

Factors Contributing Towards Slow Adoption of Information Technology (IT): A Literature Review

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Abstract

Innovation issues have long been regarded as a global concern within worldwide countries including Malaysia. One of the difficulties is regarding the slow organisational innovation within construction organisations in adopting Information Technology (IT). A lot of factors have been discussed in the literature leading towards slow organisational innovation; with respect to slow adoption of IT. Hence, the objectives of this paper are; to critically review the components contributing to slow organisational innovation, i.e. slow adoption of IT, and to synthesize the available literature and tease out the most significant factor causing the slow adoption of IT in planning the way forward. Using frequency analysis of content-based method, four main categories were teased and can be broadly divided into four namely, people, management, technology, and process. Based on the findings, people were identified as the most concerned factor rose by researchers; which include the managerial skills played by owner(s), leader(s), top management team or managerial position within organisation in influencing the technological adoption. A way forward was recommended in order to overcome the problems within 'people' in order to help owners/ leaders/ top management team to make decisions in adopting IT innovation through having 'good' managerial skills.

Keywords

Information technology (IT), slow adoption, people, management, process

Introduction

Innovations have long been regarded as an important aspect for the growth of any countries. Over the years, many researchers have studied the significance of various innovations types and its

implications. It has been reported from 1980 to date and covered various countries (ie UK, USA, Malaysia and Hong Kong), sectors (ie manufacturing, services including construction) and different level (organisation, individual or projects). In this research context, the new ideas of innovation are associated with technology or so called IT. Hassan Issa Abdul Kareem et al., (2009) and Oliveira and Martins (2011) further describe IT as a tool shared by all parties of the construction industry.

The trends in IT adoption started from the 1980s with the emergence of PC, 2D CAD, Internet, 3D CAD, Industry Foundation Class, Virtual Reality, Web 2.0, Cloud Computing and recently, BIM has made its way into the construction industry (Faizul A.Rahim et al., 2011; Barlish and Sullivan, 2012). The latest technology, i.e. BIM, is acknowledged as one of the technologies that brings positive implications towards one's organisation. Most of the large organisations or piloted projects have adopted this technology due to several motivations as such as improving the organisational ability (Sackey et al., 2013) and increase productivity (Arayici et al., 2011).

Despite many researchers acknowledging the advantages of IT, there are still several barriers causing poor utilisation of technology, limited used of IT, and slow adoption due to several factors; amongst others is the lack of understanding of the potential use of IT, concern in the handling of the technology (ie technology related risks, slow transition/progressive change and process change issue, collaboration issue) during post adoption stage (Ramayah Thurasamy et al., 2009, Hassan Issa Abdul Kareem et al., 2009; Jeen et al., 2010; Faizul A. Rahim et al., 2011 and Zahrizan et al., 2013). These barriers could lead towards the reluctance of technology innovation within construction organisations.

Methodology

The research methodology approach for this paper embraces distillation of core research material gathered from a detail literature review encompassed factors surrounding the research issues. The relevant information was retrieved from the main databases of Malaysian universities, which consists of the range of journals and articles from 1998 to 2014. Apart from that, other sources were explored from the common website (ie goggle scholars). It was then analysed using frequency analysis of content-based method in order to identify the gaps, or most significant factor which leads towards slow adoption of IT; which will then be used to come-up with the way forward.

Factors influencing the slow adoption of IT

The slow adoption of technological innovation for organisations is influenced on various factors, which can be broadly classified into four major categories namely i) people, ii) process, iii) technology, and, iv) management (refer Table 1 to 4), discussed as follows.

People

The people related factors (Russell and Hoag, 2003; Yan and Damian, 2008; Singh, Gu, and Xiangyu, 2011) have the powerful force that can influence the success and failure of IT adoption (Nur Mardhiyah Aziz et al., 2012). The factors also was identified and compiled based on the barriers in relation to the sub-category as shown in Table 1.

