the ability to efficiently achieve enterprise goals (Lin et al., 2006b).

Flexibility: the ability to process different products and achieve different goals with the same facilities (Sherehiy et al., 2007).

Speed: ability to perform the tasks in the shortest time (Sherehiy et al., 2007).

Cost effectiveness: as a financial index, cost effectiveness represents the only catalyzing factor in conducting agility stimuli (Ganguly et al., 2009).

Enterprises management should be aware of relative importance of this property which forms a competitive basis. Since determining agility weight is a decision making qualitative problem, it involves human judgment ambiguity. In this survey we proposed fuzzy series as a mathematical approach which can clarify ambiguity in decision making regarding determining weight of agility properties.

Methodology

As mentioned above, organizational readiness factors in McKinsey model includes seven items as: structure, systems, strategy, skills, staff, style and shared values. According to literature review and interviewing with experts, two factors including self-evaluation and supportive factors were added to McKinsey model. Moreover, agility criteria – based on literature review were determined as: responsiveness, competency, flexibility, speed, and cost effectiveness. Therefore we want to assessment the extended McKinsey model (9S) based on agility properties. A Flowchart of this study is shown in Figure 2.

Models applied

The main purpose of this research was to identify readiness factors for ERP implementation, to extend McKinsey 7S model, to determine and rate agility criteria, and prioritize the nine factors of ERP implementation using fuzzy hierarchical method and TOPSIS. In addition to reviewing previous literature, exploiting experts' comments was also aimed so questionnaires were distributed among the experts. A questionnaire for pairwise comparison among the criteria and another one for comparing the alternatives based on the criteria were filled by five managers who were expert in IT and quality section of Shiraz cooperative distribution enterprises. Then, data were analyzed by TOPSIS, FAHP and AHP methods using EXCEL, EXPERT CHOICE and TOPSIS Solver soft wares.

TOPSIS model is a powerful decision making method and a technique for prioritization based on similarity to ideal answer. In this method, the adopted choice should have the shortest distance from Ideal solution and the longest distance from the worst solution. This method is especially useful when decision n making should be done with many qualitative and quantitative factors (Remus, 2007).

AHP model Considering rational constrains that each man meets when he is alone, it looks that group collaboration is the only way to achieve a logical, ordered, comprehensive and complete decision. Analytical hierarchy process or AHP is a famous multiple criteria decision making method first developed by Iraqi Thomas L Saaty in 1970's. This method can be used when decision making is encountered with multiple competitive choice and criteria (DellaVechia et al., 2007).

Fuzzy approach proposed by Persian scientist Lotfi zadeh in 1965, in contrast to Aristotle's two-valued logic, accepts ambiguity as a part of system and implies uncertain and ambiguous concepts (Razmi et al., 2009). Fuzzy logic or theory is a kind of logic which replaces conclusion methods in human mind. Fuzzy series are useful for information retrieval, because the series can describe evidence issue. Moreover, since natural language is used instead of numerical variables for description of system performance and behavior in fuzzy logic, the series can be effectively exploited for information retrieval in information banks (Avazpour et al., 2014).
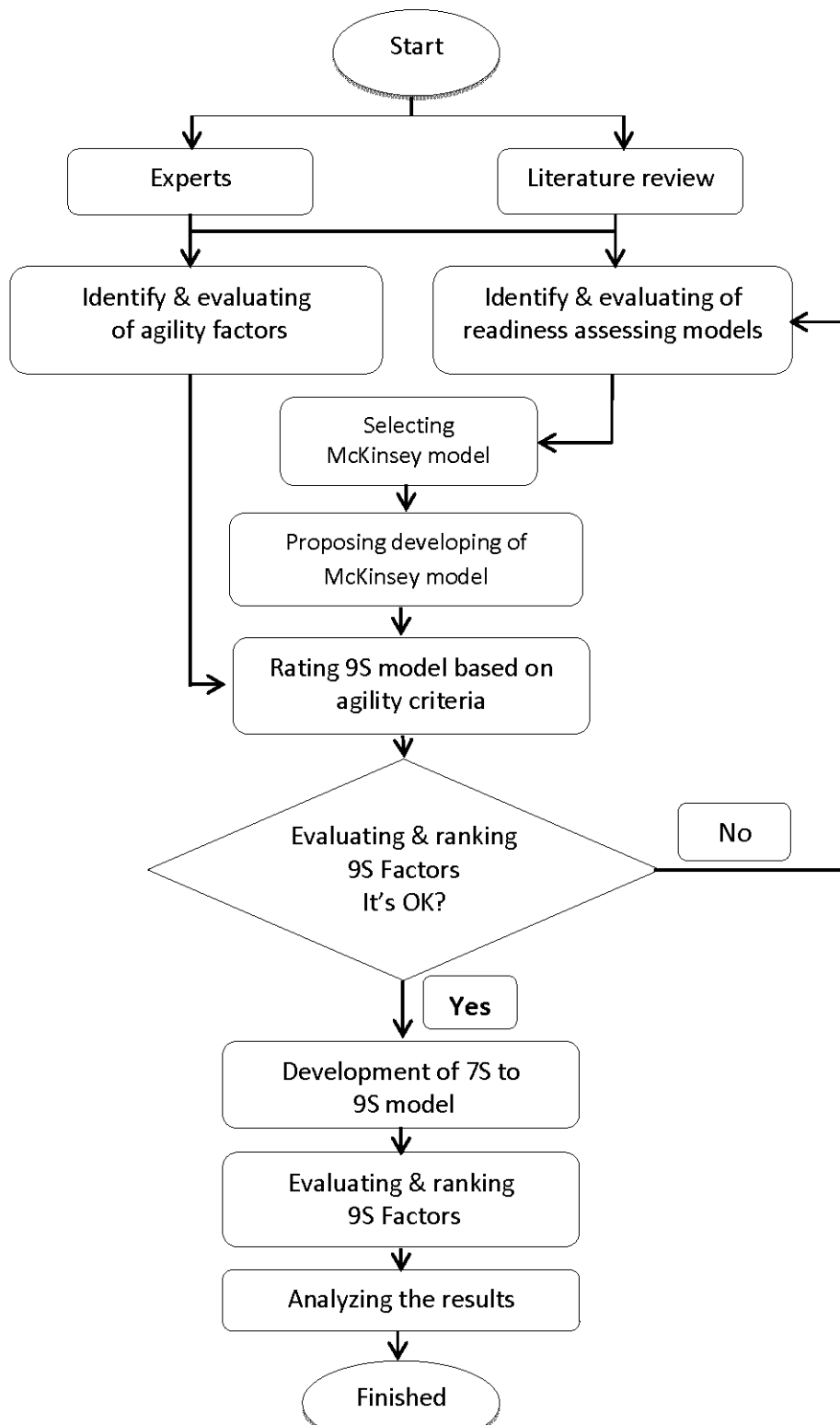
Figure 2 A Flowchart of this study

