The current issue and full text archive of this journal is available at
www.emeraldinsight.com/1753-7983.htm

Measuring the effectiveness of a human resource information system in National Iranian Oil Company

An empirical assessment

Reza Hosnavi and Majid Ramezan
Iran University of Science and Technology, Tehran, Iran

Abstract

Purpose – The purpose of this paper is to examine the impact of three specific variables, namely: system quality, information quality, and finally information use, on the effectiveness of a human resource information system (IS) in an Iranian oil company.

Design/methodology/approach – To investigate the effectiveness of a human resource IS, the paper analyzes the end-user satisfaction based on the DeLone and McLean IS effectiveness model. A methodology is developed that follows a series of steps to calculate the effectiveness of an IS. The questionnaire is designed and refined by expert review. Data from four surveys in four different organizations in the Iranian oil industry are pooled.

Findings – Results show that user satisfaction from information quality, system quality, and system use is, respectively, 0.92, 0.82, and 0.91.Therefore, the integrated human resource system in the Iranian oil company has a high degree of effectiveness. Implications of these findings are discussed along with some directions for future research.

Research limitations/implications – The model proposed in this study is applicable to a human resource environment. Modification of the proposed model may be needed in applying this model to other environments.

Practical implications – This study helps information technology managers identify the elements which impact on end-user satisfaction and assists them in planning to enhance the effectiveness of ISs by improving end-user satisfaction.

Originality/value – The results extend the understanding of the role of end-user satisfaction in IS effectiveness. The research findings have implications for the development and deployment of IS.

Keywords Information systems, Iran, Oil industry, Human resource management, User studies

Paper type Research paper

Retraction notice

The Editors and Publisher of Education, Business and Society: Contemporary Middle Eastern Issues *wish to retract the article: "Measuring the effectiveness of a human resource information system in National Iranian Oil Company: an empirical assessment" by Reza Hosnavi and Majid Ramezan which appeared in Vol. 3, No. 1, 2010 of* Education, Business and Society: Contemporary Middle Eastern Issues.

It has come to our attention that the article has previously been published in the Iranian Journal of Management*, Vol. 2, No. 2, 2009.*

The journal submission guidelines make it clear that articles must be original. The Editors and Publisher sincerely apologize to the readers.

Education, Business and Society: Contemporary Middle Eastern Issues
Vol. 3 No. 1, 2010
pp. 28-39

1753-7983
DOI 10.1108/17537981011022797

Introduction

There is ever increasing pressure on information system (IS) units to provide supplementary services to end-users. These changes are being brought about by the diffusion of client-server architectures, the growth in intranet and internet usage, continuously evolving information technology (IT) product line, growth in end-user literacy levels and needs, and emergence of alternative channels for distribution of IT products and services (Applegate *et al.*, 1999).

The notion of delivering high quality IS services and the costs associated with delivering such services are debatable. However, it can be logically argued that the quality of IS service may actually reduce costs associated with inferior software selection, poorly aimed end-user developed applications, increased maintenance of applications, lack of training for end-user computing, lack of education to enhance computer literacy skills, and poor selection of hardware. IS effectiveness can be measured from different perspectives. As a result, several IS success measures have been adopted by researchers. Providing a comprehensive review of the past literature, DeLone and McLean (2003) propose an IS success model to guide research. Key IS effectiveness variables in their model included: system quality, information quality, system use, user satisfaction, individual impact of IS, and organizational impact of IS.

Sustaining service levels is a formidable task (Watson *et al.*, 1998). Nevertheless, providing quality IS service is critical from an effectiveness standpoint. Summarizing their arguments for the need to focus on IS service quality, Pitt *et al.* (1995, pp. 173-186) suggest that: "multiple instruments are required to assess IS effectiveness". Recent evidence supports the notion that IS service quality does influence user satisfaction, a commonly used assessment of IS effectiveness (Jiang *et al.*, 2000). Given the importance of including service quality as an appropriate surrogate for IS effectiveness, a partial model of the one proposed by Pitt *et al.* (1995) is shown in Figure 1.

