020-0018

Information technology implementation success within SMEs in developing countries: An interactive model

Morteza Ghobakhloo[*]

Email: morteza_ghobakhloo@yahoo.com

Telephone: (+34) 958 241586

Daniel Arias-Aranda[*]

Email: darias@ugr.es

Telephone: (+34) 958 242349

Jose Benitez-Amado[*]

Email: joseba@ugr.es (corresponding author)

Telephone: (+34) 958 241586

[*]Department of Management

School of Economics and Business

University of Granada

Campus Universitario de la Cartuja s/n

18011 Granada, Spain

POMS 22nd Annual Conference: Operations management: The enabling link

Reno, Nevada, U.S.A.

April 29 to May 2, 2011

Abstract

Many researchers have produced a large body of research addressing factors that affect the success of information technology (IT) adoption in organizations. However, the relative importance of these factors in the context of small and medium sized enterprises (SMEs) in developing countries has not been investigated in depth. Drawing on prior operations management (OM) and information systems research, we conceptually develop an interactive model of IT implementation success and test it empirically in Iran, an example of a developing country. Specifically, our proposed research model and hypotheses are tested using survey data from a sample of 121 Iranian manufacturing SMEs. We find that IT adoption success is affected by users' (both CEOs' and staff's) IT knowledge and involvement, CEO support and external assistance. The implications of the findings for researchers and practitioners are discussed.

Keywords: IT adoption success, OM in emerging economies, technology management, OM-information systems link, manufacturing SMEs.

1. Introduction

Emerging information systems (IS) as the paramount driver of the economic development and the social changes at the moment brings about modification in communication between individuals and organizations as well as among them (Turban 2008), and absolutely renovate the way business is conducted (Loukis et al. 2009, Overby et al. 2006). As the utilization and commercialization of IT becomes more widespread throughout the world, the adoption of novel information technology (IT) can generate new business opportunities and various benefits (Howell and Wei 2010). In the recent turbulent digital business environments, small and

medium- sized enterprises (SMEs) are incrementally adopting IT to develop series of competitive activities required to generate a superior firm performance (e.g., Benitez-Amado et al. 2010a, Liang et al. 2010, Sambamurthy et al. 2003).

In the light of intensified application of IT by SMEs, as well as their specific characteristics, an exhaustive investigation of IT impact on SMEs is warranted (Bhagwat and Sharma 2007, Palvia 1996). Reviewing prior IS literature, a number of factors have been determined to be significantly connected to the success of IT which include factors simplifying SMEs movement toward IT implementation and unveiling its process more tangible and implementable such as organizational structure, adoption planning and knowledge of IT (Blili and Raymond 1993, Premkumar 2003, Thong 2001), as well as factors increasing chance of implementation success encompassing high level of user involvement, availability of financial resources, and availability of in-house expertise and external consultation (Caldeira and Ward 2003, Morgan et al. 2006, Soh et al. 1992).

1.1. IT success paradox

To appropriately investigate IT implementation success within SMEs, the nature of IT success should be scrutinized. The concept of IT implementation success, in particular, in SMEs is problematic regarding three following issues. First, in the cycle of IT innovation diffusion, adoption, implementation, and post-implementation are three discrete phases in which, adoption phase addresses decision-making process over whether to adopt IT, the implementation phase includes physical deployment of IT tools into business, and post-implementation phase deals with further technology adoption and sophistication (Carayannis 1998, Thong 2001). Thus, *IT success* concept and every relative influencing factor in each phase might have different impacts

in this cycle, while in general; information and guidelines for effective and successful IT diffusion in SMEs are considerably lacking (Thong 2001). In this research, adoption and implementation are interchangeable concepts which refer to the implementation phase.

Second, a number of legitimate measures have been defined to evaluate the extent of success of implemented IT. Using economic-rationalistic models and based on direct measures, IT success can be evaluated as IT-enabled business value (Melville et al. 2004). The term *IT-enabled business value*, which has also been interpreted as IT effectiveness (Caldeira and Ward 2002), is generally used to refer to the organizational performance effects of IT in terms of firm innovativeness, productivity/efficiency improvement, customer service enhancement, cost reduction, improved information sharing efficiency, and competitive advantage (Benitez-Amado et al. 2010a and 2010b, Bhatt and Grover 2005, Rai et al. 2006, Ray et al. 2005). In this category of research, resource-based theory is the core conceptual framework that has been adopted to interpret the relationship between IT construct and firm performance (Liang et al. 2010). Viewed from resource-based theory, the relationship between IT resources and firm performance has been scrutinized through two different sets of research models titled *direct effect models* and *indirect effect models*. The direct effect models try to link IT resources and firm performance (as two main construct) and to analyze the direct relationship between them (Bardhan et al. 2006, Bhatt and Grover 2005, Devaraj and Kohli 2000). However, the rubric of the *productivity paradox* indicating a weak relationship between IT investment and firm's productivity has recently questioned the permissibleness of direct effect models (Carr 2003). For example, in spite of some prior research reporting positive direct relationship between IT resources and firm performance (e.g., Bardhan et al. 2006, Bhatt and Grover 2005, Lai et al. 2006, Weill 1992), previous scholars such as Cragg et al. (2002), Li and Ye (1999), Ray et al. (2005), and Tallon et

al. (2000) were inconclusive in offering authoritative evidences of benefits resulting from IT investment. To overcome this paradox, recent research argued that prevalently available IT resources cannot by themselves generate sustained performance gains for a firm (e.g., Benitez-Amado et al. 2010a, Rai et al. 2006). Thus, through adding the third construct termed *higher-order organizational capabilities* (i.e., digital options, firm agility, supply chain integration, and intrapreneurship culture) as the mediator between IT resources and firm performance to the direct model, indirect model was adopted by many recent scholars (Benitez-Amado et al. 2010a and 2010b; Bharadwaj et al. 2007, Fink and Neumann 2009, Jean et al. 2010). Therefore, to evaluate IT success based on direct measures in the context of SMEs, either direct or indirect model should be devised and applied. Although the inconsistent results provided by direct models in prior research suggest us to use indirect model, the application of this model type in the context of IT success within SMEs could also be problematic. We believe that assessing higher-order organizational capabilities as mediator regarding to IT-enabled business value may not be indeed advisable in typical SMEs. The rationale behind is that in large organization, higher-order organizational capabilities are evaluated through data collection from qualified and expert key informants. For example, the role of higher-order supply chain capability (as an example of organizational capability) in IT-enabled competitiveness were questioned from supply chain and/or logistics managers in prior studies (e.g., Rai et al. 2006, Wu et al. 2006) and similarly, IT executives have been addressed to assess IT-enabled flexibility in previous IT business value literature (e.g., Fink and Neumann 2009). It should be mentioned that in typical SMEs, owner, chief information officer (CIO) and chief executive officer (CEO) are one and the same person. Owing to the specific computing environment of these firms in which in most cases, there is no IT department, CEO also becomes the specialist in various facet of IT, although

not appropriately trained or adept in IT roles (Palvia 1996). Therefore, using indirect effect models to assess the effect of IT resources on performance gains might be problematic within typical SMEs.

Third, with regard to difficulty and inconsistency in measurement of IT success based on direct measures, IS scholars have applied surrogate measures to evaluate IT diffusion success. Common measures are IT user acceptance and satisfaction with IT implementation which have been widely accepted by scholars in both developed and developing countries (Adamson and Shine 2003, Al-Gahtani et al. 2007, Rouibah et al. 2009, Venkatesh et al. 2003, Wixom and Todd 2005). Different models and theories of acceptance and satisfaction have been applied in a number of sectors and with regard to the specific characteristics of these sectors, modified version of original and well-established models have been developed and applied as well. However, each of these theories and relative models seek to evaluate IT diffusion success based on some specific factors, thus might not address all factors relative to success. For example, one stream of studies investigates the individual technology acceptance by postulating intention or usage as a dependent variable (Ajzen 1991, Davis 1989, Venkatesh et al. 2003). On the other hand, other streams focus on user satisfaction as the key factor leading to IT success by using system and information characteristics as core concepts of user satisfaction (Adamson and Shine 2003, Mahmood et al. 2000, Muhammad and Wallace 1999). Although a number of previous studies have tried to interpret IT success based on either IT acceptance or satisfaction, consistent the classification of Slappendel (1996) perceiving innovation diffusion in organizations as an interactive process, prior scholars have also integrated acceptance and satisfactions theories and evaluated both individual and structural factors as the determinants of IT success (e.g., Palvia and Palvia 1999, Wixom and Todd 2005).

From the other point of view and by developing DeLone and McLean's (1992) IT success model, Delone and McLean (2003) suggested that more incorporation of organizational impact measures into empirical research on IT success (measured based on IT acceptance and/or satisfaction) is notably needed. As a result, a number of scholars (e.g., Urbach et al. 2010) have incorporated organizational impact which is also known as *IT-enabled business value* in addition to IT acceptance and/or satisfaction to the prior IT success research models. As a result of measuring IT success through integration of different models and theories and evaluating this phenomenon as an interactive process, previous scholars have generally measured dependent variable (IT success) through a number of different variables and have addressed different aspects of success, making IT success elusive to define, and comparisons between findings and models difficult (Petter et al. 2008, Sabherwal et al. 2006). On top of mentioned problems, the inclusive measures of IT innovation diffusion success in the context of SMEs (regarding the specific characteristics of these businesses), in particular, in developing countries seems to be lacking.

In the light of abovementioned issues and regarding the lack of comprehensive and relative IT success model for SMEs, particularly in the context of developing countries, as well as unique characteristics of these businesses such as SMEs' mandatory environment and coercive power of management (Berthon et al. 2008, Lefebvre and Lefebvre 1992, Miller and Toulouse 1986, Thong and Yap 1995), specific computing environment and direct interaction of users with external entities (Palvia 1996), and their resource poverty (Thong et al. 1997, Thong 2001), this paper aims to develop and apply appropriate resource-based models of IT implementation success through analyzing IT usage, user satisfaction, and organizational impacts as constructs of IT success.

2. Theoretical background

Review of prior literature shows that a number of models have been devised to address IT success (Gable et al. 2008, Petter et al. 2008). Theory of reasoned action (Fisbein and Ajzen 1975), its modified and evolved version; the theory of planned behavior (Ajzen 1991), and the technology acceptance model (TAM) (Davis 1989) are some individualist perspectives presented to discuss how individuals accept novel concepts. With regard to the fact that TAM and its evolved version TAM2 (Venkatesh and Davis 2000) are aimed to measure the intentions to use systems, it has been suggested that it would be better to shift from predicting behavior to measuring satisfaction in the context of studying new IT success, specifically in the mandatory environments (Adamson and Shine 2003). Wixom and Todd (2005) however, suggest that user satisfaction literature and its parallel stream, technology acceptance literature are not contradictory approaches competing on understanding and interpreting IT usage behavior and value. Rather, they have offered complementary steps in a causal chain from central characteristics of system design, to prospects and beliefs about outcomes that eventually determine usage behavior. Lack of user acceptance has long been confirmed to be an impediment to the success of new IT. However, acceptance, even integrated with satisfaction is not equivalent to success (Petter et al. 2008).

2.1. IT success

Research assessing the IT success has been ongoing for more than twenty years (Gable et al. 2008). A while back, several definitions and measures of IT success were provided by prior IS literature (Urbach et al. 2010). Owing to complex and multi-dimensional nature of IT success, early attempts to define it were ill-defined though (Petter et al. 2008). Referring to this problem,

taxonomy of IT success was established by DeLone and McLean (1992) through comprehensive review of the research published during the period 1981-1987, however, they did not empirically test this model. DeLone and McLean model includes six interdependent construct/variables/components of IT success termed: System quality, information quality, use, user satisfaction, individual impact, and organizational impact. Referring to the fact that original DeLone and McLean model was found to be confusing, and through differentiating actual impacts and expected impacts, as well as by incorporating the additional construct of perceived usefulness presented in TAM (Davis 1989), DeLone and McLean model was enhanced by Seddon (1997). Another well-established modification to existing IT success concept was applied through suggested changes by Rai et al. (2002) and Seddon (1997) models. They incorporated five construct termed information and system quality, perceived usefulness, user satisfaction, and system use in their model. DeLone and McLean (2003) further reviewed the debates on original and modified the seminal model through further clarification of the use construct and adding service quality in their updated IT success model. Finally, Gable et al. (2008) re-conceptualized DeLone and McLean IT success model and validated their suggested IT success model through three separate surveys (including both exploratory and confirmatory phases). The final Gable et al. (2008) IT success model which includes four dimensions in two halves measures individual and organizational impacts (as system-quality and information-quality respectively) explicitly and intentionally at the same time.

