A Review on influencing criteria for selecting supplier of information technology services in the hospital

Sima Ajami, Ahmad Rajabzadeh¹, Saeedeh Ketabi²

Department of Health Information Technology and Management, ²Health Management and Economics Research Center, Isfahan University of Medical Sciences, School of Economics and Administrative Sciences, University of Isfahan, Isfahan, ¹Department of Health Information Technology of Seyyed Mostafa Khomeini Hospital of Tabas, Birjand University of Medical Sciences, Tabas, Iran

ABSTRACT

Organizations try to outsource their activities as much as possible in order to prevent the problems and use organizational capabilities in Information Technology (IT) field. The purpose of this paper was first, to express the effective criteria for selecting suppliers of IT services, second, to explain the advantages and disadvantages of outsourcing IT in hospitals. This study was narrative review, which search was conducted with the help of libraries, books, conference proceedings, and databases of Science Direct, PubMed, Proquest, Springer, and SID (Scientific Information Database). In our searches, we employed the following keywords and their combinations: Outsourcing, information technology, hospital, decision making, and criteria. The preliminary search resulted in 120 articles, which were published between 2000 and 2013 during July 2013. After a careful analysis of the content of each paper, a total of 46 papers were selected based on their relevancy. The criteria and sub-criteria influencing outsourcing decisions in Iranian hospitals were identified in six major categories including administrative issues, issues related to the service/product, technology factors, environmental factors, risks, and economic factors associated with 15 sub-criteria containing business integration, dependence on suppliers, human resources, focus on core competencies, facilities and physical capital, innovation, quality, speed of service delivery, flexibility, market capabilities, geographical location, security, management control, cost, and financial capability. Identify the advantages and disadvantages of outsourcing and effective criteria in IT services supplier selection causes the managers be able to take the most appropriate decision to select supplier of IT services. This is a general review on influencing criteria for electing of supplier of information technology services in hospitals.

Key words: Criteria, decision making, hospital, information technology, outsourcing

Address for correspondence: Dr. Sima Ajami,
Department of Health Information Technology and Management,
Health Management and Economics Research Center, School of Medical Management and Information Sciences, Isfahan University of Medical Sciences, Hezarjerib St., Isfahan, P. O. Box: 81745- 346, Iran.
E-mail: Ajami@mng.mui.ac.ir

INTRODUCTION

Hospitals are one of the most expensive economic sections in every country. The economic nature of these organizations has recognized the outcomes of their operation as an undeniable basic necessity due to dealing with human life and health.[1] Moreover, providing effective and efficient services has been brought to people and officials' attention. During recent years, the Ministry of Health and Medical Education has followed outsource financing strategies in line with clause 5, article 2 of 82 budget execution rules and Act III of development in order to rationalize the size of government, strengthen government accountability, and to develop the delivery of healthcare.[2]

Huge advances in information technology, in general, and health care services, in particular, have risen during the past 20 years.[3] With increasing technological advances, organizations have realized the undeniable benefits of information technology to increase the quality, accuracy, and speed of affairs, and most managers have become aware of the importance of its use in increasing efficiency and effectiveness of organizations and more satisfied customers, and have established and used information systems.[4] Therefore, every year, managers define and implement different projects in the field of information technology and information systems according to organizational needs in order to improve organization's performance. However, despite huge costs incurred in this area, in many cases, they fail due to lack of proper understanding of the advantages, disadvantages, and influencing factors in decision making. As a result, their failure leads to waste of time and money in the organization.

Today, the use of office automation and specific information systems of each organization is growing rapidly. Many organizations have a specific unit, called information technology or the like, in order to use information technology strategies properly, identify the needs of business Information Technology (IT), and address these needs. Given the rapid growth of this field, if all these goals are achieved in the organization through IT unit, these units will expand too much. However, as business domain has a significant distance with IT, this overexpansion will cause lack of integration and high overhead costs in an organization. As a result, organizations try to outsource these activities as much as possible in order to prevent the problems, and use organizational capabilities in IT field.[5] However, if there is no proper link to outsource information technology, it will just incur high costs for the outsourcing organization while the organization will lose its control over service quality, leading to low information security; thus, the organization will fail to fulfill its mission.

Outsourcing is made up of two words "out" and "sourcing" which refers to the act of transferring internal workings of an organization under contract to the supplier organization. Table 1 presents a sample of outsourcing definitions.

