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How Can ERP Improve The Organisation Innovativeness? Factors Derived From Socio-Technical And Contingency Theories

Abstract

This research adopts the Socio-Technical Theory and Contingency theory to develop and test a new framework for the possibility of improving organization innovativeness. The framework consists of three main drivers: ERP Innovation attitude, organization flexibility, and ERP skills. This research surveyed 210 ERP managers in different countries. After analysing the data using Structure Equation Modelling, that organization flexibility and the employees' user skills enhance employees' attitude towards ERP as an innovation enabler (ERP attitude) attaining ERP Innovating Benefits. Consequently, the study found that there is an indirect impact of ERP skills and Organisational flexibility on ERP Innovations mediated by the attitude. The main implication of this research is that ERP can be a source of innovation employees' believe in that. They will believe in that if the organisation is flexible and they have the required skills and knowledge for using it effectively.

Introduction

Enterprise resource planning (ERP) systems is an information system (IS) that unite several business functions to help the organization for attaining better performance (Wu & Wang, 2006; Badewi et al, 2018). The commitments of ERP systems are quite obvious as it offers managers the opportunity to reach better decisions. However, ERP systems are complicated and costly, that is why the decision of installing an ERP system requires making an analysis to determine whether an ERP system is needed or not and, is it a successful one or not if it is implemented? (Wu & Wang, 2006; de Vries & Boonstra; Huang & Handfield, 2015). According to statistics (Statistics portal), ERP Software revenue worldwide from 2014 to 2019 in billion U.S. dollars is as follow respectively: 27.5, 29.4, 31.6, 33.8, 36.3, and 38.9. Also, it is expected that the ERP Software market will be worth 41.7 billion U.S. dollars by 2020. Thus, all organizations worldwide seek to implement ERP and attain its revenue. However, till now there are no clear factors enhance ERP benefits (Chand, Hachey, Hunton, Owhoso, & Vasudevan, 2005; Stratman & Roth, 2002; Srivardhana and Pawlowski, 2007; Luo et al., 2012). ERP system can improve the organisations performance by lessening uncertainty, improving information accuracy, agile response to customer requirements and realizing lean inventory management (Lee and Whang, 2000; Yu et al., 2001; Soliman et al.,

2001; Wu & Wang, 2006; Mefford, 2009). But no sufficient evidence to support that ERP can improve organisation innovativeness (Badewi et al, 2018; Stratemanm 2007)

To bridge this knowledge gap, this research adopted socio-technical theory and contingency theory to find out possible ways for improving organisation innovations through adopting ERP systems. Literature showed that innovation from investing in technology can be realised if it fits the current system and if they open space for exchanging ideas and collaboration, as defined in the socio-technical theories (Geels, 2004; Flichy, 2008; van Waes et al 2018). Adopting socio-technical approach, we proposed that if the users' are able to use the ERP effectively, they would have a positive attitude towards it as a way for improving organisation innovativeness. This research also adopts Contingency theory (Donaldson, 2001) as a way for understanding the possible mechanisms to improve organisation innovativeness (Mone et al, 1998) through the ERP system. Since, there is no possible organisation structure could fit different environments, the organisation flexibility could enable the organisation innovativeness, if there is a strong perception that ERP is the main mechanism for that.

This research intends to extend the works of many studies (Melville 2004; Sedera et al.,2016; Badewi et al., 2018), by investigating the effect of organizational Flexibility and ERP skills on ERP attitude and in turn on ERP Innovations benefits. Accordingly, this research attains to answer the following question: Can organization flexibility improve the Employee's ERP skills and ERP attitudes innovativeness? If yes, what are the impacts of improved ERP attitudes on ERP innovation benefits? By answering these questions, this can help and advise the Operations managers, ERP managers, Chief Information Officers (CIOs), and IT portfolio managers to invest rationally in different aspects in order to improve their organization innovatively.