To develop a better understanding of IT success and examine whether the relationships presumed by the original DeLone and McLean success model are supported by results of empirical studies, several reviews and analysis of literature were conducted by prior researchers (e.g., Au et al. 2002, Bokhari 2005, Sabherwal et al. 2006, Urbach et al. 2009). Sabherwal et al. (2006)

conducted an exhaustive meta-analysis to examine the DeLone and McLean model and signified the importance of user-related and contextual attributes in IT success. However, Sabherwal et al. (2006) study has been instrumental in synthesizing the quantitative IT success research, thus it was extended through comprehensive review and analysis of both qualitative and quantitative prior studies for the period 1992-2007 by Petter et al. (2008). They reviewed IT success at both individual and organizational levels of analysis and supplied strong support for several proposed interrelationships between success dimensions in the DeLone and McLean model. While recent IS research have strongly recommended that DeLone and McLean IT success model is a useful framework for understanding the key success dimensions and their interrelationships, to create comprehensive and replicable measures of IT success, future scholars are advised to develop the measures for success in accordance with the context and objectives of the empirical research and to explore and examine relationships that have not been adequately studied (DeLone and McLean 2003, Gable et al. 2008, Petter et al. 2008).

2.2. IT success in SMEs

The proposed research model of IT success in this research is mainly formed based on the resource-based theory of the firm. Although the majority of prior IS research has used DeLone and McLean IT success model as the main theoretical foundation of their studies (Gable et al. 2008, Iivari 2005), their research models and subsequently findings cannot be generalized to SMEs. Since the literature has argued that IT success is affected by firm size (DeLone 1981, Raymond 1990), as well as owing to inherent differences between SMEs and large organizations, IT success concept would be different in the context of SMEs (Thong 2001). SMEs mainly have simple and highly centralized structures with the CEOs (Lefebvre and Lefebvre 1992), who are

also the owners and all decisions from daily functions to future investments are made by them (Bruque and Moyano 2007). Their decision influence all firms' current and future activities (Fuller-Love 2006, Smith 2007) which also refers to IT adoption decision in all stages (Bruque and Moyano 2007, Fuller and Lewis 2002). SMEs generally have limited access to the market information and globalization constraint (Madrid-Guijarro et al. 2009). Moreover, management techniques such as financial analysis, forecasting, and project management are rarely used by SMEs (Blili and Raymond 1993). Tendency to employ generalists rather than specialists, reliance on short term planning, informal and dynamic strategies and decision-making process, and lack of standardization of operating procedures are other distinctive characteristics of SMEs (Bhagwat and Sharma 2007, Dibrell et al. 2008, Thong and Yap 1995, Thong et al. 2001). However, restricted resources controlled by SMEs, which is commonly referred to as a resource (knowledge, skill, financial and managerial) poverty (Thong et al. 1997, Welsh and White, 1981), is the major differentiator between SMEs and large organizations. According to the Welsh and White's (1981) framework of resource constraints in small firms, these firms are operating under severe resource constraints which for example include time, financial, and expertise constraints. Owing to limited time, CEOs and employees of SMEs are not appropriately involved in the IT implementation which may brings about decrease in quality of implemented IT (Thong et al. 2001). Moreover, due to their financial constraints, SMEs usually do not have sufficient funds for their IT implementation, thus, they may implement cheap IT which is not fitted with their strategy and inadequate for their purpose (Lybaert 1998). Similarly, SMEs are mostly suffering from lack of in house IT expertise (Caldeira and Ward 2003, Chau 1995). Therefore, they are facing significant risks and problems with their computerization regarding their inadequate knowledge of IT implementation (Igbaria et al. 1997).

With regard to the general resource constraints in SMEs, resource-based theory has been hailed as a promising approach to the study of IT success in SMEs (e.g., Caldeira and Ward 2003, Thong 2001). Resource-based theory popularized by Wernerfelt (1984) is the well established and powerful theory which has been vastly used to study IT implementation in organizations. Resource-based theory has received such interest by researchers that it was called key perspective guiding research into the determinants of firm performance by Crook et al. (2008). Resource-based theory, focusing on the rationale of costly-to-copy attributes of the firm (Caldeira and Ward 2003), explains that firms are characterized as compilations of resources or capabilities (Thong 2001), which can provide businesses with superior performance and competitive advantage (Fink and Neumann 2009, Tarafdar and Gordon 2007). These resources or capabilities which may include a collection of tangible/intangible human/non-human assets controlled by firms such as organizational processes, information, knowledge, plant technology, and capital equipment (Liang et al. 2010, Tarafdar and Gordon 2007) assist firms to envisage and execute strategies that enhance their efficiency and effectiveness (Barney 1991). Accordingly, the unique capabilities of firms to accumulate, develop, and deploy those resources and capabilities supply and secure business with competitiveness through formulating and implementing value-enhancing strategies (Lado and Zhang 1998).

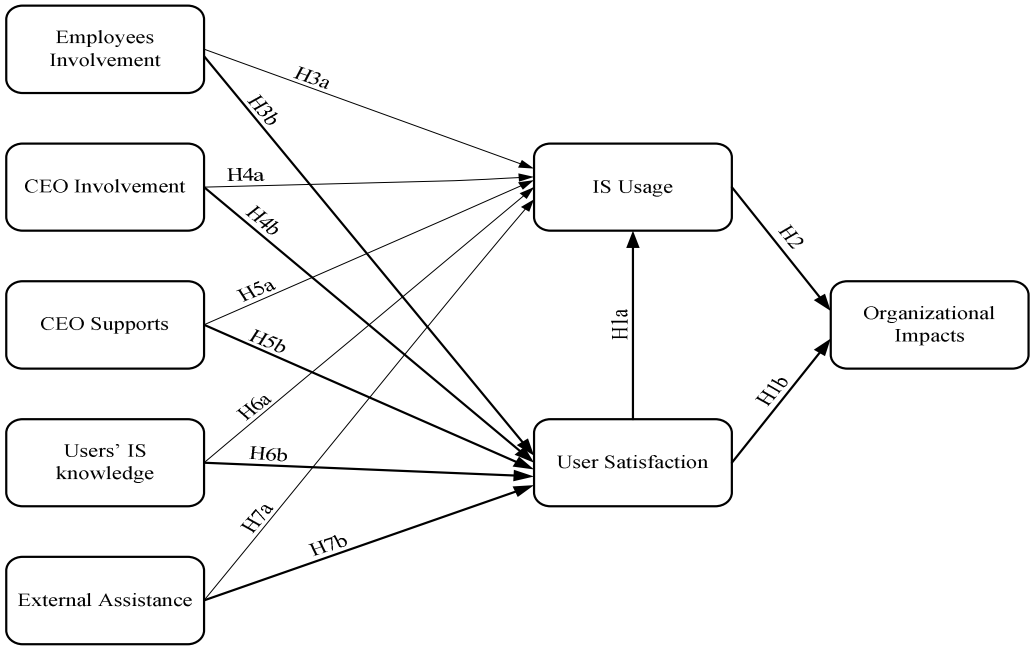
3. Proposed research model and hypothesis development

3.1. Proposed research model

Our proposed model of IT implementation success (Figure 1) is developed based on discussed theoretical background and prior IS literature. In this research and in accordance with resource-based theory of the firm (since IT resources can be viewed as both inhibitor and facilitators of IT

success in SMEs), the IT implementation environment in SMEs is conceptualized in terms of IT resources controlled by firms. These resources, categorized as employees' involvement, CEO involvement, CEO support, and users' IT knowledge, are posited to be the determinants of dimensions of IT success. Likewise, referring to Attewell's (1992) knowledge barrier theory and consistent with Thong's (2001) IT success model, external assistance is presumed to be the fifth determinant of IT success since in SMEs experiencing lack of in house IT expertise, external expertise (e.g., vendors and IT consultants) are the major source of IT training, skills and knowledge (Mishra and Srinivasan 2008, Premkumar and Roberts 1999). Moreover, the core principle of IT success in the proposed model is based on the DeLone and McLean IT success model (DeLone and McLean 2003) including three dimensions labelled IT usage, user satisfaction, and organizational impacts (Table A.1.).

Figure 1: Research model of IT implementation success within Iranian SMEs



3.2. Hypothesis development

3.2.1. IT success

3.2.1.1. Organizational impact

It is evident that adoption of IT can be resulted in a variety of significant benefits for organizations. Improved quality of tasks, time parsimony, improved job performance, staff productivity, operation efficiency, improvement in decision-making, and enhanced competitiveness are examples of IT benefits for firms (Benitez-Amado et al. 2010a, Caldeira and Ward 2002, DeLone and McLean 1992, Lado and Zhang 1998, Love et al. 2005, Melville et al. 2004). For individual level of analysis, perceived usefulness or job impact is the most common measure while in organizational level, profitability measurements are mostly preferred (Petter et al. 2008). However, there are a number of methods to measure the benefits of IT at both the individual and organizational level of analysis. Scholars such as Demmel and Askin (1992, 1996) argue that IT benefits can be categorized as strategic, tactical and pecuniary. On the other hand, other scholars discuss that benefits of IT can be generally classified as three types: Strategic, tactical, and operational benefits (Farbey et al. 1995, Irani and Love 2000 and 2002). However, Peters (1994) suggested that IT benefits fall under three classification including enhanced productivity, business expansion, and risk minimization. Furthermore, according to comprehensive review of literature developed by Rajesh and Albert (1998), strategic, informational, and transactional are three possible categories of organizational benefits. Strategic impact, tactical level impact, and operational impact are three categories of IT impact as suggested by Bradley et al. (2006). The most comprehensive instrument for organizational impact was provided by Mahmood and Soon (1991). They studied IT impacts on organizational strategic variables at two levels including organization and its parent industry which consists of

10 constructs and 49 measurement items. This instrument was further used by several scholars (e.g., Gorla et al. 2010, Tallon and Kraemer 2007) to measure both internal and external organizational impacts.

In the context of SMEs, benefits of IT which are known as organizational impacts are characterized as the positive effects of IT on firm performance (e.g., Thong 2001). We draw on the resource-based theory of the firm to define the organizational impacts regarding the effects of the IT on the firm's competitive position. This theory argues that firm can possess better performance based on resources that are firm-specific, valuable, rare, imperfectly imitable and not strategically substitutable by other resources (Fink and Neumann 2009, Liang et al. 2010). IT resources can assist firms to perform better than competitors regarding sales growth, market share, and profitability (Wu et al. 2006). Organizations also use IT as a component for the information-based innovation to stay competitive and to put their competitors in a less favorable posture (Fink and Neumann 2009). We derived items for the organizational impact construct mostly based on prior measurements of organizational impacts by Fink and Neumann (2009) and Wu et al. (2006). Since we needed a parsimonious instrument of organizational impact (as otherwise the number of items in our survey would be too large because of the additional constructs for staffs' involvement, CEO involvement, CEO support, users' IT knowledge, and external assistance required for the study), we arrived at a five-item instrument for organizational impact construct by involving only those items that are relevant to the context of SMEs. Furthermore, in this research and in accordance with DeLone and McLean (2003) IT success model, organizational impacts of IT are presumed to indirectly be achieved because of IT resources controlled by firm through mediating roles of user IT usage and user satisfaction.