There isn't a fundamental difference between the above definitions, and in fact, the definition of outsourcing is composed of three parts. First, the whole or part of the activities are entrusted to one or more external supplier (Total Outsourcing, Multiple-supplier sourcing). Second, the responsibility of performance is transferred to external supplier, and third, factors of production and the decision rights are entrusted in most cases too. Accordingly, outsourcing of information technology includes entrusting of a substantial portion of the functions of information technology, the responsibility of performance, and the decisions right to external supplier of information technology.

The purpose of this paper was first, to express the effective criteria for selecting suppliers of IT services, second, to explain the advantages and disadvantages of outsourcing IT in the hospital.

Table 1: Sample of outsourcing definitions

Author	Definition of outsourcing
Domberger *et al*. (2002)	Transferring of internal production functions of goods or services to an external provider.[6]
Power (2006)	The act of transferring work, responsibilities, and decision rights to someone else.[7]
Brooks (2006)	The use of external agents to perform one or more of organizational activities.[8]
Isıklar *et al*. (2007)	A managed process of transferring activities to be performed by others.[9]
Yang *et al*. (2007)	Devising a contract with an external organization to take primary responsibility of providing business processes.[10]
Ashley (2008)	The allocation of risk and responsibility for performing a function or service to another entity.[11]

Identify the advantages and disadvantages of outsourcing and effective criteria in IT services supplier selection cause the managers be able to take the most appropriate decision to select supplier of IT services.

MATERIALS AND METHODS

This study was narrative review, with the literature on the affective criteria for supplier selection of information technology services in a formal research framework. Our study was divided into three phases: Literature collection, assessing, and selection. The literature search was conducted with the help of library search engines available at Google, Google scholar, books, conference proceedings and databases of Science Direct, PubMed, Proquest, Springer, and SID. In our searches, we employed the following keywords and their combinations: outsourcing, information technology, hospital, decision making, and criteria in the searching areas of titles, keywords, abstracts, and full texts. The preliminary search resulted in 120 articles, which were published between 2000 and 2013 during July 2013. Only articles written in English, American, and Persian languages were considered because the researchers did not dominate on other languages. After a careful analysis of the content of each paper, a total of 46 papers were selected based on their relevancy.

RESULTS

IT outsourcing advantages and disadvantages
Knowing the advantages and disadvantages of doing anything makes the decisions to be taken very attentively and increase the efficiency of decisions. Knowing the advantages and disadvantages is important in outsourcing of IT projects and helps to provide a comprehensive view of how the project is achieved.

Today, organizations are not looking to do all the activities needed, but every organization keeps the main activities for itself and performs other activities through other suppliers have key competencies in those activities. So, in a lattice structure, a collection of suppliers, who are known with their key feature in relations to the win - come together and work together.

Today, outsourcing is an appropriate method to supply resources and has numerous benefits to organizations. The most important advantages include: To reduce costs,[12-16] improving skills,[14] increasing the organization's competitive advantage,[12-16] focus on their core processes,[12-16] innovation,[13] adjustment of human resources,[13] more efficient of activities by relying on external experts,[12-14,17] more flexibility,[12,15,16] access to the supplier's resources,[12,15,16] providing better quality of service,[13-16] and faster delivery of products and services[15] to customers because suppliers have special equipment for providing outsourced services. On the opposite, outsourcing process may have risks and threats for organizations such as strategic information security vulnerability,[12-14,17-19] dependence of organization to supplier,[16,17] difficulty in control outsourced processes,[12,13,16,18,19] difficulty of returning to the pre-outsourcing status,[13] reduced sense of job security staff,[17] increased initial costs,[17] hidden costs,[12,14,18] increased risk[16] and etc.

Therefore, considering the advantages and disadvantages of outsourcing, especially outsourcing of IT projects due to the special nature, can impact on a large part of the organization process; it is the key factor in outsourcing decisions that will reduce the risks of outsourcing.

Affective criteria for supplier selection of information technology services

In any outsourcing activity, there are risks, such as potential structural and cultural incompatibilities. To ensure success, it is crucial that both users and providers (partners) have a clear understanding of their similarities and differences, recognizing opportunities for mutual benefits under cooperative arrangements.

Since partner selection is crucial, it is imperative for decision-makers to devise, identify, and recognize effective partner selection criteria prior to outsourcing activities. Several issues are important to determining the optimal collaborator in this partner selection process, including: Whether there has been favorable past associated between the partners, whether the national and corporate cultures of the partners are compatible, and whether trust exists between the partners' management teams. Also, in order to select the correct and efficient partner, balance must be established between the different levels of contrast and multiple properties and between tangible and intangible factors related to supplier performance simultaneously and provide the possibility of comparison with the best suppliers.

