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Successful Enterprise Resource Planning Post-Implementation: Contributions of Technological Factors

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Abstract

Enterprise Resource Planning (ERP) has been widely studied in the past. However, the effective deployment of ERP in order to achieve benefits in post-implementation stage has puzzled many organizations. Therefore, the objective of this paper is to introduce a conceptual framework of the technical Critical Success Factors (CSFs) on ERP post-implementation supported by the Technological, Organizational and Environmental (TOE) theory, and adds the critical factors of ERP data accuracy, ERP implementation team, ERP implementation strategy and ERP communication which were not included in the past. This paper applies previous literature, theories and conceptual framework to present a new conceptual model that contributes to CSFs becoming empirically joined to ERP Post-Implementation Success (PIS) and discusses the impact of this new approach on ERP PIS. The paper make a bridge to fill up a research gap in how technical factors impact PIS of ERP and similarly the need to a conceptual model prearranged to offer approach into ERP PIS.

Keywords: ERP data accuracy, ERP implementation team, ERP implementation strategy, ERP communication, Technology, Organization and Environment (TOE) theory

1. Introduction

Enterprise Resource Planning (ERP) is a commercial software package i.e., Oracle, SAP, JDE, PeopleSoft, BAAN, that empowers the unification of business processes (Markus et al., 2000; Grabski et al., 2011). ERP requires an extensive amount of money to implement (Livermore and Rippa, 2011), expert individuals (Wenrich and Ahmad, 2009), allocated to promoting output through the organization (Beatty and Williams, 2006), and it's take average 6 months to 2 years to implement (Aloini et al., 2007). In the study by Panorama (ERP Consultation Company) in (2014), during the four years of research, it cost 6.5 million dollars and 16.1 months in average. Across this step, approximately 50 percent of projects have implemented ERP by the planned budgets, near 28 percent of projects have implemented ERP on their planned time and finally 66 percent of organizations cached less than 50 percent of predetermined benefits of their ERP. Studies have addressed the problems associated with the failure of firms to set up organizational benefits by focusing on Critical Success Factors (CSFs) in equivalent with the technological operation of ERP (Al-Mashari et al., 2003; Nah et al., 2003; Satyan, 2003; Umble et al., 2003; Somers and Nelson, 2004). The issue, "what makes implementation of an ERP program successful?" clearly studied in the previous.

Most researches on ERP projects success factors primarily concentrate on the pre-implementation and the implementation stages (Kumar et al., 2003; Umble et al., 2003). Other researchers suggested success factors for all ERP life stages e.g. (Mabert et al., 2003; Nah et al., 2003; Zhang et al., 2005). The successful use of ERP in order to achieve benefits confused many organizations. The common trouble is that by complementing the implementation phase organizations do not gain the benefits from the ERP (Willis and Willis-Brown, 2002). Hence, the post-implementation stage is vital to the long-standing success of the ERP (Law et al., 2010; Wilson, 2012). Thus, it is important for managers to focus on the post-implementation phase, because when ERP is implemented, these systems are usually not replaced. Indeed, they are updated and maintained to support new business processes and to obtain efficiencies in the post-implementation phase (McGinnis and Huang, 2007). Therefore, a key research problem in this study is the Post-Implementation Success (PIS) of ERP in order to gain expected benefits. But, few researchers have studied this issue. Hence, requirement of study associated to post-implementation stage of the ERP is the major incentive for current study.

In other words, there are so many researches on (ERP), but in the post-implementation stage is not enough. More specifically, what is lacking is a technological theoretical

framework for identifying CSFs that improve the post-implementation success of ERP. Thus, in an attempt to close this gap this study applied TOE framework and investigated the technical factors i.e. ERP data accuracy, ERP implementation team, ERP implementation strategy and communication, that could assure the success of ERP in post-implementation phase in order to achieve predicted benefits of ERP.

The rest of this research structured in following parts. Part 1 propose introduction, part 2 introduces the theoretical support and proposes the literature related to the research conceptual model. Part 3 elaborates on literature review, the conceptual research model and develops the prepositions. Part 4 describes the validation methodology of the conceptual model. Part 5 explain the contribution of the study. Part 6 discusses the limitation and future research and part 7 concludes this paper.

