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A combined hybrid fuzzy multiple criteria decision-making approach to evaluating of QM critical success factors in SME's Hotels Firms

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Abstract

The purpose of this study is to evaluate the importance of QM CSFs in Iranian SME's hotels firms. Primary criteria to evaluate QM CSFs are achieved by the literature survey. Through the FDM by industries and academia experts the importance CSFs were categorized in three main factors and 16 sub-factors. Two fuzzy MCDM methods are applied; fuzzy AHP and TOPSIS. The finding of this study indicated that human factors had the first rank from three perspectives and leadership as a sub-factor was the first rank from 16 sub-factors.

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Keywords: fuzzy Analytic Hierarchy Process, Fuzzy Delphi Method, TOPSIS, SME's hotels firms, quality management (QM)

1. Introduction

In the past 50 years, quality management (QM) has been broadly adopted by many firms (Sousa & Voss, 2008). At first, QM was developed in Japan; it was originated from the work of the quality gurus, Juran, Deming, Crosby, Feigenbaum, and Ishikawa and on the rise of the automobile industry of Japan in the world. During two and three decades ago, QM, seen as a revolution in management, began to exert its effects on national business systems. The

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literature often refers to QM as a social movement (Hackman & Wageman, 1995), an inclusive way for improvement of total organizational quality and performance, and a novel standard in management (Spencer, 1994). TQM has been analyzed in respect to both service and manufacturing firms; however there are fewer studies devoted to the service firms specifically (Gustafsson, Nilsson, & Johnson, 2003). QM has been increasingly identified as the key issue in differentiating service products and building competitive advantage in tourism (Koc, 2006). Some of studies in hotel and hospitality industry have investigated the role of QM by presenting the various CSFs, but there is a lack of comprehensive knowledge in hotel and hospitality industry due to the importance of QM issue which did not provide the comprehensive list of QM CSFs. Therefore this study provides the comprehensive list of QM factors based on literature. Moreover, although previous scholars in relationship on QM and hospitality industry have examined different sets of QM CSFs in their studies, but there is also lack of these studies which did not category those CSFs and one should also consider the situations and needs of hospitality industry when developing CSFs for them. However, most researchers that focus on CSFs for successful QM programs can be traced to developed countries, with but a few in developing countries (Mensah, Copuroglu, & Fening, 2012). Although QM is widely used in different industries in Iran (Askarian, Heidarpoor, & Assadian, 2010), there is little evidence that it can improve the overall quality of specific industries such as tourism and hospitality, as each industry has different features. The current study presents a review of the literature on QM and tries to identify, evaluate and prioritizing various quality management CSFs in the hospitality industry such as Iran. According to Wu (2012), the purpose of the significance of CSFs is a kind of qualitative decision-making problem and it is unavoidably included the imprecision of human decisions. Consequently, in relations to the sector of critical factor, it is enhanced to apply a kind of striking approach that may contract through the indistinct valuation of human and a kind of model aimed at providing the CSFs. As considered by (Nonaka, 1994), a mathematical method that can handle vagueness in the process of decision-making is the fuzzy set theory. This study mainly involves quantitative and qualitative measures that are presented by TFNs and defuzzified into a crisp value in order to analyze the cause and effect decision-making model. This research aims at investigating, ranking, and classifying the most important QM CSFs in SMEs hotel firms. Note that, in decision-making process, often human judgment is not clear and it cannot be easily estimated by exact numerical values. For that reason, fuzzy logic is required to handle the problems that are vague and/or imprecise. In the present study, a framework is proposed based on Fuzzy Delphi Method (FDM) and fuzzy multi-criteria decision-making (FMCDM) such as fuzzy AHP (FAHP) and TOPSIS.