In order to examine the degree of information use, we have used the technology acceptance model (TAM). This model was presented by Davis in 1989 and is shown in Figure 2. TAM is rooted in the theory of reasoned action, a model concerned with determinants of consciously intended behaviors. The theory of reasoned action proposes that beliefs influence attitudes, which in turn lead to intentions, and then generate behaviors. TAM assumes that beliefs about usefulness and ease of use are always the primary determinants of IT/IS adoption in organizations. According to TAM, these two determinants serve as the basis for attitudes toward using a particular system, which in turn determines the intention to use, and then generate the actual usage behavior. Perceived usefulness is defined as the extent to which a person believes that using a system would enhance his or her job performance. Perceived ease

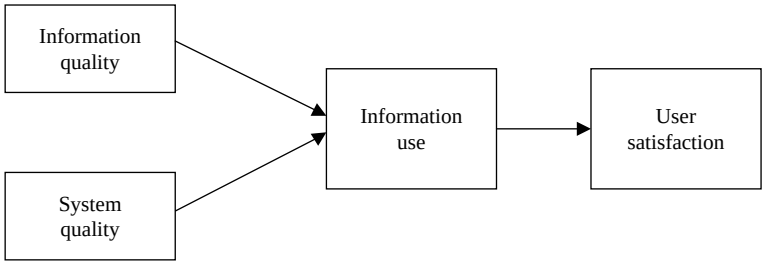


Figure 1.
Research model

of use refers to the extent to which a person believes that using a system would be free of mental effort (Liu, 2003).

Literature review

Although the effectiveness of ISs in general is one of the most extensively researched issues in the literature, scholars have not yet arrived at an agreement on a definition of "effectiveness" and its operationalization (Wierenga *et al.*, 1999). Epistemologically, according to the *Oxford English Dictionary*, it is "the power or capacity to produce a desired result." This makes it clear that effectiveness is about outcomes, consequences and results, and represents a synonym for success, since being effective means achieving the outcomes and results initially planned for. Grover *et al.* (1998) suggest that the notion of IS effectiveness is a construct comprising such facets as, among many others, efficiency, productivity, internal communication, flexibility, control, and information management.

However, this apparently straightforward construct is in fact fairly complex, because it is difficult to systematize the effect of the systems on the entity of the organization and its operations (DeLone and McLean, 2003). This is the probable explanation for the fact that an empirically validated instrument to assess the effectiveness of IS has yet to be derived (Panigyrakis and Chatzipanagiotou, 2006).

However, the importance of system quality, information quality and systems success has been recognized by many researchers as key ingredients in developing a competitive advantage. New scales and measures, along with continued research into organizational effectiveness and user satisfaction are needed. This research employed the model of IS Success developed by DeLone and McLean (2003).

A great number of studies have attempted to assess the effectiveness of IS, especially in the general IS field. The majority of the research on IS effectiveness is limited to the financial indices measurement, such as return on investment, return on assets, etc. (Qing and Plant, 2001; Krishnan and Sriram, 2000; Ryan and Harrison, 2000; Thatcher and Oliver, 2001), market share and cost (Gurbaxani and Mendelson, 1990; Railing and Housel, 1990), productivity analysis (Qing and Plant, 2001; Hitt *et al.*, 2002; Grover *et al.*, 1998) and profitability (King, 1998; Hitt and Brynjolfsson, 1996).

In an empirical investigation, the impact of design characteristics and support services on the effectiveness of marketing information systems (MrkIS) was examined. In this research the impact of five specific variables, namely:

(1) system quality;

(2) information quality;

(3) quality of the MrkIS technical support;

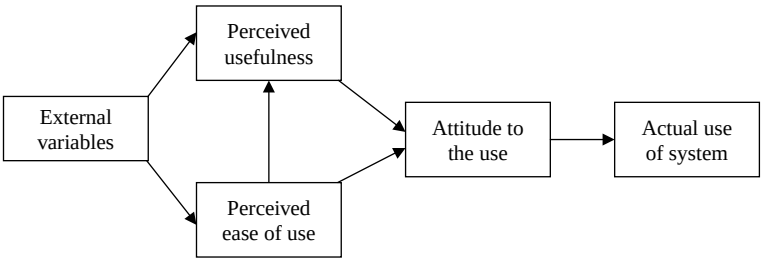


Figure 2.
Technology acceptance model

(4) the MrkIs compatibility; and
(5) the MrkIs flexibility

on the effectiveness of MrkIS were investigated.

The effectiveness measurement is based on the competing value model, which allows the definition of effectiveness on four basic dimensions. The results define the positive impact of these factors on several dimensions of effectiveness (Panigyrakis and Chatzipanagiotou, 2006).