Calculation steps

Determining inconsistency rate

Compatibility rate is used to ensure closeness of experts' judgment in scoring. In this step, the five criteria of the investigation are compared pairwise. Since compatibility rate was calculated lower than 0.1 (IR=0.06) <0.1; it is concluded that experts' judgment in scoring is close and has high validity.

Calculating criteria weights using fuzzy hierarchical analysis

In this step, data resulted from judgment of five expert managers in scoring the five criteria (by pairwise comparison) are calculated based on fuzzy triangular model (Figure 3).
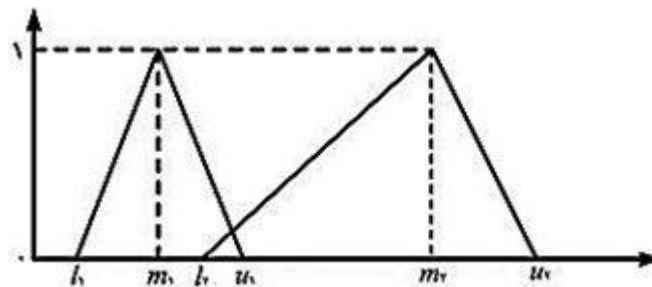

Figure 3 Triangular numbers M1 and M2

Their arithmetic operators are defined as relations (1), (2) and (3):

After performing the calculations, results of criteria weights based on fuzzy are presented in Table 3.

Table 3 Weights of criteria based on the results obtained from fuzzy hierarchical analysis

Criterion	Accountability	Competency	Flexibility	Speed	Cost effective
W_i	0.27	0.09	0.21	0.25	0.18

Prioritizing organizational readiness factors (9S) using integrated TOPSIS and FAHP

Table 4 shows scoring of nine factors affecting organizational readiness based on five criteria for implementing ERP. This scoring has been performed by five experts.

Table 4 Rating nine alternatives based on five criteria by five experts

9 S factors of organizational readiness	Agility attributes				
	Accountability	Competency	Flexibility	Speed	Cost effective
Style	(1,2,1,3,2)	(3,4,2,3,3)	(5,5,7,5,5)	(2,1,3,2,3)	(5,4,8,5,3)
Shared values	(4,3,4,3,3)	(4,4,4,3,5)	(4,5,4,3,7)	(3,2,2,2,3)	(5,5,5,3,7)
skills	(3,2,3,2,3)	(4,5,4,4,3)	(5,4,8,5,3)	(5,4,5,2,3)	(1,1,2,2,5)
Supporting factors	(5, 5,5,4,9)	(5,4,5,3,7)	(3,3,3,2,5)	(5,4,4,2,9)	(3,2,3,2,3)
systems	(3,5,3,4,3)	(4,5,4,3,7)	(5,5,5,2,5)	(3,5,4,2,3)	(5,5,7,5,5)
staffs	(3,3,2,2,5)	(5,5,5,2,3)	(5,5,5,4,3)	(3,2,4,3,3)	(1,1,2,2,5)
strategy	(4,5,4,4,7)	(4,4,4,3,3)	(2,3,2,2,3)	(3,2,2,2,7)	(5,5,5,2,3)
structure	(1,2,1,2,3)	(3,4,3,2,7)	(5,5,5,3,7)	(3,3,3,2,3)	(3,2,3,2,3)
Self-assessment	(5,1,5,2,7)	(5,3,5,3,3)	(3,2,2,2,3)	(4,4,5,2,7)	(5,5,5,2,3)