2. Review on QM CSFs

Some studies have investigated the importance of QM CSFs (Hoang, Igel, & Laosirihongthong, 2010; Kaynak, 2003; Kull & Wacker, 2010; Lam, Lee, Ooi, & Lin, 2011; Leavengood, Anderson, & Daim, 2012; Mardani, Bagheri, Soltan, & Lari; Mardani et al., 2013; Mardani, Jusoh, Soltan, & Bagheri, 2012; Mardani & Kazemilari, 2012; Martínez-Costa, Choi, Martínez, & Martínez-Lorente, 2009; Ooi, 2014; Phan, Abdallah, & Matsui, 2011; Talib, Rahman, Qureshi, & Siddiqui, 2011; Zu, Robbins, & Fredendall, 2010). A great deal of literature is focused on what is constituted in QM and what CSFs have contribution to success of QM. Various sets of CSFs have been provided and considered as essential factors for the success of QM; however, a common set of CSFs has not been identified for successful implementation of QM in the context of the hospitality industry such hotel industry. This has caused an inconsistency in the previously-conducted studies, which makes it difficult to decide which TQM CSFs should be adopted to achieve the desired results (Ooi, Arumugam, Teh, & Chong, 2008). As a result, according to the objectives of the present study, we select those QM CSFs that are supported by the literature. As a result, these CSFs are considered appropriate to be applied to the Iranian service sectors such as hospitality and hotel.

3. Research Methodology

Some scholars for investigation of their studies have employed the Multiple-criteria decision making (MCDM) and fuzzy method in hotel and hospitality industry (Horng, Liu, Chou, Yin, & Tsai, 2013). In the present study for evaluation of the most important QM CSFs in Iranian SME's hotels firms, researchers have used expert's opinions by FDM. After this stage, the study has employed FAHP for calculating the criteria weight. For the general understanding

of expert's opinions about fuzziness, FDM can help to take the decisions of the group (Izadi, Ranjbarian, Ketabi, & Nassiri-Mofakham, 2013). In the first part of this study, researchers have examined the previous studies and literature of QM CSFs as an objective of study. In the next stage FAHP has been used as evaluation criteria for QM CSFs. Finally, the authors employed a MCDM analytical tool, i.e., TOPSIS to rate and ameliorate the SME's hotels firms and identify the best option.

For the proper understanding of experts' opinions about fuzziness, the fuzzy theory has been used and the evaluation has been done on a more flexible scale. According to the QM literature and previous studies, 27 important factors have been proposed for QM CSFs evaluation in this research study. Fourteen experts participated in this study to consider the importance of the mentioned 27 factors. This study selected the experts from both industrial and academic sectors. Generally, the total numbers of experts extended from three to (Cheng, Lee, & Tang, 2009). Fourteen quality management experts were invited from tourism and hospitality industry who have at least 10 years of working experience as a quality manager and QM manager. The population of experts includes academicians that were conducting research on quality, quality consultants and quality's managers in the Iranian tourism and hospitality industry. Figure 1 demonstrates the stages of a framework of this research.

This study is focused on the examination of SME hotel firms through less of 100 employers. These SME hotel firms are certificated with an international quality standard, such as UNE 18001 standards related to hotel quality and ISO 9000 standard. The population of this study was three SME hotel firms from 100 hotels located in Iran. A questionnaire with two rounds was considered. Round one has been send to quality experts and researchers for selecting of QM CSFs and analysis with fuzzy Delphi method. The second questionnaire was based on FAHP and TOPSIS for evaluation and ranking of CSFs and three SME's hotels firms. The most important factors for evaluation of QM CSFs were extracted by literature survey. A total of 45 QM CSFs were extracted from the previously-carried out studies. Subsequent to FDM calculation, 16 CSFs were selected by the experts and classified into three different perspectives, human perspective, organizational perspective and technological perspective. According to the classification performed by the experts, the organizational perspective is consisted of six factors (C_{31} - C_{36}): C_{36} : continuous improvement; C_{35} : strategic planning; C_{34} : team working; C_{33} : organizational culture; C_{32} : organizational trust and C_{31} : process management. The human perspective includes five CSFs (C_{21} - C_{25}): C_{25} : customer focus; C_{24} : employee empowerment; C_{23} : employee fulfilment; C_{22} : employee involvement and C_{21} : Leadership. The technological perspective consists of five CSFs (C_{11} - C_{15}), C_{15} : SPC; C_{14} : Quality control & reporting; C_{13} : Benchmarking; C_{12} : ISO 9001 and C_{11} : JIT. Hierarchical framework of this classification is presented in Framework 1.

