Presenting a Model to Evaluate Factors Affecting Outsourcing of Health Information Technology Services

Mohammad Shirdeli¹, Sahar Zare², Erfan Kharazmi³, Rita Rezaee⁴, Mohammad Hadi Maher⁴

¹Department of Health Information Management, Shiraz University of Medical Sciences, Shiraz, Iran
²Department of Health Information Management, Kashan University of Medical Sciences, Kashan, Iran
³Department of Healthcare Services Management, Shiraz University of Medical Sciences, Shiraz, Iran
⁴Educational Development Center, Shiraz University of Medical Sciences, Shiraz, Iran

Corresponding author: Rita Rezaee. Educational Development Center, Shiraz University of Medical Sciences, Shiraz, Iran. ORCID ID: http://orcid.org/0000-0000-0000-0000.
E-mail: rezaeerita@yahoo.com

doi: 10.5455/aim.2018.26.190-194
ACTA INFORM MED. 2018 SEPT; 26(3): 190-194
Received: Jun 30, 2018 • Accepted: Aug 10, 2018

ABSTRACT

Introduction: Outsourcing of health information technology services (OHITS) is an important process for healthcare organizations due to the lack of expert staff to respond to rapid advance in IT and the security of patient’s information. This study aimed at presenting a model to evaluate factors affecting OHITS. Method: This is a descriptive-analytic study, conducted in 2017. Participants were experts of IT and accounting field. This research was performed in four general steps: identifying the factors affecting OHITS through literature review; determining suitable indicators by Delphi technique; prioritizing the factors using Analytical Hierarchical Process (AHP), measuring the accuracy of research hypotheses by Partial Least Square (PLS) and calculating the Goodness Of Fit (GOF) criteria for the model. Findings: the most and the least important factors affecting OHITS were “motivation” and “selection of a provider” respectively. GOF criteria was 0.697, suggesting powerful model fitting. Conclusion: Using the model presented in this research, the healthcare managers and chief officers of IT will be able to decide consciously about outsourcing projects, and also manage the project better. Keywords: Outsourcing, information technology, Partial Least Square.

1. INTRODUCTION

Organizations have to make innovative strategies in production or processes because of highly competitive challenges (1). In today’s commercial environment, Information technology (IT) is considered as a competitive resource (2). Information technology services (ITS) outsourcing is seen as a strategic tool used by many firms either to reduce their total costs on ITS or to get access to capabilities not available in-house (3, 4). The outsourcing growth has brought about a fundamental change in the way ITS are organized and delivered, with increasing dependence on external providers, now frequently located offshore (5).

The decision to outsource ITS has become a viable strategic alternative in managing the increasingly complex ITS (6) thus, outsourcing activities, even when not directly related to core business, is a complex task (4). Outsourcing IT as a major competitive advantage would be increasingly important to improve efficiency and effectiveness (7).

Many healthcare organizations are exploring outsourcing as an approach to address demands for HIT (8). There can be benefits of outsourcing, such as gaining access to expertise and improving healthcare service levels (8). There are different reasons to outsource information technology including: concentration on the main capabilities, saving costs, improving services, accomplishing the business objectives, enhancing flexibility, eliminating routine problems and issues, enhancing the quality, increasing access to new technologies, and mitigating risks (4, 9-14). However, outsourcing strategy might bring some harm to company which should be taken into account while decision making. Potential harms include: danger on depending on third party, loss of control in IT assets, possible treat for opportunism, loss of flexibility, potential loss of competitive advantage in operational management, it can cause a decline of morale and performance of the remaining employees, long term cost savings are not guaranteed (14). On the other hand corresponding regulatory mandates about patients privacy...
rights in healthcare industry have resulted in increased standardization of transaction processing, security, and privacy information (15). Thus healthcare organizations require more attention while outsourcing process.

In spite of potential benefits, After years of outsourcing corporate processes and operational functions, many outsourcing projects have failed (16). There are several reasons resulting in outsourcing failure such as: outsourcing activities that should not be outsourced, contractual hazards, technical challenges, unforeseen as well as overlooking the hidden costs of outsourcing, and selecting the wrong vendor (16-19). Diana suggests that managers of health care delivery system may not be considering significant factors affecting outsourcing process, when making sourcing decisions (20).

Outsourcing is not a new concept however, new technologies, delivery models, globalization and a more demanding end-user continue to provide impetus for outsourcing activities (21). As one of the key success factors in outsourcing IT projects is identification and evaluation of effective factors in IT outsourcing and their management. A comprehensive list of these factors needs to be considered when outsourcing to ensure it is successful. Regarding the developing trend of IT outsourcing projects in Iran and considering the fact that there has been no model capable of examining different dimensions of this field and, this research was performed with the aim of presenting a model that could make process of decision making less time consuming, less segmented and more efficient, to evaluate factors affecting outsourcing of health IT service.

