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Justifying enterprise resource planning (ERP) investment: A case study using technology, organization, and environment (TOE) framework

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Abstract

The aim of this study is to analyze the implementation of Enterprise Resource Planning (ERP) in the context of Technology, Organization and Environment (TOE). This current research uses case study approach in a company in Yogyakarta. Researchers used qualitative method by involving 31 informants in semi-structured interviews. The informants were management of a company in various level of positions. They are relevant key persons in the implementation of ERP systems, and the users of the ERP systems. Data analysis techniques included data collection, coding and reduction of data, and discussion and summarizing, were implemented. To examine validation of research data, this research used source triangulation. Results of the study show that there were challenges or obstacles and benefits of ERP systems implementation related to technology, organization and environment. The results are further discussed in this paper, including the implications for companies and literature. This research contributes by providing empirical evidence and examining TOE approach in the same time in the context of ERP implementation.

Introduction

Technological development brings changes on methods of carrying out tasks in the scope of accountancy and transaction related to quality accountancy through electronic media (Güney, 2014). The growth and fast development on information technology has digitally revolutionized economy, social and culture. Accounting information system is the system used by a company to measure the financial performance by noting and classifying all transactions such as sale, purchase, assets and liabilities in a manner that obey the certain format of standard. This is to help evaluating a company performance in the past, at the present and its prospect in the future (Ghasemi et al., 2011).

Enterprise Resource Planning (ERP) is an information system enabling a company to automate and integrate various process of its own core business (Hall, 2016). ERP system integrates all data from various lines of organizations or companies, which eases management to check performance as a whole in a company organization prior to decision making. ERP is a system covering software products supporting everyday business needs and supporting a decision making. Serving a company to meet its needs ERP is functionally integrated into some models, chain supply management, supply management, production and manufacture schedule, sales support, finance and cost accountancy, human resources management, and all data of a business process.

Applying ERP system can lead to lessening cost, decreasing operational time, and building a lean or slimmer organization. Every company needs to increase its performance in each period as the increase can best describe the achievement in managing the company's assets. The improved performance depends on the flow of a business. The accomplishment of ERP implementation project has a tremendous role on business case, therefore, the initial step is collecting agreement from decision makers in an organization. Many researches proves that implementing ERP gives significant benefits, for instance Alaskari et al. (2021) and Madanhire and Mbohwa (2016) posit that ERP can lead to efficiency. It is also believed that ERP strengthens the control system of company management (Kallunki et al., 2011).

On the other hand, according to Nafeeseh and Al-Mudimigh (2011) a traditional business case cannot have intended results as ERP has a specific feature when implemented. Rodríguez et al. (2020) conclude that ERP is one complicated system and should have organization's readiness. Teittinen et al. (2013) when researching UMKM/ Small Scale Enterprises found that the challenge in implementing ERP was the lack of skillful human resources who can do the ERP data entry thus limiting the opportunity to use management information system. The dependence on a key employee is also another issue as the employee using ERP is the control of management control (Osnes et al., 2018).

Based on aforementioned background, this research used case study approach at PT BPB[1]. PT. BPB is a state-owned business enterprise (BUMN) managing tourism. A case study is a suitable method as it can dig deeper and generate practical contribution. This research aims at investigating challenges or hindrances and benefits of implementing ERP system at PT BPB. To investigate those matters, this research uses the frame of Technology, Organization, and Environment (TOE). Therefore, it will be significant and able to contribute more knowledge as it use this approach which is not often used in any research on ERP implementation in an organization.

Literature Review

TOE framework is the model of technology adoption on the level of company examining three big influences on the potential of technology adoption, organization, and environment. The TOE framework has been used to explain the adoption of big data on business (Baig et al., 2019), smart contract and blockchain (Barnes III & Xiao, 2019; Schmitt et al., 2019), green innovation (Zhang et al., 2020). In every study, the three elements of technology, organization, and environment have proven to affect the way organization identifies the needs to seek and adopt new technology.

TOE framework integrates technological, organizational and environmental factors. In terms of design, TOE framework refers to technology adoption in an organizational perspective, not in individual one. Organizational factors are included into TOE not for individual level, while individual factors need to consider for technological adoption in individual level (Schmitt et al., 2019). TOE framework identifies three contextual aspects affecting the process of a company when adopting and implementing technology innovation organizational context, and environmental context (Tornatzky & Fleischer, 1990).

TOE model identifies three important aspects of organization affecting the process of adoption and technology implementation (Tornatzky & Fleischer, 1990), namely technological, organizational and environmental contexts as illustrated in Figure 1. TOE framework according to Oliveira & Martins (2011) creates a research model that has strong theoretical basis which can be used for various researches on adoption of innovation.

Organizational context refers to characters of organization both of its size and business coverage. Organization also refers to resources and other characteristic of organization such as size, structure, managerial structure, human resources, and employee's skills (Kuan & Chau, 2001).

[1] PT. BPB is not an abbreviation of the research object. Researchers used anonymous case study. In order to maintain anonymity in the current research, name of PT PBP is used.

Organizational context also refers to a manager or owner and to characteristics of a company (Chandra & Kumar, 2018). The available resources in an organization in favor of supporting adaptation of innovation relates to either the characteristics of supporting or hampering the adoption and implementation of innovation (Oliveira & Martins, 2011).