2. Theoretical Supports

To support and observe the assortment of relation connecting critical factors and ERP post-implementation success, several theoretical foundations are used as following: Capability Maturity Model (CMM), contingency theory, Knowledge Based View (KBV) and Technological, Organizational and Environmental (TOE). In this part these definitions will shortly explain. In Table1 is shown each construct, supporting theory and literature.

2.1 Capability Maturity Model

The Capability Maturity Model (CMM) believes that level of development in information technology can be reached just after passing a series of previous phase levels (Randeree et al., 2012). Based on Paulk and Acha (1994) CMM are described as following six phases: Phase 0 is without IT planning or development. The initial phase (phase 1) is explained as the phase that success related to personal endeavour and a just some processes are established. The repeatable phase (phase 2) is described as the phase where determining the charge, list and functionality, which are the basic project management processes, is established. The defined phase (phase 3) is defined as the phase in which all the procedures and actions in all phases of organization process are standardized, documented, and included into a standard procedure. The managed phase (phase 4) has more exhaustive process, product value and organizational activities than defined phase, which is controlled and developed. Lastly, the optimizing phase (phase 5) is explained by nonstop development, improvement and empowered by receiving reaction and new technologies. This study claims that higher stage of capability maturity could promote ERP post-implementation success, i.e., a company at phase 5 running ERP is perceived to have better achievement than a firm at phase 4, 3. Previous researches support that higher capability maturity encourages communication of ERP planned to realize business objectives (Dezdar and Sulaiman, 2009; Basu and Lederer, 2011; Oliveira and

Martins, 2011a; Supramaniam and Kuppusamy, 2011; Upadhyay et al., 2011).

2.2 Contingency Theory

Contingency theory presented that a good organizational construction related to its overall surrounding environment (Chang et al., 2011). In other words, the environment, that could influence the organization should considered by managers (Chang et al., 2011). Related research proposes that the match between contingency sources and the business surroundings such as external and internal environment can improve the organizational performance (Weill and Olson, 1989). Furthermore, if the environment matched by ERP that already being implemented, this fit can enhance the probability that external and internal benefits will improve during implementation as well as after that (Elmeziane and Elmeziane, 2012). Accurate ERP data requires the company to consider a variety of factors. For instance users of ERP should obtain enough training as well as the capability to implement ERP easily. Moreover, ERP integrated all activities across the firm, while an in correct data entry has a consecutive effect throughout the entire firm leading to the conclusion that users are not eager to accept ERP. The processing of accurate data entry has to be accomplished during pre-implementation, implementation and post-implementation stage (Umble et al., 2003; White, 2008).

2.3 Knowledge Based View (KBV)

Knowledge Based View (KBV) proposes that to achieve competitive advantage, knowledge can be applied as a characteristic and single resource (Kearns and Sabherwal, 2007), while Resource Based View (RBV) concentrate on detailed worthy resources of a company. Therefore, KBV considers the company as a "dynamic, evolving, quasi-autonomous system of knowledge production" (Kearns and Sabherwal, 2007, p. 132). ERP implementation strategy in promoting the ERP post-implementation is very important for promoting ERP configuration and ERP PIS. Furthermore, sufficient organizational information, advantage of implementation team of ERP, as well as a more systematic implementation strategy can improve performance of ERP through post-implementation stage. Competent knowledge throughout the implementation team and well organized implementation strategy, as well as capable communication and data accuracy, will help to improve the success of ERP post-implementation.

2.4 Technological, Organizational and Environmental (TOE) Theory

The technological factor in TOE theory considers the importance of technological insight in both internal and external perspective also useful in promoting organizational output (Tornatzky et al., 1990). These technologies contain various phases of the information system (IS), from foundation capabilities to the compatibility related to the

organization. These technical characteristics will ease the foundation for the realization of benefits for the organization. Technological factors are introduced as a powerful predictor in the pre-implementation or post-implementation ERP (Chwelos et al., 2001; Zhu and Kraemer, 2005).

Organizational factors are the resources existing to support and maintain the acceptance and success of the system. These factor are include company managerial structure and size, as well as delicate characteristics of the organization i.e., organizational readiness to support the arrangement and a well atmosphere to use system such as ERP (Tornatzky et al., 1990; Chau and Tam, 1997). Organization have to prepare an optimistic circumstance

for the system to implement effectively, hence organizational activities are vital for the ERP to promote businesses.

