Post-Implementation ERP Success Assessment: A Conceptual Model

Fan Zhao and Eugene Hoyt(✉)

Department of Information Systems and Operations Management, Florida Gulf Coast University, Fort Myers, USA
{fzhao, ehoyt}@fgcu.edu

Abstract. Enterprise Resource Planning (ERP) success research has been widely studied. Models to test the success of an ERP implementation have been developed, but most models do not adequately test all implementations success after implementation. This literature review study introduces a new model for testing any ERP post-implementation to determine if it was successful or not rather than relying on other models that determine it to be a failure if it did not fit within the model constraints.

Keywords: IS · ERP · Success · Post-implementation

1 Introduction

Businesses today are more strategic when it comes to selecting and implementing new systems; however, the rate of successful implementations remains low even with decades of implementation experience. There continues to be no systematic method to evaluate the success post implementation. Most researchers point to the use of Critical Success Factors (CSF) within the Enterprise Resource Planning (ERP) process for testing the failure or success of a system implementation. While this is a good start, the business community needs a better tool that can be applied across all platforms. The need for constructing an Enterprise Resource Planning (ERP) testing model is now [1]. This model, once constructed, could be used for any enterprise resource planning (ERP) implementation, regardless of size, complexity, scope, vendor or age of applications, to test if it was a success or not.

After nearly 75 years of applications on mainframes to Desktop environments and with so many implementations, why are there so many failures? The disturbing observation is the lack of conclusion on the outcome of an implementations success or failure [2]. The focus on post implementation is the evidence of no closed loop evaluation of success. Did we accomplish the objectives of our business case? Did we receive the return on investment in the period we predicted? Did we gain the competitive advantage, processes, productivity expected? Were we able to accomplish the implementation within budget, scope and time? Was the product purchased, developed or integrated or did we need to make modifications to our own expectations on what we expected?

M. Kurosu (Ed.): Human-Computer Interaction, Part III, HCII 2015, LNCS 9171, pp. 246–255, 2015.
DOI: 10.1007/978-3-319-21006-3_25

Despite the widespread research investigating ERP success and failure [3, 4], little research has empirically investigated how to evaluate ERP success. Since there are too many research studies on ERP implementation success, our research focuses on post-implementation success of ERP. While there is research on critical success factors in ERP, this empirical research focused more on relationships between critical success factors and ERP success. However, different research adopts different constructs to assess post-implementation success of ERP. There is no systematic constructs, supported by empirical studies, to evaluate post-implementation success of ERP yet. Therefore, the purpose of this article is to propose a systematic constructs to assess post-implementation success of ERP.

2 Literature Review

2.1 Information Systems (IS) Success

Plenty of research has been done on factors associated with the success of IS [6–9], notably the DeLone and McLean model (2003) which has been applied to many cases over the decade since its first publication [10, 11]. There are two versions of IS success model from DeLone and McLean. First one was developed in 1992 while the computers and Internet were not dominate in the business world. In this initial model, there are two levels, individual and organizational. They believe that system quality and information quality impact IS use and users' satisfactions, then further influence the individual behaviors, and eventually spread to organizational level.

Most studies adopt the Technology Acceptance Model (TAM) [12] to measure the system quality. However, recent researchers believe that we should use more constructs to completely represent the system quality, such as reliability, portability, user friendliness, understandability, effectiveness, maintainability, economy, and verifiability [13]. Information quality refers to the quality of system output, such as reports generated by the system. Livari [2] adopt Bailey and Pearson's construct [14] to measure information quality in six categories: completeness, precision, accuracy, reliability, currency, and format of output. IS use is typically measured in several categories, such as intent to use, which is adopted from TAM [12], frequency of use, self-reported use and actual use.

Because of the overlapping results of using all of the constructs [15], most of the studies adopt frequency of use as the dominant measure construct. However, Doll and Torkzadeh [16, 17] argue that using effects of use could be more precise than the frequency of use. Furthermore, Burton-Jones and Gallivan [18] support a measurement of using multiple perspectives across the individual and organizational levels to gain a full picture of the IS use. There are two fundamental instruments in measuring user satisfaction: End-User Computing Support (EUCS) instrument by Doll [16, 17] and User Information Satisfaction (UIS) instrument by Ives [19]. To simplify the instrument and avoid overlapping measurement of system and information quality [20], some of the researchers now prefer to use a single item to just measure overall satisfaction of the IS use (Fig. 1).