3.2.1.2. User satisfaction

The concept of user satisfaction has caused some controversy since various definitions have been provided by prior scholars (Caldeira and Ward 2002). One of the most widely used user satisfaction instrument named user information satisfaction is defined as the extent to which users believe the information system available to them meets their information requirements (Ives et al. 1983). Doll et al. (1994) end-user computing support instrument is another most widely used user satisfaction instruments. User information satisfaction might be regarded as the best surrogate assessment and the best "omnibus" construct of IT implementation success in the context of SMEs (Thong 2001). However, some researchers such as Melone (1990) argue that since user information satisfaction cannot account for varying roles and interests of the users, it might not be the appropriate measure to capture the full meaning of effectiveness. DeLone and McLean (1992) discuss that regarding the high face validity of user satisfaction, it is probably the most applied measure to assess IT success. In SME business segment, most surveys target CEOs to measure user satisfaction (Caldeira and Ward 2002). On account of unique circumstances called resource poverty, CEO of SME deals with entire spectrum of IT (Thong et al. 1997). In this environment, CEO does business directly with outside business such as IT expertise and consultant, vendors, service providers and training firms. Likewise he or she is inclined to be specialist in various aspect of IT, even though not very well qualified in those aspects (Palvia 1996). Therefore, user satisfaction concepts in SMEs might be somewhat different comparing large organizations. The model of small business user satisfaction with IT by Palvia (1996) is one the most prominent understanding on user IT satisfaction in SMEs. This model was enhanced by Palvia and Palvia (1999) through adding and investigating two other groups of factors, *business related factors* and *owner characteristics* as determinants of user satisfaction in

small firms. With regard to specific characteristics of SMEs, we derived four-item instrument for the user satisfaction construct based on prior research by Al-Gahtani and King (1999) and Thong (2001). These studies have derived their instrument for the information satisfaction construct from Doll's et al. (1994) and Ives's et al. (1983) instruments respectively. Thus, our instrument will assess both system quality and information quality in a parsimonious way as already done in prior IS research (Petter et al. 2008).

According to the updated Delone and McLean model of IT success (Delone and McLean 2003), user satisfaction as a dimension of IT success is posited to have positive effects on IT-enabled benefits. This positive relationship between user satisfaction and IT-enabled benefits were empirically confirmed by prior IS research (e.g., Iivari 2005). IS literature shows that user satisfaction has resulted in improved firm performance, enhanced job satisfaction, more agile decision-making, and increased productivity (McGill and Klobas 2005, Morris et al. 2002, Petter et al. 2008, Rai et al. 2002, Vlahos et al. 2004). On the other hand, updated Delone and McLean model of IT success (Delone and McLean 2003) also assumes that IT usage and user satisfaction are closely interrelated so that increased user satisfaction will lead to increased intention to use, and thus IT usage, which would generate IT-based business value. Relationship between user satisfaction and IT use was strongly supported by previous research, in particular when the frequency and duration of use, as well as number of applications and tasks for which the IS is used are measured (Bharati 2002, Guimaraes and Igbaria 1997, Igbaria and Tan 1997 Petter 2008). Therefore, the effect of user satisfaction on IT benefits is mediated by IT usage. With regard to abovementioned discussion, it is hypothesized that:

H1a: There is positive relationship between user satisfaction with IT and IT usage.

H1b: There is positive relationship between user satisfaction with IT and organizational impacts.

3.2.1.3. IT usage

IT usage is categorized into four different types regarding discrepancy in measurement method, which consists of self-reported and actual usage, intention to use, and frequency of use (Devaraj and Kohli 2003). Although majority of prior research have applied self-reported usage as a dimension of IT success (Delone and McLean 1992), prior literature also demonstrated significant differences between self-reported usage and actual usage (Collopy 1996, Payton and Brennan 1999) so that actual usage was found to be more precise to measure IT-enabled firm performance and success since self-reported usage is a function of possibly imprecise personal reports (Devaraj and Kohli 2003, Szajna 1996). However, and consistent with prior studies on IS usage within SMEs (e.g., Igbaria et al. 1997) self reported IT usage will be measured in this research since there is almost no access to formal information on actual IT usage, which requires for example, recording the number of computer inquiries (King and Rodriguez 1981), amount of connect time by users (Ginzberg 1981), and financed IT expenses (Gremillion 1984). However, to avoid the IT usage simplistic definition problem (while IT usage in complex concept), nature, extent, quality, and appropriateness of the IT usage should be considered (Delone and McLean 2003). Therefore, use or disuse of basic and advanced IT tools, as well as different types of usage (i.e., informational, transactional, and customer service use) are needed to be considered (Lassila and Brancheau 1999, Young and Benamati 2000). Accordingly and in addition to CEO self-reported IT usage, we examine the frequency of usage of simple and advance IT application with different functions. Referring to specific characteristics of SMEs and due to lack of comprehensive instrument to measure IT usage within these firms, we derived a three-item instrument of IT usage to fit the recent computing environment of manufacturing SMEs. Our instrument of IT usage is derived from Davis's et al. (1989) IT usage instrument. However, our

definition of IT follows prior IS research by Tan et al. (2009) and Thong and Yap (1995) defining IT as any computer applications that provide support for operations, management, and decision-making in organizations. Thus, we examine the usage of wide range of IT application [e.g., from simple word processing or Internet to enterprise resource planning (ERP)]. Owing to our instrument of IT usage, we believe that mandatory environment of SMEs does not pose any problem in employing IT usage as a success measure since variability in the quality and intensity of usage of a wide range of IT applications might have a significant impact on IT-created benefits, as well as since no IT usage is totally mandatory (Delone and McLean 2003).

Delone and McLean (2003) IT success model suggests that organizational impact is affected by IT usage. There are an abundance of prior researches providing support for significant positive effect of IT usage over net benefits/organizational impacts of IT (e.g., Almutairi and Subramanian 2005, Guimaraes and Igbaria 1997, Igbaria and Tan 1997, Kositanurit et al. 2006, Rai et al. 2002, Seddon 1997, Urbach et al. 2010). Enhanced task performance due to IT usage (Burton-Jones and Straub 2006) and improved decision performance resulted from intensive system usage regarding the duration (Yuthas and Young 1998) are example of relationship between IT usage and business benefits. Therefore, consistent with prior research, it is hypothesized that IT usage is a dimension of IT success and a determinant of IT-enabled business gains.

H2: There is positive relationship between IT usage and organizational impacts.

3.2.2. IT resources

3.2.2.1. User involvement

User involvement in IT implementation is typically considered as a significant mechanism leading to successful implementation of a new system (Fink 1998). A study by Baroudi et al. (1986) on effects of user involvement found that user involvement in IT adoption process brings about both increased user satisfaction and enhanced system usage. According to Hartwick and Barki (1994), user involvement is composed of two main components: Situational involvement and intrinsic involvement. Situational involvement refers to participation in a variety of activities which are related to new technology implementation and development whilst intrinsic involvement indicates the extent to which the object under consideration possess personal relevance, psychological significance and also considerable consequences for the individual (Amoako-Gyampah 2007). Although Barki and Hartwick (1994) distinguish between involvement and participation, most studies have used the terms interchangeably (Sabherwal et al. 2006). On the subject of the role of user involvement in SMEs, a study by Thong (2001) demonstrated that user involvement in IT implementation is one of the most significant factors required for IT success in SMEs. Individuals who are more involved with IT implementation and usage tend to be more committed with the use of the new tool and thus tend to use it in a comprehensive, broad way, taking advantage of the widest range of capabilities granted by the new tool. Involvement also facilitates a positive approach to IT usage which can maximize the individual's cognitive skills while interacting with IT. This would eventually lead to a higher user satisfaction. User involvement especially in the design of an IT will help users to develop clearer and better understanding of the system and as a result, the system will be better tailored to their specific needs (Baroudi et al. 1986). In a similar context, an empirical study by Foong

(1999) on effect of end-user and systems attributes on IT success in Malaysian SMEs found that satisfaction and systems usage can be improved through a higher level of user involvement in IT development.

With regard to the specific computing environment of SMEs in which, dissimilar to large organizations that in their computing environment users such as managers and employees normally do not interact with extra-organization environment (IT department is almost responsible for dealing with IT adoption), users (both CEO and employees) of IT in SMEs directly deal with whole spectrum of IT (Palvia 1996). Therefore, the involvement of both CEO and employees in IT implementation need to be investigated. Although in the study by Thong (2001) CEO involvement was termed as CEO support (but questioning CEO involvement), this factor is termed CEO involvement in this research. Thus, we distinguish between CEO involvement and CEO support. We define CEO involvement as CEO participation and involvement in IT implementation process while CEO support is defined as the willingness and commitment of CEO to provide the necessary resources for IT implementation (Igbaria et al. 1997). We also distinguish and examine employee involvement as a separate construct. The results of exploratory factor analysis confirmed the construct validly of our suggested instruments of CEO involvement, employees´ involvement, and CEO support (Table A.2 and A.3). CEO involvement can be particularly connected to employees´ involvement and therefore with IT usage and user satisfaction in small firms since proximity and closeness of the CEO with the rest of the staff and with the IT implementation process is higher in SMEs in comparison with large companies. Therefore, we arrived at two sets of three-item instrument for measuring the level of "consultative" (Ives and Olson 1984) involvement of both CEO and employees in three different phases of IT implementation process including system definition (named

decision-making in our research), physical design, and implementation phase (Barki and Hartwick 1994). In addition, it should be mentioned that since user involvement and user attitude are two different, but significantly related concepts, they should be differentiated (Santosa et al. 2005). Thus, it is suggested that in measuring user involvement, the evaluative part (i.e., attitude) should be excluded (Barki and Hartwick 1994).

To determine the relationship between user involvement (both CEO and employees) and dimensions of IT success, we follow Baroudi's et al. (1986) study suggesting that user involvement directly and positively affects user satisfaction and usage while effect of user involvement on system usage is mediated by user satisfaction. Consequently, we propose the following hypotheses:

H3a: There is positive relationship between employees' involvement and IT usage.

H3b: There is positive relationship between employees involvement and user satisfaction with IT.

H4a: There is positive relationship between CEO involvement and IT usage.

H4b: There is positive relationship between CEO involvement and user satisfaction with IT.

3.2.2.2. CEO support

Prior IS literature has provided evidence that top management/CEO support for IT is one of the key cornerstones of higher levels of IT success in organizations (Sabherwal et al. 2006). Since in SMEs the CEO has a greater influence on a firm's performance than does the CEO of a larger firm (Miller and Toulouse 1986), there is considerable evidence of the effect of top-management support on IT success within SMEs (Caldeira and Ward 2003, Fink 1998, Foong 1999, Premkumar 2003). On the other hand, some studies suggest otherwise. Thong et al. (1997) found

that there is no relation between the level of IT effectiveness and level of CEO support. They discuss that there is no difference in the level of IT effectiveness between small firms with high levels of top management support and small firms with low levels of top management support. However, it should be mentioned that this difference is attributable to the definition of CEO support in the study by Thong et al. (1997). CEO support in their study seeks to question CEO involvement in IT implementation.

CEO support is capable of ensuring sufficient allocation of resources and functioning as a change agent to provide a more conducive environment for IT success (Igbaria et al. 1997). With regard to the fact that CEOs are closer to the users in SMEs, the impact of CEO's support on IT satisfaction would be higher since the CEO is more aware of the mechanisms that explain information satisfaction thanks to the use of IT. A supportive CEO would be more aware and also concerned about the ways connecting IT implementation to user satisfaction and ultimately to better firm performance. To sum, it should be stated that concerning the enormous impacts of CEOs in SMEs and due to their role as the key decision makers, CEO support might be associated with greater IT success in these firms (Premkumar and Roberts 1999). Thus, we follow the finding of the recent study by Sabherwal et al. (2006) showing that top-management support positively and directly affects user satisfaction and IT usage. Accordingly, we use mostly Igbaria et al. (1997) instrument as a source of items for our four-item CEO support construct through rewording selected items for clarity and to suit the indicator variables. The following hypotheses are proposed.

H5a: There is positive relationship between CEO support and IT usage.

H5b: There is positive relationship between CEO support and user satisfaction with IT.