Environmental factors involve that the organizations external environment could influence the post-implementation process of the system through the central organization. Because implementing ERP within the entire organization is a complex function, the operation process of ERP requires in-depth information the ERP implemented organization may not have i.e., knowledge. By the way, organizations are influenced by their related industries, its competitors, and the ability of the firms to obtain the resources that supplied by others.

Table 1
Constructs, supporting theory and literature.

Key	Construct	Theory	Supporting Literature
EDA	ERP Data Accuracy	Contingency theory, TOE theory	White (2008); Dezdar and Sulaiman (2009); Madapusi and Ortiz (2014)
EIT	ERP Implementation Team	knowledge base view, TOE theory	White (2008); Dezdar and Sulaiman (2009); Zhu et al. (2010); Basu and Lederer (2011); Dezdar and Ainin (2011a); Dezdar and Ainin (2011b); Oliveira and Martins (2011a); Supramaniam and Kuppusamy (2011); Upadhyay et al. (2011); Madapusi and Ortiz (2014)
EIS	ERP Implementation strategy	knowledge base view, TOE theory	White (2008); Dezdar and Sulaiman (2009); Zhu et al. (2010); Basu and Lederer (2011); Dezdar and Ainin (2011a); Dezdar and Ainin (2011b); Oliveira and Martins (2011a); Supramaniam and Kuppusamy (2011); Upadhyay et al. (2011); Madapusi and Ortiz (2014)
ECOM	ERP Communication	Capability maturity model, TOE theory	White (2008); Dezdar and Sulaiman (2009); Basu and Lederer (2011); Oliveira and Martins (2011b); Supramaniam and Kuppusamy (2011); Upadhyay et al. (2011); Madapusi and Ortiz (2014)

3. Literature Review

3.1 ERP post-implementation success

According to ERP life cycle theory, an ERP is deployed into an organization during a series of stage, pre-implementation, implementation, and post-implementation. The failure rate of ERP implementation has been reported as high as 70 percent (Iskanius, 2010), mainly caused by the firms failing to focus on Critical Success Factors (CSFs) in equivalent with the technological functioning of their ERP (Al-Mashari et al., 2003; Nah et al., 2003; Umble et al., 2003; Somers and Nelson, 2004).

Most studies evaluate ERP success by whether the ERP has been implemented within the scheduled time and/or budget, but do not consider that the final aim of using ERP is to create business value and enhance business performance. The successful deployment and use of ERP can have a double effect on the survival and performance of businesses (Markus et al., 2000). Hence, in order to enhance business performance and create business value implementation of the ERP projects should be considered as a continuous process (Hillman Willis and Hillary Willis-Brown, 2002; Esteves, 2009; Kouki et al., 2010). Therefore, the concentration of the ERP projects moves to the post-implementation stage (Markus et al., 2000). On the other hand, although not many studies focused on the long-standing outcome that take place in the post-implementation stage (Worrell, 2008), previous researches indicated that the system must be improved in the post-implementation phase in order to maximization of its worth

and finally making competitive advantage for the firms (Law et al., 2010; Wilson, 2012).

Previous studies indicate that when the ERP is implemented successfully, it does not means that the entire ERP program is implemented successfully because ERP includes three stage of implementation and if the post-implementation phase is not successful the entire implementation cannot be considered successful (Al-Mashari and Al-Mudimigh, 2003). As a pattern, implementation success evaluated by the ERP implementation budget and time schedule (Yusuf et al., 2004). Even so, the post-implementation success of ERP is explained by many criteria i.e., organizational performance and the investment rate of return (Sedera and Gable, 2004; Ifinedo et al., 2010). At the post-implementation phase, organizations mostly concentrate on the benefits extracted from the operation of ERP in order to obtain advantages from the operated ERP and to optimize Post-Implementation Success (PIS) of ERP (Al-Mashari et al., 2003; Zhu et al., 2010).