Table 1. Summary on People Factors

No	Sub-Category	References	No of articles
1	Training	Ahuja et al., (2009); Hassan Issa Abdul Kareem and Abu Hassan Abu Bakar (2011) ; Gledson et al., (2012) ; Ernawati Mustafa Kamal et al., (2012); Roshana Takim et al., (2013)	5
2	Interaction	Lee (2001); Narimah Kasim and Peniel (2012); Grilo et al., (2013)	3
3	Attitudes	Gu et al., (2007); Arayici et al., (2009); Wong et al., (2009); Kamaruzzaman et al., (2010); Hafez Salleh et al., (2011); Ernawati Mustafa Kamal and Flanagan (2012); Ren and Kumaraswamy (2013); Kherun Nita Ali et al., (2013); Zahrizan, et al., (2013); Meng-Han et al., (2014)	10
4	Individual beliefs	Arayici et al., (2009); Olatunji et al., (2010); Narimah Kasim and Peniel (2012); Davies and Harty (2013); Zahrizan et al., (2013)	5
5	Top management support	Papadakis and Bourantas (1998); Russell and Hoag (2003); Sexton and Barret (2003); Sargent et al., (2005); Salman Azhar et al., (2008); Damirch et al., (2011); Hunter and Cushenbery (2011); Nur Madhiyah Aziz and Hafez Salleh (2011); Barlish and Sullivan, (2012); Peltier et al., (2012); Nur Mardhiyah Aziz et al., (2012); Kearney et al., (2013); Azam Abdollahzadehgan et al., (2013); Roshana Takim et al., (2013)	14
Total			37

Training: Training (Roshana Takim et al., 2013) is the first component that shows positive influence towards technological adoption. This was proven when previous researchers argued that the insufficiency of training and the unavailability of expert users in construction companies (Hassan Issa Abdul Kareem and Abu Hassan Abu Bakar, 2011) or insufficient ICT professional (Yang et al., 2007) able to influence the adoption at low level.

Interaction: Interaction has become another important area to embed positive adoption within organisation. Unfortunately, people in construction faced difficulties to interact efficiently. The consistency of this argument have been explained by Grilo et al., (2013), which claimed minimum interactions between the various participants across the building project. Furthermore, each expert group in a construction project employs its own unique way of communicating information (Lee, 2001). This barrier has been supported by the nature of construction which is fragmented (Peniel and Narimah Kasim, 2012).

Attitudes: Attitude towards technology and process (Ren and Kumaraswamy, 2013) is another area that should be taken into consideration to influence the adoption of any technological innovation. Previous researchers have proven that most of the studies show that people attitudes play direct influence towards IT adoption. Thus, the following attitudes might not help organisation to adopt if : (1) they reluctance to initiate new workflows or train staff by organisation (Arayici et al., 2009) (2) they are not aware of the problems arisen (Zahrizan Zakaria et al., 2012) such as the potential of tool capabilities (Gu et al., 2007); (3) they are not ready completely (Kherun Nita Ali et al., 2013; Zahrizan et al., 2013) or lack of creating a sense of need and urgency for change (Hafez Salleh et al., 2011) (4) they do not recognize IT usefulness and the effect on profitability (Wong et al., 2009) (5) they have less confident to adopt new tool (Meng-Han et al., 2014). These findings therefore conclude that it's all about psychological factors (Kamaruzzaman et al., 2010) and motivation passing by individual (Ernawati Mustafa Kamal and Roger Flanagan, 2012).

Individual beliefs: Other is individual beliefs. Adoption of IT depends largely on one of the prominent factors which are perceptions from employee (Davies and Harty, 2013). Due to employee lack of familiarity towards technology use, some of them were reluctant to change from their normative practices (Zahrizan et al., 2013; Arayici et al., 2009; Peniel and Narimah Kasim, 2012). Meanwhile, in another situation, Olatunji et al., (2010) revealed that this new technology also might be able to threaten the client's requirements for any professional services as what have been identified in quantity surveying fields.

Top management support: Top management support is another factors influencing IT adoption (Sargent et al., 2005; Salman Azhar et al., 2008; Barlish and Sullivan, 2012) especially with regards to owners of organisation (Sexton and Barret, 2003). Being top of the management body, the decision either to adopt or not are largely depends on their capabilities as decision makers. Thus, the level of support, awareness (Roshana Takim et al., 2013) and readiness to adopt IT (Russell and Hoag, 2003; Nur Madhiyah Aziz and Salleh, Hafez, 2011; Azam Abdollahzadehgan et al., 2013) have been one of the main criteria that affects IT adoption. This is consistent with researchers from previous fields which state managerial teams as the main drivers of IT adoption. As depicted in Table 1, this includes manufacturing and hotel industry (Papadakis and Bourantas, 1998; Kearney et al., 2013; Peltier et al., 2012). It also affects other types of innovation (Damirch et al., 2011; Hunter and Cushenbery, 2011) and organisation (Jong et al., 2003).

