

EXPLAINING INTENTION TO USE AN ENTERPRISE RESOURCE PLANNING SYSTEM: A REPLICATION AND EXTENSION

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Original scientific paper

Enterprise Resource Planning (ERP) plays an important role in handling the organizations' information flow due to shorter cycle and faster information transactions. Hence, it is crucial to understand the implementation of ERP as it ensures that management could make better strategic decisions. This paper extends existing models to study the impact of shared beliefs concerning the benefits of Enterprise Resource Planning (ERP) among users. Factors such as project champion, training, shared beliefs, perceived ease of use, perceived usefulness, and attitude towards use were found to be significant in determining intention to use ERP system. The findings support the notion that systems or technologies, which are perceived to be easy to use and understand, would be viewed as more useful from the end-user's perspective. Implications of the findings, potential limitations of the study, and directions for future research are suggested.

Keywords: communication, Enterprise Resource Planning (ERP), perceived ease of use, perceived usefulness, project champion, shared beliefs in the benefit of ERP, training

Objašnjenje namjere primjene sustava za planiranje resursa poduzeća: ponavljanje i proširenje

Izvorni znanstveni članak

Planiranje resursa poduzeća (ERP-Enterprise Resource Planning) ima važnu ulogu u manipuliranju informacijskim tokom poduzeća zbog kraćeg ciklusa i brzih transakcija informacija. Stoga je bitno razumjeti primjenu ERPa jer to znači da uprava može donositi bolje strateške odluke. Ovaj rad proširuje postojeće modele proučavajući utjecaj zajedničkog uvjerenja korisnika u prednosti primjene ERPa. Shvatio se da su čimbenici kao što su uloga voditelja projekta, obuka, opće uvjerenje, shvaćanje lakoće korištenja, shvaćanje korisnosti i stav prema uporabi, bitni pri donošenju odluke o primjeni ERP sistema. Rezultati podržavaju shvaćanje da bi sistemi i postupci koji se smatraju lakim za uporabu i razumijevanje bili prihvaćeni kao korisniji sa stajališta krajnjeg korisnika. Sugeriraju se implikacije rezultata, moguća ograničenja istraživanja i smjernice za daljnja istraživanja.

Ključne riječi: komunikacija, obuka, planiranje resursa poduzeća (ERP), shvaćena korisnost, shvaćena lakoća uporabe, vođa projekta, zajedničko uvjerenje u dobrobit ERP-a

1 Introduction

In today's business world, where competitive advantages come mostly from intangibles, information systems have become key tools for information and knowledge management within firms [39, 18, 19]. In this sense, more and more manufacturing companies are using Enterprise Resource Planning (ERP) systems to handle the organization information flow. The Enterprise Resource Planning (ERP) is a packaged business software system that enables a company or organization to manage its resources efficiently and effectively (e.g., materials, human resources, finance and the like) by providing a fully integrated solution to meet an organization's information processing needs [44]. The use of ERP system could further enhance performance, cutting costs, and also achieve strategic advantages. One of the problems with ERP systems is that they are complex to use and it is important to have a good methodology on how to implement the system. In view of the fact that IT is becoming more pervasive and reaching new professionals and working environments, the acceptance of ERP systems are becoming an increasing crucial issue. As a result, the Technology Acceptance Model (TAM) has been used as an approach to execute the different information systems [36].

On the other hand, beliefs in the systems form the basis for attitude formation and consequently, hence, an understanding of how beliefs are formed offers an opportunity to understand how interventions might be used to shape beliefs and therefore, behavioural intentions

in the context of the introduction of new technology [8, 23].

Unfortunately, many fields normally do not communicate with each other concerning the sharing of the inherent intellectual foundations even though few studies were attempted to investigate related fields in a systematic way [24]. In searching for answers to the above questions, there is a need to develop a general framework that can depict the fundamental elements and concerns of the information field.