The main objective of supplier selection is to identify suppliers with the highest potential for meeting a firm's needs consistently and with acceptable costs. This selection is done via a wide comparison of suppliers and based on a set of criteria. To select probable suppliers, proper and effective criteria can judge the ability of each supplier to meet the needs continually and effectively by using appropriate criteria.[20]

To identify the effective criteria for selection of suppliers of IT services in hospital, the criteria identified in relevant various studies are as follows [Figure 1].
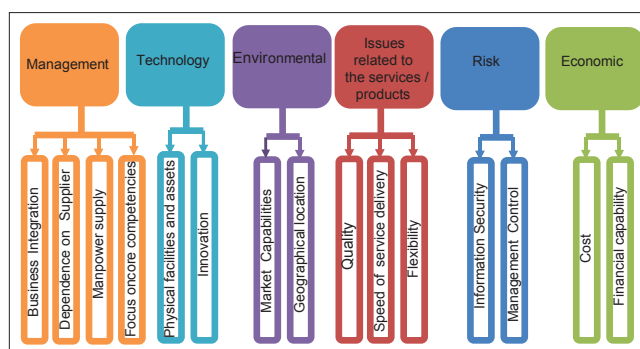

Figure 1: Criteria and sub-criteria of supplier selection information technology

Management
- Business Integration: Most organizations working in fields other than IT. If these organizations decide that provide IT services to internal sources will lose their integrity[5]
- Dependence on Supplier: High dependence on an IT supplier is perceived as a main risk that might threaten the client's business performance[5,21,22]
- Manpower supply: By outsourcing have the possibility to access skilled workforce and temporary[23-29]
- Focus on core competencies: Activities which do not constitute a core competence of the firm can be given to outside firms who can provide these at a lower cost.[22,23,30]

Technology
- Physical facilities and assets: Physical facilities and assets supplier can increase the capabilities of technology and will not be needed to invest in the IT field by the organization[23-26,29,31-34]
- Innovation: Up-gradation of technology.[24,35-37]

Issues related to the services/products
- Quality: Extent to which the product specifications are met[5,19-21,23-28,30-32,37-40]
- Speed of service delivery: Suppliers must provide the required services in the shortest possible time, otherwise will reduce the competitiveness of the organization[5,19-21,28,31,39,40]
- Flexibility: This criterion is a qualitative measure stating how fast the outsourcer can adapt its system to changes.[5,19,21,23,24,27,31,32,39,41]

Environmental
- Market Capabilities: Having a market of skilled manpower, infrastructure, and technology to meet the needs of the organization[5,20,31]
- Geographical location: Geographical location may be in different time zones, which require working at odd hours.[27,28]

Risk
- Information Security: If you have medical records or any other confidential information that will be transmitted to the outsourcing company, there is a risk that the confidentiality may be compromised[5,19,22,23,27,34]

- Management Control: Loss of management control is the most important reason for not outsourcing.[5,19,22,23,37]

Economic

- Cost: It refers to the total cost involved, and it has to be reduced[5,19,20,23-25,27,28,30,31,39-42]
- Financial capability: Financial capability is essential for suppliers to assure continuity of supply and reliability of product quality.[20,21,28,31-34]

DISCUSSION

The criteria and sub-criteria influencing outsourcing decisions in Iranian hospitals were identified in six major categories including administrative issues, issues related to the service/product, technology factors, environmental factors, risks, and economic factors associated with 15 sub-criteria containing business integration, dependence on suppliers, human resources, focus on core competencies, facilities and physical capital, innovation, quality, speed of service delivery, flexibility, market capabilities, geographical location, security, management control, cost, and financial capability.

Chyan Yang and Jen-Bor Hung in a study titled "A decision model for Information System (IS) outsourcing" expressed factors influencing outsourcing decisions, including economic agents, strategic, management, technology, and quality.[35]

Kaya also considered quality, cost, organizational factors, technological factors, and environmental factors as the main criteria affecting the decision to outsource and announced that environmental factors with weight 0.312 and organizational factors with weight 0.223 have the greatest impact on decision making.[43]

Nahavandi *et al.* suggested that issues related to product with weight 0.540, environmental issues with weight 0.297, and management issues with weight 0.163 are the main criteria influencing IT outsourcing decisions.[5]

Liou and Chaung identified eleven criteria for supplier selection and expressed that loss of management control with weight 0.156, speed of service delivery with weight 0.136, and information security with weight 0.134 have the greatest impact on decision making.[19] These criteria are similar to the criteria identified in this study, but the weight prioritization criteria have obvious differences in various studies.