3.1. Fuzzy Delphi Method

The analytic structure of this study is presented in Fig 1. In this paper, fuzzy set theory, qualitative and quantitative approaches are combined for the evaluation of the QM CSFs in order to select three Iranian SME's hotels firms. Initially, a survey was done on the literature to find primary factor for evaluating QM CSFs. A total number of 45 CSFs were collected from the previously-conducted studies and experts opinion. A two-fuzzy questionnaire was provided for this study. In the first phase, the questionnaire was formed using 45 CSFs of QM gathered from the literature and experts suggestion. In the second phase, the questionnaire was distributed among some QM experts to be evaluated by them and their suggestions and opinions were taken into account. The use of expert questionnaires is a useful tool for gathering required data in a Delphi survey when, due to time and distance, interview cannot be held (Dalkey & Helmer, 1963).

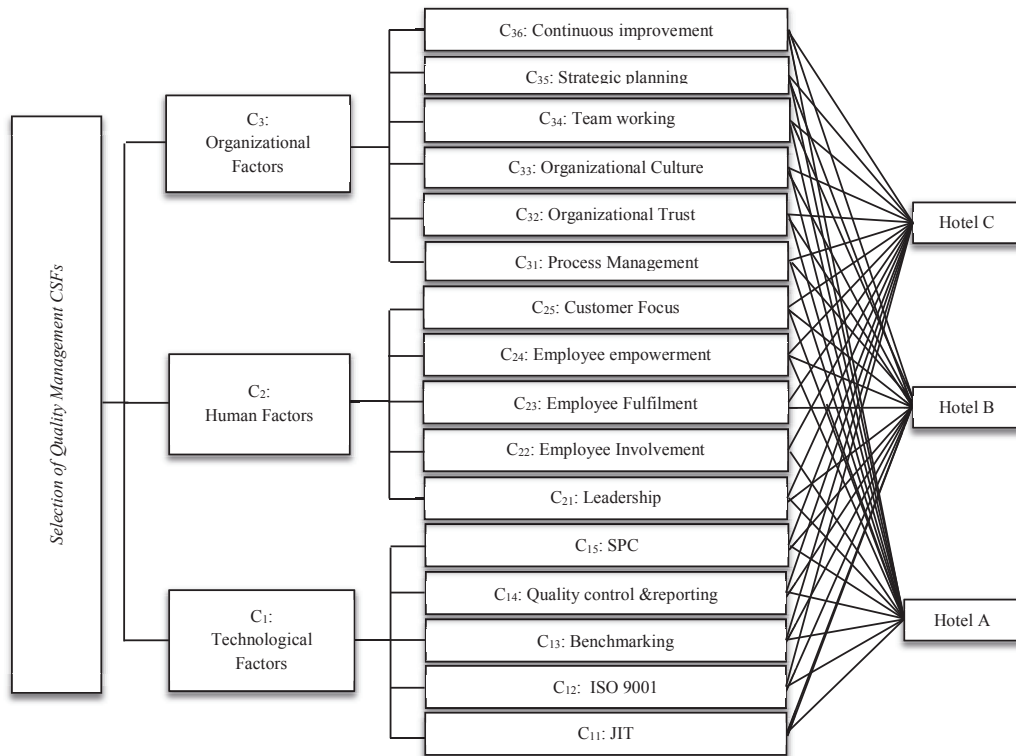


Figure 1. Hierarchical framework of QM CSFs

The questions were extracted from literature and some of them were suggested by the experts in an open format. Online survey questionnaires were used to collect the experts' information. Totally, 14 questionnaires were returned and validated successfully. Then, weights for the 45 CSFs and ratings of three hotels were converted into fuzzy sets according to the experts' responses on a 9-level evaluation scale. A along with traditional Delphi process, FDM is possibly combined with the fuzzy theory. The Fuzzy Delphi process takes vague concepts involved, and this helps to gather opinions reached to a consensus with the benefit of ensuring that the analysis have been performed in a careful way. To understand generally the opinions of experts concerning fuzziness, FDM is capable of taking the decisions of the group (Kabir & Sumi, 2012). After the calculation of FDM, 16 CSFs were selected. According to literature and suggestions of experts, the 16 CSFs were categorized in three perspectives (human perspective, organizational perspective and technological perspective).

By eliminating 29 less important indicators from the total of initial 45 QM CSFs, they were reduced to 16 indicators. According to the literature, discussions held with the experts, and experts' suggestions, 16 CSFs were categorized into three perspectives, human perspective, organizational perspective, and technological perspective. Framework 1 represents these categories based on the perspective and sub-perspective for Iranian SME's hotels firms, which can be also used to determine the criteria weights in the FAHP method.