3.2 ERP Benefits in Post-Implementation Phase

In view of the importance of the post-implementation success of ERP with the intention of realize benefits, one of the main objectives of this study is to analyze the, ERP benefits of Shang and Seddon (2003) framework expressed in various literature concerning ERP implementation and post-implementation success between 2003 and 2013. It is not rational to study all the ERP benefits mentioned in the literature in a limited time and budget, only the most

significant ones for both researchers and practitioners will be incorporated. These benefits are multidimensional, some being tangible and others intangible. ERP benefits could be classified into operational, managerial, strategic, IT infrastructure and organizational (Shang and Seddon, 2003; Raymond et al., 2006) (see Table2). Operational benefits include daily actions that usually repeated regularly to generate and consuming resources. ERP mechanizes and unified legacy business processes in order to offer tangible benefits such as cost reduction, cycle time reduction, productivity improvement, quality improvement and improved customer service. ERP as an enterprise system prepares managerial benefits which are mostly intangible and consist of managerial functions including allocation and manage of the resources, supervisory of operations and maintain of strategic business decisions (Shang and

Seddon, 2003). Strategic activities are including planning in long-range and decisions in high-level such as business integration and achievement, product planning, marketing competition, customer retention and capital sourcing. IT infrastructure consists of information technology capitals that offer an underpinning infrastructure for business functions (Davenport and Linder, 1994).

Implementation of an ERP results in organizational focus, unity, knowledge and execution of its selected planes. Organizational benefits emerge in employees' growth of a mutual visualization about the future of the organization and promote communication linking individuals that promotes shared understanding. In addition, through the incorporated decision-making practice, agreement may be formed for following action.

Table 2
ERP benefits in post-implementation phase.

Reference	Implementation phase	Benefits used in the survey
Nejib (2013)	Post-implementation	Operational benefits (OP)
		Managerial benefits (MB)
Shao *et al.* (2012)	Post-implementation	Operational benefits (OP)
		Managerial benefits (MB)
Zhu *et al.* (2010)	Post-implementation	Operational benefits (OP)
		Managerial benefits (MB)
Kouki *et al.* (2010)	Post-implementation	Operational benefits (OP)
		Managerial benefits (MB)
Esteves (2009)	Post-implementation	Operational benefits (OP)
		Managerial benefits (MB)
		Information technology benefits (IT)
Kamhawi (2008)	Post-implementation	Operational benefits (OP)
		Managerial benefits (MB)
		Information technology benefits (IT)
Annamalai and Ramayah (2011)	Implementation	Operational benefits (OP)
		Managerial benefits (MB)
		Strategic benefits (SB)
		Information technology benefits (IT)
		Organizational benefits (OR)
Katerrattanakul*et al.* (2006)	Implementation	Operational benefits (OP)
		Managerial benefits (MB)
		Information technology benefits (IT)
Spathis and Ananiadis (2005)	Implementation	Operational benefits (OP)
		Managerial benefits (MB)
		Information technology benefits (IT)
Shang and Seddon (2002)	Implementation	Operational benefits (OP)
		Managerial benefits (MB)
		Strategic benefits (SB)
		Information technology benefits (IT)
		Organizational benefits (OR)

3.2.1 ERP Benefits in This Study

Based on the comparison presented in Table 2, operational and managerial benefits are generally more related to the post-implementation stage as confirmed by the literature (Kouki et al., 2010; Zhu et al., 2010; Shao et al., 2012; Nejib, 2013). Therefore, operational and managerial benefits are result of enhancement in activities that ERP can improve brings to the organization, and strategic, organizational and the IT infrastructures are not representative of the post-implementation success of ERP for the following reasons:

Strategic activities are involved continuing planning, advanced decisions and strategic competitive advantage

such as business growth and the business innovation that the company obtained over a period of time. This competitive advantage can be affected by other sources i.e., business strategy and market environment etc. Hence, it is more difficult to distinguish between strategic benefits of an ERP system, especially in post-implementation phase, from those of other sources. Furthermore, organizational benefits are result of the improvement in employees' image about outlook of the organization and better communication that improves understanding of employees by facilitating business learning, building common vision and empowerment. Hence, organizational benefits represent the ongoing gains of the organization over time, and therefore cannot refer only to organizational benefits of

the ERP especially in post-implementation phase. Construction of a good infrastructure is an essential managerial intention in every IT project to increase IT infrastructure capacity. In line with the objectives of this study, improvement of the IT infrastructure benefits is not filling up the aim of this study (Kouki et al., 2010; Zhu et al., 2010; Shao et al., 2012; Nejib, 2013).

