CASE STUDIES OF THE HUMAN CRITICAL SUCCESS FACTORS IN INFORMATION TECHNOLOGY (IT) IMPLEMENTATION IN MALAYSIAN CONSTRUCTION INDUSTRY

N.M. Aziz[1]*, H. Salleh[1]
[1]*Department of Quantity Surveying, Faculty of Built Environment, Universiti Malaya Kuala Lumpur, Malaysia*
*Corresponding author: nurmardhiyah@gmail.com

Abstract

Incorporating information technology (IT) into the business process becomes the major concern of every industry around the world. Unfortunately, the high failure rates of IT implementation revealed by researches became a serious concern to all. Much has been written about the critical success factors (CSFs) for IT implementation. But none have highlighted the major reasons for the failure, which is human issue. Human are the foundation of every organization will determine the success and failure of IT implementation. More attention should be given to this issue in an effort to reduce the failure rates. In regards to this matter, this research paper identified the CSFs focusing on the human issue. Literature findings listed 21 CSFs that contribute to the success of IT implementation across industries. Four construction organizations were selected to test the existence of the factors identified. Semi-structured interviews were employed as they offer sufficient flexibility to ensure that all relevant factors are covered. Several key issues contributing to successful implementations of IT are identified. Findings reported in this research paper will benefits the construction organizations by giving them a clearer understanding on CSFs in implementing IT, maximising the probability to success and also serve as a guideline for future planning.

Key words: human, critical success factors, construction industry, IT, developing countries.

Introduction

The revolution of IT has changed the business process nowadays. The transformation had made the traditional business process become more simple and effective and can be completed in the shortest time possible and inexpensive. Tremendous IT benefits reported around the world had encourage construction industry (CI) to adopt it (Chen and Kamara 2011, Alaghbandrad, Nobakht et al. 2011). Huge organization investment on IT can be seen around the world as reported by Enterprise Innovation Editors (2011) and Jehangir, Dominic, Naseebullah, & Khan (2011).

Despite the huge investment rate reported, the limited success that had been achieved in the real business environment is very disappointing. Garg (2010), reported that the failure rates are in the range of 60-90%, in the form of exceeding budget, behind the project schedule and fail to meet the expectation. Further investigations were then carried out by researchers in finding the reasons behind this situation. Earlier findings showed that the failures are related to the technical aspect (Griffith, Zammuto et al. 1999). Findings in the 21st century revealed that IT failures are not related to the technical aspects (Peansupap and Walker, 2005). Evidence showed that human are the largest barrier in implementing IT especially in the CI (Hartmanna and Fischer 2009, Lou and Alshawi 2009). Xue, Shen, Fan, Li, & Fan, (2012) also highlight the direct influence of human on the successful implementation of IT in CI. It is human, who design, work with and leverage the technology. Thus, understanding their capability to use it is very important (Un and Price 2007).

Human issue has become the critical factor thereby needing full attention from everyone. They are the most important assets in every organization. Being the ultimate user of the technology, they have strong influence to the success or failure of implementing IT. Research on the human issue can provide an insight to understand human and their ability to cope with the technology that is going to be used or being used in the organization (Un and Price 2007). Most organizations however, overlooked about this aspect; thus failed to obtain full potential of IT.

Until today, little research has been conducted on CSFs in implementing IT within the context of the Malaysian CI. It is important for this industry to improve their business process strategically by using IT because they are one of the major contributors to the country's economy. Thus, this research paper will identify human CSFs that influence the successful implementation of IT in Malaysian CI. The identified factors are believed to give better understanding and clearer picture of the factors that are vital for the successful implementation of IT.

Research methodology

Firstly, the author reviewed and analysed literature from year 2001 to 2012 to identify existing evidence concerning CSFs in IT implementation across industries. Eighty one (81) documents on CSFs in IT implementation across industries were reviewed, which are not only limited to articles published in peer reviews and journals, but also thesis. Then, four construction organizations located in Klang valley were selected to discern the factors. Semi-structured interviews were employed to reflect the reality of the current situation. This method allowed rich collection of data in terms of experience and perception through probing the conversation in details, where the collected data cannot be measured in quantitative approach (Kamar, Alshawi et al. 2009).

History of Critical Success Factors (CSFs)

Effort to identify CSFs that contribute to IT success had begun since a decade ago (Floropoulos, Spathis et al. 2010). This technique was first introduced by John F. Rockart of MIT in 1979 (Boynton and Zmud 1984), and was later popularized by Rockart (Rockart 1979). According to Yen-Ching *et. al,* Chun (2010), CSF is a simple concept, where the organization need to identify certain factors that is really critical for the organization to succeed. If the objectives associated with these factors are not achieved, the organization will fail. Basically, CSF is about getting things done correctly in order to succeed. Identifying the important factors will become the guideline for the organizations that will help them to succeed.