Information quality

Organizations today have access to vast stores of data that come in a wide variety of forms and may be stored in places ranging from file cabinets to databases, and from library shelves to the internet. The enormous growth in the quantity of data, however, has brought with it growing problems with the quality of information, further complicated by the struggles many organizations are experiencing as they try to improve their systems for knowledge management and organizational memory. Failure to manage information properly, or inaccurate data, costs businesses billions of dollars each year (Wang, 2005). Measures of information quality focus on the output produced by a system and the value, usefulness or relative importance attributed to it by the user. Most of the measures, therefore, are perceptual in nature. Bailey and Pearson (1985) identified nine characteristics of information quality including: accuracy, precision, currency, output timeliness, reliability, completeness, conciseness, format, and relevance and this began a stream of research in user satisfaction. Other researchers have added criteria such as understandability (Srinivasan, 1985), report usefulness (Mahmood and Medewitz, 1985), sufficiency, freedom from bias, comparability, and quantitativeness (King and Epstein, 1983).

During research on executive ISs, Rainer and Watson (1995) defined five characteristics of information quality: accuracy, timeliness, conciseness, convenience, relevance. Seddon (1997) also included accuracy, timeliness, and relevance in his definition of information quality.

System quality

Measures of system quality typically focus on performance characteristics of the system under study. Research has looked at resource utilization and investment utilization (Kriebel and Raviv, 1980), accuracy, processing speed, time of response, ease of access, ease of use, friendly working environment and latest technology in the hardware and software of the system (Panigyrakis and Chatzipanagiotou, 2006).

Hamilton and Chervany's (1981) list of system quality measures is probably the most well known. These are as follows: data currency, response time, turnaround time, data accuracy, reliability, completeness, system flexibility and ease of use. More recently, Seddon (1997) considers system quality to be concerned with "bugs" in the system (system reliability), user interface consistency, ease of use, documentation quality, and quality and maintainability of the program code.

User satisfaction

The reliance on user satisfaction in measuring IS success is common among management information systems (MIS) researchers and practitioners (Ives and Olson,

1984) and several standardized instruments have been developed and tested (Doll and Torkzadeh, 1988). The user information satisfaction (UIS) instrument is grounded in research performed during the 1980s by Bailey and Pearson (1983) that introduced a list of 39 factors affecting computer user satisfaction.

In follow-up research, Ives, Olson, and Baroudi, in an effort to improve internal consistency and reliability, produced an abbreviated survey instrument by eliminating factors with the lower correlations (Ives *et al.*, 1983). Baroudi and Orlikowski (1988) later reaffirmed the reliability and validity of the Ives, Olson, and Baroudi short-form measure as an effective tool for evaluating user satisfaction. Most of these instruments, however, are geared towards the evaluation of a specific application rather than end-user computing in general. Doll and Torkzadeh (1988) introduced another measure of user satisfaction in the late 1980s, called the end-user computing satisfaction measure.

Though Ives, Olson, and Baroudi's UIS measure and Doll and Torkzadeh's end-user computing satisfaction measure continue to be popular, certain reservations must be highlighted. Melone (1990) introduces the notion that, though previously introduced instruments produce valid evaluations of system effectiveness, there is no clear relationship established between system effectiveness and user satisfaction. More recently, Seddon defines user satisfaction as a subjective evaluation of the various individual, organizational, and societal consequences of IS use. He asserts that the user satisfaction measure is, definitionally, a measure of the net benefits perceived by the IS's stakeholders (individuals, groups of individuals, management of organizations, and society).

Seddon (1997) maintains that previously introduced user satisfaction measures (e.g. Ives, Olson, and Baroudi) do not adequately measure this idealized construct.

System use

The actual use of a computer system can be affected by the degree to which systems characteristics match user task needs (Goodhue and Thompson, 1995). Researchers must consider the nature, extent, quality, and appropriateness of the system use. The nature of system use could be addressed by determining whether the full functionality of a system is being used for the intended purposes. With regard to the extent of use, various states of systems utilization can be identified based on the use or nonuse of basic and advanced system capabilities. Simply measuring the amount of time a system is used does not properly capture the relationship between usage and the realization of expected results. On the other hand, it can be argued that declining usage may be an important indication that the anticipated benefits are not being realized.

The rejection of system use as an effectiveness variable when system usage is mandatory is also flawed. Even when use is required, variability in the quality and intensity of this use is likely to have a significant impact on the realization of the system benefits (DeLone and McLean, 2003).

