2014

Critical Success Factors for the Acquisition of Enterprise Systems: Empirical Validation

Tariq Bhatti
Zayed University, UAE, tariq.bhatti@zu.ac.ae

15P. Critical Success Factors for the Acquisition of Enterprise Systems: Empirical Validation

Tariq Bhatti
Zayed University, UAE
Tariq.Bhatti@zu.ac.ae

Abstract

Enterprise Systems are high cost propositions as they place tremendous demands on organization's time and resources. Successful investments in Enterprise Systems require a sound understanding of the acquisition and implementation processes of these enterprise-wide systems. The ERP Implementation literature contains many examples of organizations that have implemented successfully. However, there have been cases where organizations did not achieve success due to wrong acquisition of ERP systems. Few studies have scientifically developed and tested constructs that represent critical success factors of ERP acquisition projects. Based on a survey of 53 organizations in Australia, the results suggest 60 item instrument measures ten dimensions of CSFs of ERP acquisition is well - validated. It is argued that model proposed in the paper is valuable to researchers and practitioners interested in acquiring Enterprise Resource Planning systems.

Keywords

ERP, CSF, Acquisition, implementation, empirical research

1. Introduction

The business environment is changing dramatically and in order to stay competitive in the market, organizations must improve their business practices and procedures. Organizations within all departments and functions upgrade their capability to generate and communicate accurate and timely information. The organizations which have successfully implemented the ERP systems are reaping the benefits of having integrated working environment, standardized process and operational benefits to the organization. Not all ERP implementations have been successful. There have been horror stories of ERP implementation and improper implementation has taken the companies to bankruptcy and in several cases organizations decided to abandon the ERP implementation projects. The questions many academicians and researchers have asked, what are the reasons of success and failure of ERP implementations. Some of the reasons cited in the literature are lack of support of top management support, resistance from employees, poor selection (acquisition) of ERP systems and vendor etc. This research is an attempt to extend the ERP acquisition research by defining the conceptual domains constructs and operational measures specific to ERP acquisition critical success factors to advance ERP research. The objective of this paper is to develop an instrument for measuring ERP acquisition critical success factors. We follow two step processes; first, we identify 12 constructs covering critical success factors for ERP acquisition. Second, because the constructs are latent variables, we apply a rigorous procedure for ensuring the psychometric adequacy of the resulting new multi-item measurement scales.

In the next section of this paper integrated model is presented. Section 3.0, constructs and the definitions for the study are presented. In section 4, scale development process is discussed. In section 5.0 field survey and data analysis is presented. In the last section of this paper we conclude with a discussion of the implications of our results and usage of the scales, review the limitations of our study, and offer some concluding thoughts.

We conducted a cross-disciplinary literature review encompassing OBB, Change management, MIS, strategic management, innovation diffusion, and operations to develop a framework, construct definitions, and item generation for this study. This process yielded the baseline model depicted and a set of initial measurement scales for twelve theoretically important critical success factors.