Case study description and findings

Four construction organizations; organization Alpha, organization Beta, organization Gamma and organization Delta were selected to participate in this study. Table 1 describe the overview of the selected organizations.

Table 1: Overview of the selected organizations

	Organization Alpha	Organization Beta	Organization Gamma	Organization Delta
Establishment Year	1974	1976	1976	1963
Business Type	Private	Private	Private	Private
Business Category	Property developer	Engineering and construction	Quantity surveying	Property development and health care services
Staffs	Approximately 1000	Approximately 2300	Approximately 200	Approximately 400
Type of IT system	Enterprise Resource Planning	Document Management System	Enterprise Collaboration System	Computerise Maintenance Management System
Reasons for systems adoption	Difficult to track information such as sales transaction, loan information and others	Difficulties to respond quickly to the changing business needs	Problems in controlling their projects information and its security	Too many customisation to fulfil client requirement
System's Implementation Year	10 years	4 years	11 years	7 years
System Development	Customised	Developed	Customised	Developed
System's developer	Vendor	In-house	Vendor	In-house
System's customizer	In-house	In-house	In-house	In-house

Findings from the interview shows that all the CSFs found in literature are proven to exist in all the four organizations. On top of that, two additional CSFs are found during the interviews. They are personal characteristic and competencies. From the experience of the IT managers in all organizations; individual characteristics such as their confident levels, thoughts and ideas will encourage them to use the system which leads to the successful implementation of the system itself. All managers also agree that competencies do contribute to a successful system's implementation. This includes the competencies of IT managers, IT staff and also users. Interview findings are discussed below. Finding from the interview were tabulated in Table 2.

Training/skills: The importance of training/skills in successful IT implementation has been highlighted by previous researchers (Buruncuk and Gülser, 2001; Raj *et al*., 2011). Appropriate training helps users to understand a system and to use the system effectively. According to Limsarun

and Anurit (2011), training can be regarded as a way of educating and motivating staff to use IT in their respective organizations. It also helps users to understand their new roles and responsibilities, thus creating effective environment for IT implementation (Abbaszadeh*et. al.,* 2010). According to Ooi*et. al.,*(2010), training enables creation of an environment that will encourage users to use IT within an organization. The significance of this factor is not only found to be relevant for the CI, but also other industries, for example Chang *et. al.,*(2010) studied 87 samples of 4 real estate organizations in Taiwan revealed that adequate training and skills enabled efficient usage of IT among users.

Communication: Communication is very important as it serves the basic functions in managing organization. It can be described as the interaction process of conveying information, ideas, opinion, instructions, decisions, rules and plans throughout the entire organization. All organizations involved in this study have effective interactions amongst them. Methods of communications that they used include e-mail, meeting, telephone, memos, intranet and others. Therefore, this is also an important factor as it has direct effect on the successful implementation of IT in organizations. According to Habib (2009), the lack of effective communication will lead to the failure of IT implementation as users don't have clear information about their contribution, roles and the achievements.

Knowledge/experience: According to Hussein et al (2007), having adequate knowledge in IT is essential as it will give a positive influence to the extent of usage of the technology in organization.The level of knowledge will influencemanagement's perception of IT, its responsibilities, usefulness and strategic value to the organization (Kelegai and Middleton 2004). IT leader and IT staff from all organizations have required knowledge and experience as they have managed to maintain their own system. On top of that, organization Beta and organization Delta able to developed their own system. This clearly shows that this factor is fundamental in all organizations.

Motivation: Motivation may be considered a driving force in achieving objectives. According to Davis and Songer (2008), strong motivation can overcome many difficulties in using new technologies. As new technologies are usually more complex, highly motivated users may adopt the new system more effectively. Therefore, managers should take initiatives to motivate users to use IT/IS. Motivating users is important as it may affect staffs reactions towards the usage of organizational system. According to Nahar *et. al.,*(2006), motivation can be improved by understanding organizational cultures, identifying needs and preference, as well as offering rewards.

Employee behavior towards IT: Human is the critical factor that influence the success and failure of IT implementation in the organizations (Lou and Alshawi 2009). Their behavior towards the IT/IS implementation has indirect effect on the way the system is being used. Thus, this factor indirectly determines the success or failure of IT implementation in organization. Users in all organizations show positive reactions. This is an important factor as it may contribute to the successful implementation of the system.