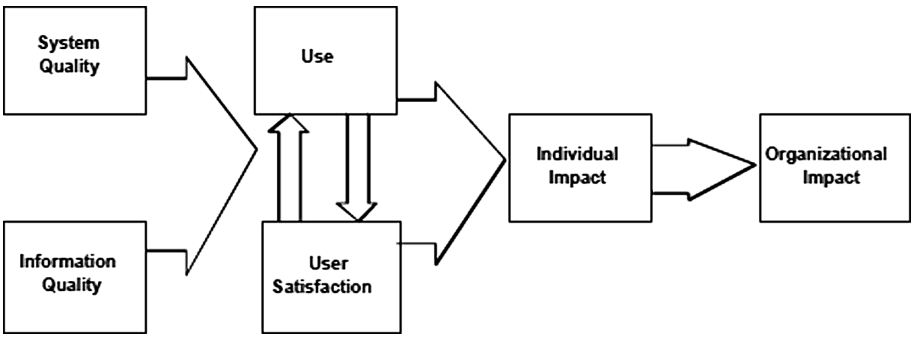

Fig. 1. The DeLone-McLean model for IS success

In 2003, DeLone and McLean updated the initial model and propose a new research model by adding several new variables and restructure the framework. With 10 more years of IT/IS experiences, now they have a clearer picture of IS. Besides information quality and system quality, service quality was added to the model as the first layer; the construct use was divided into two parts: intention to use and use because they posit in the context of IS usage, users will first have the intention to use the system before they actually use it. The relationship with user satisfaction therefore changes to a circle: after the initial use of the IS, user satisfaction will cause users' intention to use, and the more the experiences the user has with the IS, the more satisfaction generated and this relationship eventually will impact the net benefits of the organization.

Service quality is an achievement of reaching desired services level of IS for the users. SERVQUAL is adopted to measure the service quality even though some researchers criticize the instrument [10]. In the updated model, DeLone and McLean found more internal and external impacts rather than just organizational, such as work group impacts, industry impact, consumer impact, and so on. Therefore, they decide to combine all the impacts into one single category called Net Benefits (Fig. 2).

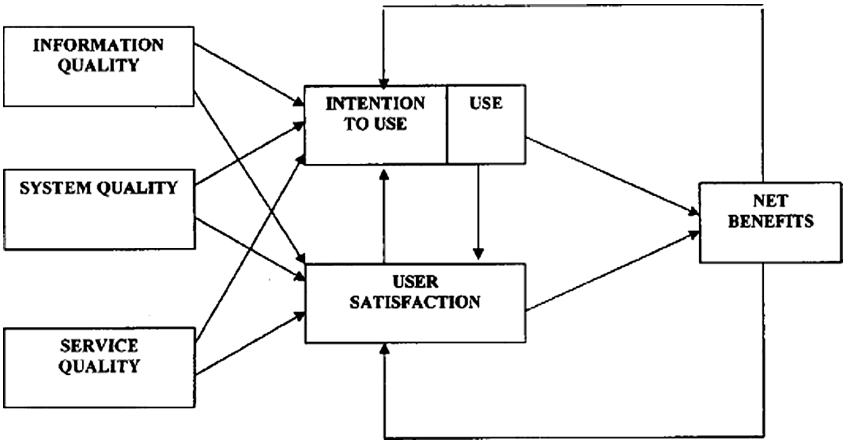

Fig. 2. The updated DeLone-McLean model for IS success

To support the DeLone-McLean Model applications, Iivari [2] conducted an empirical study to testify the model in a field study. All the relationships are found significant except two: the influence of system use on individual impact and the influence of information quality on system use.

2.2 ERP Life Cycle

ERP is unique within Information Systems (IS) because of its size. According to Capaldo and Rippa [21], there are three phases in a typical ERP life cycle: pre-implementation, implementation, and post-implementation. Pre-implementation refers to the strategic planning stage before the ERP actual project implementation, including strategic decision making, planning, system design, and system selection. Implementation phase focuses on physical processes of software and hardware installation, parameterization, database and system integration, testing, and system stabilization. Lastly, post-implementation is the stage for organizations to run and maintain the ERP systems at daily bases. The post-implementation includes six processes [22]:

- Corrective process, such as application of vendor additions and troubleshooting
- Adaptive process, such as modifications/enhancements and authorization
- Perfective process, such as system version upgrade
- Preventive process, such as administration and work-flow monitoring
- User Support process, such as help desk and user training and education
- External process, such as Coordination and administration among supplier and customers

2.3 ERP Success

To increase the efficiency and effectiveness of ERP adoptions and applications, it is necessary to study the success of ERP. However, during its life cycle, there are more than one success levels of ERP. The majority of the current studies focus on ERP implementation success. Only a few studies conducted research on ERP post-implementation success. Even in post-implementation success studies, there are two different methods, what we called Type I and Type II.