Literature Review

Socio-Technical Theory and Contingency theory are the dominant theories to understand how organizational Flexibility affects the attitude of the employees which in turn affect ERP Innovations benefits. First regarding Socio-Technical theory, in 1977, Bostrom & Heinen investigated that many MIS obstacles have been assigned to organizational behavioral problems. They found out that millions of dollars organizations spend on ICT developments are of little advantage because systems continue to fail. They argued that behavioral difficulties are the result of inadequate designs. They suggested reframing ICT design methodology within the Socio-Technical Systems (STS) design approach. The STS approach

is considered as an effective way to change the way in which organizations operate. It is a satisfying way to in meeting task requirements. This approach considers any working system is constituted of two jointly independent components: social and technical. The technical system is involved with processes, tasks, and technology needed to transform inputs to outputs. The social system is concerned with the attributes of people (e.g., attitudes, skills, and values), the relations among people, compensation systems, and authorization structures.

Also, on the same track (Paddock, 1986; Geels, 2004; Smith et al., 2005) examined procedures and mechanisms used to develop information which is key factors to achieve ultimate success for the system of the organization. They explained traditional and non-traditional approaches such as Socio-Technical approach. They believed that Social-Technical approach has the power to dismiss some of the difficulties associated with traditional approaches as behavioral problems and attitude. (Patnayakuni & Ruppel, 2010) concluded that the use of skilled teams was found to be significantly related to ERP attitude based on the STS approach. Overall, it can be said that the socio-technical systems approach has been used successfully to design manufacturing and service organization processes for the past decades within organizations to ensure a successful implementation for technology (Geels and Schot, 2010; Patnayakuni and Ruppel 2010; Foxon, 2011; Goggins et al., 2011; Markard et al., 2015; Chen et al., 2017; Edmondson et al., 2018).

On the other side, Contingency theory is an organizational theory that declares that there is no best way to organize a corporation, to lead a company, or to make decisions. Instead, the optimal plan of work is contingent (dependent) upon the internal and external situation. Contingency theorists emphasize that an organization should optimize its performance by a strategy that aligns its capabilities with environmental requirements (Ho, 1996; Smith et al., 2012; Helkio & Tenhiala, 2013; Márcio et al., 2016). In 1999, Schroder & Sohal investigated organizational characteristics and their expected benefits. Their study adopted contingency theory to understand the roles of the different variables play within an organization such as attitudes, skills, principal ownership and the company size. They used the questionnaire as a research instrument. The questionnaire was mailed to manufacturing companies in Australia and New Zealand. They found that Organizational flexibility improves workforce and ERP attitude.

Theoretical Framework

The following hypotheses are to set the theoretical glue between the three drivers (ERP attitude, ERP skills, and organization flexibility) and ERP innovating benefits

ERP Attitude affect ERP innovation

According to the Theory of reasoned action, ERP attitude is the main driver for any behavior (Bagchi, Kanungo, & Dasgupta, 2003; Fishbein & Ajzen, 1975). If there is a positive ERP attitude towards using certain technologies in a certain way, their behaviors will follow (Amoako-Gyampah & Salam, 2004; Venkatesh & Davis, 2000). Following the same logic, attitude towards ERP system is one of the critical factors for success (Al-Mashari, 2003). Attitude towards the use of ERP triggers the useful use of the system (Costa, Ferreira, Bento, & Aparicio, 2016). Similarly, if ERP is perceived to be an innovative tool, and there is a positive attitude towards using it for innovating, this could improve the innovation performance from the ERP. Thus, this research argues that the employees' attitude affects ERP innovation.

H1: Attitude towards ERP as an innovative technology affects the organisational innovativeness

ERP Skills and Innovatoin

Skills are defined as individuals' capabilities to accomplish certain tasks adequately and efficiently (Gattiker, 1992). ERP requires many skills and competencies (Charland, Léger, Cronan, & Robert, 2016). They are the technical skills (i.e. ability to use computers in day to day activities) (Hawari & Heeks, 2010), business-related skills (Sprakman, O'Grady, Askarany, & Akroyd, 2018), and business-technical skills (Al-Mashari, Al-Mudimigh, & Zairi, 2003). Based on Socio-Technical and contingency theory, ERP Skills affect ERP attitude. Thus, this research argues that the employees' using skills affect employees' ERP attitude.