Goodhue explored task-technology fit (TTF) which suggests that better outcomes (i.e. performance) will result when there is a match between the task and the technology used. TTF measures would include items to assess the quality, currency, relevance and locatibility of data (ease of determining what data is available and where), ease of use of the system, response time and presentation (Goodhue and Thompson, 1995).

IS in the Iranian oil industry

The boundary of IT services in the oil industry is shown in Figure 3. As shown in this figure, all IT services are provided for the National Iranian Oil Company (NIOC) but some of these services are provided for the ministry of petroleum. However, integrated human resource system services are offered to the whole petroleum ministry including NIOC.

This system has been provided and implemented using the latest technology of information storing and recycling (using data bank). This system has over 4,000 computer plans, its information volume is 22 GB and has over 180 millions information records with over 3,000 users in the oil industry. It is completely decentralized and online. High security, integrity, and relations with other systems are some of the characteristics of an integrated human resource system.

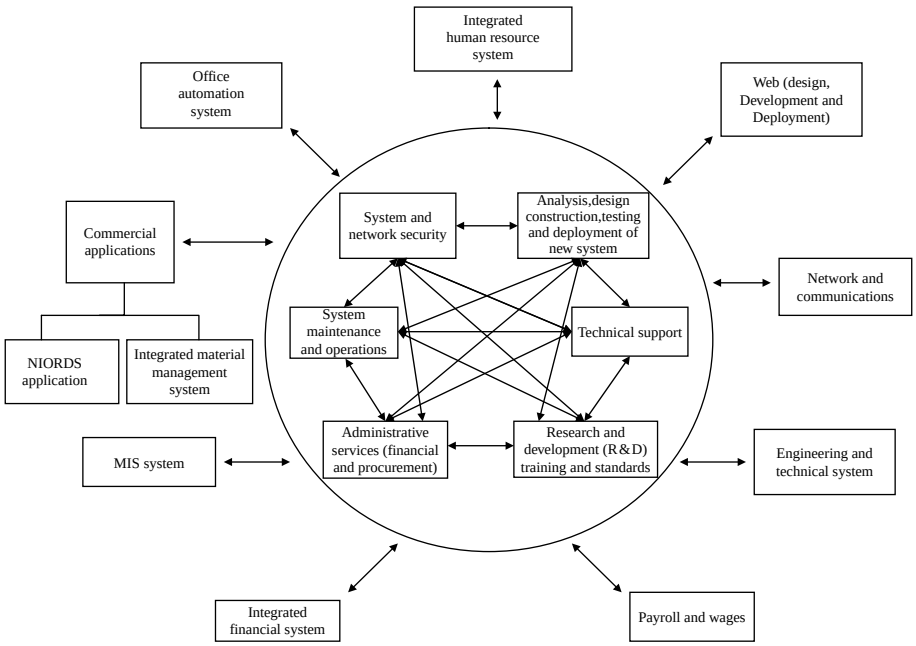
Methodology

Research objectives

Four research propositions can be derived from the foregoing review of the literature. The studies reviewed in the MIS effectiveness dimensions make it clear that user satisfaction has the potential to influence effectiveness of IT/IS. On these grounds, the following proposition is advanced for investigation:

P1. The integrated human resource system in the NIOC is an effective system.

We examine this proposition by means of three other hypotheses:



Note: Inside the circle means all IT services to National Iranian Oil Company and outside the circle means services to Ministry of Petroleum including National Iranian Oil Company

Figure 3.
Boundary of IT services in the oil industry

H1. Users are satisfied by the system quality.

H2. Users are satisfied by the information quality of system.

H3. Users are satisfied with their use of the system.

IS effectiveness questionnaire

A pilot questionnaire was distributed to the users of the system. The final questionnaire contained 28 statements, to which respondents indicated their agreement on a five-point Likert scale (from strongly disagree to strongly agree). Four main companies of the ministry of petroleum were included in the research (total of 180 questionnaires). Owing to their knowledge of the integrated human resource system and their ability to give valid answers, only users of the system were asked to complete the questionnaires. The summary of the questionnaire is shown in Table I.

Reliability and validity

Reliability is a mechanism employed to check the internal consistency of test items (questions) against every other test item when completed by different participants. In order to estimate reliability, we sent questionnaire to 35 users of system. Overall, Cronbach's alpha for the sample was 0.92 which indicate an excellent level of statistical internal consistency of responses to questionnaire items across individuals.