In type I method, ERP post-implementation success is studied as a dependent variable and the purpose of this type of research is to find out what are the main factors impacting the ERP post-implementation success and how to maximize the benefits of the success. Ng [23] raises a conceptual model for ERP post-implementation success. Besides the factors he adopted from DeLone-McLean Model, degree of customization, operation characteristics of the system, and three fitness variables, such as data fit, process fit, and user interface fit, are found significantly related to user satisfaction and/or system use and eventually influencing net benefits from the ERP system (Fig. 3).

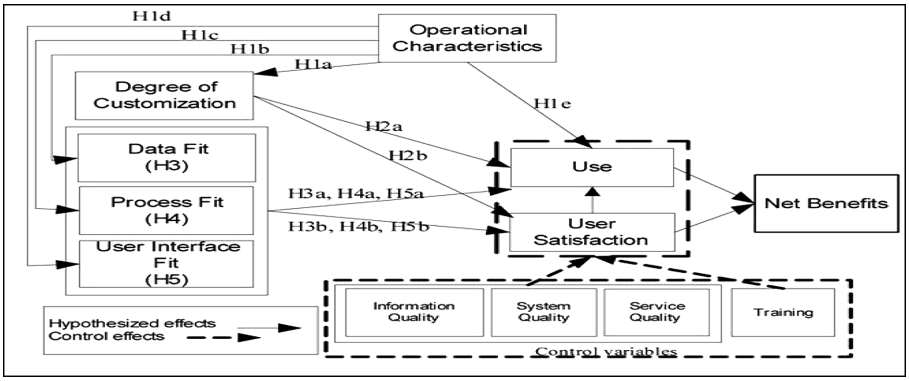

Fig. 3. A conceptual model of ERP success

From a practical development perspective, Zhu [24] proposed another research model to reveal the factors leading ERP post-implementation success. They distinguished all the factors into two levels: first order contract, including project management, system configuration, leadership involvement, organizational fit, and external support, and second order construct with technological aspect (implementation quality) and organizational aspect (organizational readiness) (Fig. 4).

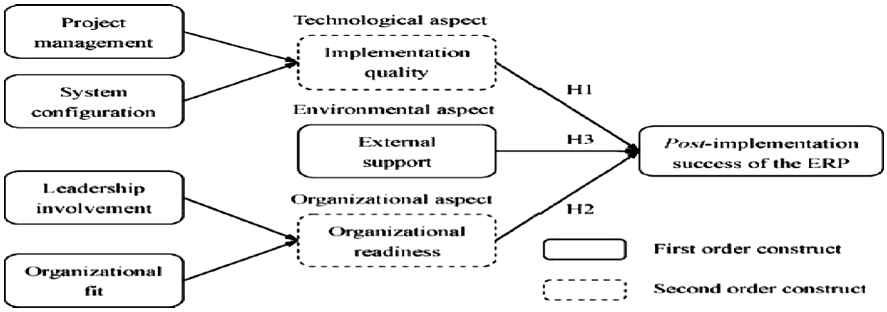

Fig. 4. Research model for ERP post-implementation success

Drawing from the leadership theory, by emphasizing organizational culture and knowledge sharing on transformational leadership, Shao [25], identified four organizational culture factors, development culture, group culture, hierarchical culture, and rational culture, which are impacted by transformational leadership, influencing ERP knowledge sharing and ERP Success (Fig. 5).

Additionally, according to the Change Management Model, AL-Ghamdi [26] proposed a research model leading to a successful ERP outcome. There were five levels in the model:

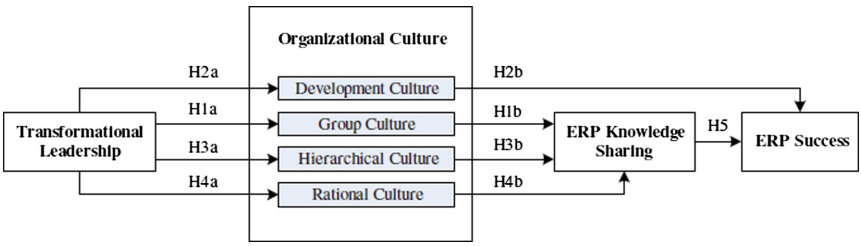

Fig. 5. Research model from Shao, et al.