Given that different criteria have been identified to choose supplier of IT services, most of which are usually mental factors, a significant difference is observed in ranking and rating of influencing criteria on supplier choice. This fact emphasizes on the importance of using systematic and multi-criteria patterns, which help decision makers to identify definite priority of decision options with proper rating of different criteria. As IT unit has a lot of responsibilities, which are not simply measureable with money scales, evaluation methods based on financial criteria are not suitable.[44] Analytical

Hierarchy Process (AHP) is one of multi-criteria decision processes that consider mental factors as well as concrete factors in decision making[45] and one of the group decision making techniques is utilized to determine priorities.[46]

CONCLUSION

Different factors have been identified and used by researchers in order to outsource decisions, but various studies show a significant difference in criteria1 rating. These differences are due to organizational, environmental, and economic factors. Therefore, influencing criteria in decision of outsourcing should be investigated separately according to organization's position and mission, environmental and economic situation, and advantages and disadvantages of each form of IT service supplying. This way, the organization will be able to make proper outsourcing information technology decisions.

REFERENCES

1. Ferdosi M, Farahabadi SM, Jandagheian M, Haghighat M, Naghdi P. Outsourcing effectiveness of admission units of imaging centers in Ayatollah Kashani Hospital to non-governmental sector. Hospital J 2011;10:52-61.
2. Torani S, Maleki M, Ghodosi Moghadam S, Gohari M. Comparison of efficiency and effectiveness of firozgar education drugstore before and after of outsourcing. Health Manag 2009;12:59-72.
3. Ajami S, Ketabi S, Saghaeiannejad S, Heidari A. Requirements and areas associated with readiness assessment of Electronic Health Records implementation. J Health Adm 2011;14:71-8.
4. Tohidi H. The Role of Risk Management in IT systems of organizations. Procedia Comput Sci 2011;3:881-7.
5. Nahavandi N, Yousefian MH, Bayat A. IT outsourcing strategy selection: The case of Iranian Banking Industry. Q J New Econ 2008;13:89-110.
6. Domberger S, Jensen PH, Stonecash RE. Examining the magnitude and sources of cost savings associated with outsourcing. Public Perform Manage Rev 2002:148-68
7. Power M. The outsourcing handbook: How to implement a successful outsourcing process. London, United Kingdom: Kogan Page Publishers; 2006.
8. Brooks N. Understanding IT outsourcing and its potential effects on IT workers and their environment. J Comput Inf Syst 2006;46:46-53.
9. Isıklar G, Alptekin E, Büyüközkan G. Application of a hybrid intelligent decision support model in logistics outsourcing. Comput Oper Res 2007;34:3701-14.
10. Yang DH, Kim S, Nam C, Min JW. Developing a decision model for business process outsourcing. Comput Oper Res 2007;34:3769-78.
11. Ashley E. Outsourcing for dummies. New Jersey: Wiley Publishing; 2008.
12. Tayauova G. Advantages and disadvantages of outsourcing: Analysis of outsourcing practices of Kazakhstan banks. Procedia Soc Behav Sci 2012;41:188-95.
13. Bertolini M, Bevilacqua M, Braglia M, Frosolini M. An analytical method for maintenance outsourcing service selection. Int J Qual Reliab Manag 2004;21:772-88.
14. Kurdia M, Abdul-Tharim A, Jaffar N, Azli M, Shuib M, Ab-Wahid A. Outsourcing in facilities management-A Literature Review. Procedia Eng 2011;20:445-57.
15. Willcocks L, Hindle J, Feeny D, Lacity M. IT and business process outsourcing: The knowledge potential. Inf Syst Manage 2004;21:7-15.
16. Pirannejad A, Salami H, Mollaee A. Outsourcing priorities of government functions: Analytic network process approach. Afr J Bus Manag 2010;4:1723-35.