In order to increase the content validity of the research instrument, the questionnaire was "pilot-examined." For this purpose, 20 personal interviews were conducted with managers and experts who agreed not only to fill in the questionnaire, but also to comment on the scales employed. Their suggestions were collected and some reformations were made to improve validity of questionnaire.

Concept	Dimensions	Measures
IS effectiveness	Information quality	Information accuracy
		Information preciseness
		Information completeness
		Information timeliness
		Information compatibility
		Information understandability
		Information volume appropriateness
	System quality	Limitation of unauthorized access
		Ease of system use
		Presenting integrated reports
		Time of response
		Changeability in the system conditions
		Prevention from programs interruption
	System use	Job performance improvement
		Goal achievement
		Flexible interaction with system
		Ease of doing tasks using the system
		Clear and understandable interaction with system
		Productivity improvement using the system
		Ease of requesting from system

Table I.
Dimensions and measures of IS effectiveness

Data collection

The data presented and analyzed here form part of a broader study of four main companies in the Ministry of Petroleum in Iran, which use IT/IS services. The sampling frame thus includes these four companies as well the staff of the Ministry of Petroleum. The users of these companies are in the administrative units. To collect the required data, a detailed questionnaire was developed. For the purposes of this paper, three independent variables are of relevance: information quality, system quality, and information use.

Our research population were the users of the system in Tehran city. 180 users were selected randomly from four main companies. The distribution table of users is present below in Table II.

Data analysis

In order to confirm or reject the hypotheses, we used the binomial test which is a nonparametric test. The results of the hypotheses tests are shown in Table III.

According to the results of the data analysis (Table III), all hypotheses are confirmed. The statistical significance was established at 0.05. Therefore, the integrated human resource system in the oil industry is an effective IS.

Conclusion

The main goal of this research was to assess IS effectiveness. Since, the quality or effectiveness of ISs is so hard to measure directly, many researchers have turned to indirect measures such as UIS. Therefore, this paper has presented a scheme for evaluating MIS effectiveness by means of measuring user satisfaction with information quality, system quality and system use. The results indicate that users are satisfied with

Name of company	Number of users	Company weigh	Allocated sample
NIOC& MOP staff	556	0.5	90
NIORDC	239	0.22	39
NIGC	243	0.22	39
NPC	72	0.06	12
Total	1,110	1.00	180

Table II.
Allocated sample to per company

Category	n	Observed prop.	Test prop.
Information quality group $1 \leq 3$	13	$q = 0.08$	
Group $2 > 3$	150	$p = 0.92$	0.5
Total	163	1.00	
System quality group $1 \leq 3$	29	$q = 0.18$	
Group $2 > 3$	134	$p = 0.82$	0.5
Total	163	1.00	
System use group $1 \leq 3$	15	$q = 0.09$	
Group $2 > 3$	148	$p = 0.91$	0.5
Total	163	1.00	

Table III.
Results of testing hypotheses

these three dimensions of IS effectiveness. Accordingly, with effective training, ease of accessibility to the system and relevance of information to the users' jobs, the IT sector managers in the oil industry in Iran can plan to remove paper from daily working. Hopefully also, employees will be able to perform their tasks with high accuracy, precision and speed. We draw the following conclusions.

For each research endeavor, the selection of IS effectiveness dimensions and measures should be contingent on the objectives and context of the empirical investigation, but, where possible, tested and proven measures should be used.

With the growth of management support systems and the advent and development of e-commerce systems, voluntary systems use is more common today than it was a decade ago. We, therefore continue to advocate the inclusion of the degree and nature of system use as a critical dimension of IS effectiveness measurement. Actual use measures should be preferred to self-reported use measures. Also, usage measures should capture the richness of use as a system phenomenon including the nature, level, and appropriateness of use, and should not simply measure the frequency of use.

Finally, more field-study research should investigate and incorporate net benefits measures. Examining satisfaction and usage measures are not an acceptable alternative to measuring performance (i.e. net benefits) directly. Although the three variables are correlated, the relationships between them are not sufficiently strong to warrant their use as substitutes for one another.

Managerial implications

The findings of our study have important implications for human resource and IT managers who implement IT-based systems, and for those who design and supply them. They can help users to approach the specification and effectiveness of their human resource system in a more specific and more holistic manner. Our findings show that managers contemplating changes, upgrades or new systems need to take into account how those will fit with the present system, so that the overall effectiveness of the system is at least sustained if not improved.