2. Model Development

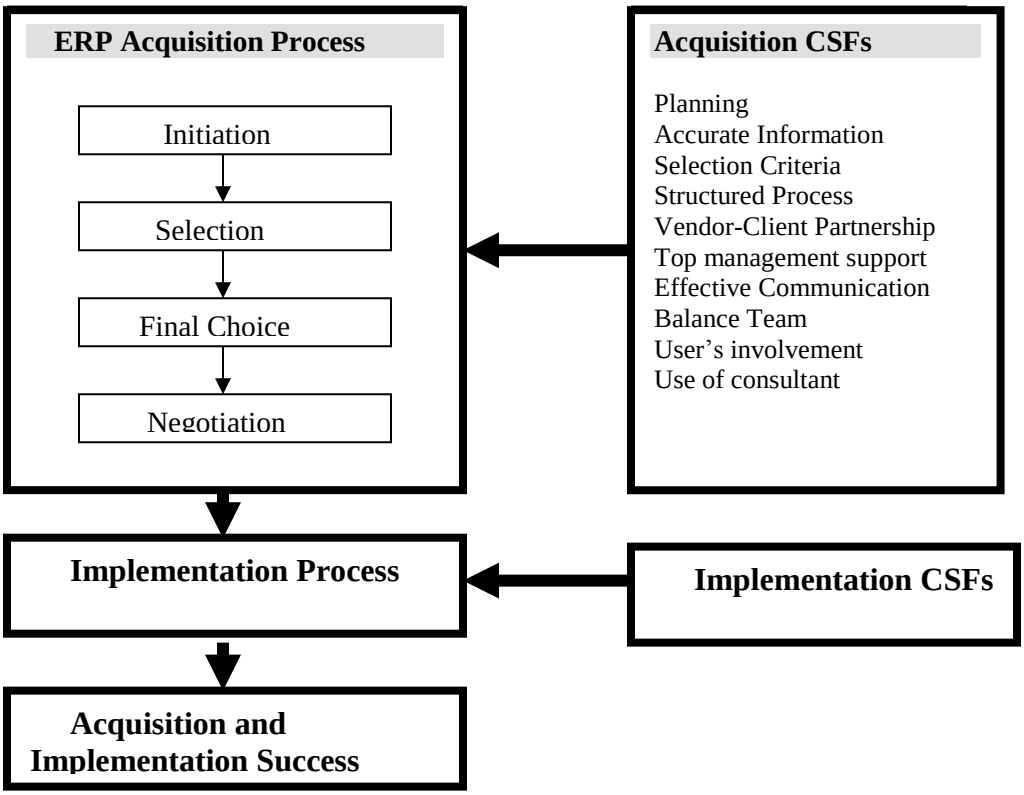

Figure 1: Enterprise Resource Planning Systems acquisition framework.

Figure 1 illustrates the conceptual model developed for this study. Drawing from multiple literature bases, we introduced an integrative, conceptual framework of what we call "integrated ERP implementation," which is comprised of a set of theoretically important constructs. This framework has been developed based on the organizational buying behaviour, in which the ERP acquisition goes through different processes before it is implemented. There are number of

factors that affect the ERP acquisition process are termed in this study as acquisition critical success factors. Upon the completion of ERP acquisition project the project is implemented and performance is measured by a mix of acquisition and implementation success.

3. Conceptual Domains of CSFs for ERP Acquisition

Since the model constructs are latent variables, which cannot be measured directly, multi-item scales, each composed of a set of individual items, were needed to obtain indirect measures of each construct. The items listed in this section represent the scales as drawn from the practitioners, and refined through an expert judge-based manual sorting process (Stratman and Roth, 2002). These scales were further refined (and some items were dropped) as a result of an empirical test of a survey instrument containing these initial scales.

Rockart (1979) presented critical success factors (CSFs) as an aid to assist the management to focus its time and effort by monitoring results in those areas that are most important in helping to attain organisational goals. CSFs are those areas of organisational effort that must meet certain predetermined results for the entity to attain its goals. The ability of an organisation to monitor performance in those areas and measure results is essential for success.

CSFs can be understood as the few key areas where things must go right for the implementation to be successful. Past studies have identified a variety of CSFs for ERP implementation, among which context related factors consistently appear. The ERP acquisition process begins after the organisation has decided to adopt an ERP system. It is a set of phases and activities that involve initiation, selecting, evaluating and negotiating to acquire an ERP system for an organisation. Following are the commonly identified CSFs identified by several researchers and are pertinent for the success of ERP implementation project. Implementation process stages and implementation are not included the current research study. CSFs are the number of factors that may affect the ERP implementation process, and the probability of conversion success has been identified in the IT implementation, IT failures, and business process re-engineering literature. Among the more important factors are top management support and involvement, need for a project champion, user training, technological competence, project planning, change management and project management (Somers and Nelson, 2001). From the perspective of ERP implementation, additional issues which could be incorporated are business process re-engineering, business teams and others. In the next section, a list of CSFs associated with implementation has been derived through a process that involved identification and synthesis of those critical requirements for implementation that have been recommended by practitioners and academicians through an extensive review of the literature (Somers and Nelson, 2001).