3.2.2.3. User IT knowledge

User attributes such as user's experience with IT have an important role in the eventual success of IT (Guimaraes and Igbaria 1997, Sabherwal et al. 2006). Similarly, CEO's and staffs' (as the IT users) IT knowledge and experience is another trait affecting IT success in SMEs (Drew 2003, Fink 1998, Lybaert 1998, Thong 2001). With regard to the general lack of IT expertise in SMEs and difficulty in recruiting IT professionals (due to financial constraints), users with adequate IT knowledge can make a more effective contribution to the IT implementation by their involvement in decision-making and implementation phase (Thong 2001). One the subject of CEO IT knowledge, a study by Thong et al. (1995) demonstrated that small firms with CEOs who are more knowledgeable about IT are more probable to implement IT. Moreover, it was found that in SMEs, CEOs with higher levels of computing skills are more satisfied with the implemented IT rather than those having inferior IT knowledge (Palvia and Palvia 1999). These views are consistent with the findings of other studies which found that sufficient knowledge of IT and its consequent influences over organization could be the motivation and supportive for IT usage in SMEs (Fink 1998, Lybaert 1998). On the other hand, successful implementation of IT needs sharing of knowledge, training, and higher levels of skills by the employees who are also the users of IT (Egbu et al. 2005). An experimented user would be more able to seize all the advantages provided by a new IT and therefore would be more satisfied. Furthermore, skilled, knowledgeable employees tend to reinforce their self-efficacy and self-esteem through the use of a new IT since being good with the IT will provide them with a preponderant position, recognition and status in the company which at the end might increase their level satisfaction with IT. Although above-mentioned discussion signifies the positive impacts of user's IT knowledge and experience over user satisfaction and IT usage, surprisingly, little IT success

research have examined these direct relationships. More research has examined the relationship between users' IT knowledge and the perceived ease of use and perceived usefulness of IT (e.g., Igbaria et al. 1997, Venkatesh and Davis 2000). However, one study, examining IT success within SMEs, found that user satisfaction was positively and directly affected by user IT knowledge (Thong 2001). On the other hand, Thompson et al. (1994) suggested that IT usage is affected by IT experience of users while direct influence of IT experience on IT usage is more pronounced comparing the indirect influences by the mediating role of attitude/belief components. Similarly and in the context of IT success, Guimaraes and Igbaria (1997) and Sabherwal et al. (2006) demonstrated that users' IT knowledge directly affects IT usage. Therefore, we propose the following hypotheses:

H6a: There is positive relationship between users' IT knowledge and IT usage.

H6b: There is positive relationship between users' IT knowledge and user satisfaction with IT.

3.2.2.4. External assistance

There is a body of research showing that the assistance of external IT expertise, consultants and, vendors and their quality are some of the most important aspects of the IT implementation. Their professional skills could have positive impacts upon IT implementation process while most SMEs are suffering from lack of internal IT experts and hiring external consultants (Gable 1991, Morgan et al. 2006, Premkumar and Roberts 1999, Soh et al. 1992, Thong 2001, Walczuch et al. 2000). Cragg and Zinatelli (1995) pointed out that lack of internal expertise has seriously hindered IT sophistication and evolution within small firms, therefore, they must overcome this problem through either seeking help from external sources or developing their own internal end-users' computing skills (DeLone 1981). According to Thong et al. (1997), external consultants

and vendors are main sources of external IT expertise regarding IT implementation within small firms. A study by Soh et al. (1992) of 96 Singaporean small firms revealed that level of IT usage within this kind of firms hiring consultants is higher than those of small firms without consultants. This result is reinforced by a study of Thong et al. (1997) who demonstrated that small firms with high levels of external IT expertise have higher level of IT effectiveness. Their study also revealed that higher level of IT consultant effectiveness brings about higher level of user satisfaction and overall IT effectiveness. Lack of IT knowledge in SMEs can be compensated through the mediating role of external experts by lowering the IT knowledge barrier to achieve successful IT implementation (Attewell 1992). Consistent with Thong (2001), the responsibilities of external experts (i.e., training, technical support, information requirements analysis, and recommending fit hardware and packaged software) are the combination of the duties of both consultants and vendors.

To best of our knowledge, little has been done to understand the direct relationship between external assistance and user satisfaction, as well as IT usage. In the study of IT implementation success within SMEs, Thong (2001) found that user satisfaction is significantly affected by external assistance. On the other hand, although IS literature suggests that external assistance exerts positive influence over IT usage and effectiveness, prior IT success research studying direct relationship between external assistance and IT usage are still missing. Therefore, it is hypothesized that responsibilities of external experts, which is termed external assistance in this research, is positively related with user satisfaction and IT usage. Accordingly, we develop our four-item construct of external assistance mostly based on Thong (2001) instrument by rewording selected items for clarity and to suit the indicator variables.

H7a: There is positive relationship between external assistance and IT usage.

H7b: There is positive relationship between external assistance and user satisfaction with IT.

4. Research methodology

4.1. The sample

The sampling frame of this research includes all manufacturing SMEs located in the main industrial areas of Semnan Province. This province covers an area of 96,816 square kilometers and is one of the 30 provinces of Iran, which is located in the north of the country and is regarded as one of the biggest industrial regions in Iran. The list of SMEs was obtained from the website of Semnan Administration of Industries and Mines (http://www.imo-semnan.ir/), as well as by collaboration of authorities from both this administration and the enterprise of Semnan province industrial cities. Based on the list, as well as cooperation of the authorities, the information of manufacturing SMEs located within Semnan province were retrieved. In this research, small enterprise is defined by a number of employees and it refers to enterprise with fewer than 50 employees. Accordingly, medium-sized enterprise refers to enterprise by the greatest extent of 250 employees.

4.2. Data collection

In this research, the population of interest was defined as the CEOs (top managers or owners) of Iranian SMEs since they are in better position to understand the current situation and future strategies and status of their firms (Thong and Yap 1995). In order to identify and remove the potential deficiency of the questionnaire, estimate average required response time and evaluate its comprehension, pilot study was conducted before final data collection. The questionnaire was

piloted on 30 CEOs of the SMEs in the different industrial areas in Semnan province with the purpose of testing and assuring face validity of the questionnaire. Based on the feedback from the pilot study, some questions were rephrased to improve their clarity. As a result, some minor revisions were applied to the questionnaire before final data collection. Finally, from 465 qualified manufacturing SMEs for participation in this study, 124 CEOs (besides 30 CEOs participated in pilot study) agreed to participate in the survey. To increase the response rate and avoid data missing in the study, questions of personal administrative questionnaire were asked from CEOs through interviews instead of sending questionnaire to them for collecting data. Finally, 121 questionnaires were filled by interview with CEOs of SMEs.

5. Results and discussion

With regard to the objective of this research which is to investigate the factor affecting the success of IT implementation within Iranian SMEs, the suggested research model of IT success in SMEs is evaluated using structural equation modeling.

5.1. Assessment of the measurement models

The proposed research model of success in this study (Figure 1) includes 29 items describing eight latent variables: CEO involvement, employees´ involvement, users' IT knowledge, CEO support, and external assistance as five exogenous variables and user satisfaction with IT, IT usage, and organizational impacts as three endogenous variables (Figure A.1).

The most fundamental event in structural equation modeling test is the evaluation of measurement model validity, which is dependent on goodness-of-fit (GOF) for the measurement model and specific evidence of construct validity (Hair et al. 2006). Therefore, to test the model validity, the confirmatory factor analysis (CFA) was computed using the AMOS software. GOF shows how well the specified model reproduce covariance matrix among the indicator items (Hair et al. 2006). Several GOF measures such as Chi-square statistic, goodness-of-fit index (GFI), root mean square error of approximation (RMSEA), standardized root mean squarer residual (SRMR), comparative fit index (CFI), and normed fit index (NFI) are presented by previous scholars, which are categorized in three different groups: Absolute, incremental and parsimony fit indices (Ho 2006). The selection of most proper indices is a matter of dispute among methodologists. According to Jaccard and Wan (1996), the use of at least three fit tests, one from each of the mentioned three categories is recommend to reflecting diverse criteria. Kline (1998) recommends at least four tests, such as Chi-square; GFI, NFI, or CFI; NNFI; and SRMR. Moreover, Hair et al. (2006) suggest that reporting X^2 value and degree of freedom, along with CFI and RMSEA will often provide sufficient unique information to evaluate.

Based on the GOF indices shown in Table 1, measurement model test presents a relative good fit between the data and the proposed measurement model. For example, Chi-square GOF test shows that the model does fit the data well, X^2 (N = 121, d.f. = 349) = 390.381, p = 0.073, CMIN = 1.119 (Ho 2006). This test can be assumed reliable since all skew and kurtosis values are within the range of +/- 1.0, as well as the multivariate kurtosis value of 1.566 (which is lesser that 1.96) means there is non-significant kurtosis, thus, significant multivariate normality (Schumacker and Lomax 2004). In addition, the RMSEA was 0.031, which fall between the recommended range of acceptability (between 0.03 and 0.08) (Hair et al. 2006). The SRMR also

shows the model fit since it is lesser than the cutoff value of 0.08 recommended by (Hair et al. 2006). Moreover, although NFI is a little lesser that its cutoff value (0.9), CFI as a derivative and improved version of NFI, which seeks to include model complexity in a fit measure, significantly passes its cutoff value (0.9) (Hair et al. 2006, Ho 2006), thus shows that measurement model has a good fit with the data.

Table 1: GOF indices of measurement model

GOF index	CMIN	RMSEA	SRMR	CFI	NFI
Value	1.119 (p = 0.063)	0.031	0.0514	0.982	0.855

On the other hand, to test the construct validity of measurement theory, the factor loading, reliability, and variance extracted should be provided to estimate the relative amount of convergent validity among item measures. Table A.4 shows that all standardized factor loadings (ranging from 0.74 to 0.93) and composite reliabilities (ranging from 0.824 to 0.915) exceed from ideal cutoff value of 0.7 as recommended by Fornell (1982). In addition, all average variance extracted (AVE) ranging from 0.609 to 0.759 exceed from cutoff value of 0.5 recommended by Hair et al. (2006).

5.2. Assessment of the structural model

At the next step, the validity of structural model needs to be assessed since the measurement model has been already specified and validated with CFA. In order to assessing the validity of research structural model, it should be noted that the recursive structural model cannot provide any better fit than measurement model (e.g., providing a lower X^2 comparing measurement model) (Hair et al. 2006). Thus, structural theory might lack validity if structural model fit is

significantly worse than CFA fit (Anderson and Gerbing 1992). The GOF indices of structure model are shown in Table 2, which shows the relative good fit. As a result, the structural model is strongly suggestive of adequate structural fit since it is demonstrating an insignificant ΔX^2 value with its CFA model (ΔX^2 = 6.75). Furthermore, no evidence of interpretational confounding exists since comparing the CFA loading estimates with those standardized factor loading from the structural model shows inconsiderable fluctuations (less than 0.01) (Hair et al. 2006).