- Level 1: change management environment,
- Level 2: strategies, processes, and techniques,
- Level 3: user reaction,
- Level 4: IT personnel re-skilling, user training, readiness, and introduction to new system;
- Level 5: successful system implementation (Fig. 6).

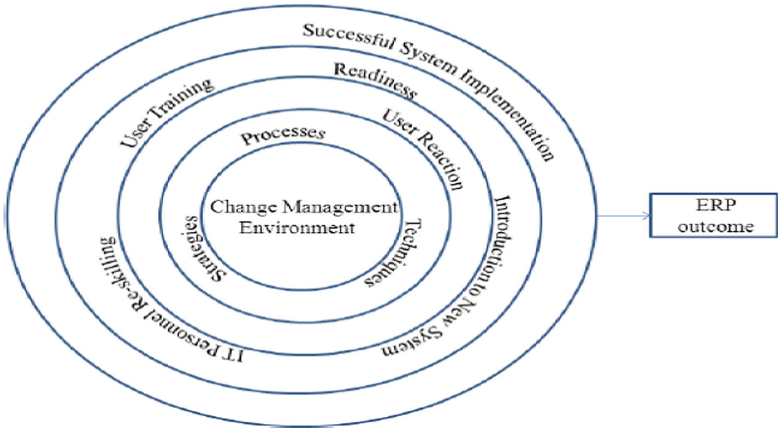

Fig. 6. Proposed change management model for successful ERP

By contrast, type II success focused on how to evaluate ERP post-implementation success. Shao [25] concluded that ERP post-implementation success should include four aspects:

- After ERP implementation, operational cost in the firm is reduced;
- After ERP implementation, sales income in the firm is increased;
- After ERP implementation, managerial decision efficiency in the firm is improved;
- After ERP implementation, customer satisfaction in the firm is enhanced.

Zare and Ravasan [27] stated a new model to assess the post-implementation success. Besides the DeLone-McLean IS Success Model, the authors added two new constructs in their research framework: workgroup impact, the system effective influence on sub-units or departments in the organization [1], and inter-organizational impact, evaluated through increased customer service/satisfaction, e-government enabler, better supplier relationships, e-business/e-commerce enabler, improved service/product delivery, improved cooperation with colleagues and so on [28].

Using the Fuzzy Analytic Network Process (ANP), Moalagh and Ravasan [29] proposed another assessment model with a middle level of managerial success, organizational success and individual success (Fig. 7).

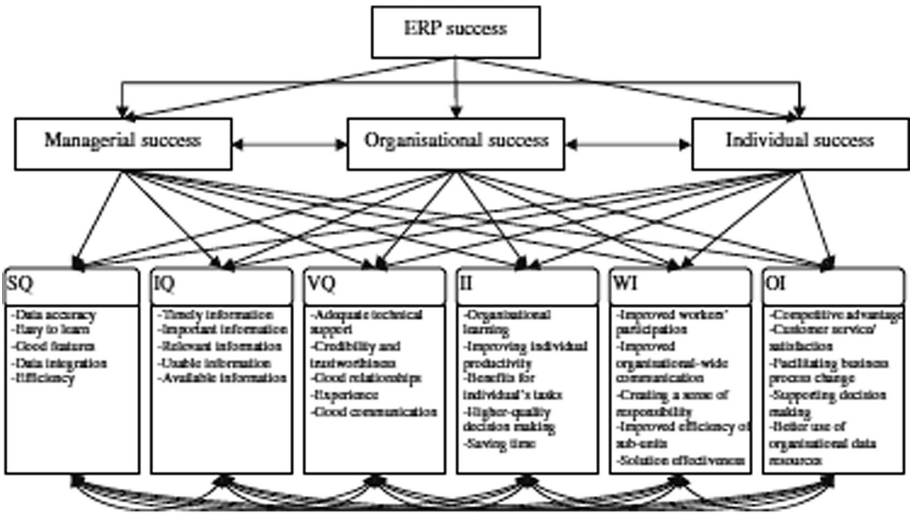

Fig. 7. ANP framework for ERP success assessment

3 Research Model

In this research model, we do not agree with the model proposed by Zare and Ravasan [27]. Even though the authors argue that inter-organizational impacts should be paid attention to when we evaluate the success, we believe that the constructs in inter-organizational impacts are overlapped by the constructs from other factors, such as service quality, organizational impact, and so on. Additionally, we also have questions with Moalagh and Ravasan's [29] model regarding to the three middle levels. The three middle level constructs are all measured by all six third level constructs, which means it's useless to have these three middle levels in the research model and without these three constructs, this research model is back to the model proposed by Ifinedo [1].