2. MATERIAL AND METHODS

This is a descriptive analytical study, conducted at Shiraz University of medical sciences in 2017 with the aim of presenting a model to evaluate factors affecting outsourcing of IT services in health industry using fuzzy analytical hierarchy process (FAHHP). All experts of IT field and financial affairs of the University and its affiliate units, which included 30 individuals, were invited to participate in this study. The inclusion criteria were having MSc degree and at least two years’ work experience in IT and financial affairs field and the exclusion criteria included unwillingness to participate in the study and a working experience less than two years.

To identify the primary factors affecting ITS outsourcing of the health sector, literature were reviewed. Extracted factors were provided to the experts as a questionnaire in the first round of Delphi technique. 75% consensus was applied to select components. The determined consensus was not reached, so the second round of Delphi was conducted. The factors obtaining from Delphi technique were weighted due to the varied importance, so that more proper and reliable effective factors would be measured. In order to rank the factors, fuzzy analytical hierarchy process was employed. The AHP, developed by Thomas Saati, is one of the most comprehensive techniques designed for decision-making with multiple criteria and different options because it allows hierarchical formulation of the problem, the possibility of different quantitative and qualitative criteria consideration in the problem as well as the possibility of performing sensitivity analysis on the criteria and sub-criteria.

Analytical hierarchy process was based on paired comparison facilitating judgment and calculations; it also shows the consistency and inconsistency rate of the decision. All comparisons are performed as paired in this process. Decision-makers used oral judgments in these comparisons. Next, a checklist was prepared for performing paired comparisons, and the factors were arranged in two ahead of each other, and a spectrum ranging from high preference to least preference was used as Table 1 (2).

| Verbal statement of status of comparison of i in relation to j | Fuzzy equivalent | Inverse fuzzy Equivalent |
|---------------------------------------------------------------|-----------------|-------------------------|
| EquallyPreferred                                              | (1, 1, 1)       | (1, 1, 1)               |
| In between                                                    | (1, 2, 3)       | [MathJax not available] |
| Moderately Preferred                                          | (2, 3, 4)       | [MathJax not available] |
| In between                                                    | (3, 4, 5)       | [MathJax not available] |
| Strongly Preferred                                            | (4, 5, 6)       | [MathJax not available] |
| In between                                                    | (5, 6, 7)       | [MathJax not available] |
| Very strongly Preferred                                       | (6, 7, 8)       | [MathJax not available] |
| In between                                                    | (7, 8, 9)       | [MathJax not available] |
| Extremely Preferred                                           | (9, 9, 9)       | [MathJax not available] |

Table 1. The fuzzy spectrum equivalent to nine-degree scale of Saati in AHP technique

To present the model, structural equations of the research hypotheses were analyzed individually using partial least squares (PLS) technique. Finally the general model of the research was tested using the same technique. There were several reasons behind selection of PLS method in this research. The most important reasons include: superiority of this method for small samples, abnormal data, constructive measurement models, suitable predictability, model complexity (large number of structures and indicators), exploratory research, development of theory, use of classified variables, and investigation of homogeneity, testing the theory and hypotheses, and testing hypotheses including modifying variables. Descriptive statistics were analyzed using SPSS 22; to test conceptual model Lisrel software 8.8 was applied; to measure the significance of the relationships, t statistic has been calculated through bootstrapping technique; and the final model is output of smart PLS software 2.

3. FINDINGS

Out of total amount, 76 primary components were identified through literature review. At the end of the second round of Delphi the experts approved seven main categories of components and 30 subcategories. The results obtained from applying two rounds of Delphi technique are provided in Table 2 to identify the effective factors in outsourcing of health IT services.

Table 3 shows the final priority of the criteria and sub-criteria based on the AHP steps and the output of Super Decision software.

The top 10 ranks have been presented in Table 4, based on the final weights.

The measurement model has been presented for construct validity, and also divergent validity was investigated. Next, using PLS approach, the relations of the research variables and the major model have been presented. In the general model of the research shown in Figure 1, the measurement
Bootstrapping technique, as provided in Figure 2.

Significance of relationships, t statistics has been calculated by FAHP technique.