Table 2: GOF indices of structural model

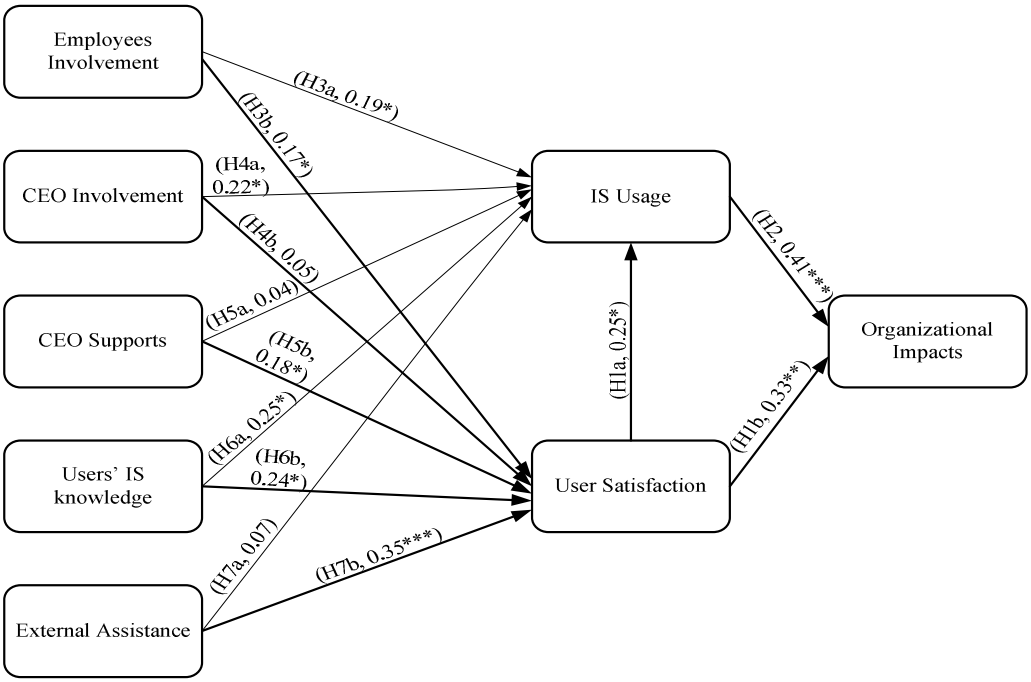
GOF index	CMIN	RMSEA	SRMR	CFI	NFI
Value	1.122 DOF= 354 X^2 = 397.137 (p = 0.057)	0.032	0.0575	0.981	0.852

5.3. Model analysis

Figures 2 and A.2 presents the assessment of structural model which shows most of the hypotheses were supported except for hypotheses H4b, H5a, and H7a. For H1a, the result indicates that user satisfaction has a significant positive effect on IT usage ($\beta = 0.25$, $p < 0.05$). Consistent with hypotheses H1b and H2, user satisfaction and IT usage are both positively related to organizational impacts. The data shows that user satisfaction (H3a) and IT usage (H4) have a strong direct effect on organizational impacts ($\beta = 0.33$, $p < 0.01$; $\beta = 0.41$, $p < 0.001$, respectively). It should be stated that user satisfaction has a significant indirect effect on organizational impacts through IT usage.

According to the Figure 2, the effects of exogenous factors including employees´ involvement, CEO involvement, CEO support, users' IT knowledge, and external assistance on organizational impacts are indirect through user satisfaction and IT usage. The data shows that consistent with H3a and H3b, employees´ involvement positively influences both IT usage and user satisfaction ($\gamma = 0.19$ and 0.17, respectively, $p < 0.05$). The result confirms that although CEO involvement has positive effects on IT usage (H4a: $\gamma = 0.22$, $p < 0.05$), it has no significant effects on user satisfaction (H4b). Moreover, consistent with H5b, CEO support have positive effects on user satisfaction ($\gamma = 0.18$, $p < 0.05$), however, there is no significant relationship between CEO support and IT usage (H5a). Consistent with H6a and H6b, Figure 2 shows that users' IT knowledge has positive direct effects on IT usage and user satisfaction ($\gamma = 0.25$ and 0.24, respectively, $p < 0.05$), which implies that users' IT knowledge is an important determinant of IT usage and user satisfaction. Furthermore, while external assistance has no significant effect on IT usage (H7a is not supported), consistent with H7b, it has a positive direct effect on user satisfaction ($\gamma = 0.35$, $p < 0.001$).

Figure 2: IT success structural pass model with standardized path coefficient



5.4. Discussion

This research proposed an integrated structural equation model of IT implementation success in SMEs through examining IT success as a function of user satisfaction, IT usage and organizational impacts. The descriptive statistics indicate that Iranian SMEs' awareness of the need to derive benefit from IT has been growing since all surveyed SMEs have used at least one form of IT (Table A.5). The results from the hypotheses testing indicate that external assistance is the main determinant of user satisfaction within SMEs, which is consistent with work of Thong (2001) who found that external expertise is the most determinate of IT success within SMEs. For these firms generally experiencing lack of resources such as financial, skills, and professionals (Attewell 1992), lack of internal IT experts and difficulty in recruiting and retaining IT professionals, as well as affording costs of providing IT training for employees can impose major problem in successful implementation of IT (Premkumar and Roberts 1999, Thong

et al. 1997). In such circumstances, the professional skills of external experts (i.e., IT consultants, government, and vendors) can significantly make up for lack of IT skills and experience in SMEs (Thong 2001). Therefore, it is crucial that management should consider the fact that external support is essential for SMEs having no sufficient IT expertise to implement these new technologies successfully. In general, when IT meets the expectations and needs of users, user satisfaction increases. Conversely, users are dissatisfied when IT does not provide information required. The assistance of external expertise can provide IT users with lower knowledge barrier (Attewell 1992) and thus more confidence in their capability to use IT (Thatcher and Perrewe 2002). Although external assistance is the most significant determinant of user satisfaction, surprisingly, and inconsistent with H7a no significant relationship was found between external assistance and IT usage. Our explanation for this finding is that CEOs of SMEs in the context of this study have taken the advantage of external assistance mostly to enhance the system and information characteristics (core concepts in satisfaction with IT) such as IT accuracy, reliability, and compatibility and alignment with business strategy. Likewise, it seems that within Iranian SMEs, the assistance of external expertise has not been used to its' full potential to improve users' behavior and attitudes regarding effective IT usage (e.g., training campaigns to improve users' perceived usefulness and ease of use toward implemented IT).

The results also demonstrate that users' IT knowledge is almost the most important factor affecting IT success in SMEs since it is the most determinant of IT usage, and the second most important determinant of user satisfaction within Iranian SMEs. This finding support the studies by Palvia and Palvia (1999) and Thong (2001) who found that user IT knowledge is an important determinant of user satisfaction and subsequently IT success in SMEs. According to the argument of knowledge barriers defined by Attewell (1992), users' skill and knowledge

development can facilitate and speed up the adoption of IT technologies. Users' increased IT knowledge can be resulted in more effective users' contribution in IT deployment process, bring about more realistic and pragmatic expectations of implemented IT (Thong 2001). Thus, regarding the generally lack of internal IT expertise, it is imperative that managers of SMEs use the assistance of external expertise (e.g., vendors and IT consultants) as the major source of IT training, skills and knowledge (Mishra and Srinivasan 2008, Premkumar and Roberts 1999, Thong 2001).

The importance of top management support in success of IT in SMEs has been well-recognized (Igbaria et al. 1997, Premkumar and Roberts 1999, Thong 2001, Thong et al. 1997). Consistent with H5b, management support positively affected user satisfaction. Management support can take a variety of forms such as encouragement to use the system, allocating adequate resources such as computer hardware, granting wider selection of user-friendly software of special use to different jobs, providing training programs, and encouraging experimentation with microcomputers (Igbaria et al. 1997, Riemenschneider et al. 2003). Since the implementation of IT involves interaction with trading partners and creating business agreements for using the technology, as well as since resistance to IT-created changes in business need to be overcome, top management's support and commitment are required in such circumstances (Premkumar and Roberts 1999). Contrary to our hypotheses, no significant relationship was found between CEO support and IT usage. It explains that despite the higher CEO support in providing resource for effective IT usage increases satisfaction with IT (regarding the both system and information), the pattern of IT usage is not affected by CEO support. One possible explanation is that regarding the specific mandatory environment of Iranian manufacturing SMEs, the level of IT usage may be merely determined by strategies of these businesses and higher CEO support only enhances

user satisfaction. It should be mentioned that 66.1 percent of respondents in this study agreed that fulfilling specific standards necessitated by government and/or customers requirements (e.g., different ISOs) have forced them to implement and use IT applications since most of them are persuaded to have and use these kinds of standards, which signify the mandatory environment of Iranian SMEs. Another possible explanation is that effect of CEO support on IT usage may be understood in the light of dependence of IT usage on perceived ease of use and usefulness, which is lacking in our research. For example, in the Igbaria's et al. (1997) IT acceptance model, the effect of CEO support on IT usage was found to be fully mediated by perceived ease of use and usefulness. Likewise, in the study by Sabherwal et al. (2006), the effect of top management support on IT usage was significantly mediated by perceived usefulness.

Our results also show that user involvement (both management and employees) is an important determinant of IT success within SMEs. Consistent with H3a and H3b employees´ involvement has direct positive effects on user satisfaction and IT usage. Likewise, IT usage was found to be positively affected by CEO involvement in accordance with H4a. However, inconsistent with H4b, no relationship was found between CEO involvement and user satisfaction. These results support previous studies developed by Palvia and Palvia (1999), Thong (2001), and Foong (1999) who found that user involvement is one of the most significant determinants of IT success within SMEs. The role of user involvement in IT success is sizeable since user involvement in the design of an IS will help users to develop clearer and better understanding of the system (Baroudi et al. 1986). Moreover, the potential IT users involvement and participation actively in the process of IT implementation might help them to be ensured that their recommendations and requirements are incorporated into the IT, feel a sense of ownership over the final implemented IT, and thus decrease their resistance to adapt to new work procedures (Thong 2001). Likewise,

if end users could be encouraged to be involved with IT implementation through having time-off form routine responsibilities, advantages such as better fit of IT to users' expectations, easiness of using the IT applications due to achieved IT knowledge and learning experience during the design phase, strong sensation of ownership, and decreased resistance to change could be achieved, those improvement which increase the probability of successful IT implementation too (Fink 1998, Thong 2001).

The results also indicate that consistent with H1b and H2, user satisfaction and IT usage are both positively related to organizational impacts. The data shows that user satisfaction and IT usage have a strong direct effect on organizational impacts. Furthermore, user satisfaction consistent with H1a has a strong direct effect on IT usage. In this sense, individuals (managers and employees) are more likely to use IT if they are satisfied with it. Thus, it needs to be mentioned that user satisfaction has a significant indirect effect on organizational impacts through IT usage. According to the results of this study, the total effect of user satisfaction is slightly greater than the total effect of IT usage on organizational impacts. This may suggest that in the context of SMEs, level of IT-enabled business benefits is affected primarily because of level of users' satisfaction with implemented IT and secondarily on the basis of IT usage in these firms.

In addition and consistent with Delone and McLean's (2003) IT success model, these findings provide support for another prior research (e.g., Sabherwal et al. 2006, Thong 2001, Urbach et al. 2010) which demonstrated that IT-enabled organizational impacts are positively affected by user satisfaction. These findings are also consistent with prior research showing that IT usage has a positive direct effect on IT-enabled organizational impacts (Delone and McLean 2003, Rai et al. 2002, Seddon 1997, Urbach et al. 2010).

6. Conclusion

6.1. Limitations

Our results must be interpreted in the light of the study's limitations. First, the research model of this study was explored in several Iranian manufacturing industries. While it is true that this improves the generalizability of the study, biases that might be introduced across industries could be of some concern. Second, only 124 CEOs of SMEs agreed to participate in this research. Larger number of participating SMEs would have increased the validity of these results. Third, to avoid model complexity, we assessed some constructs of this research (e.g., organizational impact) by using parsimonious measures since we had anticipated the relatively small number of qualified participants. Larger multi-item measures can be used to capture aspects of these constructs conceivably not assessed here. Similarly, we limited our measurement of determinants of IT success to IT resource controlled by SMEs in the light of the resource-based theory of the firm and determinants of IT success suggested by Delone and McLean (2003) such as information quality were excluded from our model. Thus, measurement of these constructs in addition to constructs examined in our model needs to be elaborated on to effectively represent their entirety. Fifth, we also did not incorporate constructs of perceived ease of use and perceived usefulness in relationship with IT usage to our IT success model, which may explain that we did not get support for H5a and H7a. Finally, the research uses data provided by only one key informant per firm which were CEOs of surveyed SMEs while it would have been preferable to use two key informants per firm.

6.2. Future research directions

This study can be extended in several directions. The proposed model can be tested on samples of SMEs in other countries to determine its generalizability. One of the issues with which scholars might be concerned is how the results of this research would have changed if opinions of employees were examined too. In addition, more research is needed to explore the relationships that have not been adequately examined in this research. In examining the relationship between IT resources (as determinant of dimensions of IT success) and IT usage, the incorporation of constructs of IT acceptance is required. Thus, more research is needed on examining the relationships between perceived ease of use and usefulness and dimensions of IT success. On the other hand, Sabherwal et al. (2006) have taken an important step in examining the determinants of IT usage by incorporating the user-related construct such as user attitude and training. Future researchers are advised to incorporate more user related constructs in there IT success research as our research has not adequately addressed these constructs. In addition, since none resource-based IT success research has examined the interrelationship between IT resources and information quality, systems quality, and service quality (as suggested by Delone and McLean 2003) and their joint impacts over dimensions of IT success, more research are needed to address this issue.