Nah, Zuckweiler and Lau (2003) studied the Chief Information Officers' (CIO) perceptions on CSFs for ERP implementation. Hong and Kim (2002), in their study, explored the root of the high failure rate of ERP implementation from an "organizational fit of ERP" perspective. Al-Mashari, Al-Mudimigh and Zairi (2003) presented a novel taxonomy of the critical success factors of the ERP implementation process. Nah et al., (2001), based on a literature review, found 11 factors critical for ERP implementation. Teamwork and composition in the ERP implementer is a key factor influencing the ERP implementation success. Zhang and Banerjee (2003) analysed critical success factors affecting the implementation of ERP systems in China

with a focus on both generic and unique factors. Bingi, Sharma and Godla (1999) proposed ten factors critical for the implementation of ERP systems. Some of these factors include: top management commitment, integrating, finding and retaining competent consultants, selecting a suitable ERP package, and user training. Jung and Goldenson (2003), in a survey of 117 firms from 17 countries, found that companies attribute ERP success to three elements: user training and effective change management, handling the risks of project management, and continued executive commitment. Nah et al., (2001) characterised the success factors cited into eleven key areas: ERP teamwork and composition; change management program and culture; top management support; business plan and vision; business process re-engineering with minimum customisation; project management; monitoring and evaluation of performance; effective communication; software development, testing and trouble-shooting; project champion; and appropriate business and IT legacy systems.

Nah, Zuckwiler and Lau (2003), in a survey of 1,000 companies, found that CIOs rated top management support, project champion, ERP teamwork and composition, project management, and change management program and culture to be the most critical for successful ERP implementation. Their findings on the CIOs' ranking of ERP critical success factors are largely consistent with the literature. The Somers and Nelson (2004) research study results suggest that the early literature- and case-based research on enterprise systems does not take into account the importance of several key variables. Esteves, Pastor and Carvalho, (2003) proposed a unified model of CSFs for ERP implementation. They collected an extensive number of CSFs from the literature and categorised them from four perspectives: strategic, tactical, organisational and technological. Parr and Shanks (2000a) proposed a model of ERP project implementation using two case studies. Eleven critical success factors from an ERP project team and users of the system were identified as management support, best people full-time, empowered decision-makers, deliverable dates, champion, vanilla ERP, smaller scope, definition of scope and goal, balanced team, commitment change. Somers and Nelson (2003) proposed critical success factors across the stages of Enterprise Resources Planning (ERP) implementations using the responses from 86 organisations that completed, or are in the process of completing, an ERP implementation. The results provide advice to management on how best to utilise their limited resources to choose those CSFs that are mostly likely to have an impact upon the implementation of the ERP system.

Brief description for each CSF for acquisition of ERP system is presented below. These CSFs were confirmed by the academicians and executives through a focus group.

Proper planning for an ERP acquisition project with adequate time frame is a key factor in successfully acquiring an ERP system. It involves outlining proposed strategic and tangible benefits, resources, costs and risks, and the timeline is critical.

It is imperative that the 'information' about ERP vendors and systems be accurate and reliable during the acquisition process. Achieving this involves verification and cross-checking of the information sources for their reputation and credibility.

Selection criteria refer to the criteria developed by the project team and management for the selection and evaluation of ERP systems.

The structured process refers to defining the structure of the acquisition phases. This includes techniques that would be used to manage the process at the very beginning of the planning phase of the acquisition process. A well-defined structure for the acquisition process presupposes the need, also, for a clear authority for the process.

Vendor-client partnership refers to partnership during the acquisition and then implementation of ERP systems between the vendors and organization intending to acquire and implement ERP systems. This relates to the mutual understanding of each other's respective needs and capabilities and creating a mutual trust for long-term relationships.

Evaluation techniques are the procedures used for evaluating the potential vendors and ERP systems. Acquisition team-members decide which techniques are more suitable, given the system attributes and selection criteria.

Top management support refers to the involvement and support of top management during the ERP acquisition process. Providing the required human, technical and budgetary resources is a critical part of this support. However, the most successful acquisition projects have benefited from full-time executive champion who participate in team meetings, monitor the acquisition efforts and provide clear direction of the project.

Effective communication in the ERP acquisition process refers to the extent and frequency of information-sharing between management, employees and users. This means not only sharing information between the management but also communicating with the users and non-users of ERP system in the organisation.

Having a balanced team means selecting a project team that consists of cross-functional people and the best people from various functional departments that are associated with the system.

Users' involvement refers to the involvement of users in the acquisition process, which is an important factor in the success of acquisition process. Involving users in the acquisition process with the project could minimise conflict with the project team by addressing their needs.