3.2. Fuzzy AHP

In the third step, the FAHP approach was used for the calculation of relative weight of the QM CSFs in three SME's hotels firms, namely A, B, and C. These SME's hotels firms were selected because they were of the biggest hotels in

Iran (Arak province) and they have been using the QM system for several years. In the present study, FAHP is used because many researchers Buckley (1985) who have investigated the fuzzy AHP have shown that fuzzy AHP provide scientifically describes decision making processes in comparison with the conventional AHP methods in which numerical values of linguistic variables are directly employed to evaluate criteria.

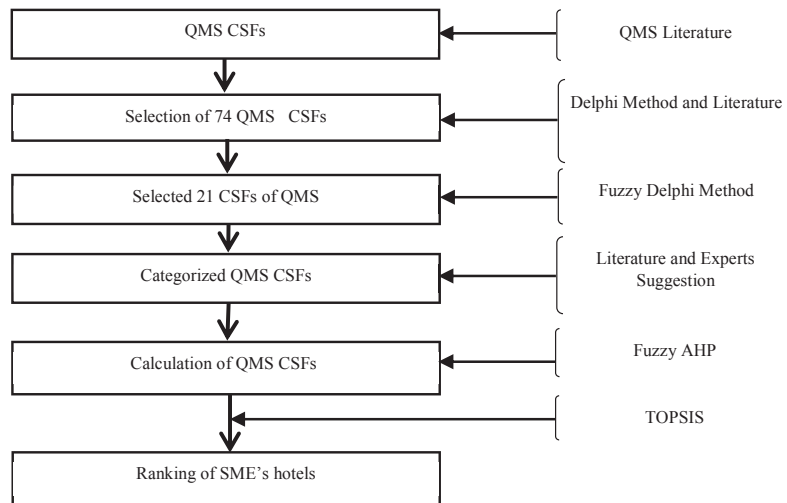


Figure 2: Process of QM system CSFs framework development

In cases where the decision-making process is fuzzy in the environment, the fuzzy numbers are employed for the purpose of evaluation through taking into consideration the deviations of decision takers. The current complex economic conditions have caused most of decisions made to be in such an environment. Therefore, fuzzy AHP or other similar methods are commonly employed in spite of their complexity in the calculation process (Özdağoğlu & Özdağoğlu, 2007).

3.3. The fuzzy weight of QM CSFs

For ranking the most significant QM CSFs in the three SME’s hotels firms based on the hierarchical framework introduced in the first stage, in this research, the FAHP questionnaire was distributed among the experts of QM industries in order to attain their suggestions and opinions. This questionnaire was designed based on the Triangular Fuzzy Numbers (TFN). Tables 1 and Table 2 show the fuzzy weight and the fuzzy judgment values of QM CSFs by FAHP.

3.4. Ranking of the SME's hotels firms

For the purpose of this study, three huge Iranian SME’s hotels firms were selected, including hotel A, B, and C. Then, they were evaluated by the experts in terms of the QM success. Due to the differences existed among the viewpoints of the experts, various opinions of different managers and experts were combined to achieve a comprehensive and objective evaluation. The authors employed the nine linguistic for evaluating the QM success based on the evaluation criteria. Each TFN denotes a linguistic variable in a range of 0–100. Afterward, the final fuzzy synthetic judgment of the three hotels was deduced from the fuzzy criteria weights presented in Table 1 and the fuzzy judgment values shown in Table 2. As a result, based on FAHP, the present research used TOPSIS for ranking the hotel firms success. Referring to Table 1, the paper has integrated the BNP values to average fuzzy judgments of

various experts. In the following of section present the calculation results of TOPSIS. Table 3 and Table 4 show results of TOPSIS.