6.3. Contributions to operations management (OM) and IS research

This paper provides a starting point for a new direction for research on an enduring topic. We believe that this empirical research makes a contribution to both OM and IS research by developing an interactive resource-based model of IT implementation success for future research through combining theoretical explanations and empirical findings from the IS literature that

may provide a clearer understanding of determinants of IT success in SMEs. To best of our knowledge, our model is one of the rare IT success model which applies resource-based theory in conjunction with the unique characteristic of SMEs to assess IT success within these firms, while tries to cover the three different well-established dimensions of IT success suggested by Delone and McLean (2003). In our model, we tried to go beyond the core characteristics of IT as the determinants of dimensions of IT success and incorporate IT resources controlled by SMEs in the light of the resource-based theory and Attewell's (1992) knowledge barrier theory to conceptualize the key determinants of IT implementation success in this entrepreneurial segment. The implication of our success model in not merely limited to the context of SMEs, rather can be applied in different business contexts suffering from any sort of resource constraints.

6.4. Implications for practicing managers

The findings of this research have several implications for SMEs, IT consultants, and IT vendors responsible for improving and institutionalizing IT to SME business segment. To achieve the high level of IT implementation success, CEOs of SMEs should be aware that the involvement of both top management and employees (which are users of IT) in different stages of IT adoption (decision-making process and implementation) is imperative. The rationale behind is that due to special environment of SMEs in which users of IT are responsible for IT adoption process, their involvement will be resulted in better understanding of implemented IT, making the IT tools more user-friendly and compatible with requirements of users, and decreased resistance and anxiety toward implemented IT, those facilitating conditions that directly or indirectly affect IT success. Likewise, CEOs of SMEs are required to be supportive regarding the implementation of IT in their businesses. This means that they should be willing and committed to provide the

necessary resources and authority/power for IT adoption. Their support motivates greater user participation, and leads to greater IT success, in terms of user satisfaction and IT use. CEOs of SMEs, as the key decision-maker in their businesses and responsible for most of important business activities such as decision-making over future plans and interacting with business partners can overcome any problems in and resistance to IT implementation and are crucial facilitator for this phenomenon. This support can involve providing training programs, allocation of adequate resources such as financial resources, and encouraging staffs to use IT in their daily activities.

Moreover, users' IT knowledge is a significant facilitator of IT success within SMEs. SMEs have to ponder that due to general lack of IT expertise in these firms and the difficulty in recruiting IT professionals, user IT knowledge can facilitate more successful IT implementation through decreasing degree of uncertainty entangled with IT implementation, increasing satisfaction with the implemented IT, and enhancing effectiveness of contribution to the different phases of IT adoption. Therefore, the level of IT knowledge and skills of users of IT in SMEs should be improved. This improvement can be done through providing training and using the assistance of IT expertise. However, since most SMEs are suffering from lack of internal IT experts and have difficulty in recruiting IT experts (due to financial constraints), SMEs have to overcome this drawback by seeking help from external sources. External assistance, which might include external consultants, government, and vendors, are responsible for providing training, technical support, information requirements analysis, and recommending fit hardware and packaged software. Therefore, CEOs of SMEs should be aware of any possible and existing external assistance, which can help them to implement IT in their businesses successfully.

6.5. Final conclusions

We have developed and tested a resource-based model of IT success based on Attewell's (1992) theory of knowledge barrier and Welsh and White's (1981) resource constraints framework. This study focuses on investigation of IT implementation success within Iranian SMEs, which are economically and culturally different from other developing countries, as well as developed countries in particular. Using empirical survey data of manufacturing SMEs, this research was aimed to seek both technical and human IT resources affecting successful implementation of IT within SMEs. This paper tries to provide significant support for the arguments made in prior IT literature by testing some determinants of IT success in the prior models (Delone and McLean 2003, Rai et al. 2002) and also contributes to the research on resource-based theory of the firm (Caldeira and Ward 2003, Thong 2001). Using structural equation modeling to analyze the suggested model of this research, user's (both CEO and employees) IT knowledge and involvement, CEO support, and external assistance were revealed as significant determinants of IT success within Iranian SMEs while IT success was defined based on three dimensions: IT usage, user satisfaction, and IT-enabled organizational impacts.

References

Adamson, I., & Shine, J., 2003. Extending the new technology acceptance model to measure the end user information systems satisfaction in a mandatory environment: A Bank's Treasury. Technology Analysis and Strategic Management 15(4), 441-455.

Ajzen, I., 1991. The theory of planned behavior. Organizational Behavior and Human Decision Processes 50(2), 179-211.

Al-Gahtani, S.S., Hubona, G.S., & Wang, J., 2007. Information technology (IT) in Saudi Arabia: Culture and the acceptance and use of IT. Information & Management 44(8), 681-691.

Al-Gahtani, S.S., & King, M., 1999. Attitudes, satisfaction and usage: Factors contributing to each in the acceptance of information technology. Behaviour & Information Technology 18(4), 277-297.

Almutairi, H., & Subramanian, G.H., 2005. An empirical application of the DeLone and McLean model in the Kuwaiti private sector. Journal of Computer Information Systems 45(3), 113-122.

Anderson, J.C., & Gerbing, D.W., 1992. Assumptions and comparative strengths of the two-step approach: Comment on Fornell and Yi. Sociological Methods & Research 20(3), 321-333.

Attewell, P., 1992. Technology diffusion and organizational learning: The case of business computing. Organization Science 3(1), 1-19.

Au, N., Ngai, E.W.T., & Cheng, T.C., 2002. A critical review of end-user information system satisfaction research and a new research framework. Omega: The International Journal of Management Science 30(6), 451-478.

Bardhan, I., Whitaker, J., & Mithas, S., 2006. Information technology, production process outsourcing, and manufacturing plant performance. Journal of Management Information Systems 23(2), 13-40.

Barki, H., & Hartwick, J., 1994. Measuring user participation, user involvement, and user attitude. MIS Quarterly 18(1), 59-82.

Barney, J.B., 1991. Firm resources and sustained competitive advantage. Journal of Management 17(1), 99-120.

Baroudi, J.J., Olson, M.H., & Ives, B., 1986. An empirical study of the impact of user involvement on system usage and information satisfaction. Communications of the ACM 39(3), 212-238.

Benitez-Amado, J., Llorens-Montes, F.J., & Perez-Arostegui, M.N., 2010a. Information technology-enabled intrapreneurship culture and firm performance. Industrial Management & Data Systems 110(4), 550-566.

Benitez-Amado, J., Perez-Arostegui, M.N., & Tamayo-Torres, J., 2010b. Information technology-enabled innovativeness and green capabilities. Journal of Computer Information Systems 51(2), 87-96.

Berthon, P., Ewing, M.T., & Napoli, J., 2008. Brand management in small to medium-sized enterprises. Journal of Small Business Management 46(1), 27-45.

Bhagwat, R., & Sharma, M.K., 2007. Information system architecture: A framework for a cluster of small and medium-sized enterprises (SMEs). Production Planning and Control 18(4), 283-296.

Bharadwaj, S., Bharadwaj, A.S., & Bendoly, E., 2007. The performance effects of complementarities between information systems, marketing, manufacturing, and supply chain processes. Information Systems Research 18(4), 437-453.

Bharati, P., 2002. People and information matter: Task support satisfaction from the other side. Journal of Computer Information Systems 43(2), 93-102.

Bhatt, G.D., & Grover, V., 2005. Types of information technology capabilities and their role in competitive advantage: An empirical study. Journal of Management Information Systems 22(2), 253-277.

Blili, S., & Raymond, L., 1993. Information technology: Threats and opportunities for small and medium-sized enterprises. International Journal of Information Management 13(6), 439-448.

Bokhari, R.H. The relationship between system usage and user satisfaction: A meta-analysis. The Journal of Enterprise Information Management Decision 18(2), 211-234.

Bradley, R.V., Pridmore, J.L., Byrd, T.A., 2006. Information systems success in the context of different corporate cultural types: An empirical investigation. Journal of Management Information Systems 23, 267-294.

Bruque, S., & Moyano, J., 2007. Organisational determinants of information technology adoption and implementation in SMEs: The case of family and cooperative firms. Technovation 27(5), 241-253.

Burton-Jones, A., & Straub, D.W., 2006. Reconceptualizing system usage: An approach and empirical test. Information Systems Research 17(3), 228-246.

Caldeira, M.M., & Ward, J.M., 2002. Understanding the successful adoption and use of IS/IT in SMEs: An explanation from Portuguese manufacturing industries. Information Systems Journal 12(2), 121-152.

Caldeira, M.M., & Ward, J.M., 2003. Using resource-based theory to interpret the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises. European Journal of Information Systems 12(2), 127-141.

Carayannis, E.G., 1998. The strategic management of technological learning in project/program management: The role of extranets, intranets and intelligent agents in knowledge generation, diffusion, and leveraging. Technovation 18(11), 697-703.

Carr, N.G., 2003. IT doesn't matter. Harvard Business Review 85(4), 41-49.

Chau, P.Y.K., 1995. Factors used in the selection of packaged software in small businesses: Views of owners and managers. Information & Management 29(2), 71-78.

Collopy, F., 1996. Biases in retrospective self-reports of time use: An empirical study of computer users. Management Science 42(5), 758-767.

Cragg, P., King, M., & Hussin, H., 2002. IT alignment and firm performance in small manufacturing firms. The Journal of Strategic Information Systems 11(2), 109-132.

Cragg, P.B., & Zinatelli, N., 1995. The evolution of information systems in small firms. Information & Management 29(1), 1-8.

Crook, T.R., Ketchen Jr., D.J., Combs, J.G., & Todd, S.Y., 2008. Strategic resources and performance: A meta-analysis. Strategic Management Journal 29(11), 1141-1154.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly 13(3), 319-339.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R., 1989. User acceptance of computer technology: A comparison of two theoretical models. Management Science 35(8), 982-1003.

DeLone, W.H., 1981. Firm size and the characteristics of computer use. MIS Quarterly 5(4), 65-77.

DeLone, W.H., & McLean, E.R., 1992. Information systems success: The quest for the dependent variable. Information Systems Research 3(1), 60-95.

Delone, W.H., & McLean, E.R., 2003. The DeLone and McLean model of information systems success: A ten-year update. Journal of Management Information Systems 19(4), 9-30.

Demmel, J.G., & Askin, R.G., 1992. A multiple-objective decision model for the evaluation of advanced manufacturing system technologies. Journal of Manufacturing Systems 11(3), 179-194.

Demmel, J.G., & Askin, R.G., 1996. Multiobjective evaluation of advanced manufacturing system technology investments with risk. IIE Transactions 28(3), 249-259.

Devaraj, S., & Kohli, R., 2000. Information technology payoff in the health-care industry: A longitudinal study. Journal of Management Information Systems 16(4), 41-67.

Devaraj, S., & Kohli, R., 2003. Performance impacts of information technology: Is actual usage the missing link? Management Science 49(3), 273-289.

Dibrell, C., Davis, P.S., & Craig, J., 2008. Fueling innovation through information technology in SMEs. Journal of Small Business Management 46(2), 203-218.

Doll, W.J., Xia, W., & Torkzadeh, G., 1994. A confirmatory factor analysis of the end-user computing satisfaction instrument. MIS Quarterly 18(4), 453-461.

Drew, S., 2003. Strategic uses of e-commerce by SMEs in the east of England. European Management Journal 21(1), 79-88.

Egbu, C.O., Hari, S., & Renukappa, S.H., 2005. Knowledge management for sustainable competitiveness in small and medium surveying practices. Structural Survey 23(1), 7-21.

Farbey, B., Targett, D., & Land, F., 1995. Evaluating business information systems: Reflections on an empirical study. Information Systems Journal 5(4), 235-252.

Fink, L., & Neumann, S., 2009. Exploring the perceived business value of the flexibility enabled by information technology infrastructure. Information & Management 46(2), 90-99.

Fisbein, M., & Ajzen, I., 1975. Belief, attitude, intention and behavior: An introduction to theory and research, Addison-Wesley, Reading, MA.