Consultants' involvement refers to the involvement of consultants during the acquisition of ERP systems. Organisations frequently use outside consultants for acquisition of their software, availing themselves of the consultants' experience. Consultants may have experience and knowledge in certain ERP modules and can guide the organisation to choose the better fit system for the clients.

Clear goals and objectives of the ERP acquisition process refer to the management establishing and adhering to the goals and objectives of the project in advance. The project objectives should be clear, measurable and controllable, and the savings quantifiable.

4. Scale Development for CSFs of ERP Acquisition

Scale development, or the design and re-finement of multi-item scales employed to measure the constructs are vital to empirical research in management information systems (Stratman and Ruth, 2002) Establishing the validity of the scales is dependent first upon establishing that they are reliable measures (Churchill,1995). One of the goals of this research study is to create reliable and valid multi-item scales for measuring the 12 constructs described in Section 2. The content validity of these constructs was tentatively established by extensive literature reviews and interviews with managers and customers of technology-mediated services.

4.1 Item Generation

Constructs brief description is provided in Section 3 are necessary, but not sufficient, to advance our understanding of the critical success factors of ERP acquisition. Thus, the first step in constructing new multi-item measurement scales is to generate sets of items that tap into the latent constructs and permit us to accurately and reliably assess these constructs from management' perspectives (Churchill, 1995). Some of the constructs involved in this research have been operationalized in previous studies and scales were available for these constructs. However, none of the existing scales was exactly appropriate for re- application in the context of ERP acquisition.

4.2 Iterative item refinement

To refine the scales, we adapted (Churchill, 1995) widely used methodology for instrument development. This method recognizes that the complexity inherent in many business processes cannot be adequately measured by a single scale. Multi-item measures can reduce measurement error by providing a more robust construct of complex variables through averaging several individual items. The challenge is to develop a set of items that capture the essence of the construct with the desired reliability and validity.

After the initial item pool was generated, then the items were purified. This purification step is designed to remove the potential for measurement error from the new construct to improve their reliability. Collecting data from an initial sample of respondents helps to address these issues. Specifically, a manual factor technique (Menor, 1998) was used to establish tentative scale reliability and validity, as well as to assess potential problems with the unidimensionality of the constructs. The manual sorting procedures was conducted iteratively, using independent panels of expert judges for each round. The judges had recent industry experience with the implementation and use of ERP software in a business environment.

Each expert judge was given a questionnaire containing short descriptions of each of the proposed constructs, together with a randomized list all of the items generated from the literature. In each round, the panel of expert judges was asked to assign each item to one of the identified constructs. Items that were not consistently grouped into their target construct during this process were considered for rewording or elimination. Note that this sorting procedure follows the technique described in (Moore and Benbasat (1991), which differs from the traditional Q-sort technique (Stephenson, 1953) in that there are no restrictions on the number of items which may be placed in any of the defined construct categories.

In the first round the six expert judges on ERP implementation from the academia were selected to go through the constructs and initial items generated from the literature. The experts were asked to assign each item to one of the defined constructs. The items which were not associated with any construct were reworded and revised. In the second stage of the item purification, six experts from the industry with wide experience in acquisition of ERP system were invited for panel discussions. All of the six experts who were grouped in three panels with two three members each were given these items with a short description of each construct and also a list of items which were generated from the literature and discussion with academicians. Some of the items were revised and reworded to include in the relevant construct. To assess the pre-test scale reliability of the qualitative judgments made during the sorting process, an item placement ratio (Stratman and Roth, 2002) was used.

Although the method for content validation for this study is the literature review, input from experts (using manual sorts) was used in addition to the literature review for validating the content of the construct scale. A scale is said to have content validity if the scale's items form a representative sample of the theoretical domain of the construct (Stratman and Roth, 2002).

The item placement ratios assess both the validity of the generated items and the reliability of the proposed measurement scales. If there is a high degree of inter-judge (expert) agreement, then the percentage of items placed in the target construct will also be high. In addition, scales based on constructs with a percentage of correct item placement ratio of 70% or greater is generally considered acceptable. The technique described in Moore and Benbasat's (1991) was applied to determine the item placement ratios for the constructs of this study. Most of the constructs scored above 70%, which is good indicator for the acceptance of these constructs.