2 Literature review

2.1 Technology Acceptance Model (TAM)

In a global market, manufacturing companies are exposed to competition from not only local competitors but also worldwide players in the industry. Hence, it is imperative for companies to have a responsive, integrated, and succinct management procedure to face the challenge from local as well as global competition in the 21st century. Over the past two decades, Davis's [20] Technology Acceptance Model (TAM) is considered as one of the most influential models used in explaining the acceptance of information technology (IT) [36]. Theorists such as Fishbein and Ajzen [26] have adapted the causal chain to specifically predict the user's acceptance of IT. They have further elaborated that an individual's subjective assessment of the possible conclusion regarding a particular behaviour, together with the affective evaluation of these conclusions would subsequently generate either positive or negative feelings about a particular behaviour. This model explains the

belief-attitude-intention-behaviour relationship to a user’s IT acceptance. Numerous researchers have applied TAM to analyse a user’s behaviour, particularly its application to diverse types of information systems (IS) [e.g., 3, 35, 68].

TAM indicates that perceived usefulness (PU) and perceived ease of use (PEU), together with attitude toward using, are the major criteria of behavioural intention to use IT [20, 21]. This model has proposed a link that the higher the user’s PEU and PU, the higher the attitude. Subsequently, the degree of PU and attitude would lead to a higher degree of behavioural intentions and finally the actual system usage. Hence, it is implied that a high degree of PU and PEU would result in a higher level of actual use of system and actual amount of use or the diversity of use [36]. Past empirical studies have shown that TAM explains the variance in usage intention [15] as well as actual use [69].

2.2 Extensions of Technology Acceptance Model

Venkatesh and Davis [69] had further extended the original model of TAM to include antecedents for PU

such as the subjective norm, image, job relevance, and output quality and results demonstrability. This model which was named as TAM2 has proven plausible results as it could explain about 60 % of the variance in perceived usefulness [14]. In addition to this, few other models such as Theory of Planned Behaviour (TPB) by Ajzen [4], Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. [70] have been used across a range of other related disciplines in the IS research field but not as extensively studied as TAM. Hence, TAM is still considered to be the most suitable theoretical approach in examining IS context [30, 47].

2.3 ERP Implementation

An ERP system implementation involves high cost from millions to billions of dollars and the performances are not guaranteed. Past researches have indicated that in many cases, the system was not able to deliver the expected results after the implementation has been conducted [38]. Besides, the implementation of ERP system involves a wide range of complicated issues and resources.

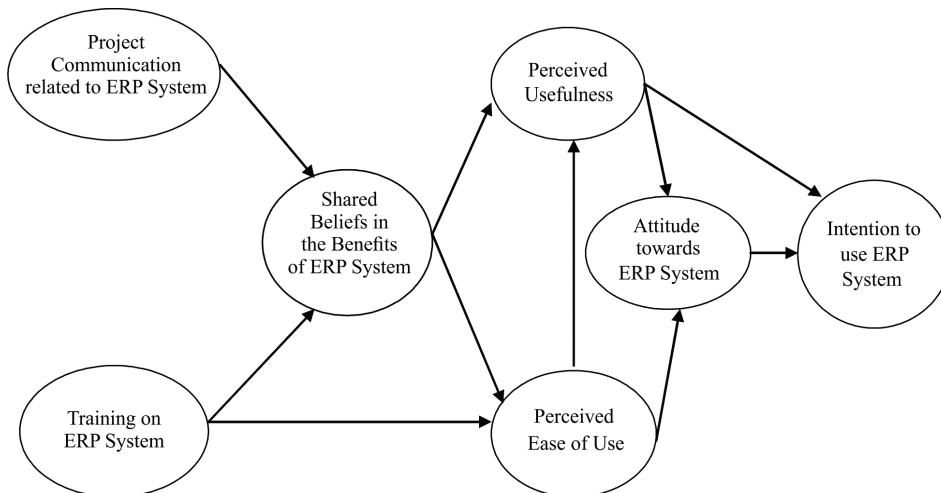


Figure 1 Model developed by Amoako-Gyampah and Salam [8]