3.3 ERP Critical Success Factors (CSFs)

There are evidence that indicate variety of CSFs exists and have significant role in success of ERP project in different phases, so recent literatures prioritized and classified these CSFs regard to the long range of implementation process in ERP life cycle (Kræmmergaard and Rose, 2002; Kumar et al., 2003; White, 2008). Ultimately this study is focused on critical factors in post-implementation stage in an effort to show how they can lead to prosperity in ERP post-implementation. Critical success factors are presented in Table 3.

Table 3
Critical success factors.

Ref	ERP Data Accuracy	ERP Implementation Team	ERP Implementation Strategy	ERP Communication
Parr and Shanks (2000)		√		
Nah et al. (2001)			√	
Somers and Nelson (2001)				√
Shanks et al. (2001)		√		
Somer and Nelson (2004)				√
Nah and Delgado (2006)				√
Madapusi (2008)	√	√	√	√
Kronbichler et al. (2009)		√		√
Zhu et al. (2010) Schniederjans and Yadav (2013)		√	√	
Shaul and Tauber (2013)	√	√	√	√
Madapusi and Ortiz (2014)	√	√		
Tarhini et al. (2015)	√	√	√	√
Sum	4	8	5	7

3.4 Developed Conceptual Framework and Propositions

The conceptual framework illustrated ERP Enablers that refer to the capabilities, forces, attributes and resources that contribute to ERP success in the post-implementation phase. As a result, subsequent propositions are suggested by this study for future research to investigate.

P1: ERP data accuracy has positive effect on ERP post-implementation success.

P2: ERP communication has positive effect on ERP post-implementation success.

P3: ERP implementation team has positive effect on ERP post-implementation success.

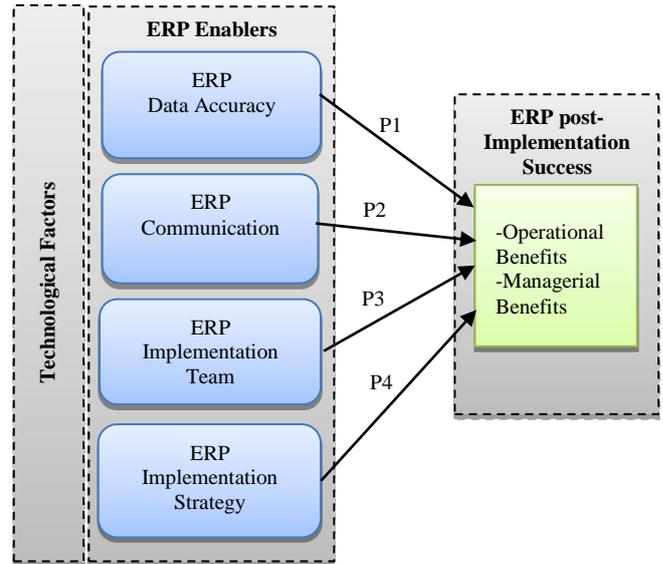P4: ERP implementation strategy has positive effect on ERP post-implementation success.

Fig. 1. Conceptual framework.

3.4.1 ERP Data Accuracy Influence PIS of ERP

ERP data accuracy explains the integration of data, which inter to the ERP and the output information gained from the ERP (Vosburg and Kumar, 2001; White, 2008; Madapusi and Ortiz, 2014; Tarhini et al., 2015). Due to the integrated character of the ERP, an inaccurate data entry has a consecutive effect throughout the entire company and results in reduced operator motivation or unwillingness to apply the ERP on a daily basis. The process of data accuracy should be taken in the pre-implementation stage of ERP implementation and extended throughout the ERP life cycle (Umble et al., 2003). Vosburg and Kumar (2001) and Xu et al. (2002) further propose that employees have an important and continuous role in the preservation and promotion of data integrity in the ERP. Workforces need to realize the perception of data integrity in a consistent approach within the organizations that use this data in a consequence (White, 2008; Madapusi and Ortiz, 2014; Tarhini et al., 2015). Based on the foregoing, this study offers the following proposition:

P1: ERP data accuracy has positive effect on ERP post-implementation success.