Foong, S.Y., 1999. Effect of end-user personal and systems attributes on computer-based information system success in Malaysian SMEs. Journal of Small Business Management 37(3), 81-87.

Fornell, C., 1982. A second generation of multivariate analysis: Methods. Vol. 1, Praeger, New York, NY, U.S.A.

Fuller-Love, N., 2006. Management development in small firms. International Journal of Management Reviews 8(3), 175-190.

Fuller, T., & Lewis, J., 2002. 'Relationships mean everything': A typology of small-business relationship strategies in a reflexive context. British Journal of Management 13(4), 317-336.

Gable, G.G., 1991. Consultant engagement for computer system selection: A proactive client role in small businesses. Information & Management 20(2), 83-93.

Gable, G.G., Sedera, D., & Chan, T., 2008. Re-conceptualizing information system success: The IS impact measurement model. Journal of the Association for Information Systems 9(7), 377-408.

Ginzberg, M.J., 1981. Early diagnosis of MIS implementation failure: Promising results and unanswered questions. Management Science 27(4), 459-478.

Gorla, N., Somers, T.M., & Wong, B., 2010. Organizational impact of system quality, information quality, and service quality. The Journal of Strategic Information Systems 19(3), 207-228.

Gremillion, L.L., 1984. Organization size and information system use: An empirical study. Journal of Management Information Systems 1(2), 4-17.

Guimaraes, T., & Igbaria, M., 1997. Client/server system success: Exploring the human side. Decision Sciences 28(4), 851-876.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., & Tatham, R.L., 2006. Multivariate data analysis, 6th ed., Prentice Hall, Upper Saddle River, NJ, U.S.A.

Hartwick, J., & Barki, H., 1994. Explaining the role of user participation in information system use. Management Science 40(4), 440-465.

Ho, R., 2006. Handbook of univariate and multivariate data analysis and interpretation with SPSS. CRC Press, New York, NY, U.S.A.

Howell, J., & Wei, J., 2010. Value increasing model in commercial e-banking. Journal of Computer Information Systems 51(1), 72-81.

Igbaria, M., & Tan, M., 1997. The consequences of information technology acceptance on subsequent individual performance. Information & Management 32(3), 113-121.

Igbaria, M., Zinatelli, N., Cragg, P., & Cavaye, A.L.M., 1997. Personal computing acceptance factors in small firms: A structural equation model. MIS Quarterly 21(3), 279-305.

Iivari, J., 2005. An empirical test of DeLone and McLean model of information systems success. The Data Base for Advances in Information Systems 36(2), 8-27.

Irani, Z., & Love, P.E.D., 2000. The propagation of technology management taxonomies for evaluating investments in information systems. Journal of Management Information Systems 17(3), 161-177.

Irani, Z., & Love, P.E.D., 2002. Developing a frame of reference for ex-ante IT/IS investment evaluation. European Journal of Information Systems 11(1), 74-82.

Ives, B., & Olson, M.H., 1984. User involvement and MIS success: A review of research. Management Science 30(5), 586-603.

Ives, B., Olson, M.H., & Baroudi, J.J., 1983. The measurement of user information satisfaction. Communications of the ACM 26(10), 785-793.

Jaccard, J., & Wan, C.K., 1996. LISREL approaches to interaction effects in multiple regression. Sage Publications, California, U.S.A.

Jean, R.J., & Sinkovics, R.R., 2010. Relationship learning and performance enhancement via advanced information technology: The case of Taiwanese dragon electronics firms. International Marketing Review 27(2), 200-222.

King, W.R., & Rodriguez, J.I., 1981. Participative design of strategic decision support systems: An empirical assessment. Management Science 27(6), 717-726.

Kline, R.B., 1998. Principles and practice of structural equation modeling: A very readable introduction to the subject, with good coverage of assumptions and SEM's relation to underlying regression, factor, and other techniques. Guilford Press, New York, NY, U.S.A.

Kositanurit, B., Ngwenyama, O., & Osei-Bryson, K.M., 2006. An exploration of factors that impact individual performance in an ERP environment: An analysis using multiple analytical techniques. European Journal of Information Systems 15(6), 556-568.

Lado, A.A., & Zhang, M.J., 1998. Expert systems, knowledge development and utilization, and sustained competitive advantage: A resource-based model. Journal of Management 24(4), 489-509.

Lai, F., Zhao, X., & Wang, Q., 2006. The impact of information technology on the competitive advantage of logistics firms in China. Industrial Management & Data Systems 106(9), 1249-1271.

Lassila, K.S., & Brancheau, J.C., 1999. Adoption and utilization of commercial software packages: Exploring utilization equilibria, transitions, triggers, and tracks. Journal of Management Information Systems 16(2), 63-90.

Lefebvre, E., & Lefebvre, L.A., 1992. Firm innovativeness and CEO characteristics in small manufacturing firms. Journal of Engineering and Technology Management 9(3-4), 243-277.

Li, M., & Ye, L.R., 1999. Information technology and firm performance: Linking with environmental, strategic and managerial contexts. Information & Management 35(1), 43-51.

Liang, T.P., You, J.J., & Liu, C.C., 2010. A resource-based perspective on information technology and firm performance: A meta analysis. Industrial Management & Data Systems 110(8), 1138-1158.

Loukis, E.N., Sapounas, I.A., & Milionis, A.E., 2009. The effect of hard and soft information and communication technologies investment on manufacturing business performance in Greece: A preliminary econometric study. Telematics and Informatics 26(2), 193-210.

Love, P.E.D., Irani, Z., Standing, C., Lin, C., & Burn, J.M., 2005. The enigma of evaluation: Benefits, costs and risks of IT in Australian small and medium-sized enterprises. Information & Management 42(7), 947-964.

Lybaert, N., 1998. The information use in a SME: Its importance and some elements of influence. Small Business Economics 10(2), 171-191.

Madrid-Guijarro, A., Garcia, D., & Van Auken, H., 2009. Barriers to innovation among Spanish manufacturing SMEs. Journal of Small Business Management 47(4), 465-488.

Mahmood, M.A., & Soon, S.K., 1991. A comprehensive model for measuring the potential impact of information technology on organizational strategic variables. Decision Sciences 22(4), 869-897.

Mahmood, M.A., Burn, J.M., Gemoets, L.A., & Jacquez, C., 2000. Variables affecting information technology end-user satisfaction: A meta-analysis of the empirical literature. International Journal of Human Computer Studies 52(4), 751-771.

McGill, T.J., & Klobas, J.E., 2005. The role of spreadsheet knowledge in user-developed application success. Decision Support Systems 39(3), 355-369.

Melone, N.P., 1990. A theoretical assessment of the user-satisfaction construct in information systems research. Management Science 36(1), 76-91.

Melville, N., Kraemer, K., & Gurbaxani, V., 2004. Review: Information technology and organizational performance: An integrative model of IT business value. MIS Quarterly 28(2), 283-322.

Miller, D., & Toulouse, J.M., 1986. Chief executive personality and corporate strategy and structure in small firms. Management Science 32(11), 1389-1409.

Mishra, B.P., & Srinivasan, R., 2008. A framework for classifying innovations: Substantiation through Indian cases. International Journal of Business Innovation and Research 2(1), 41-56.

Morgan, A., Colebourne, D., & Thomas, B., 2006. The development of ICT advisors for SME businesses: An innovative approach. Technovation, 26(8), 980-987.

Morris, S.A., Marshall, T.E., & Rainer Jr., R.K., 2002. Impact of user satisfaction and trust on virtual team members. Information Resources Management Journal 15(2), 22-30.

Muhammad, A.A.K., & Wallace, R.S.O., 1999. The influence of attitudes on personal computer utilization among knowledge workers: The case of Saudi Arabia. Information & Management 36(4), 185-204.

Overby, E., Bharadwaj, A., & Sambamurthy, V., 2006. Enterprise agility and the enabling role of information technology. European Journal of Information Systems 15(2), 120-131.

Palvia, P.C., 1996. A model and instrument for measuring small business user satisfaction with information technology. Information & Management, 31(3), 151-163.

Palvia, P.C., & Palvia, S.C., 1999. An examination of the IT satisfaction of small-business users. Information & Management, 35(3), 127-137.

Payton, F.C., & Brennan, P.F., 1999. How a community health information network is really used. Communications of the ACM 42(12), 85-89.

Peters, G., 1994. Evaluating your computer investment strategy. In: Willcocks, L. (Ed.), Information management: The evaluation of information systems investments, 1st ed., Chapman & Hall., London, 99-111.

Petter, S., DeLone, W., & McLean, E., 2008. Measuring information systems success: Models, dimensions, measures, and interrelationships. European Journal of Information Systems 17(3), 236-263.

Premkumar, G., 2003. A meta-analysis of research on information technology implementation in small business. Journal of Organizational Computing and Electronic Commerce 13(2), 91-121.

Premkumar, G., & Roberts, M., 1999. Adoption of new information technologies in rural small businesses. Omega: The International Journal of Management Science 27(4), 467-484.

Rai, A., Lang, S.S., & Welker, R.B., 2002. Assessing the validity of IS success models: An empirical test and theoretical analysis. Information Systems Research 13(1), 50-69.

Rai, A., Patnayakuni, R., & Seth, N., 2006. Firm performance impacts of digitally-enabled supply chain integration capabilities. MIS Quarterly 30(2), 225-246.

Rajesh, M., & Albert, L.L., 1998. An instrument for assessing the organizational benefits of IS projects. Decision Sciences 29(4), 803-838.

Ray, G., Muhanna, W.A., & Barney, J.B., 2005. Information technology and the performance of the customer service process: A resource-based analysis. MIS Quarterly, 29(4), 625-652.

Raymond, L., 1990. Organizational context and information systems success: A contingency approach. Journal of Management Information Systems 6(4), 5-20.

Riemenschneider, C.K., Harrison, D.A., & Mykytyn, P.P., 2003. Understanding IT adoption decisions in small business: Integrating current theories. Information & Management 40(4), 269-285.

Rouibah, K., Hamdy, H.I., & Al-Enezi, M.Z., 2009. Effect of management support, training, and user involvement on system usage and satisfaction in Kuwait. Industrial Management & Data Systems, 109(3), 338-356.

Sabherwal, R., Jeyaraj, A., & Chowa, C., 2006. Information system success: Individual and organizational determinants. Management Science 52(12), 1849-1864.

Sambamurthy, V., Bharadwaj, A.S., & Grover, V., 2003. Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. MIS Quarterly 27(2), 237-263.

Seddon, P.B., 1997. A respecification and extension of the DeLone and McLean model of IS success. Information Systems Research 8(3), 240-253.

Slappendel, C., 1996. Perspectives on innovation in organizations. Organization Studies 17(1), 107-129.

Smith, M., 2007. "Real" managerial differences between family and non-family firms. International Journal of Entrepreneurial Behaviour and Research 13(5), 278-295.

Soh, C.P.P., Yap, C.S., & Raman, K.S., 1992. Impact of consultants on computerization success in small businesses. Information & Management 22(5), 309-319.

Szajna, B., 1996. Empirical evaluation of the revised technology acceptance model. Management Science 42(1), 85-92.

Tallon, P.P., & Kraemer, K.L., 2007. Fact or fiction? A sensemaking perspective on the reality behind executives' perceptions of IT business value. Journal of Management Information Systems 24(1), 13-54.

Tallon, P.P., Kraemer, K.L., & Gurbaxani, V., 2000. Executives' perceptions of the business value of information technology: A process-oriented approach. Journal of Management Information Systems 16(4), 145-173.

Tan, K.S., Chong, S.C., Lin, B., & Eze, U.C., 2009. Internet-based ICT adoption: Evidence from Malaysian SMEs. Industrial Management & Data Systems 109(2), 224-244.

Tarafdar, M., & Gordon, S.R., 2007. Understanding the influence of information systems competencies on process innovation: A resource-based view. The Journal of Strategic Information Systems 16(4), 353-392.

Thatcher, J.B., & Perrewe, P.L., 2002. An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy. MIS Quarterly 26(4), 381-396.