Management

Meanwhile, management factors that cause decreasing rate of adoption can be classified into several sub categories as shown in Table 2. First is regarding the organisational turnover, investment and financial (i.e, Ahuja et al., 2009; Gledson et al., 2012; Narimah Kasim and Peniel, 2010). Some argued on the relationship of slow adoption with annual turnover, whereas some raise the issue on the higher cost of involved in the overall implementation and maintenance.

This condition might give tremendous effects on small and medium size (SMEs) organisation particularly. Second is, size of the organisation (Zhou et al. , 2012; Moore and Abadi, 2005 and Leeuwis, 2012). Third is the nature of organisational (ie Hassan Issa Abdul Kareem et al., 2009). These includes the policies and regulations (Ernawati Mustafa Kamal and Flanagan, 2012) and working environment which differs for each projects (Adriaanse et al., 2010), thus leads to the difficulties on its adoption. Fourth is depending on the organisational readiness towards IT adoption such as Building Information Technology (BIM). Finally, followed by overall economic conditions (Underwood and Isikdag, 2011) as the economic crisis is really discourage the adoption of IT within construction organisations.

Table 2. Summary on Management Factors

No	Sub-category	References	No of articles
1	Turnover, investment, financial and cost	Ojiako et al., (2005); Ahuja et al., (2009); Ramayah Thurasamy et al., (2009); Narimah Kasim and Peniel (2010); Ernawati Mustafa Kamal and Flanagan (2012); Gledson et al., (2012); Azam Abdollahzadehgan et al., (2013)	7
2	Sizes of organisation	Moore and Abadi (2005); Zhou et al., (2012); Leeuwis (2012)	3
3	Organisational nature	Adriaanse et al., (2010); Hassan Issa Abdul Kareem et al., (2009); Ernawati Mustafa Kamal and Roger (2012)	3
4	Organisational readiness	Arayici et al., (2009)	1
5	Economic conditions	Underwood and Isikdag (2011)	1
Total			15

Process

The clarity of the process and procedure (ie no clear understanding made across different countries (ie barriers and hazards) remains the main issue to inject positive response among construction professionals. Others, is concern on evaluation issue; that focus more on cost benefit rather than return of the investment. Besides that, the unclear nature of IT, the complexity of the construction practices, mismatch of demand and expectations by construction industry, new enforcement by clients, lack of government involvement and rapid changes in the latest trends have caused the organisational readiness to adopt IT merely at minimum level.

Table 3. Summary on Process Factors

No	Sub-category	References	No of articles
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1	Clarity of the process and procedures	Gu et al., (2007)	1
2	Evaluation issue	Ganah and Kamara (2013)	1
3	Unclear nature of IT	Bataw (2013); Wong and Sloan (2004)	2
4	Complexity of the construction practices	Che Wan Fadhil et al., (2000); Peansupap and Walker (2005); Sebastian (2010); Yee and Nur Emma Mustaffa (2012)	4
5	Construction industry demand and expectations	Bowden et al., (2006); Ruddock (2006)	2
Total			10

Technology

Another factor of slow adoption is technology (ie Singh et al., 2011). As depicted in Table 4, the factors contributing towards slow organisational innovation have been identified due to the fragmented nature of various construction operations, interoperability problems (ie low level of their interoperability with other existing applications, no face-to-face interaction among the construction professionals), technical problems (ie including compatibility and reliability) and business process related issues, liability issue (ie having liability of projects, liability of immobility, liability of uncertain demand) and many heterogeneous applications and systems typically in use by the different players, together with the dynamics and adaptability needed to operate in this sector (Grilo and Jardim-goncalves, 2010).

Some researchers also acknowledged the studies pertaining to how construction organisation perceived technology as an expensive tools to be adopted (Aryani Ahmad Latiff et al., 2013) and proved some of construction professionals that were reluctant to participate (ie electronic data exchanges) (Mahamadu et al., 2013).