3.4.2 ERP Communication Influence PIS of ERP

Communication through the all levels of the organization and among all stages of the ERP life cycle is vital to assuring implementation success of ERP (White, 2008). The top management should communicate the benefits of ERP and assist in helping team members understand the vision of the ERP implementation, which should be handled by the change management team. The most important duty of ERP is to offer an integrate face of business functions and interdepartmental communication is the heart of the ERP implementation process (Akkermans

and van Helden, 2002). Tarhini et al. (2015) proposes that stable, open, two ways, and honest communication within all levels of stakeholders and throughout the ERP life cycle is crucial for ERP success.

Communication between departments is important from the early stages of the project and even after going live with the system. The goals and objectives of implementing the ERP software should be communicated early in the project to gain approval and user acceptance from the departments involved. An honest information strategy can result in better understanding of organizational needs and therefore faster approval and effective handling of the ERP. Teltumbde et al. (2002) highlight that CSFs i.e., top management support, planning, alignment and communication are vital in supporting successful ERP deployment and propose that effective usage of these CSFs would enable firms to control information from the ERP and rapidly obtain early benefits from it. Hence, the following proposition is formulated:

P2: ERP communication has positive effect on ERP post-implementation success.

3.4.3 Implementation Team Influence PIS of ERP

Implementation team refers to authorized individuals who present sufficient business and technical skills in ERP post-implementation success (Stratman and Roth, 2002; Kumar et al., 2003; White, 2008; Zhu et al., 2010; Madapusi and Ortiz, 2014). By not considering the project and user needs, insufficient attention to the IT and practical capital are the most common reasons for failure in ERP implementation (Gefen and Ridings, 2002). A powerful implementation team retains responsibility for making a complete list as well as the overall project policy, which further creates assurance that crucial resources are prepared when they are required (Tarafdar and Roy, 2003; White, 2008; Madapusi and Ortiz, 2014, Tarhini et al., 2015). This study proposes the following proposition based on the foregoing discussion:

P3: ERP implementation team has positive effect on ERP post-implementation success.

3.4.4 Implementation Strategy Influence PIS of ERP

ERP Implementation strategy is related to the ERP implement procedure throughout the firm (Mabert et al., 2001; Mabert et al., 2003). Teltumbde et al. (2002) offers that the method of implementation ERP is a key factor that could influence the success of the ERP. Implementation strategies include a phase by phase approach or one complete phase approach, where the firms' focus on fast activating their ERP program and move away from their legacy process deployments (Friedman and Johnson, 2000; Karakanian, 2000). If firms promote their implementation area, they would recognize that their ERP implementation strategies are impacted by various factors i.e., physical scope, technical scope, implementation procedure process, and resource distribution (Parr and Shanks, 2000; White,

2008; Madapusi and Ortiz, 2014; Tarhini et al., 2015). Therefore, this study intends to investigate the following:

P4: ERP implementation strategy has positive effect on ERP post-implementation success.

4. Validation Methodology of the Conceptual Model

This study has prepared a conceptual framework for both professionals and researchers to characterize the range of critical factors prepared by applying the TOE framework for ERP post-implementation stage. This study add value to the knowledge by preparing a theoretically supported conceptual model that presents a selection of critical factors, some of which have been empirically validated and as some which have not. Moreover, this research paper presented an overview into other presented CSFs in the literature that their relationship by ERP PIS not examined previously, including ERP data accuracy, ERP implementation team, ERP implementation strategy, as well as a two ways and honest ERP communication. The study presented to practitioners a framework that describes introduced CSFs and theoretically supported technological factors, which practitioners can apply as tools to promote and optimize ERP post-implementation success. On the other hand, this study only prepares the first step in presenting a framework for optimization ERP and does not examine their relationship in previous. In this study the proposed frame work is rationally validated by making discussion about characteristics of the framework with comparing them with other previous ERP post-implementation success framework. Table 1 provides further analysis of how this study theoretically supported the presented model and supporting model by literature. This study focuses on studies in the past 12 years which are more significant in ERP post-implementation success. Several papers from 2001 to 2013 were reviewed in Table2 by searching the key words "ERP post-implementation success", "ERP post-implementation benefits" and "ERP Critical Success Factors". The final research model provided in current study is depicted in Fig. 1.