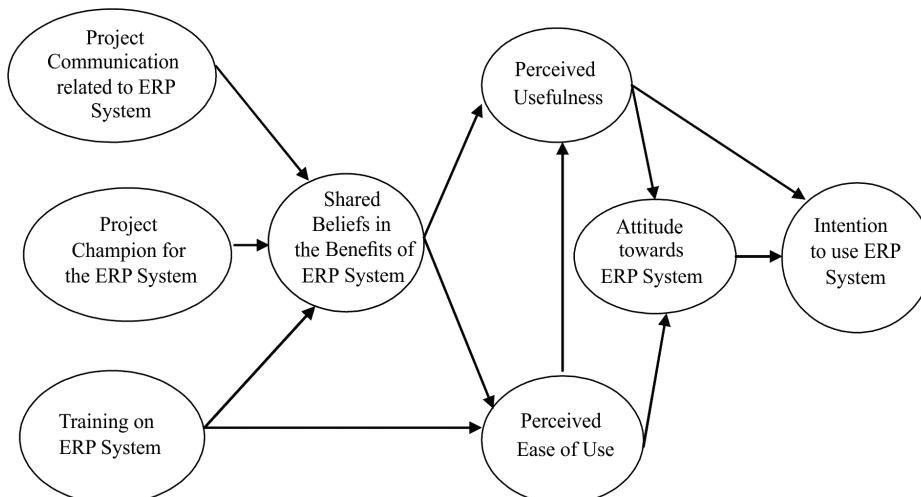


Figure 2 Research Model (adapted from Amoako-Gyampah and Salam [8])

Past studies posited that the failure of ERP applications might not be due to the inefficient technology, fund, internet, application software, or

software implementation but due to the beliefs of the enterprises [61]. Hence, according to Mandal and Gunasekaran [40], business process reengineering (BPR)

is a must in order to achieve a successful implementation. Many factors have contributed to the successful implementation of process reengineering such as human resources, training of employees, organization structure, objective and performance evaluation etc. [5, 17, 38].

3 Research model and hypotheses

The research model is developed based on TAM [20, 21]. TAM as pioneered by Davis [20] advances the Theory of Reasoned Action (TRA) by postulating that perceived usefulness (PU) and perceived ease of use (PEU) are key determinants that inevitably lead to the actual usage (U) of a particular technology or system. Perceived usefulness is defined as the extent to which a person believes that using a particular system or technology would enhance his or her job performance. Perceived ease of use on the other hand, is defined as the extent to which a person believes that using the particular system or technology would be free from effort [20]. The research model for this study is adapted from Amoako-Gyampah and Salam [8] shown in Fig. 1 whereas the research model for this study is shown in Fig. 2.

3.1 Communication, project champion, training, and shared belief

Kydd [33] posited that proper communication would reduce uncertainty and equivocality in the process of IT development. Hence, communication plays an important role in achieving project management success. Besides, it is also necessary to open-up communication between different parts of the departments and foster the development and maintenance of these relationships. This is to ensure that implementation related issues could be raised, investigations and analysis could be undertaken, and subsequently solutions could be developed and conducted. As noted by Carter et al. [13] if information were communicated effectively from the implementers to the end users about the benefits of using new technology, it would increase the shared beliefs about using the technology. This is further supported by Sharratt and Usoro (2003) that face to face communication is an effective mechanism for gaining knowledge which would subsequently facilitate the creation of new knowledge in the recipient. On the other hand, project champion was found as one of the critical factors to ERP implementation success [44]. It is important to place someone who has the power to set goals and legitimize change for projects throughout the organization [25]. As noted by Shehab et al. [60], the project champion who plays a key role in change management efforts, might be or might not be a formal member of the project team. However, it is also likely that a champion emerges from among the key business leaders [11].

Travica [67] evidenced that perceptions of training assistance received, and system maintenance can also have effects on the use of IS system. Thus, it is mandatory to have an implementation term to focus on the system development so as to sustain a strong and continual focus on the end-user. However, training program could only be implemented successfully with the assistance from management and acceptance by the end users.

Researchers such as Gordon and Tarafdar [27] further confirmed that IT-based competence in collaboration and communication is important in accelerating the sharing of information and knowledge where subsequently knowledge sharing and communication will allow innovative services to be delivered. On the other hand, a project champion is needed to persuade top management for continuous change efforts [6] and that can only be done by effective communication through the entire project and reaching all levels of employees [16].

H₁: Project communication related to ERP system is positively related to shared beliefs in the benefits of ERP system

H₂: Project champion related to ERP system is positively related to shared beliefs in the benefits of ERP system

H₃: Training on ERP system related to ERP system is positively related to shared beliefs in the benefits of ERP system.

3.2 Training, shared beliefs, PEU, and PU

As stated by Zhang et al. [72], perceived usefulness and perceived ease of use have preceding effects on important user's intention to use a target technology. This implies that effective training would ease the use of new technology.