Table 4. Summary on Technology Factors

No	Sub-category	References	No of articles
1	Construction operations	Alaboud et al., (2013)	1
2	Interoperability problems	Hyoung-June (2008); Hyoung-June and Ji-Hyun (2010); Hyoung-June and Ji-Hyun (2010); Kamal Hossain et al., (2013)	4
3	Technical problems	Salman Azhar et al., (2008); Abuelmaatti and Ahmed (2010); Gu and London (2010); Rezgui et al., (2013)	4
4	Liability issue	Demian and Walters (2013)	1
5	Applications/tools	Hyoung-June (2008); Grilo and Jardim-Goncalves (2009); Hyoung-June and Ji-Hyun (2010)	3
6	How technology is perceived	Aryani Ahmad Latiff et al., (2013);Mahamadu et al., (2013)	2
Total			15

Results and Discussion

This research has found that majority of previous literatures have discussed on four (4) main categories that have been identified contributing towards slow adoption of IT. This includes people, management, process and technology. Using frequency analysis; 'people factors' contributes about thirty-seven (37) articles in totals, followed by technology; fifteen (15) in total, management; fifteen (15) in totals and process with ten (10) in totals (refer Table 1 to 4). This results therefore shows that among four, 'people factors', was reported to be the most prominent factor (refer Table 1). This term, which always synonymous with 'non technical issue' (Gu and London, 2010) or soft issues' (Nur Mardhiyah Aziz and Hafez Salleh, 2011), comprises of construction professionals; both employees and managerial position groups (including managers, top management team, owner(s) and leader(s) of the organisation). A central discussion among construction professionals are regarding identifying factors influencing slow adoption of IT due to individual beliefs, interaction, knowledge and experience or top management support posed by them.

Having said that, people involvement in managing IT or construction innovations during pre until post adoption stage of construction innovation is critically needed and requires more attention compared to other factors (ie technology). This is supported by Ghobadian and Gallear, (1999) and Wilson and Stokes (2006), which stated the significant of people within organisation; as a main driver of innovation. This is agreed by Florence (2003), who added their capabilities as the root cause of slow adoption of IT within construction organisation especially in SMEs. Nevertheless, the details discussion on various people capabilities among two groups of a construction professional is too generic, unsystematic and remains inconclusive thus far. Thus, a separation of studies between managerial and employees' factors should be taken into consideration since the studies are made from both combinations. This is consistent with previous researchers which have acknowledged managerial capabilities as the most important aspect that should be developed compared to others (Gann, 2000). In fact, they have strong potential to influence employee's reaction towards any technological innovation, which can be executed through their continuous support (refer Table 1)

Therefore, failure to consider their involvement will cause the following matters: (i) difficulties to improve an organisational performance due to losing of the important knowledge and skill (Kissi et al., 2012). (ii) may often leads to the root cause for many of the human resource development problems (Macmahon, 1999) or so called administrative problems (Musteen et al., 2010) (iii) affects business success and organisation's competitiveness (Luoma, 2000) (iv) This will then discourage the implementation of IT (Hafez Salleh et al., 2011). Thus, a study on findings factors contributing slow adoption of IT from managerial aspects remains more important than employee's aspects. This should be further viewed and developed from their direct influences towards IT adoption; through attitudes, skills, knowledge, experience; individual beliefs and etc (refer Table 1) and their indirect influences towards technological innovation via organisation (ie the roles they played in creating better organisational nature and readiness).

Conclusion and Way Forward

This study has explored the technological innovation adoption problems generally, which has affected many construction organisations; i.e. with respect to looking into the factors influencing IT adoption. Most of literatures have discussed the factors ranges from people, management, process and technology for better identification of slow adoption problem. Unfortunately, this problem still happening and often being raised among previous researchers in developed countries. Based on thorough analysis of the existing literature, this study has found that ‘people factor’ especially with respect to manager(s)/ leader(s), and / or owner(s), has become the backbone of this problem. With the belief of the potential roles played by managers in ensuring the successful adoption of new IT (via direct and indirect influence), this study has come up with a conclusion to place greater attention on developing their own capabilities prior to conceptualise a new framework from managerial perspective.

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