H2: ERP skills affect the attitude towards ERP as an innovative technology positively

H3: ERP Skills affect organisation innovativeness positively

H4: Attitude mediates the relationship between the skills and organisational innovativeness positively

Organization Flexibility and Innovation

Organization flexibility can be defined as the relationship between different actors, tasks, and objectives (Hatch & Cunliffe, 1997; Parker, 1992). While attitude is the main driver for any behavior (Bagchi, Kanungo, & Dasgupta, 2003; Fishbein & Ajzen, 1975). If there is a positive attitude towards using certain technologies in a certain way, their behaviors will follow (Amoako-Gyampah & Salam, 2004; Venkatesh & Davis, 2000). Based on Contingency and Socio-Technical theory, Flexibility affects attitude (Schroder & Sohal, 1999). Thus, this research argues that the organization flexibility (in terms of the Job description) affect an employee's attitude.

H2: organisation flexibility affects the attitude towards ERP as an innovative technology positively

H3: organisation flexibility affects organisation innovativeness positively

H4: Attitude mediates the relationship between the organisational flexibility and organisational innovativeness positively

Research Methodology

This research used questionnaire collected by phone from 210 ERP manager from 210 organisations globally as illustrated in table 1. The sample is distributed from different geographic locations. 64 respondents are from Arab countries. 53 respondents are from Europe and 48 are from United states of America. According to industry, Manufacturing sector represent 72 response out of 210 and service sector represents 70 out of 210.

Table 1:Sample characteristics

Industry		Area	
Retailing	15	Arab	64
Manufacturing of Slow Moving Consumer Goods (e.g. Cars, TVs, Computers)	30	Europe	53
Manufacturing of Fast Moving Consumer Goods (e.g. Food industry, Grocery items)	42	US	48
Oil and Gas	12	Australia	5
Construction	16	Others	15

Service Companies (Hotels, hospitals, and banks)	70		
Missing	25	Missing	25
Total	210	Total	210

This research has six concepts: innovation benefits, attitude, skills, and organizational flexibility. All the constructs are seven items scale. The summary of constructs is in table 3.

The ERP innovation benefits are borrowed from (Dougherty and Hardy, 1996; Nerkar and Roberts, 2004). The three items used are the successful differentiation of an organization's products from those of its competitors, the continuous improvement of the ways of producing and delivering products and services, and the continuous development of new successful products and services. The attitude items are adapted from (Bagchi, Kanungo and Dasgupta, 2003; Saeed *et al.*, 2010) to fit with this research context (i.e. the attitude towards ERP as an innovation enabler). They relate to which planning technologies are required for innovation, and whether users believe that information technologies enable innovation. Skills are developed based on qualitative findings presented in Badewi et al (2018). ERP user skills are mainly the users' ability to jump between forms and screens easily and smoothly without difficulties, ability to use and to find basic reports, to know which reports shall be used and to reach their reports easily.

The organizational flexibility measure is borrowed from (Kester, Hultink and Griffin, 2014; Wang, Libaers and Jiao, 2015). These are whether your organization is able to change its process structure easily and efficiently and whether your organization changes easily to reflect unforeseen changes in the market.

All the constructs are valid and reliable as summarised in table 3. The tools used to ensure the validity and reliability of the constructs were exploratory factor analysis using dimension reduction (reported in the appendix), heterotrait-monotrait ratios, Cronbach's alpha, composite reliability, average variance extracted, and Rho_A. All figures are accepted. The composite reliability and AVE are more than 0.5, which represents adequate convergent validity and reliability (Fornell & Larcker, 1981). Also, to ensure the discriminate validity, the AVE of each construct is greater than the highest shared variance with other constructs.

This research takes the required precautions due to the possible presence of systematic error related to the informants. The presence of respondent error (or common

method bias) is tested using Harman’s single-factor test, based on Podsakoff et al. (2003). It was conducted by inserting all independent and dependent variables in an exploratory factor analysis. The first factor accounted for 20.81% of the total 83.50% variance, demonstrating a lack of evidence of considerable common method bias in this study.