Table 3. determining the final priority of indices using FAHP technique

| No. | Main criterion | Secondary criterion | Rank of score | Sub criterion | Sub criterion | Sub criterion | Sub criterion | Sub criterion |
|-----|----------------|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 1   | Quality        | Investment on technology planning and innovations          | 113           | 7.53          | 113           | 7.53          | 113           | 7.53          |
| 2   | Motivation     | Satisfactory contracts                                      | 115           | 7.47          | 115           | 7.47          | 115           | 7.47          |
| 3   | Risk Management| Duration and fast provision of service                      | 115           | 7.47          | 115           | 7.47          | 115           | 7.47          |
| 4   | Strategic decisions | Contribution of the project to achieving the organizational objectives | 114 | 7.60 | 114 | 7.60 | 114 | 7.60 |
| 5   | Financial      | Information security risks                                  | 114           | 7.60          | 114           | 7.60          | 114           | 7.60          |
| 6   | Selection provider | Similar experience                                        | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 7   | Risks          | Outsourcer or provider lack of skills in IT outsourcing projects | 108           | 7.07          | 108           | 7.07          | 108           | 7.07          |
| 8   | Services       | Venturing a business plan by the key figures of the project | 105           | 7.00          | 105           | 7.00          | 105           | 7.00          |
| 9   | Strategic decisions | Project of the provider and the risks associated with legal matters | 113           | 7.53          | 113           | 7.53          | 113           | 7.53          |
| 10  | Financial      | Services and financial resources                            | 113           | 7.53          | 113           | 7.53          | 113           | 7.53          |
| 11  | Financial      | Selection of contractor                                     | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 12  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 13  | Financial      | Financial management                                        | 108           | 7.07          | 108           | 7.07          | 108           | 7.07          |
| 14  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 15  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 16  | Financial      | Project of the provider and the risks associated with legal matters | 113           | 7.53          | 113           | 7.53          | 113           | 7.53          |
| 17  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 18  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 19  | Financial      | Selection of contractor                                     | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 20  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 21  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 22  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 23  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 24  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 25  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 26  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 27  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 28  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 29  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |
| 30  | Strategic decisions | Experience of the provider                                  | 109           | 7.27          | 109           | 7.27          | 109           | 7.27          |

Table 2. The mean scores of experts

| Criteria | Weight | Sub criteria | Total weight | General weight | Rank |
|----------|--------|--------------|--------------|----------------|------|
| Quality  | 0.2101 | Investment on technology planning and innovations | 0.2101 | 0.7398 | 2 |
| Motivation| 0.2058 | Satisfactory contracts | 0.2058 | 0.6836 | 2 |
| Risk management | 0.090 | Duration and fast provision of service | 0.090 | 0.2700 | 2 |
| Strategic decisions | 0.146 | Contribution of the project to achieving the organizational objectives | 0.146 | 0.4384 | 2 |
| Financial | 0.127 | Selection of contractor | 0.127 | 0.3966 | 2 |

Table 3. determining the final priority of indices using FAHP technique

| No. | Main criterion | Secondary criterion | Rank of score | Sub criterion | Sub criterion | Sub criterion | Sub criterion | Sub criterion |
|-----|----------------|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 1   | Concentration of the main capabilities | 0.170 | 0.0376 | 24 |
| 2   | Investment on technology planning and innovations | 0.170 | 0.0376 | 24 |
| 3   | Satisfactory contracts | 0.170 | 0.0376 | 24 |
| 4   | Duration and fast provision of service | 0.170 | 0.0376 | 24 |
| 5   | Contribution of the project to achieving the organizational objectives | 0.170 | 0.0376 | 24 |
| 6   | Selection of contractor | 0.170 | 0.0376 | 24 |
| 7   | Suitability of hidden and variable costs | 0.170 | 0.0376 | 24 |

Figure 1. PLS technique of the general model of the research

Figure 2. T-value statistics of the general model of the research using bootstrapping technique
Tenenhä et al, which is calculated by the following formula (22):

\[
GOF = \sqrt{\text{Avg(Communalities)} \times R^2}
\]

Calculation of GOF:

\[
R^2=0.662
\]

\[
GOF = \sqrt{0.734 \times 0.662} = \sqrt{0.485} = 0.697
\]

4. DISCUSSION

According to the finding and presented model for evaluation of effective factors in health ITS at Shiraz University of medical sciences, all of the research factors had significant effects on outsourcing of health ITS. The results obtained from general fitting of the model indices suggest that the model has a good fitting.

Based on comparative viewpoints of the participants “Motivation”, “quality”, and “Strategic decisions” were the most important factors respectively. “Concentration on the major capabilities” was the most important sub-criteria in IT outsourcing.