The manual sorting process produced refined multi-item scales for the constructs discussed in the previous section. Although our panel members of industry and academic experts are experienced in acquisition and implementation of ERP system and are qualified to assess the content validity of proposed constructs and items, empirical testing was performed to ensure the validity of the scales for the purposes of analysis for this study and to contribute in the area of ERP systems planning. This is evidenced from Churchill (1979), who proposes the development of measurement instrument norms as the final step in new scale development. This was performed using data obtained from the mail survey.

5. Field Survey

Satisfied by the apparent reliability and parsimony of our new measurement scales, we moved into the next phase of testing our survey instrument in a field setting. For this phase, the mail survey was targeted at decision makers within the Australian Companies that had acquired Enterprise resource Planning system. The questionnaire used in this study attempted to measure the theoretical model illustrated and discussed in section 2.

Initial survey instrument was pilot tested during mid of 2003 and it was further refined to be ready after a pilot survey was undertaken. The final survey was sent out to the respondents in November - December, 2003 and comprised of 18 questions in eight sections. Data used to test the CSF instrument were obtained from 53 respondents from Australia. Each respondent company had implemented ERP system and the respondents had experience in either been

involved in ERP implementation of their organization. The questionnaire was sent through mail to the 500 organizations and 53 usable surveys were received making the response rate to be around 11%. Most of the items in this study were itemized using Likert- Scale, in which respondents were asked to indicate their level of importance for each of the construct items (critical success factors) using their response on a seven point scale.

The measurement analysis emphasizes explanations of the reliability and validity of the new instruments for measuring these constructs. The validity and reliability measure indicate that the instrument has the potential for use in further studies.

5.1 Reliability Analysis

Reliability is one of the most critical elements in assessing the quality of the construct measures (Churchill, 1995), and it is a necessary condition for scale validity. A statistically reliable scale provides consistent and stable measures of a construct. Composite reliability estimates are used to assess the inter-item reliability of the measures. Estimates greater than .70 are generally considered to meet the criteria for reliability. Some items may be removed from the construct scales if their removal results in increases in the reliability estimate, however, care must be taken to ensure that the content validity of the measures is not threatened by the removal of a key conceptual element.

As shown in the table below that reliability of each factor is above .75. In table 1, composite reliability estimates for each of the measurement scales is shown.

Constructs	Items	Alpha
Planning	8	.92
Accurate information	4	.83
Selection criteria	6	.90
Structured process	5	.87
Vendor–client partnership	5	.89
Top management support	5	.89
Effective communication	4	.85
Balanced team	5	.89
Users' involvement	5	.84
Consultants' involvement	5	.92

Table 1: Constructs (CSFs) items and reliability values

5.2 Content Validity

The content validity of a questionnaire refers to the representativeness of item content domain. It is the manner by which the questionnaire and its items are built to ensure the reasonableness of

the claim of content validity. The conceptualization of survey instrument constructs are based on preliminary literature review to form the initial items, the personal interviews with practitioners and experts used for scale purification suggest that the survey instrument has strong content validity.

5.3 *Construct Validity Analysis*

Construct validity is established by showing that the instrument measures the construct it is intended to measure. Construct validity is evaluated by performing correlation and factor analysis. High correlations considered to indicate construct validity. The results of factor analysis performed on the items important for the success of ERP acquisition process. These items formed ten factors with a high variance and reasonable eigenvalue.

Factor 1: Factor analysis results show that the first factor was associated with the Planning critical success factor of ERP acquisition. The items from "planning" and "clear goals and objectives" constructs merged under one factor. After the extraction, the items "ERP acquisition objectives are identified" and "Organisations define the reasons for acquisition of ERP system" were removed from this factor, due to the low loading factor. The remaining eight items with factor-loading are shown in Table 2 under the "Planning" factor. The factor-loading ranges between .72 and .83. All the items indicate the importance given to planning as a critical success factor.

Factor 2: Four items formed this factor. The item "Acquisition team needs to consider and gather a lot of information before deciding on ERP vendor and system" had a very low loading value and therefore was deleted from the accurate information construct. The remaining four items with the factor loading are shown in table 2.

Factor 3: The six items of "selection criteria" and "evaluation technique" constructs merged into this factor, with a high loading factor. The remaining four items of these constructs had very low factor-loading and loaded on other factors with weak factor-loading, hence were removed. The items "attributes for evaluation of ERP systems are identified precisely", "establish possible list of suitable ERP vendors", "integrate the knowledge and judgment of external experts to choose an ERP project" and "use appropriate evaluation techniques to determine ERP suitability" were removed due to their weak loading. The remaining one item was loaded into the selection criteria and was included in this factor.