Table 2: Constructs validity and reliability

Items	Reference
ERP Innovations (CR = 0.931, AVE = 0.771, rho_A = 0.932, α = 0.931)	
Enabled building business innovations	(Dougherty & Hardy, 1996; Nerkar & Roberts, 2004; Jajja et al., 2017)
Enabled your organization to successfully differentiate its products from the competitors’	
Enabled your organization to continuously improve the ways of producing/delivering products and services	
Enabled your organization to continuously develop new successful products and services	
ERP Innovation Attitude (CR = 0.766, AVE = 0.623, rho_A = 0.774, α = 0.762)	
Users believe the system is helpful and useful	(Wu & Wang, 2006; Jones & Carey, 2011; Tsinopoulos & Al-Zu’bi, 2012)
There is a positive belief that planning is critical to organisational success	
Organisational Flexibility (CR = 0.9, AVE = 0.818, rho_A = 0.903, α = 0.898)	
Your organization is able to change its process structure easily and efficiently	(Kester, Hultink and Griffin, 2014; Wang, Libaers and Jiao, 2015)
Your organization changes easily to reflect unforeseen changes in the market	
ERP Skills (CR= 0.837, AVE = 0.57, rho_A = 0.856, α = 0.84)	
Users are able to jump between forms and screens easily and smoothly	(Wu & Wang, 2006; Giunipero et al., 2006; Bendoly & Prietula, 2008; Badewi, 2016; Scholten & Dubois, 2017; Badewi et al., 2018)
Users can use the basic reports	
Users know which reports they want to use	
Users are able to reach their desired reports easily and smoothly	

Testing hypothesis

Structure Equation Modelling is used to test the hypothesis using SMART PLS. The model is fit because Standardized Root Mean Square Residual (SRMR) is below 0.1, it is 0.049 and

Normed Fixed Index (NFI) is higher than the threshold of 0.9 which is .905. This model is fit and could be used to produce reliable and valid results since the required conditions are met (Bentler and Bonett, 1980; Hair et al, 2017; Dijkstra and Henseler, 2015).

Most of this research hypotheses are supported. Hypothesis 1 is confirmed because the attitude towards the ERP as an innovation enabler improved the organization innovativeness significantly ($\beta = .214, \rho < 0.00$). ERP skills play a role mediated by the attitude towards ERP as an innovation enabler in the business. The second hypothesis is confirmed since ERP skills have significant effect on the perception towards ERP as an innovation enabler ($\beta = .299, \rho < 0.00$). But this research is failed to prove the third hypothesis as ERP skills do not have direct effect on organization innovations ($\beta = .063, \rho > 0.10$). However, this research support the fourth hypothesis as the relationship is fully mediated because ERP Skills found to have an indirect effect on the organization innovations ($\beta = .064, \rho < 0.05$.) to form a significant total impact on it ($\beta = .127, \rho < 0.05$).

Organisation flexibility also plays a significant role in improving the attitude towards ERP as an innovation enabler ($\beta = .306, \rho < 0.00$) as to verify the fifth hypothesis. Also, it has a direct effect on the innovation ($\beta = .505, \rho < 0.00$) to confirm the sixth hypothesis and have a significant mediating impact through the attitude ($\beta = .066, \rho < 0.00$) to confirm the seventh hypothesis.

Table 3: Summary of the findings

H	Path	Impact	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Decision
1	ERP innovation Attitudes -> Innovations	0.214	0.066	3.231	0.001	Support
2	ERP Skills -> ERP innovation Attitudes	0.299	0.088	3.405	0.001	Support
3	ERP Skills -> Innovations (Direct Effect)	0.063	0.064	0.978	0.328	Not
4	ERP Skills -> ERP innovation Attitudes -> Innovations	0.064	0.028	2.299	0.022	Support
4	ERP Skills -> Innovations (Total Effect)	0.127	0.062	2.034	0.043	Support
5	Organisational Flexibility -> ERP innovation Attitudes	0.306	0.068	4.504	0.00	Support
6	Organisational Flexibility -> Innovations (Direct Effect)	0.505	0.062	8.098	0.00	Support

7	Organisational Flexibility -> ERP innovation Attitudes -> Innovations	0.066	0.025	2.663	0.008	Support
7	Organisational Flexibility -> Innovations (Total Effect)	0.571	0.059	9.719	0.00	Support