Strategic planning of the health care organizations should be formulated in a way that creates active or agile organization instead of passive organizations. One of the main organizational policies is concentration on the main activities and relegation of other activities to outsources (23, 24). Decentralization policy should be applied because it seems practically impossible for a single organization to do well in all fields. Organizations should identify core tasks which can be performed by the organization itself as well as those which cannot. Barthélémy announced “Outsourcing activities that should not be outsourced” as an important reason resulting in outsourcing failure (19). To determine the tasks which should be performed in collaboration with other organizations is a very important decision for organization survival.

The “investment on technological planning and innovations” was the most important sub-criteria of “quality” affecting outsourcing of health ITS. In today’s world which health care has become an industry, it is important to have a competitive advantage. In today’s industrial economy, innovation has emerged as a main source of competitive advantage, but it is still completely elusive for organizations. Outsourcing is likely to emerge as a way to experiment with innovative technologies and even bring innovation into health care organizations. Outsourcing results in faster performance, increased quality of services, and time-saving for managers (25). Gonzalez consider “Access to new technologies” a reason for outsourcing (26). Tang et al considered quality as one of the determinant parameters in decision making for outsourcing (27). Other studies also believe that improving quality of IT services is one of the IT outsourcing reasons (28, 29). Thus, outsourcing has the potential to bring about business value in health care industry.

The third important factor was “Strategic decisions” and “contribution of the project in achieving the organizational objectives” as the most important sub-criteria. Managers should consider that outsourcing project is align with strategic plan of their health care organization. According to literature, providers have access to more advanced technologies and count on more motivated staff and better management systems to be able to gain a high-quality service coordination or control, or are more strongly committed than the internal staff to make the alliance with the organization work properly (30-32).

Although many studies (16, 17, 33) direct primary attentions of the healthcare organizations to the risks of the outsourcing projects, in this study risks had a less impact on outsourcing in comparison with other factors; however risk considerations are much highlighted in healthcare organizations due to the legal aspects and patient’s rights. “Information security” is a very important sub-criteria and its related considerations should be clearly incorporated in outsourcing contracts.

“Financial factor” was among the top 10 sub-criteria in our study. Apparently, respondents believe that managers should be justified about investing on outsourcing since Outsourcing allows managers get rid of the additional costs and therefore, have the opportunity to use their existing resources in a more efficient manner and in different areas, on their basic capabilities (34).

“Selection of provider” was the least important factor. However, a more scientific decision making process for choosing outsourcing providers, is very important to increase the success rate of outsourcing; and even it is necessary to gather a multi-disciplinary team in order to select the best provider.

5. CONCLUSION

This study suggests a decision model for evaluating factors affecting OHITS. “Motivation” and “selection of provider” were the most and the least important criteria in comparison with the other seven studied factors. Using the model presented in this research, the healthcare managers and chief officers of IT will be able to decide about outsourcing projects consciously and scientifically especially when criteria are numerous and inter-related, and there for best manage the process.

- Acknowledgment: This paper has been extracted from MSc thesis of Mohammad Shirdeli, MSc. student of health information management. The thesis was financially supported by Vice-chancellor for research affairs of Shiraz University of Medical Sciences with grant number 10767 and ethical code IR.SUMS.REC.1394.S1030. The author wish to thank all participants.
- Conflict of interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

REFERENCES

1. Weinzier R. A Replication and Extension of Organization–Growth Determinants. Journal of Business Research. 2000; 48(35-41).
2. Chen T, Zhang J, Lai K. An Integrated Real Options Evaluating Model for Information Technology Projects under Multiple Risks. International Journal of Project Management. 2009; 27(8): 776-786.
3. Gusmão A, Costa A. Evaluation of IT/IS is outsourcing projects using the DEA methodology. Mediterranean Conference on Information Systems. 2012; 2012 Proceedings: 24.
Presenting a Model to Evaluate Factors Affecting Outsourcing of Health Information Technology Services

Routledge. AMIS (Advances in Management Information Systems). 2015; 340 (ISBN 978-0-7656-1685-2).

5. Rouse A. Explaining IT Outsourcing Purchasers’ Dissatisfaction. PACIS 2006, Proceedings. 2006; 1.

6. Teng J, Cheon M, Grover V. Decisions to Outsource Information Systems Functions Testing a Strategy. decision science. 1995; 26(1): 75-103.

7. Ahmadi E, Vasati M, Miandehi H, Tourni H. [Identify and rank the factors affecting IT outsourcing in universities using AHP technique]. The National Conference on Management Engineering, Institute of Higher Education Mhrastan, Gilan, Iran. 2016.