Factor 4: All the five items belonging to structured process loaded into this factor, with factor-loading ranging between .71 and .89.

Factor 5: This factor is associated with the items of the vendor–client partnership critical success factor. All items of this construct loaded into one factor with the loading ranging from 0.78 to 0.85.

Factor 6: All he five items belonging to top management support formed one factor with high factor loading. Factor loading for this factor are shown in table 5.2.

Factor 7: The seventh factor was associated with items of effective communication in the acquisition process, with the greatest load ranging from 0.78 to 0.86, except for "acquisition team-members are clearly informed about the project's scope, objectives and tasks", which had a factor-loading below .40 and hence was removed from this factor. The remaining items of this factor with the loading are shown in Table 5.2, underneath the "Effective Communication" factor.

Factor 8: Cross-sectional team members, roles and responsibilities of team members, their knowledge, ability to make decisions and team-members' experience in the acquisition of similar system items formed this factor with the greatest factor loading. The items of this factor have a high factor-loading and relate to the balanced team critical success factor for ERP acquisition process.

Factor 9: This factor is associated with all items of users' involvement, with the greatest load ranging from 0.72 to 0.85. All five items indicate the importance given to users' involvement in ERP acquisition.

Factor 10: Five items with reasonably high factor-loading formed this factor. The factor-loading of these items ranges between .82 and .92.

The results of the factor analysis proved that these factors were indeed representing major constructs in addition to being significant.

Prior research in similar area suggests that validation strategies for establishing construct validity include item-to-total correlation as well (Doll and Torkzadeh, 1989; Klenke, 1992). It measures the correlation of each of the items to the total scale. Items with a low correlation can be deleted. The minimum value of each corrected item-to-total correlation was above 0.40.

Measure	Mean	Items	Item-to-total correlation
Effective communication	6.01	4	.62, .68, .76, .71
Planning	5.90	8	.79, .65, .70, .73, .71, .78, .76, .65
Top management support	5.88	5	.80, .70, .77, .74, .70
Users' involvement	5.85	5	.58, .75, .61, .70, .63
Balanced team	5.81	5	.77, .82, .73, .68, .72
Vendor–client Partnership	5.66	5	.60, .42, .62, .60, .59
Structured process	5.63	5	.76, .82, .72, .65, .57
Selection criteria	5.61	6	.80, .78, .65, .79, .72, .67
Accurate Information	5.60	4	.51, .72, .75, .65
Consultants' involvement	5.55	5	.75, .69, .74, .61, .70

Table 2: Ranking and Item-to-total Correlation for Acquisition Critical Success Factors

All 51 items of 10 constructs were included in this analysis. Values for all item-total correlations for the eight critical success factors were greater than .60 (range .60–.82) indicating that each scale of the items had good correlation with the other items comprising the overall scale score. Whereas the values of accurate information and vendor–client partnership were moderate, internal consistencies of the item-total correlations were more than 0.42. In general, the coefficients of all the constructs were greater than 0.42, confirming validity of these constructs are highly acceptable. Based on the ratings and mean values, results indicate the top five critical success factors for ERP acquisition

as ranked by the respondents are effective communication, planning, top management support, user involvement and balanced team. As narrated by Somers and Nelson (2001), effective communication is essential for the project team, between the team and the rest of the organisation, and with the vendors. These findings are similar to implementation literature (Somers and Nelson, 2004; Esteves and Pastor, 2002a), in which the studies have identified that top management and effective communication are the two important success factors for ERP system. Similarly, the importance of top management support in providing resources, commitment and champion is very important for acquisition. Planning has been also identified as one of the important CSFs in the literature by Verville and Halington (2003a) as well. The survey result demonstrates that most organisations believe that planning, top management support and effective communication in the first place are critical for successfully acquiring ERP systems. User's involvement in the implementation of ERP has been cited by several studies. It is important for the acquisition because user's when they are involved in the selection and evaluation process suitable system for the organization considering the current processes of the organization. Balanced team has been found to be consistent with the Fiona, Kathryn and Janet, 2003)

6. Conclusion

The primary contributions of this paper are the definition of new constructs associated with the ERP acquisition and the development of new multi-item measurement scales for measuring these constructs. Unlike much prior ERP acquisition research, our study takes a grounded theory approach using ERP experts' perceptions. Future ERP implementation empirical research linking these constructs in causal models in an ERP will benefit significantly from the existence of relevant construct definitions and good measurement scales. A secondary contribution of this work is the demonstration of a rigorous empirical scale and item development process.