Interpersonal relationship: Interpersonal relationship is believed to have positive impact on the communications patterns which influence the successful implementation IT in organization. Strong interpersonal relation among users is an advantage as they are willing to put more time and effort to help each other to utilize IT in the organization (Mullen 2005). Findings show that there is a good relationship with everyone in all the four organizations. This factor is considered as a less important factor since it does not have direct effect on the system implementation success.

Commitment: Commitment from organization and users are crucial to successfully implement IT. Users' commitment is important as they have to devote themselves to use the technology, while organizational commitment referring to the top managers to support end-users to use IT. Havelka(2002), in his research has proved that high level of commitment gives positive influence on IT success. Peansupap & Walker (2005) identified that the basic requirement to successfully implement IT is to have full commitment from users and organization. Numerous examples of failures due to the lack of commitment had been discussed by many researchers over the years (Peansupap and Walker 2005, Habib 2009, Aggarwal 2010). Everyone in all four organizations gives full commitment in using the system and this factor have strong influence on the system implementation success.

Table 2: Interview findings from the participated organizations

Elements	Organization Alpha	Organization Beta	Organization Gamma	Organization Delta
Training/ skills	2 days training by system vendor, a months before system implementation	4/5 days training by system vendor given after the system implementation	½ day training by IT Dpt, 1 or 2 months before system implementation	1/2 days training by IT Dpt, 3/4 months before system implementation
Communication	Methods include e-mail, telephone, memo and meeting when necessary	Methods include e-mail, telephone, memo and meeting when necessary	Methods include e-mail, telephone, memo and meeting when necessary	Methods include e-mail, telephone, memo and meeting when necessary
Knowledge & experience	IT leader and staff have the required knowledge	IT leader and staff have the required knowledge	IT leader and staff have the required knowledge	IT leader and staff have the required knowledge
Motivation	The system enables them to perform the job effectively.	The system enables them to perform job effectively, easy to use and speed up their work. Users were rewarded every time they use the system	The system is easy to use, speed up their work and enable them to perform their job effectively	The system has speed up their work, able to perform analysis effectively generate report automatically
Employee behaviour towards IT	Positive reactions towards the surrounding are obtained from users	Positive reactions towards the surrounding are obtained from users	Positive reactions towards the surrounding are obtained from users	Positive reactions towards the surrounding are obtained from users
Interpersonal relationship	This factors helps to overcome problem relating to system's	This factors helps to overcome problem relating to system's	This factors helps to overcome problem relating to system's	This factors helps to overcome problem relating to system's
Commitment	full commitment from users and top management	full commitment from users and top management	full commitment from users and top management	full commitment from users and top management
Attitude	Mixed reactions encountered from users. Even so, majority of them are confident	Mixed reactions encountered from users. Even so, majority of them are confident	Mixed reactions encountered from users. Even so, majority of them are confident	Mixed reactions encountered from users. Even so, majority of them are confident
Top management support	Actively support and participate	Actively support and participate	Actively support and participate	Actively support and participate
Leadership/ IT Leader	Adequate leadership skills & able to perform work without any problem	Adequate leadership skills & able to perform work without any problem	Adequate leadership skills & able to perform work without any problem	Adequate leadership skills & able to perform work without any problem
User involvement	involved in identify their requirement, testing the prototype	involved in identify their requirement, testing the prototype and give feedback for further refinement	involved in identify their requirement, testing the prototype and give feedback for further refinement	involved in identify their requirement, testing the prototype
Team work/ Collaboration	A very high level of cooperation from everyone	A very high level of cooperation from everyone	A very high level of cooperation from everyone	A very high level of cooperation from everyone
Focus & vision	IT Manager has clear focus and vision which lead to the successful implementation of the system	IT Manager has clear focus and vision which lead to the successful implementation of the system	IT Manager has clear focus and vision which lead to the successful implementation of the system	IT Manager has clear focus and vision which lead to the successful implementation of the system
IT staff roles & responsibility	responsible for maintaining and customised the system	responsible for developing and maintaining the system	responsible for customised and maintaining the system	responsible for developing and maintaining the system
Management style	Participative management style is employed	Participative management style is employed	Participative management style is employed	Participative management style is employed
Willingness to change	Some users have issues to use it as it involved changes in their work process.	Minority of staff have issues in using the system at the beginning	Older generations have problems to use the system at early stage	A minority of users are reluctant to use the system at the initial stage
Organizational culture	Positive culture exists as they manage to successfully implement the system.	Positive culture exists as they manage to successfully implement the system.	Positive culture exists as they manage to successfully implement the system.	Positive culture exists as they manage to successfully implement the system.
Awareness	Users are aware of the system's implementation as they are involved from the early stages to testing the prototype	Users are aware of the system's implementation as they are involved from the early stages to testing the prototype	Users are aware of the system's implementation as they were asked to identify their needs in the early stages	Users are aware of the system's implementation as they are involved from the early stages to testing the prototype