According to Rogers [58] ease of use is reciprocal to complexity which is defined as "the degree to which an innovation is perceived as relatively difficult to understand and use". In the Malaysian context, researches on technology use have demonstrated that the perceived ease of use and perceived usefulness are important predictors of the decision to not only adopt a technology but to continue to use that technology [28, 32, 49, 50, 51, 53].

Past researchers recognized that information sharing is a key element in today's organization [62]. Generally, employees in organizations see positive outcomes when there is a shared belief about the utility of a particular system. However, some individuals might believe the opposite because of past experience or personality traits. Ardichvili et al. [9] suggested that before employees decided to interact or share knowledge with their senior colleagues, they would make predictions and place expectations on others, based on their previous experience.

Amoako-Gyampah and Salam [8] argued that many users at different organization levels are involved in the implementation process, as such to achieve success a sense of mutual trust and commitment must be developed amongst the various participants. They also pointed out that this shared sense of belief about information systems project benefits is the one that allows participants to find common grounds and a shared sense of purpose. Other researchers such as Parr and Shanks [46] pointed out that management support, best people full time, and empowered decision makers, deliverable dates, use of champions, are examples of critical success factor for ERP implementations in general.

- H₄: Training on ERP system related to ERP system is positively related to perceived ease of use of the ERP system
- H₅: Shared beliefs in the benefits of ERP system is positively related to perceived ease of use of the ERP system
- H₆: Shared beliefs in the benefits of ERP system is positively related to perceived usefulness of the ERP system
- H₇: Perceived ease of use will positively influence the perceived usefulness of the ERP system.

3.3 PU, Attitude, and Intention

Rogers [57] theorized that perceived ease of use demonstrates the degree to which an invention is seen as not too difficult to understand, learn or operate. Perceived ease of use in TAM has been defined as the extent to which a person believes that using a certain technology will be free of effort [20]. Lai and Yang [34] noted that perceived usefulness is concerned only with the future benefits including higher performance and bonuses after performing the task. This indicates that the application of ERP with a higher level of perceived usefulness is one for which an end user believes that there is a positive use-performance relationship. Bhattacharjee [10] observed that a person’s willingness to transact with a particular

system is already considered as perceived usefulness. Thus, it is expected that users would adopt the ERP system if they perceived ERP would assist them to attain desired performance outcomes. Nonetheless, past researchers have not found conclusive evidence about whether the construct in TAM would have a significant influence on the perceived usefulness of technology [e.g., 35, 63, 66].

Venkatesh and Davis [68] demonstrated that there is a strong correlation between behavioural intention and actual behaviour. This implied that the usage of enterprise applications with a higher level of perceived usefulness would be successful only if an employee believes that there is a positive use-performance relationship. Hence it is believed that the building of strong relationships with key management areas and managers to develop openness and receptiveness to change and to smooth the way for changed business processes would also affect the behavioural intention to use the system. Besides, past research such as by Lai and Yang [34] has shown that user satisfaction is the expectation benefits from aggregating all the benefits that a person wishes to get by using the enterprise applications, hence the more useful enterprise applications, the more likely the user is likely to use the system.

Table 1 Scale source and validity

Variable/Items	Source	Communality	Loading
ERP Project Communication (93,86 %)	[48]		
I was well-informed about the project through the company newsletters	[7]	0,939	0,969
I was informed about the project through presentation, demonstrations or road shows		0,939	0,969
ERP Training (88,18 %)	[68]		
The kind of training provided to me was complete	[7]	0,845	0,919
My level of understanding was substantially improved after going through the training programme		0,918	0,958
The training gave me confidence in the ERP system		0,891	0,944
The training was of adequate length and detail		0,836	0,914
The trainers were knowledgeable and aided me in my understanding of the system		0,919	0,959
Project Champion (91,40 %)	[43]		
Project Champion is a visible senior manager		0,852	0,923
Project champion has power to set goals.		0,944	0,972
Project champion has power to legitimize change		0,946	0,973
Belief in the benefits of the ERP Project (88,64 %)	[42]		
I believe in the benefits of the ERP system	[7]	0,906	0,906
My peers believe in the benefits of the ERP system		0,878	0,937
My management team believes in the project benefits		0,875	0,935
Attitude towards ERP system (88,88 %)	[65]		
The ERP system will provide access to more data	[22]	0,835	0,914
The ERP system will make data analysis easier	[7]	0,900	0,949
The ERP system will be better than the old system		0,903	0,950
The ERP system will provide accurate information		0,920	0,959
The ERP system will provide integrated, timely and reliable information		0,885	0,941
Perceived Usefulness (95,95 %)	[22]		
Using the ERP system will increase my productivity	[7]	0,959	0,980
The ERP system will be useful in my job		0,959	0,980
Perceived Ease of Use (92,72 %)	[22]		
Learning to operate the ERP system will be easy for me	[65]	0,927	0,963
It will be easy to get the ERP system to do what I want it to do	[7]	0,927	0,963
Behavioural Intention (92,23 %)	[22]		
I expect to use the ERP system	[65]	0,922	0,960
I expect the information from the ERP system to be used	[7]	0,922	0,960