After that, with calculating five steps as follows: Geometric mean of rating matrix of nine alternatives based on five criteria; Normalized matrix of scoring nine alternatives based on five criteria; Schematic presentation of weighted matrix multiplied by normalized matrix; Product of multiplication of normalized matrix by weighted matrix; Positive and negative ideal items of each items in the column.

After determining positive and negative ideal solutions, distance of each n-dimension item is assessed using Euclidean method, meaning that distance of solution i from positive and negative ideal solutions (di- and di+) is estimated. Then closeness to ideal solution (CLi) is calculated. The results are presented in Table 5

Table 5 Results of calculating positive and negative ideal items and closeness to ideal solution

d1+	0.01146135	d1_	0.005965	CL1	0.342298
d2+	0.00752762	d2_	0.006962	CL2	0.480482
d3+	0.00915421	d3_	0.005883	CL3	0.391229
d4+	0.00517733	d4_	0.011519	CL4	0.689912
d5+	0.00578878	d5_	0.008232	CL5	0.587129
d6+	0.0089446	d6_	0.004823	CL6	0.350315
d7+	0.00655826	d7_	0.008566	CL7	0.566375
d8+	0.01127547	d8_	0.004133	CL8	0.268229
d9+	0.00736521	d9_	0.007417	CL9	0.501752

Prioritizing of nine factors of organizational readiness is presented in Table 6.

Table 6 Final ranking of nine organizational readiness factors using integrated method

9S factors of organizational readiness		rank
Style	A1	8
Shared values	A2	5
Skills	A3	6
Supporting factors	A4	1
Systems	A5	2
Staffs	A6	7
Strategy	A7	3
Structure	A8	9
Self-assessment	A9	4

As can be seen from Table 6, supportive factors, systems and strategy were rated the first, second and third places. The lowest rate belongs to style, staff and structure; and self-evaluation, shared values and skills are rated in median places.

Conclusion

The present study was carried out to identify and rank organizational readiness factors for implementing ERP based on agility and by extending McKinsey 7S model approach. So in this research by reviewing organizational readiness models (Razmi model, BEST model, Sosia and Nanayakkara model and McKinsey 7S model) (Razmi et al., 2009; Hanafizadeh and Ravasan, 2011), organizational readiness dimensions for

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implementing ERP were analyzed and finally it was revealed that McKinsey 7S model is more comprehensive and complete. According to literature review from other references (rather than aforementioned models), it seemed that self-evaluation(Hauswald et al., 2011; Pinheiro et al., 2013; Boehm et al., 2013; Hidayanto et al., 2013; González-Villar et al., 2014), and supportive factors(Finney and Corbett, 2007; Dezdar and Sulaiman, 2009; Rahmati, 2010; Nasir and Sahibuddin, 2011; Alaskari et al., 2013; Saleh et al., 2013), are important factors that can play role in extending McKinsey 7S model. Therefore, 9S model was used in next steps. Furthermore, by evaluating agility and its criteria, five criteria as responsibility, flexibility, competency, speed and cost effectiveness were identified as the main criteria of agility(Menor et al., 2001; Mathiyakalan et al., 2005; Lin, et al., 2006a; Lin, et al., 2006b; Swafford et al., 2006; Sherehiy et al., 2007; Bottani, 2009; Tseng and Lin, 2011; Avazpour et al., 2014).

Therefore, the nine organizational readiness factors (McKinsey extended model) were considered as alternatives and five factors of organizational agility were considered as criteria. In this study, criteria (based on pairwise comparisons) and alternatives (based on 5 criteria) were rated by five expert managers. By calculating compatibility rate (0.06<0.1), weight of each criterion was determined by fuzzy AHP approach. Then, by including weight coefficients of criteria in alternatives scores, organizational readiness factors (as alternatives) were prioritized using TOPSIS technique.

Results obtained in this study indicate that the highest weight belongs to responsibility and the lowest weight belongs to competency. Moreover, in alternatives ranking, supportive and self-evaluation factors (added to McKinsey model) are ranked the first and fourth places. Therefore it can be claimed that McKinsey 7S model can be extended to 9S model, throughout perspective of Iranian managers. It is a unique research. So far in the field of ERP, only its key factors have been rated by researchers but it was for the first time that organizational readiness factors were prioritized. The results achieved in this research can be used as reference and guideline by researchers and industrialists.

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