Thompson, R.L., Higgins, C.A., & Howell, J.M., 1994. Influence of experience on personal computer utilization: Testing a conceptual model. Journal of Management Information Systems 11(1), 167-187.

Thong, J.Y.L., 2001. Resource constraints and information systems implementation in Singaporean small businesses. Omega: The International Journal of Management Science 29(2), 143-156.

Thong, J.Y.L., & Yap, C.S., 1995. CEO characteristics, organizational characteristics and information technology adoption in small businesses. Omega 23(4), 429-442.

Thong, J.Y.L., Yap, C.S., & Raman, K.S., 1997. Environments for information systems implementation in small businesses. Journal of Organizational Computing and Electronic Commerce 7(4), 253-278.

Turban, E., 2008. Information technology for management. John Wiley & Sons, Inc. New York, NY, U.S.A.

Urbach, N., Smolnik, S., & Riempp, G., 2009. The state of research on information systems success: A review of existing multidimensional approaches. Business & Information Systems Engineering 1(4), 315-325.

Urbach, N., Smolnik, S., & Riempp, G., 2010. An empirical investigation of employee portal success. The Journal of Strategic Information Systems 19(1), 184-206.

Venkatesh, V., & Davis, F.D., 2000. A theoretical extension of the technology acceptance model: Four longitudinal field studies. Management Science 46(2), 186-204.

Venkatesh, V., Morris, M.G., Davis, G.B., & Davis, F.D., 2003. User acceptance of information technology: Toward a unified view. MIS Quarterly 27(3), 425-478.

Vlahos, G.E., Ferratt, T.W., & Knoepfle, G., 2004. The use of computer-based information systems by German managers to support decision making. Information & Management 41(6), 763-779.

Walczuch, R., Van Braven, G., & Lundgren, H., 2000. Internet adoption barriers for small firms in the Netherlands. European Management Journal 18(5), 561-572.

Weill, P., 1992. The relationship between investment in information technology and firm performance: A study of the valve manufacturing sector. Information Systems Research 3(4), 307-333.

Welsh, J.A., & White, J.F., 1981. A small business is not a little big business. Harvard Business Review 59(4), 18-32.

Wernerfelt, B., 1984. A resource-based view of the firm. Strategic Management Journal 5(2), 171-180.

Wixom, B.H., & Todd, P.A., 2005. A theoretical integration of user satisfaction and technology acceptance. Information Systems Research 16(1), 85-102.

Wu, F., Yeniyurt, S., Kim, D., & Cavusgil, S.T., 2006. The impact of information technology on supply chain capabilities and firm performance: A resource-based view. Industrial Marketing Management 35(4), 493-504.

Young, D., & Benamati, J., 2000. Differences in public web sites: The current state of large U.S. firms. Journal of Electronic Commerce Research 1(3), 94-105.

Yuthas, K., & Young, S.T., 1998. Material matters: Assessing the effectiveness of materials management IS. Information & Management 33(3), 115-124.

Appendix

Table A.1: Constructs of IT adoption success model

Research constructs	Definition	Data source
Employees involvement	Employees participation and involvement in IT adoption process	Barki and Hartwick (1994) and Thong (2001)
CEO involvement	CEO participation and involvement in IT adoption process	Barki and Hartwick (1994) and Thong (2001)
CEO support	The willingness and commitment of CEO to provide the necessary resources and authority/power for IT implementation success	Igbaria et al. (1997), and Premkumar and Roberts (1999)
Users' IT knowledge	The level of knowledge of IT users (both staffs and managers) about IT	Thong (2001), and Thong and Yap (1995)
External assistance	The extent, quality and availability of assistance for IT implementation provided by external entities such as vendors, external IT consultants, and government	Premkumar and Roberts (1999), and Thong (2001)
User satisfaction	The extent to which the CEO of SME is satisfied with the implemented IT tools, as well as with the quality of information provided by them	Al-Gahtani and King (1999), and Thong (2001)
IT usage	The type of IT tools used in SMEs along with the frequency of usage of these tools, as well as the extent of using IT by CEOs for business	Davis et al. (1989), and Igbaria et al. (1997)
Organizational impacts	Organizational benefits resulted from adoption and utilization of IT such as inter-organizational and consumer impacts in term of competitive advantage	Fink and Neumann (2009), and Wu et al. (2006)

Table A.2: Total variance explained by selected items

Component	Initial eigenvalues		
	Total	Percent of variance	Cumulative (%)
1	4.604	46.044	46.044
2	2.026	20.260	66.305
3	1.467	14.675	80.980
Kaiser-Meyer-Olkin measure of sampling adequacy = 0.803 Extraction based on initial eigenvalues higher that 1.00			

Table A.3: Varimax rotation factor pattern for the items

Statement	Component		
	1	2	3
CEOsup3	**0.877**	0.131	0.099
CEOsup1	**0.861**	0.068	0.174
CEOsup4	**0.852**	0.132	0.139
CEOsup2	**0.828**	0.135	0.130
Userinv1	0.145	**0.911**	0.084
Userinv3	0.133	**0.890**	0.232
Userinv2	0.126	**0.879**	0.252
CEOinv3	0.122	0.141	**0.891**
CEOinv2	0.145	0.218	**0.880**
CEOinv1	0.207	0.189	**0.847**

Extraction method: Principal component analysis
Rotation method: Varimax with Kaiser normalization

Table A.4: Assessment of the measurement model

Variable	Factor loading (> 0.7)	R^2 (> 0.5)	Composite reliability (> 0.7)	AVE (>0.5)
User involvement (1-7 scale)	-	-	0.904	0.759
Userinv1	0.93	0.86		
Userinv2	0.82	0.67		
Userinv3	0.86	0.74		
CEO involvement (1-7 scale)	-	-	0.875	0.701
CEOinv1	0.87	0.76		
CEOinv2	0.80	0.64		
CEOinv3	0.84	0.71		
CEO support (1-7 scale)	-	-	0.897	0.686
CEOsup1	0.84	0.71		
CEOsup2	0.78	0.61		
CEOsup3	0.86	0.74		
CEOsup4	0.83	0.69		
Users' IT knowledge (1-7 scale)	-	-	0.824	0.609
UITK1	0.82	0.67		
UITK2	0.74	0.55		
UITK3	0.78	0.61		
External assistance (1-7 scale)	-	-	0.899	0.691
ExtAssis1	0.82	0.67		
ExtAssis2	0.81	0.66		
ExtAssis3	0.79	0.62		
ExtAssis4	0.90	0.81		
User satisfaction (1-7 scale)	-	-	0.897	0.685
Satis1	0.79	0.62		
Satis2	0.82	0.67		
Satis3	0.85	0.72		
Satis4	0.85	0.72		
IT usage (1-7 scale)	-	-	0.848	0.651
ITuse1	0.84	0.71		
ITuse2	0.79	0.62		
ITuse3	0.79	0.62		
Organizational impacts (1-7 scale)	-	-	0.915	0.682
OrgImp1	0.82	0.67		
OrgImp2	0.83	0.69		
OrgImp3	0.81	0.66		
OrgImp4	0.83	0.69		
OrgImp5	0.84	0.71		

Table A.5: Level and frequency of IT usage by surveyed Iranian SMEs

Types of IT tools	Level of usage among Iranian SMEs (%)	Frequency of usage by SMEs using certain IT tools
Word processing	100.00	Quite frequently
Internet	90.91	Frequently
E-mail	77.69	Slightly frequently
Corporate website	28.10	Neutral
Local area network	34.71	Slightly frequently
Electronic data interchange	54.40	Slightly frequently
Accounting/finance software	93.39	Extremely frequently
Sales/marketing software	11.57	Quite infrequently
Production control/planning software	50.41	Slightly frequently
Quality control/quality assurance	35.54	Neutral
Inventory management software	76.86	Quite frequently
Computer-assisted design	35.54	Slightly infrequently
ERP applications	0.00	N/A
Transportation management systems	5.79	Slightly infrequently
Electronic bar coding systems	21.49	Slightly frequently
Computerized maintenance management software	43.80	Slightly infrequently
Simulation software/systems	4.96	Quite infrequently
Artificial intelligence/expert systems	0.00	N/A
Pick and place robots/other robots	1.65	Extremely frequently
Materials requirements planning	0.83	Neutral
Manufacturing resource planning	0.00	N/A
Electronic staff input/output control system	51.24	Quite frequently

Figure A.1: Measurement model

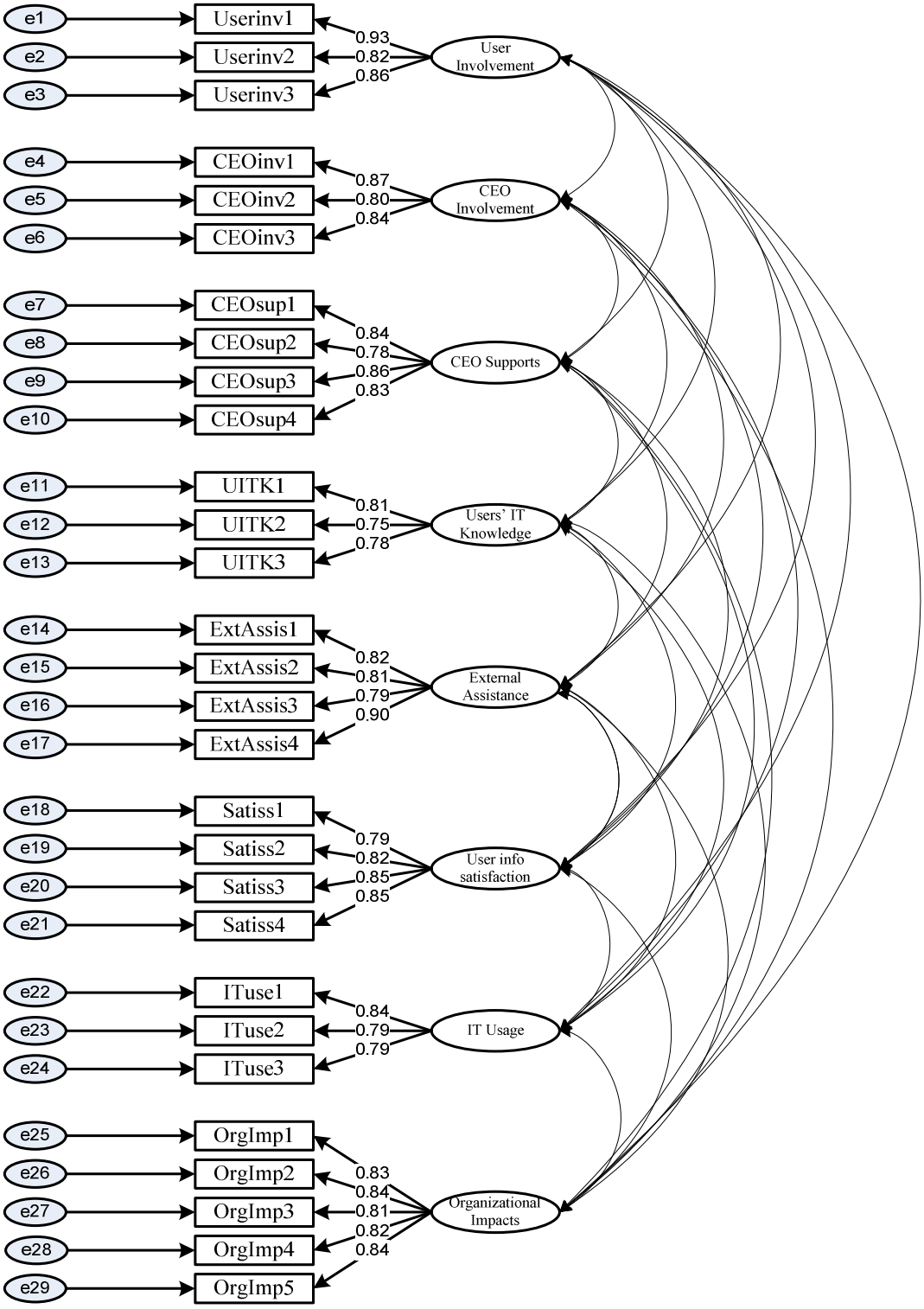


Figure A.2: Structural Model