Studies by Agarwal and Karahanna [2] and Venkatesh and Davis [69] both indicate that perceived

ease of use and perceived usefulness affect behavioural intentions through two forms - the ‘direct’ and ‘indirect’

form. Other researchers like Szajna [64] posit that perceived usefulness has a direct influence on intention whereas the perceived ease of use has only an indirect effect on intention through perceived usefulness. This is also evidenced in the study by Amoaka-Gyampah [7] which concluded that users' perception of the perceived usefulness, ease of use of the technology, and the users' level of intrinsic involvement are the most important factors that affect their intention to use the technology. Hence, a research model and associated hypotheses were proposed for this study.

H₈: Perceived usefulness of the ERP system will positively influence attitude towards ERP system

H₉: Perceived ease of use of the ERP system will positively influence attitude towards ERP system

H₁₀: Perceived usefulness of the ERP system will positively influence intention to use ERP system

H₁₁: Attitude towards ERP system will positively influence intention to use ERP system.

4 Methodology

4.1 Sample and procedure

Penang was chosen for the study because of the manufacturing companies' availability, convenience, budget and time constraints. The non-probability convenience sampling design was chosen due to time constraint and also a practical option one survey questionnaire was sent to each manufacturing organization implementing ERP. Convenience sampling has been viewed as an acceptable approach particularly in recent operational management studies due in part to the benefits of increased internal validity and control from such selection [29]. Respondents should comprise of the production control department managers, production department managers, materials department managers, engineering department managers, information technology department managers or executives within the organization, who are aware of the ERP implementation. The questionnaire was adopted from various literature and is shown in Tab. 1.

Table 2 Descriptive of the Main Variables

Variable	Mean	Standard Deviation	Reliability (alpha)
Training	3,01	1,24	0,966
Communication	2,86	1,44	0,934
Project Champion	3,23	1,25	0,953
Shared Beliefs	3,23	1,24	0,936
Attitude	3,16	1,25	0,967
Perceived ease of Use	3,17	1,16	0,920
Perceived Usefulness	3,04	1,32	0,956
Intention to use	3,42	1,14	0,916

Note: Scale 1= strongly disagree, 5= strongly agree

Tab. 2 presents the mean and standard deviations of the main variables together with their respective reliability values. The reliability values ranged from 0,916 for intention to use to 0,967 for attitude.

4.2 Research Findings

4.2.1 Profile of the Respondents

A total of 69 respondents participated in this research. A majority were males with the ages ranging from 26 to 40. Some were holding executive and engineer position while the rest were holding management positions. Most had a basic degree with a significant portion also holding higher degrees such as Masters or PhD.