In our research model, we believe that the success of ERP post-implementation should be considered based on the original aims/purposes when organizations decide to implement the system. If the ERP achieves the original aims/purposes, we can say it is successful. Otherwise, even if it fits in the success model proposed in previous studies, we cannot say the ERP post-implementation is successful. Or, for example, based on the previous research models, the assessment shows failure of the ERP post-implementation because of the worsened supplier relationship after the ERP implementation. We cannot say the ERP post-implementation is not successful if, in the beginning, the organization did not have building a better relationship with suppliers as one of their aims/purposes for the ERP adoption (Fig. 8).

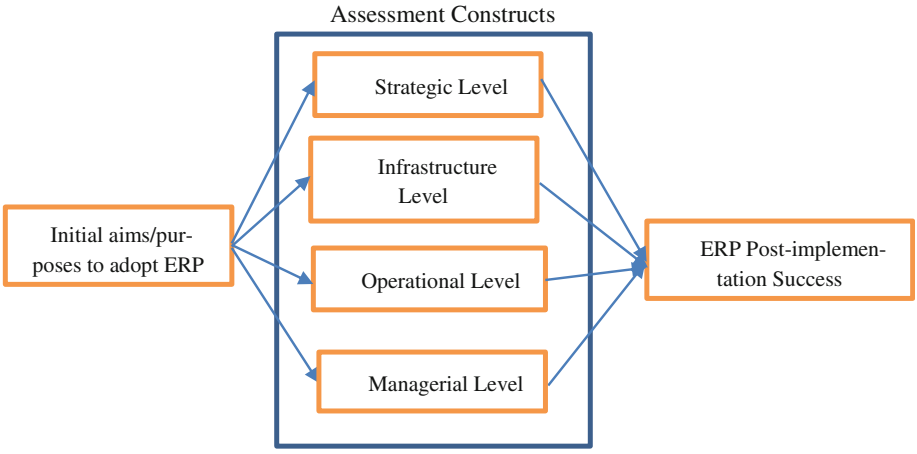

Fig. 8. Proposed research model for post-implementation assessment

Through data standardization and process integration, ERP systems have the potential to facilitate communications and coordination, enable the centralization of administrative activities, reduce IS maintenance costs and increase the ability to deploy new IS functionality [30]. Therefore, back to the original purposes of ERP adoption, we propose our research model to systematically evaluate the ERP post-implementation success:

In this model, we conceptualize the assessment into four levels consisting of the strategic level, infrastructure level, operational level, and the managerial level. In the strategic level, strategic purposes will be evaluated, such as to increase market responsiveness, sharpen the organization's competitive edge, and so on. Infrastructure level refers to IT/IS structures in the organization, such as reduce IT/IS maintenance costs, system integration, data centralization, and so on. Operational level can be evaluated through operational activities, such as adopt best practices, improve productivity, reduce operational costs, and so on. Managerial level focuses on the centralization of administrative activities, improvement of communications, effective decision making, and so on.

4 Discussion and Conclusions

This research intended to find the appropriate constructs to evaluate ERP post-implementation successes. Through the literature review process we discovered the need for a new model dealing with the ERP post-implementation success rather than the success by itself. The proposed model for testing the ERP post-implementation will offer a broader scope for testing ERP post-implementation success than previous models researched. Our study broadens the research of ERP post-implementation success thereby bringing opportunity for future research in this area.