8. Malevoc SN, Borycki EM, Kushniruk AW. An evaluation of health information technology outsourcing success. Studies in health technology and informatics. 2015; 208: 253-257.

9. Chalos P. Costing, Control, and strategic analysis in outsourcing decisions. Journal of Cost Management. 1995; 8(4): 7-31.

10. Quinn J, Hilmer F. Strategic outsourcing. Sloan management review. 1994; 35(4): 43-55.

11. Chen L, Wang T. Optimizing partners’ choice in IS/IT outsourcing projects: The strategic decision of fuzzy VIKOR. International Journal of Production Economics. 2009; 120: 233-242.

12. Offodile O, Abdel-Malek L. The virtual manufacturing paradigm: the impact of IT/IS outsourcing on manufacturing strategy. International Journal of Production Economics. 2002; 75: 147-159.

13. Lacity M, Hirschheim R. The information systems outsourcing bandwagon. Sloan Management Review. 1993; 35: 73-86.

14. Stamenovic M, Dobraca A. Benefits of Outsourcing Strategy and IT Technology in Clinical Trials. Acta Inform Med. 2017; 25(3): 203-207. doi: 10.5455/aim2017.25.203-207.

15. Lorence DP, Spink A. Healthcare information systems outsourcing. International Journal of Information Management. 2004; 24(2): 131-145.

16. Cabral S, Quelin B, Maia W. Outsourcing Failure and Reintegration: The Influence of Contractual and External Factors. Long Range Planning. 2014; 47(6): 365-378.

17. Brandes H, Lilliecreutz J, Brege S. Outsourcing - success or failure?: Findings from five case studies. European Journal of Purchasing & Supply Management. 1997; 3(2): 63-75.

18. IBM. IBM Mega Disaster. report from the Queensland Health Payroll System Commission of Inquiry. 2007.

19. Barthélemy J. The seven deadly sins of outsourcing: Academy of Management Perspectives. 2017; 17(2).

20. Diana ML. Exploring information systems outsourcing in U.S. hospital-based health care delivery systems. Health care management science. 2009; 12(4): 434-450.

21. Yang DH, Kim S, Nan C, Min J. Developing a decision model for business process outsourcing. Computer Operational Research. 2007; 34: 3769-3778.

22. Tennenhaus M, Amato S, Vinzi V. A global Goodness-of-Fit index for PLS structural equation modeling. In Proceedings of the XLII SIS Scientific Meeting. 2004: 739-742.

23. Zhu Z, Hsu K, Lillie J. Outsourcing - a strategic move: the process and ingredients for success. Management Decision. 2001; 39: 373-378.

24. Gonzales R, Gasco J, Llopis J. Information systems outsourcing success factors: a review and some results. Information Management and Computer Security. 2005; 13: 399-418.

25. Hosseini SA, Rahimi AR. Studying the effectiveness of outsourcing projects in Islamic Azad University as a cultural institutional culture Management Journal. 2011; 11.

26. Gonzalez R, Gasco J, Llopis J. Information Systems Outsourcing Reasons and Risks: a New Assessment. 2009.

27. Tang O, Musa SN. Identifying risk issues and research advancements in supply chain risk management. International Journal of Production Economics. 2011; 133.

28. Claver E, Gonzalez R, Gasco J, Llopis J. Information systems outsourcing: reasons, reservations and success factors. Logistics Information Management. 2002; 15(4).

29. Smith A, Mitra S, Narasimhan S. Information systems outsourcing: a study of pre-event firm characteristics. Journal of Management Information Systems. 2000; 15(2).

30. Clark TD, Zmud RW, McCray GE. The Outsourcing of Information Services: Transforming the Nature of Business in the Information Industry. Journal of Information Technology. 1995; 10: 221-237.

31. Lee JN, Huynh MQ, Hirschheim R. An integrative model of trust on IT outsourcing: Examining a bilateral perspective. Information Systems Frontiers. 2008; 10(2): 145-163.

32. Baldwing L, Irani Z, Love P. Outsourcing Information Systems: Drawing Lessons from a Banking Case Study. European Journal of Information Systems. 2001; 10(1): 15-24.

33. Nduwimfura P, Zheng J. A Review of Risk Management for Information Systems Outsourcing. International Journal of Business, Humanities and Technology. 2015; 5(4).

34. Yilmaz A, Beduk A. Evaluation of the Effect of the Outsourcing on Resource Dependency and Transaction Cost Approach: A Research in Konya Oz, Turkey. Procedia Social and Behavioral Sciences. 2014; 109: 737-752.