A second important implication for users of IT-based MIS is the strategic importance of such systems. Since, they can potentially have a significant impact on various aspects of overall effectiveness; decisions pertaining to the information infrastructure should be holistic. This means that both users and other functional managers, as appropriate, should be involved in the decision-making process.

Management needs to consider how a decision to invest in a certain technology might influence the operations and the priorities of different departments, including those that will not directly use the specific IT. There are parallel implications for companies offering IT solutions and services.

Comprehension of the strategic impact that IT-based MIS can have on their customers' operations will allow them to increase the value of their products and services, and their ability to differentiate their offering from the competition. The imperative is to develop an integrated value proposition, and to be able to explain how it can contribute to the overall competitiveness of a potential customer. For instance, added-value services such as system maintenance or upgrades not only provide technical assistance to the client but also, equally importantly, affect its ability to act promptly and in a customer-focused way.

Limitations of the study and future research directions

Clearly, this study has not been free of limitations. We do not consider that they diminish its contribution significantly, however, because future research can easily tackle them.

Specifically, two issues are a concern. The first is the focus of the study on the oil industry. While the decision to do so reflects the widespread adoption and application of IT at the top end of this sector, it does limit the generalization of our findings to other sectors. Hence, a first direction for further research is to examine the structure and psychometric properties of the proposed measuring instrument in other sectors. Also, the Iranian context of the study may constrain the generalizibility of our findings.

Finally, this study has adopted a subjective assessment of MIS effectiveness. While there is general evidence for a good correlation between subjective and objective assessment of effectiveness, it would be advisable to replicate the study in other national contexts and different industry sectors, for a clear picture, particularly with respect to the structure of the measuring instrument that we have proposed for the assessment of MIS effectiveness.

References

Applegate, L.M., McFarlan, F.W. and McKenney, J. (1999), *Corporate Information Systems Management: Text and Cases*, 5th ed., Irwin McGraw-Hill, Boston, MA.

Bailey, J.E. and Pearson, S.W. (1983), "Development of a tool for measuring and analyzing computer user satisfaction", *Management Science*, Vol. 29 No. 5, pp. 530-45.

Bailey, J.E. and Pearson, S.W. (1985), "A validation of the end-user computing satisfaction instrument in Taiwan", *Information and Management*, Vol. 39 No. 6, pp. 503-11.

Baroudi, J.J. and Orlikowski, W.J. (1988), "A short form measure of user information satisfaction: a psychometric evaluation and notes on use", *Journal of Management Information Systems*, Vol. 4 No. 4, pp. 44-59.

DeLone, W.H. and McLean, E.R. (2003), "Information system success: a ten-year update", *Journal of Management Information Systems*, Vol. 19 No. 4, pp. 10-25.

Doll, W.J. and Torkzadeh, G. (1988), "The measurement of end user computing satisfaction", *MIS Quarterly*, Vol. 12 No. 2, pp. 259-74.

Goodhue, D.L. and Thompson, R.L. (1995), "Task-technology fit and individual performance", *MIS Quarterly*, Vol. 19 No. 2, pp. 213-36.

Grover, C., Fackrell, J., Vereecken, H., Martens, J.-P. and van Coile, B. (1998), "Designing prosodic databases for automatic modeling in 6 languages", *Proceedings of the 3rd ESCA/COCOSDA Workshop on Speech Synthesis, Jenolan Caves*, pp. 93-8.

Gurbaxani, V. and Mendelson, H. (1990), "An integrative model of information systems spending growth", *Information Systems Research*, Vol. 1 No. 1, pp. 23-46.

Hamilton, S. and Chervany, N.L. (1981), "Evaluating information system effectiveness, Part I. Comparing evaluation approaches", *MIS Quarterly*, Vol. 5 No. 3, pp. 55-69.

Hitt, L.M. and Brynjolfsson, E. (1996), "Productivity, business profitability, and consumer surplus: three different measures of information technology value", *MIS Quarterly*, Vol. 20 No. 2, pp. 121-42.

Hitt, L.M., Wu, D.J. and Xiaoge, Z. (2002), "Investment in enterprise resource planning: business impact and productivity measures", *Journal of MIS*, Vol. 19 No. 1, pp. 71-99.

Ives, B. and Olson, M.H. (1984), "User involvement and MIS success: a review of research", *Management Science*, Vol. 30 No. 5, pp. 586-603.