Table 1. Fuzzy weight of QMS CSFs by FAHP

Criteria (dimension and index)	Local weights	Overall weights	BNP *	Standard BNP **	Rank
C ₁	(0.010,0.136,0.198)		0.18	0.23	3
C ₁₁	(0.200,0.279,0.379)	(0.019,0.039,0.076)	0.29	0.05	10
C ₁₂	(0.168,0.246,0.354)	(0.013,0.028,0.056)	0.26	0.03	13
C ₁₃	(0.136,0.190,0.267)	(0.013,0.026,0.051)	0.20	0.03	14
C ₁₄	(0.150,0.217,0.304)	(0.012,0.024,0.048)	0.22	0.03	15
C ₁₅	(0.089,0.126,0.174)	(0.012,0.024,0.047)	0.13	0.03	16
C ₂	(0.164,0.232,0.327)		0.24	0.32	1
C ₂₁	(0.289,0.392,0.537)	(0.048,0.091,0.176)	0.41	0.11	1
C ₂₂	(0.202,0.278,0.376)	(0.033,0.065,0.123)	0.29	0.07	5
C ₂₃	(0.158,0.230,0.327)	(0.022,0.044,0.089)	0.24	0.05	8
C ₂₄	(0.261,0.355,0.483)	(0.034,0.067,0.132)	0.37	0.08	3
C ₂₅	(0.191,0.274,0.373)	(0.018,0.038,0.075)	0.28	0.04	11
C ₃	(0.137,0.192,0.273)		0.20	0.26	2
C ₃₁	(0.211,0.293,0.411)	(0.029,0.056,0.112)	0.31	0.07	7
C ₃₂	(0.164,0.222,0.310)	(0.029,0.056,0.112)	0.23	0.04	12
C ₃₃	(0.229,0.330,0.475)	(0.038,0.077,0.155)	0.35	0.09	2
C ₃₄	(0.235,0.333,0.471)	(0.030,0.063,0.129)	0.35	0.07	4
C ₃₅	(0.210,0.308,0.437)	(0.020,0.042,0.083)	0.32	0.05	9
C ₃₆	(0.229,0.312,0.424)	(0.030,0.063,0.129)	0.32	0.07	6

Table 2. Indexes weight of Hotels by FAHP

Indexes	Hotel A	Hotel B	Hotel C
C ₁₁	0.57	0.52	0.63
C ₁₂	0.56	0.57	0.60
C ₁₃	0.60	0.57	0.57
C ₁₄	0.50	0.63	0.60
C ₁₅	0.57	0.60	0.45
C ₂₁	0.55	0.56	0.62
C ₂₂	0.55	0.60	0.58
C ₂₃	0.57	0.63	0.52
C ₂₄	0.56	0.53	0.63
C ₂₅	0.53	0.50	0.69
C ₃₁	0.54	0.57	0.63
C ₃₂	0.47	0.66	0.58
C ₃₃	0.52	0.65	0.54
C ₃₄	0.56	0.42	0.76
C ₃₅	0.62	0.52	0.58
C ₃₆	0.49	0.75	0.60

Table 3. negative ideal solutions A⁻ by and Ideal solutions A⁺ by TOPSIS

Indexes	Hotel A	Hotel B	Hotel C	A ⁺	A ⁻
C ₁₁	0.04377	0.02916	0.00000	0.04377	0.00000
C ₁₂	0.00927	0.00000	0.02318	0.02318	0.00000
C ₁₃	0.01579	0.00336	0.00000	0.00000	0.01579
C ₁₄	0.02416	0.00000	0.02416	0.02416	0.00000
C ₁₅	0.01126	0.01207	0.00000	0.01207	0.00000
C ₂₁	0.12368	0.00000	0.02456	0.12368	0.00000
C ₂₂	0.07147	0.00837	0.00000	0.07147	0.00000
C ₂₃	0.05268	0.00000	0.03539	0.05268	0.00000
C ₂₄	0.03667	0.07408	0.00000	0.07408	0.00000
C ₂₅	0.03706	0.01847	0.00000	0.03706	0.00000
C ₃₁	0.06037	0.03346	0.00000	0.06037	0.00000

C ₃₂	0.03086	0.00000	0.02319	0.00000	0.03086
C ₃₃	0.00000	0.00000	0.08117	0.08117	0.00000
C ₃₄	0.00000	0.03919	0.07836	0.07836	0.00000
C ₃₅	0.00000	0.02366	0.04098	0.04098	0.00000
C ₃₆	0.00000	0.01069	0.05316	0.05316	0.00000

Table 4: The relative closeness (RCi)

Final ranking	CL	d_i^+	d_i^-	Hotels
3	0.4717	0.4830	0.5409	Hotel A
2	0.4764	0.4854	0.5334	Hotel B
1	0.6005	0.7245	0.4819	Hotel C

The relative closeness (RCi) to the ideal solution and evaluation result by TOPSIS are shown in Table 4. The relative closeness values for the three hotels are hotel A (RC = 0.4717), hotel B (RC = 0.4764), and hotel C (RC = 0.6005).