Trust	Users trust the system, colleagues and management	Users trust the system, colleagues and management	Users trust the system, colleagues and management	Users trust the system, colleagues and management
Satisfaction	Users are satisfied with this system as it help them to perform their work effectively	Users are satisfied with this system as it help them to perform their work effectively	Users are satisfied with this system as it help them to perform their work effectively	Users are satisfied with this system as it help them to perform their work effectively

Attitude: Attitude plays an important part in life and in an organization for the successful IT implementation. Having staff with positive attitude would help the organization to strive as they do maintain positive thinking towards everything. The implementation of new system would be easier as they are looking forward for the benefit of the new technology. Mixed reactions obtain from the four organizations. However, majority of the users have positive attitude towards the system. This factor is very important due to the strong correlation to IT implementation. Empirical studies have recognized positive attitude towards IT a necessary condition for their successful implementation (Nahar, Lyytinen et al. 2006, Davis and Songer 2008).

Top management support: This factor is widely accepted as the compulsory factor for IT implementation (Abbaszadeh*et. al.*, 2010; Daojin, 2010). This factor is critical because senior management is responsible in providing all the necessary resources such as financial assistance and manpower needed during the implementations of IT in any organization. Any system cannot be effectively implemented when there is a lack of support from the top management. This is consistent with findings from Palanisamy *et. al.,*(2010) in North America, involving 183 organizations which also identified top management support as the most influential factor to IT acquisition. This finding is also supported by research carried out by Ifinedo(2008), involving 44 organizations in Finland and Estonia, which highlighted the significant relation between senior management support and IT success. Having a strong senior management support is critical in every organization. Their roles are not only limited to encouraging employees to use the system, but also ensuring its effective usage and implementation (Pollaphat and Miroslaw, 2011).

Leadership/ IT leader: Leadership is one of the factors that contribute to the success of IT implementation as it deals with issue of how to achieve collaboration and unity in an organization. Having a good leader will directly or indirectly promote higher levels of staffs/users self-efficacy and empowerment (Peansupap and Walker 2005, Walumbwa, Lawler et al. 2005). This will encourage effective use of the system and eventually lead to its success. Leaders in the four organizations perform their duties very well as they manage to encourage users to use the system. This is an important factor as it may influence to the successful implementation of the system.

User Involvement: User involvement is defined as the participation of actual users of the application in the development process (Havelka 2002). This is an important factor as it requires users to use their skills, experience and knowledge to successfully implement IT. This will give them the authority in making decisions, controlling their own work and being more responsible (Evans and Lindsay 2002), thus developing a sense of ownership. A strong feeling of ownership may increase users commitment and lead to a positive impact to successfully implement IT (Havelka 2002). It is suggested that organizations should consider the involvement of users in decision-making process due to its impact on IT success rates (Habib, 2009; Lind and Culler, 2009). Indeed, a survey among 65 worldwide organizations conducted by Raman *et. al.,*(2006), revealed that lack of user involvement may affect the IT/IS utilization leading to implementation failure.

Teamwork/ Collaboration: Teamwork/collaboration has a powerful influence in gaining the users acceptance towards the introduction of the new system in the organization (Utley 2001). Research carried out by Hwang and Xu (2007), Bhatti (2005) and Kronbichler *et. al.*(2009), identifies that teamwork as one of the factors that influence the system success. Findings from research show that there is a high level of cooperation among from everyone from all the four organizations. This factor however, does not have a direct impact on the successful IT implementation but affecting the way it is used and benefits obtained from its usage (Hwang and Xu 2007).

Focus & vision: A clear focus and vision of the organization and leader is very important as they are responsible to guide the employee towards certain achievement. Everyone in the organization need to have the same focus and ambition as this features required directing their major attention towards achieving successful IT implementation in their organization (von Urff Kaufeld, Chari *et al.* 2009). This factor is well in place in all the four organizations, confirming it as an important factor for IT implementation.

IT Staff Roles and Responsibilities: IT staffs are responsible either to plan, develop or maintain the IT in the organization. Their roles and responsibilities are critical as it contributes towards the successful implementation of IT. IT staff includes the IT manager, programmer, technician, analyst; who are responsible for maintaining, developing and implementing all IT related activity within an organization. The successful implementation of IT depends on the roles and responsibilities of IT staff. Without them, it is difficult for organizations to implement new technologies. Findings from a survey in the health industry in Taiwan conducted by Hung *et. al.,*(2010), showed that the higher adoption rate of IT in organizations will increase in parallel to the roles and responsibilities of IT staff. This indicates that the adoption of IT in an organization is equivalent to the roles and responsibilities of IT staffs.