Ives, B., Olson, M.H. and Baroudi, J.J. (1983), "The measurement of user information satisfaction", *Communication of the ACM*, Vol. 26 No. 10, pp. 785-93.

Jiang, J.J., Klein, G. and Crampton, S.M. (2000), "A note on SERVQUAL reliability and validity in information system service quality measurement", *Decision Sciences*, Vol. 31 No. 3, pp. 725-44.

King, M. (1998), "From technical to socio-technical change: tackling the human and organizational aspects of systems development projects", *European Journal of Information Systems*, Vol. 14, pp. 1-2.

King, W.R. and Epstein, B.J. (1983), "Assessing information system value", *Decision Sciences*, Vol. 4 No. 1, pp. 34-45.

Kriebel, C. and Raviv, A. (1980), "An economics approach to modeling the productivity of computer systems", *Management Science*, Vol. 26 No. 3, pp. 297-311.

Krishnan, G.V. and Sriram, R.S. (2000), "An examination of the effect of IT investments on firm value: the case of Y2K-compliance costs", *Journal of Information Systems*, Vol. 14 No. 2, pp. 95-109.

Liu, J. (2003), "Variations and teleconnections: observational and modeling studies", PhD thesis, Columbia University, Palisades, NY.

Mahmood, M.A. and Medewitz, J.N. (1985), "Impact of design methods on decision support system success: an empirical assessment", *Information & Management*, Vol. 9 No. 3, pp. 137-51.

Melone, N.P. (1990), "Theoretical assessment of the user-satisfaction construct in information systems research", *Management Science*, Vol. 36 No. 1, pp. 76-91.

Panigyrakis, G.G. and Chatzipanagiotou, K.C. (2006), "The impact of design characteristics and support services on the effectiveness of marketing information systems: an empirical investigation", *Review of Business Information Systems – Second Quarter*, Vol. 10 No. 2, pp. 91-100.

Pitt, L.F., Watson, R. and Kavan, B.C. (1995), "Service quality: a measure of information systems effectiveness", *MIS Quarterly*, Vol. 19 No. 2, pp. 173-86.

Qing, H. and Plant, R. (2001), "An empirical study of the causal relationship between IT investment and firm performance", *Information Resources Management Journal*, Vol. 14 No. 3, pp. 12-15.

Railing, L. and Housel, T.J. (1990), "An intraorganizational network based system. Information networking and data communication", *International Federation for Information Processing Refereed Conference Proceedings, Lillehammer*.

Rainer, R.K. Jr and Watson, H.J. (1995), "The keys to executive information systems success", *Journal of Management Information Systems*, Vol. 12 No. 2, pp. 83-98.

Ryan, S.D. and Harrison, D.A. (2000), "Considering social subsystem costs and benefits in information technology investment decisions: a view from the field on anticipated payoffs", *Journal of MIS*, Vol. 16 No. 4, pp. 30-41.

Seddon, P.B. (1997), "A respecification and extension of the DeLone and McLean Model of IS success", *Information Systems Research*, Vol. 8 No. 3, pp. 240-53.

Srinivasan, A. (1985), "Alternative measures of system effectiveness: associations and implications", *MIS Quarterly*, Vol. 9 No. 3, pp. 243-53.

Thatcher, M.E. and Oliver, J.R. (2001), "The impact of technology investments on a firm's production efficiency, product quality, and productivity", *Journal of MIS*, Vol. 18 No. 2, pp. 17-46.

Wang, R. (2005), *Information Quality (Advances in Management Information Systems)*, M.E. Sharpe, Armonk, NY, April 30, p. 12.

Watson, R., Pitt, L.F. and Kavan, B.C. (1998), "Measuring information systems service quality: lessons from two longitudinal case studies", *MIS Quarterly*, Vol. 22 No. 1, pp. 61-79.

Wierenga, B., van Bruggen, G.H. and Staelin, R. (1999), "The success of marketing management support systems", *Marketing Science*, Vol. 18 No. 3, pp. 196-207.

Further reading

Ajzen, I. (1991), "Theory of planned behavior", *Organizational Behavior and Human Resource Processes*, Vol. 50 No. 2, pp. 179-211.

DeLone, W.H. and McLean, E.R. (1992), "Information system success: the quest for the dependent variable", *Information Systems Research*, Vol. 3 No. 1.