References

Al-Mashari, M. and Al-Mudimigh, A. (2003). "*ERP Implementation: Lessons from a Case Study*". Information Technology & People, 16 (1), 21–34.

American Manufacturing Firms" Supply Chain & Logistics Journal, Vol. 5, Issue 1, pp. 5-8, 2002.

Bingi, P., Sharma, M. K. and Godla, J. K. (1999). "*Critical Issues Affecting an ERP Implementation*". Information Systems Management, 16 (3), 7–14.

Churchill, "*A paradigm for developing better measures of marketing constructs".* Journal of Marketing Research, Vol 16, Issue 3, pp. 64-73, 1995.

Esteves J., Pastor J. and Carvalho J. (2003). "*Organizational and National Issues of an ERP Implementation in a Portuguese Company*". *IFIP 8.2+9.4 Conference*, Athens, Greece.

Esteves, J. and Pastor, J. (2002). "*A Framework to Analyze Most Critical Work Packages in ERP Implementation Projects*". Proceedings of the International *Conference on Enterprise Information Systems (ICEIS),* Spain.

Hensley, R.L. "*A review of OM studies using scale development techniques*", Journal of Operations Management, Vol 17, Issue 3, pp.343-358, 1999.

Hong, K. K. and Kim, Y. G. (2002). "*The Critical Success Factors for ERP Implementation: an Organizational Fit Perspective*". Information & Management, 40 (1), 25–40.

Jeff Jeff Stratman and Roth, "*Enterprise Resource Planning (ERP) Competence Constructs: Two -stage Multi-Item Scale Development and validation*". Decision Sciences, Vol. 33, Issue 4, pp. 601-626, 2002.

Jung Ho-Won and Goldenson, D. R. (2003). "*CMM-Based Process Improvement and Schedule Deviation in Software Maintenance*". CMU/SEI-2003-TN-015.

Menor, "*An empirical investigation of new service development competence and performance"*, working paper, Kenan – Flager Business School, 1998.

Moore, G.C. & Benbasat. "*Development of an instrument to measure the perceptions of adopting an information technology innovation".* Information Systems research", Vol 2, Issue 2, 192 -272, 1991.

Nah, F. H., Lau, L., Janet, S. and Kuang J. (2001). "*Critical Factors for Successful Implementation of Enterprise Systems*". Business Process Management Journal, 7 (3), 285–296.

Nah, F.-H., Zuckweiler, K. M. and Lau, J. L. S. (2003). "*ERP Implementation: Chief Information Officers' Perceptions of Critical Success Factors*". International Journal of Human–Computer Interaction, 16 (1), 5–22.

Parr, A. and Shanks, G. (2000a). "*A Model for ERP Project Implementation*". Journal of Information Technology, 15, 289–303.

Rockart F, "*Chief executives define their own data needs*", Harvard Business Review Issue 57, pp. 81-93, 1979.

Somers, T. and Ragowsky, R. (2002). "*Enterprise Resource Planning*". Journal of Management Information Systems, 19 (1), 11–15.

Somers, T. M. and Nelson, K. (2001). **"***The Impact of Critical Success Factors Across the Stages of Enterprise Resource Planning Implementation*". Proceedings of the 34th International Conference of System Sciences (HICSS), Big Island, HI, USA.

Somers, T. M. and Nelson, K. G. (2004). "*A Taxonomy of Players and Activities Across the ERP Project Life Cycle*". Information & Management, 41 (3), 257–278.

Stephenson, W. "*The study of Behavior: Q-technique and its methodology*". Chicago, University of Chicago Press, pp. 78, 1953.

Verville, J. and Halington, A. (2003). "*Analysis of the Decision Process for Selecting ERP Software: Case of Keller Manufacturing, Integrated Manufacturing Systems*". International Journal of Manufacturing Technology Management, 14 (5), 423–432.