4. Conclusion

In recent years, fuzzy theory has attracted a great deal of attentions and they have been used extensively for problem solving purposes. The present paper proposed an approach that combines fuzzy AHP, fuzzy Delphi method and TOPSIS in order to rank the QM systems projects in three SME's hotels firms. The results of this study found that human as main factors of QM CSFs had the first rank (0.32), organizational factors (0.26) and technological factors (0.23) rank two and rank three sequentially. In addition; the finding of this study indicated that leadership was the first rank (0.11) from 16 sub-factors of QM CSFs. In an effort this study considered issues that deserve more attention in hospitality research, namely QM systems such as UNE 18001 standards related to hotel quality and ISO 9000 standard and especially in an under studied and fast growing location such as the Iran.

The present study has the following contributions: previous studies such as Wang, Chen, & Chen (2012) on relationship between TQM and hospitality industry examined some of TQM factors. Thus the first contribution of present study is identifying and presenting the comprehensive list of TQM CSFs based on literature review. Second; category of QM CSFs based on three perspectives for hotel and hospitality industry, Third; the first study that using the fuzzy Delphi method for identifying the most important of QM CSFs in Iranian hotel and hospitality industry, Fourth; proposes a technique uniting the fuzzy Delphi technique and the fuzzy AHP to fragment the critical issues aimed at fruitful QM in hotel and hospitality industry and finally ranking the most importance of QM CSFs in hospitality and hotel industry based fuzzy AHP and TOPSIS for rank of the SMEs hotel firms.

References

- Askarian, M., Heidarpoor, P., & Assadian, O. (2010). A total quality management approach to healthcare waste management in Namazi Hospital, Iran. *Waste management*, 30(11), 2321-2326.
- Buckley, J. J. (1985). Ranking alternatives using fuzzy numbers. *Fuzzy sets and systems*, 15(1), 21-31.
- Cheng, J.-H., Lee, C.-M., & Tang, C.-H. (2009). An application of fuzzy Delphi and fuzzy AHP on evaluating wafer supplier in semiconductor industry. *WSEAS Transactions on Information Science and Applications*, 6(5), 756-767.
- Dalkey, N., & Helmer, O. (1963). An experimental application of the Delphi method to the use of experts. *Management science*, 9(3), 458-467.
- Gustafsson, A., Nilsson, L., & Johnson, M. D. (2003). The role of quality practices in service organizations. *International Journal of Service Industry Management*, 14(2), 232-244.
- Hackman, J. R., & Wageman, R. (1995). Total quality management: empirical, conceptual, and practical issues. *Administrative science quarterly*, 309-342.
- Hoang, D. T., Igel, B., & Laosirihongthong, T. (2010). Total quality management (TQM) strategy and organisational characteristics: Evidence from a recent WTO member. *Total quality management*, 21(9), 931-951.
- Hornig, J.-S., Liu, C.-H., Chou, S.-F., Yin, Y.-S., & Tsai, C.-Y. (2013). Developing a Novel Hybrid Model for Industrial Environment Analysis: A Study of the Gourmet and Tourism Industry in Taiwan. *Asia Pacific Journal of Tourism Research*(ahead-of-print), 1-26.