17. Adeleye BC, Annansingh F, Nunes MB. Risk management practices in IS outsourcing: An investigation into commercial banks in Nigeria. Int J Inf Manage 2004;24:167-80.
18. Hsu CI, Chiu C, Hsu PL. Predicting information systems outsourcing success using a hierarchical design of case-based reasoning. Expert Syst Appl 2004;26:435-41.
19. Liou JJ, Chuang YT. Developing a hybrid multi-criteria model for selection of outsourcing providers. Expert Syst Appl 2010;37:3755-61.
20. Ketabi S, Hagh shenas A, Hadadyan A. Multi-criteria supplier selection using fuzzy AHP. Ind Manage Stud 2006;12:73-96.
21. Araz C, Mizrak Ozfirat P, Ozkarahan I. An integrated multicriteria decision-making methodology for outsourcing management. Comput Oper Res 2007;34:3738-56.
22. Ghazi Zadeh Fard SZ, Ahmadvand A, Bahr AH. Design of decision making model to outsource activities in repair and maintenance division (A Governmental Organization Case Study). Police Hum Dev 2012;8:55-72.
23. Razmi J, Faghih-Roohi S. Decision making about information systems outsourcing using Fuzzy analysis hierarchy process. Ind Technol Dev 2010;8:35-48.
24. Veni KK, Rajesh R, Pugazhendhi S. Development of decision making model using integrated AHP and DEA for vendor selection. Procedia Eng 2012;38:3700-8.
25. Kahraman C, Engin O, Kabak O, Kaya I. Information systems outsourcing decisions using a group decision-making approach. Eng Appl Artif Intell 2009;22:832-41.
26. Wang JJ, Yang DL. Using a hybrid multi-criteria decision aid method for information systems outsourcing. Comput Oper Res 2007;34:3691-700.
27. Khalfan A, Gough TG. IS/IT Outsourcing Practices in the Public Sector: A case study of a developing country. Mexico: Research Report Series-University of Leeds school of computer studies LU SCS RR; presented at BITWorld 2000; 2000 (15).
28. Ha SH, Krishnan R. A hybrid approach to supplier selection for the maintenance of a competitive supply chain. Expert Syst Appl 2008;34:1303-11.
29. Hafeez K, Malak N, Zhang Y. Outsourcing non-core assets and competences of a firm using analytic hierarchy process. Comput Oper Res 2007;34:3592-608.
30. Buyukozkan G, Feyzioglu O. An intelligent decision support system for IT outsourcing. Proceedings of the Third international conference on Fuzzy Systems and Knowledge Discovery: New York City: Springer Publishing; 2006: 1303-12. DOI: 10.1007/11881599_162.
31. Chen LY, Wang TC. Optimizing partners' choice in IS/IT outsourcing projects: The strategic decision of fuzzy VIKOR. Int J Prod Econ 2009;120:233-42.
32. Bottani E, Rizzi A. An adapted multi-criteria approach to suppliers and products selection-An application oriented to lead-time reduction. Int J Prod Econ 2008;111:763-81.
33. Jaskowski P, Biruk S, Bucon R. Assessing contractor selection criteria weights with fuzzy AHP method application in group decision environment. Autom Const 2010;19:120-6.
34. Hassanzadeh A, Razmi J. An integrated fuzzy model for supplier management: A case study of ISP selection and evaluation. Expert Syst Appl 2009;36:8639-48.
35. Yang C, Huang JB. A decision model for IS outsourcing. Int J Inf Manage 2000;20:225-39.
36. Kung CY. Using fuzzy sets and grey decision-making to construct the performance evaluation model of firm's outsourcing management–A case study of avionics manufacturer in Taiwan. Qual Quant 2006;40:577-93.
37. Kremic T, Tukel OI, Rom WO. Outsourcing decision support: A survey of benefits, risks, and decision factors. Supply Chain Manage An Int J 2006;11:467-82.
38. Hsu PF, Hsu MG. Optimizing the information outsourcing practices of primary care medical organizations using Entropy and TOPSIS. Qual Quant 2008;42:181-201.
39. Montazer GA, Saremi HQ, Ramezani M. Design a new mixed expert decision aiding system using fuzzy ELECTRE III method for vendor selection. Expert Syst Appl 2009;36:10837-47.
40. Shyur HJ, Shih HS. A hybrid MCDM model for strategic vendor selection. Math Comput Model 2006;44:749-61.
41. Barthelemy J. The seven deadly sins of outsourcing. Acad Manage Exec 2003;17:87-98.
42. Godwin GU. Using analytic hierarchy process to analyze the information technology outsourcing decision. Ind Manage Data Syst 2000;100:421-9.
43. Kaya I. Evaluation of outsourcing alternatives under fuzzy environment for waste management. Resour Conserv Recycling 2012;60:107-18.
44. Ketabi S, Hagh shenas A, Dalvi MR. Performance evaluation using balanced scorecard through analytic hierarchy process. Manage Knowl 2007;20:21-46.
45. Ajami S, Ketabi S. Performance evaluation of medical records departments by analytical hierarchy process (AHP) approach in the selected hospitals in Isfahan. J Med Syst 2012;36:1165-71.
46. Ketabi S, Yaghoubi M, Karimi S, Javadi M. Factors affecting patients' length of stay in Alzahra hospital based on hierarchical analysis technique. Health Inf Manage 2011;8:326-34.