4.2.2 Results

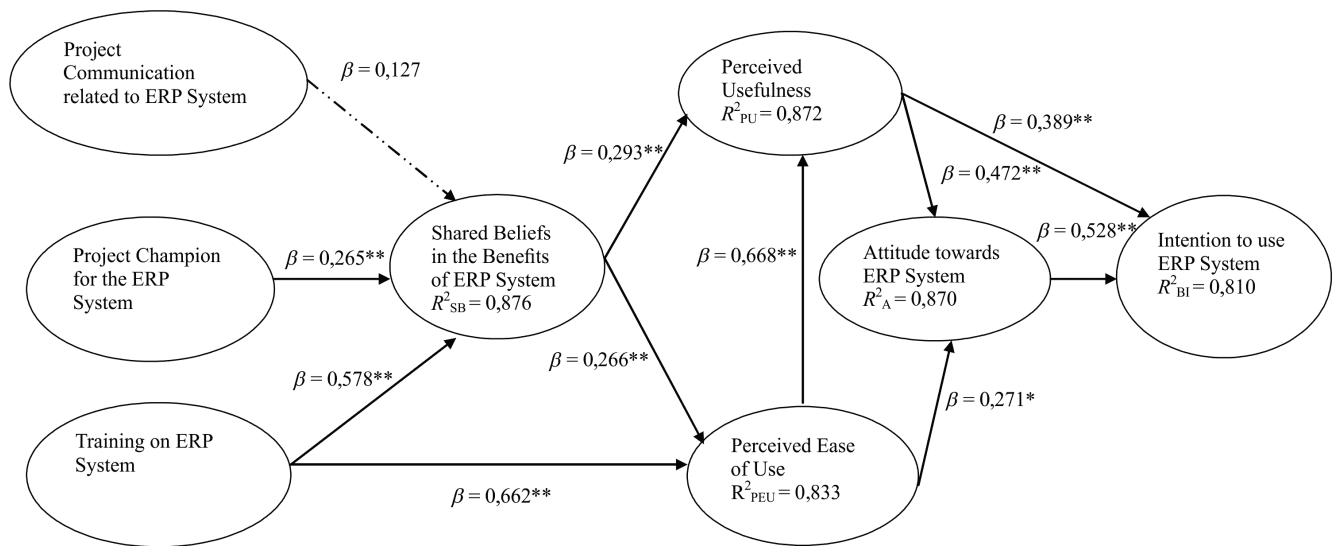
Tab. 3 presents the summary of regression results and Fig. 3 presents the details of the analysis. It was found that project champion and training have significant positive impact on shared belief with $\beta = 0,265$ ($p < 0,01$) and $\beta = 0,578$ ($p < 0,01$) respectively, hence giving support for H₂ and H₃ of the study.

Table 3 Summary of regression results

Dependent variable	Independent variable	F value	R ²	Adjusted R ²
Shared Belief	Communication	152,49**	0,876	0,870
	Training			
	Project champion			
Perceived Ease of Use	Shared Belief	162,35**	0,833	0,828
	Training			
Perceived Usefulness	Shared Belief	224,90**	0,872	0,868
	Perceived ease of use			
Attitude towards use	Perceived usefulness	217,98**	0,870	0,866
	Perceived ease of use			
Behavioural intention	Perceived usefulness	138,11**	0,810	0,804
	Attitude towards use			

** $p < 0,01$

However, project communication did not add any significant contribution in explaining the variation in shared belief. On the other hand, the direct effects of the predictors, namely shared belief and training significantly explained 83,3 % of the variability in perceived ease of use with $\beta = 0,665$ ($p < 0,01$) and $\beta = 0,266$ ($p < 0,01$) respectively, thus H₄ and H₅ are fully supported. As for perceived usefulness, H₆ and H₇ where the independent variables which are shared belief and perceived ease of use were found contributing 86,8 % of the variability in perceived usefulness $\beta = 0,293$ ($p < 0,01$) and $\beta = 0,668$ ($p < 0,01$) respectively. In analysing attitude towards use, the main effect of the predictors such as perceived usefulness and perceived ease of use explained a total of 86,6 % of the variability in attitude towards use with $\beta = 0,472$ ($p < 0,01$) and $\beta = 0,271$ ($p < 0,05$) respectively, which give support to H₈ and H₉. Two dimensions of behavioural intention namely, perceived usefulness and attitude towards use were found to be significantly predictive of behavioural intention ($p < 0,01$) with $\beta = 0,389$ and $\beta = 0,528$ respectively, explaining 80 % of the variability, hence H₁₀ and H₁₁ are also supported.



Note: $^{**}p < 0,01$, $^*p < 0,05$

Figure 3 Detailed results of the analysis

5 Discussion and conclusion

5.1 Discussion

This paper presents results from a study of behavioural intention to use an ERP system in the manufacturing sector. The theoretical background for the study was from the TAM model, which was further complemented with issues related to project champion, communication and training related to the ERP system. To date, little has been done to theorize the important predictors for initial and on-going ERP implementation success [11].