5. Contribution of the Study

This research paper propose a new approach to TOE theory by highlights the important roles of some new technological antecedents of ERP post-implementation success. Therefore, this study introduced some new technological factors (i.e., ERP data accuracy, qualification of ERP implementation team, ERP implementation strategy and ERP communication) to shed new light to the body of knowledge about the role of technological factors in the effective implementation and maintaining of ERP in post implementation stage. In summary, this study makes several contributions to the ERP community. First, it contributes to the ERP researches by examining the effect of ERP enablers' critical factors on ERP post-implementation benefits. Second, it contributes to TOE theory by theoretically showing that ERP data accuracy, ERP implementation team, communication, and

implementation strategy are more powerful technical critical resources to improving ERP benefits. The findings of the study illustrate that firms can leverage CSFs to improve success of ERP in post-implementation stage in order to receive expected benefits. Furthermore, the outcomes demonstrate that different critical success factors may have different effects on ERP benefits; extending the common statement of TOE theory that resources bring competitive advantages. Third, this study contributes to the ERP studies by exhibiting additional evidence of the different effects of CSFs on ERP post-implementation success.

In addition, this research paper can guide the practitioner by propose applicable method in order to promote ERP post-implementation success and present what they need to care during and after their ERP implementation. Then it could motivate them in conduct their post-implementation efforts more effective. Likewise, practitioners whom experienced collapse in their ERP post-implementation activities and have struggle with post-implementation difficult situation can have a much better reaction to come out with its difficulty to speed up the value creation of the ERP and the achievement of its benefits.

6. Limitation and Future Research Directions

The conceptual framework which is presented in this study has not been empirically examined. Whereas some CSF models for ERP post-implementation success introduced ERP data accuracy, ERP communication, ERP implementation team and ERP implementation strategy, a comprehensive component of project success in post-implementation stage has not been presented previously, so further studies must be established to examine this relationship empirically. Further limitation of the study is that the behavioral perspective in ERP post-implementation and how they can promote success have not been assessed yet. Future studies may focus on preparing how different kinds of behavior i.e., personal or group, more precisely in the ERP area, could affect success at different levels and stages. In addition, while there are some researches that observe the force of CSF's on ERP implementation and post-implementation success, there are still need to investigate the impact of CSF's on other CSF's. Study by Sternad et al. (2011) evaluate the impact of external factors on ERP usage, and investigate the effect of communication and training on overall ERP benefits. In another study Shao et al. (2012) investigated the mediating impact of organizational culture and knowledge sharing between leadership and ERP post-implementation success. Given the lack of research on CSFs i.e., ERP data accuracy, ERP communication, ERP implementation team and ERP implementation strategy and their impact on ERP post-implementation success, this research paper proposed that future works could not only focus to examine the impact of presented four critical factors on ERP post-implementation success empirically, and must go further and explore what are the antecedent of these factors, and what can impact on those CSFs? Additionally, are there any mediator or moderator factors that can impact on strength or weakness of this relation? While many questions left unanswered, the researcher of this study wish that future researchers fit in these recommendations to contribute improvement in knowledge in the area of ERP post-implementation.

7. Conclusion

It can conclude that previous studies criticized and synthesized a long record of CSFs in ERP implementation and post-implementation without any approach about that how they can serve in making dimensional relationship between CSFs and post-implementation. This research paper believes that further studies need to complete to promote perception of ERP post-implementation by preparing an exhaustive review that investigate more ERP post-implementation success. The study hopes to provide an applicable theoretical base framework of technological critical factors for ERP post-implementation supported by TOE framework. The key importance of the data accuracy and two ways and honest communication in the ERP were the most important approach that this study help to fill up it. Needless to say that, new investigation should expand the perspective and insight of these four CSFs introduced in this study during and after ERP implementation. The study hopes that the presented model can help to optimizing ERP post-implementation benefits, in implementation and after the implementation phase. In addition, it is hoped that future studies open new room to examine the impact of some antecedent variable on ERP post-implementation success. In particular, scholars can develop this piece-meal framework to contribute and integrate into their own models of ERP post-implementation success to prepare more comprehensive model on ERP PIS. Finally, the authors of this research paper warmly encourage other authors to do further empirical investigations by applying the dimensions and model of this study in further researches in the future.

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