Management style: Management style refers to the approach used by the management to organize, influence and control human activities to achieve organizational objectives (Rezaei *et. al.,* 2009). The importance of management style in successfully implementing IT/IS has been highlighted by many researchers (Erdogan *et. al.,* 2008; Xue e*t. al.,* 2012) due to the fact that management style has indeed influenced the organizations' performance by facilitating internal behavior consistency (Rahman and Kumaraswamy, 2005). Research findings by Lu and Wang, (1997) and Hussein *et. al.,*(2007), revealed that management style has a positive relationship with IT implementation success. Gorla and Lin (2010) also stated that good management has the ability to lead to successful implementation of IT. The importance of this factor is not only reflected in the CI, but also other industries. The survey among the agricultural industry in Iran regarding the impact of organizational factors on management information success by Rezaei *et. al.*,(2009) revealed that management style is highly correlated to IT success.

Willingness to change: Study by Ranjan and Bhatnagar(2009) showed that users' willingness to change have major influence on whether or not IT system are successfully implemented. A concern is that users will naturally refuse to change due to habits they acquire over time; the resistance exists because a new system involves changes of user behavior (Peansupap and Walker, 2005). This suggest that major action should be taken by such organizations to overcome this problem to improve efficiently, including ways to encourage users to change as such changes are beneficial in enabling users to perform their work effectively, giving clear advantage to such organizations. Davis and Songer (2008), suggested that individuals higher up the organizational hierarchy are more willing to change comparatively as they have the authority to adjust to the changes to suit to their requirements.

Organizational culture: Understanding the organizational culture is very important as it will give positive or negative effects on staff and workplace. The characteristic of organizational culture such as information sharing, team working, trust, fairness, enthusiasm have a high positive influence with the successful IT implementation (Habib 2009). Findings shows that all the four organizations practiced good culture as they manage to implement the system successfully and overcome all problems arise during the system implementation. This factor is also important as failure to understand organizational culture will result disappointment to reap many of the perceived benefits of IT.

Awareness: Awareness is one of the most important qualities which are necessary in implementing anything including technology. Stewart *et al.*(2004), in their research identified that low level of awareness or exposure to IT is one of the factors that inhibit the successful implementation of IT in organization. Users in Organization Alpha, Organization Beta and Organization Delta are aware about the system because they were involved from the early stage to the end of the system development. Users in Organization Gamma on the other hand only involved at the early stage of the system development.

Trust: Trust between co-workers, trust on the system and trust to the management are essential attributes which is believed to have a strong effect to successfully implement IT. The existence of trust is required among the users in order to respond openly and share their thoughts and perceptions which lead to the successful implementation of IT (Al-Alawi, Al-Marzooqi et al. 2007). Findings show that users in the four organizations trust the system, colleagues and management. This is an important factor as it may influence the successful implementation of the system.

Satisfaction: Employees are the valuable assets of the organization as their satisfaction leads to the success or failure of the organizations (Attar and Sweis 2010). According to Colman (2007), the level of user satisfaction has mainly been accepted as the sign for a successful system. Their satisfaction will encourage them to work efficiently thus lead to quality performance which leads to increased profit. Users in all the four organizations were satisfied with the system that they used.

Conclusions

Current trend of implementing IT in organization has encouraged CI to incorporate the technology in their work activity. The implementation however, becomes a challenge due to the high failure rates reported over the years (Kim, Kim et al. 2009). According to Batenburg & Constantiou (2009), most organization fail to get value form IT implementation. Human have been identified as the salient reason for this failure (Kim, Kim et al. 2009, Lou and Alshawi 2009). As a result, it is important for the CI to identify human CSFs that can contribute to the successful implementation of IT. Twenty one human CSFs found from reviewing 81 literatures. These CSFs were then tested in four construction organizations to confirm its existence in CI. On top of that, 2 additional CSFs found during the interviews; personal characteristic and competencies. It can be concluded that, there are 23 human

CSFs that need to be considered to successfully implement IT. This research is important for the practitioner perspective as it underpins the need for IT manager in construction organizations to take a proactive interest in identifying their human e-readiness level, which has become the salient reasons for failure in implementing IT. The study also has important implications for researcher, as it broadens the area of e-readiness research in CI by identifying factors that require attention that might have been overlooked over the years. This research only points out the presence of human CSFs in CI. The importance of each CSFs are still unknown and in need of further research.

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