Generally, the regression analysis has shown a high R^2 of above 80 % for all variables. All hypotheses were supported for except project communication. The findings supported the original model proposed by Amoako-Gympah and Salam [8] except for the fact that project communication which was a significant predictor in the original study but was not significant in this research. Another difference was that in Amoako-Gympah and Salam [8] study the path between perceived usefulness and intention was not significant but in this study it was significant. The new construct added which was project champion was found to be a significant predictor of shared beliefs which indicates that the existence of a project champion helps in enhancing the shared beliefs in the benefits of the ERP system. Nah et al. [44] posited that project champion is one of the top five critical success factors for the implementation of ERP system in the organization, whereas training is a prerequisite for success in implementing ERP systems [71]. Besides, as noted by Travica [67], the implication for practitioners is clear where the IS staff must internalize the axiom that the user interface is the system for users. This is especially true in the case where self-service systems put an extraordinary burden on casual users. Hence, having a good project champion and on-going training in the company will improve the shared beliefs in the benefits of ERP system.

The findings have also suggested that training provided on ERP system and shared beliefs would have a positive impact on perceived ease of use of ERP system.

This is particularly true as indicated by previous researchers [e.g. 31], insufficient training of end-users is one of the major causes of ERP project failure. Hence, training is needed to ease the fear of users and to reduce their resistance of using ERP system. When the end users are comfortable and believe in the system, then only they will perceive it as easy to use.

In addition, with regard to perceived usefulness, previous researchers such as Calisir [12] and Liu et al. [37] have demonstrated that perceived ease of use would positively influence perceived usefulness. Our findings have also added to the point that shared beliefs in the benefits of ERP system would also have significant impact on perceived usefulness.

Past researchers [1, 20] have elucidated that perceived ease of use was also found to have a positive influence on the intention to use the ERP systems as when it is perceived to be easier to use is more likely to be accepted by the users, thus end users would have a more positive attitude towards using the ERP system. In addition to that, it was also concurred by past researchers that a system that is high in perceived usefulness is one that the user believes that will reduce his/her task ambiguities and eventually increase work-related performance [1, 20, 41, 45, 52], hence end users would be more willing to use the system. Besides, in their study, Ramayah and Lo (2007) also concluded that perceived usefulness was the more influential driver in predicting the intention to use ERP systems.

The results of our study provide several theoretical contributions to ERP implementation system. First, the study presents empirically tested and reliable constructs which were found significant in predicting intention to use an ERP system.

In addition to that, other factors such as organizational culture, the readiness of the organizations and their capacity and willingness to change pre and post implementation support and other critical success factors would also contribute to the success of ERP implementation system. In view of the above, organization management teams play a vital role in ensuring that the new system is embedded in the day to

day work life of end users. Communications and trainings are needed so that the end users would realize that the implementation of the systems would bring more benefits to them.

From a management point of view, our results suggest that relative behavioural intention to use the ERP system lies on many factors. The findings indicate that, when developing a new system, the implementers should build on the benefits of ERP systems and its responsiveness to the end users.

5.2 Limitations

As with any research, this study has several limitations. This current study has relied primarily on samples drawn specifically from the workers in the manufacturing sectors. Thus, it is not certain whether the results obtained can be generalized to professional level jobs in other industries. Next, this is not longitudinal study, and like any other cross-sectional study, it can only provide a static perspective on ERP implementation system. Clearly, a longitudinal approach would have placed researcher in a better position to draw causal conclusions. Therefore, only conclusions or discussions of the general relationships between the variables of interest could be drawn.

5.3 Conclusion

Our results suggest the need for the extension of TAM model which are tailored for ERP system. This general model may not be sufficient to explain the behavioural intention to use ERP system. Even though our findings have not indicated that project champion, communication, and training contributed to the intention to use ERP system, nonetheless past researchers have found the importance of adding these factors in measuring the intention to use ERP system. Hence, we claimed that while the traditional measure of new technology acceptance model is important for ERP, the private nature and the new contexts, where the project champion, communication and training context can be used, warrant the augmenting of traditional models. This study hopes to draw a sharper model in the implementation of ERP system so to improve long and short-term decision making.

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