- Izadi, B., Ranjbarian, B., Ketabi, S., & Nassiri-Mofakham, F. (2013). Performance Analysis of Classification Methods and Alternative Linear Programming Integrated with Fuzzy Delphi Feature Selection. *International Journal of Information Technology and Computer Science (IJITCS)*, 5(10), 9.
- Kabir, G., & Sumi, R. (2012). Integrating fuzzy Delphi method with artificial neural network for demand forecasting of power engineering company. *Management Science Letters*, 2(5).
- Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of operations management*, 21(4), 405-435.
- Koc, E. (2006). Total quality management and business excellence in services: The implications of all-inclusive pricing system on internal and external customer satisfaction in the Turkish tourism market. *Total Quality Management & Business Excellence*, 17(7), 857-877.
- Kull, T. J., & Wacker, J. G. (2010). Quality management effectiveness in Asia: The influence of culture. *Journal of Operations Management*, 28(3), 223-239.
- Lam, S.-Y., Lee, V.-H., Ooi, K.-B., & Lin, B. (2011). The relationship between TQM, learning orientation and market performance in service organisations: An empirical analysis. *Total Quality Management & Business Excellence*, 22(12), 1277-1297.
- Leavengood, S., Anderson, T. R., & Daim, T. U. (2012). Exploring linkage of quality management to innovation. *Total Quality Management & Business Excellence*(ahead-of-print), 1-15.
- Mardani, A., Bagheri, M. M., Soltan, E. K. H., & Lari, M. K. Relationship between National Culture and Soft Total Quality Management in Iranian Multinational Firms.
- Mardani, A., Bin Jusoh, A., Bin Md Nor, K., Soltan, H., Kish, E., & Kazemi Lari, M. (2013). Total Quality Management and Organizational Culture framework for Small and Medium-Sized Businesses (ISMBs) in Iran. *Caspian Journal of Applied Sciences Research*, 2(10).
- Mardani, A., Jusoh, A. B., Soltan, E. K. H., & Bagheri, M. M. (2012). THE EFFECT OF ORGANIZATIONAL CULTURE STEMMING FROM NATIONAL CULTURE ON TOTAL QUALITY MANAGEMENT VALUES, CASE STUDY: IRANIAN SMALL AND MEDIUM ENTERPRISES (SME'S). Paper presented at the International conference on management, economics and finance-ICMEF.
- Mardani, A., & Kazemilari, M. (2012). Relationship between national culture and TQM implementation, Case study: Iranian multinational electrical manufacturing companies. *Asian Journal of Management Research*, 3(1), 291-312.
- Martinez-Costa, M., Choi, T. Y., Martinez, J. A., & Martinez-Lorente, A. R. (2009). ISO 9000/1994, ISO 9001/2000 and TQM: the performance debate revisited. *Journal of Operations Management*, 27(6), 495-511.
- Mensah, J. O., Copuroglu, G., & Fening, F. A. (2012). Total Quality Management in Ghana: Critical Success Factors and Model for Implementation of a Quality Revolution. *Journal of African Business*, 13(2), 123-133.
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization science*, 5(1), 14-37.
- Ooi, K.-B. (2014). TQM: A facilitator to enhance knowledge management? A structural analysis. *Expert Systems with Applications*, 41(11), 5167-5179.
- Ooi, K.-B., Arumugam, V., Teh, P.-L., & Chong, A. Y.-L. (2008). TQM practices and its association with production workers. *Industrial Management & Data Systems*, 108(7), 909-927.
- Özdağoğlu, A., & Özdağoğlu, G. (2007). Comparison of AHP and fuzzy AHP for the multi-criteria decision making processes with linguistic evaluations. *İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi*, 6(11), 65-85.
- Phan, A. C., Abdallah, A. B., & Matsui, Y. (2011). Quality management practices and competitive performance: Empirical evidence from Japanese manufacturing companies. *International Journal of Production Economics*, 133(2), 518-529.
- Sousa, R., & Voss, C. A. (2008). Contingency research in operations management practices. *Journal of Operations Management*, 26(6), 697-713.
- Spencer, B. A. (1994). Models of organization and total quality management: a comparison and critical evaluation. *Academy of Management Review*, 19(3), 446-471.
- Talib, F., Rahman, Z., Qureshi, M., & Siddiqui, J. (2011). Total quality management and service quality: an exploratory study of quality management practices and barriers in service industry. *International Journal of Services and Operations Management*, 10(1), 94-118.
- Wang, C.-H., Chen, K.-Y., & Chen, S.-C. (2012). Total quality management, market orientation and hotel performance: the moderating effects of external environmental factors. *International Journal of Hospitality Management*, 31(1), 119-129.
- Wu, W.-W. (2012). Segmenting critical factors for successful knowledge management implementation using the fuzzy DEMATEL method. *Applied Soft Computing*, 12(1), 527-535.
- Zu, X., Robbins, T. L., & Fredendall, L. D. (2010). Mapping the critical links between organizational culture and TQM/Six Sigma practices. *International Journal of Production Economics*, 123(1), 86-106.