References

1. Ifinedo, P., Rapp, B., Ifinedo, A., Sundberg, K.: Relationships among ERP post-implementation success constructs: an analysis at the organizational level. Comput. Hum. Behav. **26**(5), 1136–1148 (2010)
2. Iivari, J.: An empirical test of the DeLone-McLean model of information systems. Data Base Adv. Inf. Syst. **36**(2), 8–27 (2005)
3. Peslak, A.: Enterprise resource planning success: an exploratory study of the financial executive perspective. Ind. Manage. Data Syst. **106**(9), 1288–1303 (2006)
4. Tsai, W., Hsu, P., Cheng, J., Chen, Y.: An AHP approach to assessing the relative importance weights of ERP performance measures. Int. J. Manage. Enterp Dev. **3**(4), 351–375 (2006)
5. Wang, E., Chen, J.: The influence of governance equilibrium on ERP project success. Decision Support Systems **41**, 708–727 (2006)
6. Drury, D., Farhoomand, A.: A hierarchical structural model of information systems success. INFOR **36**(1/2), 25–40 (1998)
7. Larsen, K.: A taxonomy of antecedents of information systems success: variable analysis studies. J. Manage. Inf. Syst. **20**(2), 169–246 (2003)
8. Rai, A., Lang, S., Welker, R.: Assessing the validity of IS Success Models: an empirical test and theoretical analysis. Inf. Syst. Res. **13**(1), 50–69 (2002)
9. Sabherwal, R., Jeyaraj, A., Chowa, C.: Information system success: individual and organizational determinants. Manage. Sci. **52**(12), 1849–1864 (2006)
10. DeLone, W., McLean, E.: The DeLone and McLean model of information systems success: a ten-year update. J. Manage. Inf. Syst. **19**(4), 9–30 (2003)
11. DeLone, W., McLean, E.: Information systems success: the quest for the dependent variable. Inf. Syst. Res. **3**(1), 60–95 (1992)
12. Davis, F.D.: Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. **13**(3), 318–346 (1989)
13. Rivard, S., Poirier, G., Raymond, L., Bergeron, F.: Development of a measure to assess the quality of user-developed applications. DATA BASE Adv. Inf. Syst. **28**(3), 44–58 (1997)
14. Bailey, J.E., Pearson, S.W.: Developing a tool for measuring and analyzing computer user satisfaction. Manage. Sci. **29**(5), 530–545 (1983)
15. Collopy, F.: Biases in retrospective self-reports on time use: an empirical study of computer users. Manage. Sci. **42**(5), 758–767 (1996)
16. Doll, W.J., Torkzadeh, G.: Developing a multidimensional measure of system-use in an organizational context. Inf. Manage. **33**(4), 171–185 (1998)

17. Doll, W.J., Torkzadeh, G.: The measurement of end-user computing satisfaction. MIS Q. **12** (2), 259–274 (1988)
18. Burton-Jones, A., Gallivan, M.J.: Toward a deeper understanding of system usage in organizations: a multilevel perspective. MIS Q. **31**(4), 657–680 (2007)
19. Ives, B., Olson, M.H., Baroudi, J.J.: The measurement of user information satisfaction. Commun. ACM **26**(10), 785–793 (1983)
20. Rai, A., Lang, S.S., Welker, R.B.: Assessing the validity of is success models: an empirical test and theoretical analysis. Inf. Syst. Res. **13**, 50–69 (2002)
21. Capaldo, G., Rippa, P.: A planned- oriented approach for ERP implementation strategy selection. J. Enterp. Inf. Manage. **22**(6), 642–659 (2009)
22. Nah, F., Faja, S., Cata, T.: Characteristics of ERP software maintenance: a multiple case study. J. Softw. Maint. Evol.: Res. Pract. **13**(6), 399–414 (2001)
23. Ng, C.: A case study on the impact of customization, fitness, and operational characteristics on enterprise-wide system success, user satisfaction, and system use. J. Global Inf. Manage. **21**(1), 19–41 (2013)
24. Zhu, Y., Li, Y., Wang, W., Chen, J.: What leads to post-implementation success of ERP? an empirical study of the Chinese retail industry. Int. J. Inf. Manage. **30**, 265–276 (2010)
25. Shao, Z., Feng, Y., Liu, L.: The mediating effect of organizational culture and knowledge sharing on transformational leadership and enterprise resource planning systems success: an empirical study in China. Comput. Hum. Behav. **28**, 2400–2413 (2012)
26. AL-Ghamdi, A.: Change management strategies and processes for the successful ERP system implementation: a proposed model. Int. J. Comput. Sci. Inf. Secur. **11**(2), 36–41 (2013)
27. Zare, A., Ravasan, A.: An extended framework for ERP post-implementation success assessment. Inf. Resour. Manage. J. **27**(4), 45 (2014)
28. Su, Y., Yang, C.: A structural equation model for analyzing the impact of ERP on SCM. Expert Syst. Appl. **37**(1), 456–469 (2010)
29. Moalagh, M., Zare Ravasan, A.: Developing a practical framework for assessing ERP post-implementation success using fuzzy analytic network process. Int. J. Prod. Res. **51**(4), 1236–1257 (2013)
30. Gattiker, T., Goodhue, D.: Understanding the local-level costs and benefits of ERP through organizational information processing theory. Inf. Manage. **41**, 431–443 (2004)