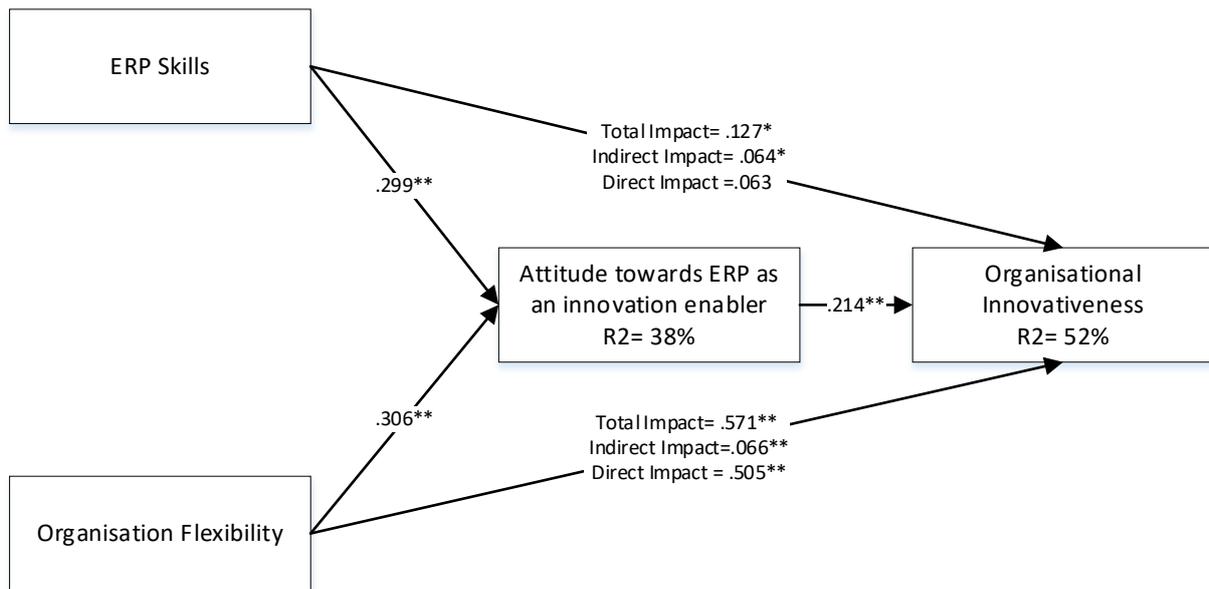


Figure 1: Research Model - **P<0.00, *P<0.05, Model SRMR = .04

Discussion

This research adopted the Socio-Technical Theory and Contingency theory to develop and test a new framework for the possibility of improving organization innovativeness through adopting an ERP system. The study concluded that Organizational Flexibility has a positive direct significant impact on ERP attitude. In addition to that, employees' ERP skills have also a positive direct significant impact on their attitude. This conclusion means when users are able to jump between forms and screens easily and smoothly, use the basic reports, know which reports they want to use, and able to reach their aspired reports easily and smoothly, user's attitude is enhanced. Consequently, the study found that ERP Attitudes improves ERP Innovating Benefits. This outcome means when the attitude of employees toward ERP technology is positive that improve ERP innovation benefits. Thus, it can be said that skills and organization Flexibility have significant indirect impacts on ERP innovating mediated by the ERP Innovation attitude.

This paper is the first to test the mediating impacts of attitude on the relationship between the organisational Flexibility towards ERP innovation benefits. The direct relationship between attitude and benefits have been examined before in the literature ((Costa et al., 2016; Ifinedo, Rapp, Ifinedo, & Sundberg, 2010; Saeed et al., 2010)). But this study examined indirect relation of organization flexibility and ERP Skills on ERP Innovation Benefits.

This research contributes help and advises the Operations managers, ERP managers, Chief Information Officers (CIOs), and IT portfolio managers to invest rationally in different aspects in order to improve their organization innovatively. Also, the main contribution is figuring out how the Organization flexibility can impact employees' attitudes and in return effect ERP innovation Benefits. This research has several implications for operations and IT managers. ERP is an automating tool that can improve the innovativeness of the business if there is a positive attitude towards organisational flexibility, and user ERP skills. Attitudes can be improved through workshops, flyers, inspiring videos, sessions, and training about the ERP as innovation enablers. We do not argue this will directly be translated into innovation; rather, this will motivate users to learn ERP skills to use the system for innovating. Moreover, it is important to enhance attitude through skills and organisational flexibility in order to improve Innovation.

Accordingly, operation managers should facilitate the tools for learning users ERP skills by giving them training, learning portals, and workshops on quantitative skills. Also, the organization Flexibility is important for improving innovativeness. The organization should be able to change its process structure easily and efficiently, and changes easily to reflect unforeseen changes in the market. Besides that, organizations must have benefit accountability position to follow up the benefits realization process from the implementation of new ideas, and sponsoring unit to implement/sponsor the new ideas.

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