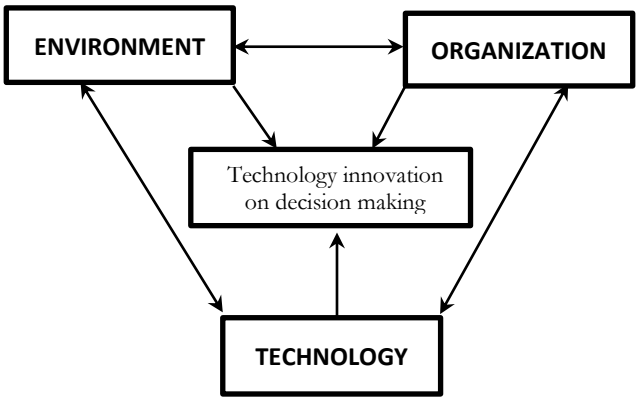

Figure 1. Technology-Organisation-Environment Framework
Source (Tornatzky & Fleischer, 1990)

Environmental context is the area where a company runs its business such as business, competitors, and government (Oliveira & Martins, 2011). Environmental context also relates to industry, competitive regulations, and regulation issues (Jia et al., 2017). Included to this concept of environment is the place where a company manages its business, including an industry where it operates, competitor and government (Cao et al., 2014). In a more competitive environment, an organization tends to innovate by choosing more to adopt to a new innovation as a result (Baig et al., 2019). A competitive pressure refers to any pressure that a company receives from any competitor in an industry (Chandra & Kumar, 2018).

According to Ghasemi et al. (2011) technology is used to manage data, including processing, collecting, organizing, storing, and manipulating data in any ways that generates qualified information, in that the information which is relevant, accurate, and on time which later will be used for personal, business and government for decision making. Güney (2014) found the benefits of technology for a company or for any individual as the user of the technology.

ERP is basically the acronym of the three elements of words which are Enterprise (organization), Resources, Planning. Those three words eventually are encapsulated into one verb, planning that is an action to plan, thus ERP emphasizes the aspect of planning and managing the company's resources in the form of integrated and multi module application designed to support various functions in a company. Enterprise Resource Planning (ERP) according to Hall (2016) is a model of information system enabling an organization to automate and integrate its core business.

ERP system is a package of a module software which has undergone an evolution from Manufacturing Resources Planning-MRP II. A manufacture mostly has traditional basis of closed data base which contains different data base, separated, and also independent. Therefore, lack of effective communication among various systems mostly is the result of a separated system design process (Hall, 2016). ERP supports the good and accountable flow of information by bridging the communication between supplier and consumers (Chofreh et al., 2018, 2020).

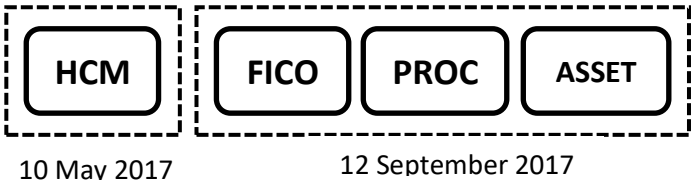

Figure 2. ERP Implementation Process in PT BPB

The stages of ERP system implementation at PT BPB were started from planning prior to implementation stage. ERP planning process at PT BPB was executed in the mid of 2017 commenced by integrated payment system which in the next quarter of the same year was continued by financial module FICO (*Financial and Controlling*), and *Procurement and Asset*. The planning stage of ERP is illustrated on picture 2.

Implementation stage was started from the module of *Human Capital* (HC). The payment for employees had been conducted since June 2018 for all working units of PT BPB. Organizational context refers to characteristics of organization for both size and business coverage. Meanwhile, organization relates to resources and other characteristic of a company such as size, organizational and managerial structure, human resource and employment's skills (Kuan & Chau, 2001). Organizational context refers to the owner or manager and organizational characteristics (Chandra & Kumar, 2018). The available resources in an organization refers to organizational characteristics that can facilitate and hamper adoption and implementation of innovation (Oliveira & Martins, 2011).

Implementation stage was started from module of Human Capital (HC). The payment had successfully done by June 2018 for all units of PT BPB. The pay slip documents had been digitalized (email, employment website). Next implementation was finance module (FICO). The ERP implementation on finance of PT BPB was started on September 7, 2018, comprising of Account Payable process, Account Receivable process; cash-in and cash-out proposal; financial report; asset and enterprise management. The last module implemented was the module of Assets and Inventory, from material request, procurement management, and finance management.

Research Methods

This research used qualitative approach by collecting data from informants and did not need calculation analysis. The method used was explorative case study. A case study is a deep analysis and contextual toward a case alike in an organization where characters and definition of a problem are likely similar to what happens at the present (Saunders et al., 2009). A case study is believed to be able to answer the research questions in a deeply manner (Benbasat et al., 1987). A research strategy will be assistant to reach goals of the research and able to answer the research questions of the study. Therefore, choosing a certain strategy of a research will depend on the purpose of the research and on types of research questions, besides it will also consider individual views on what make good research, in additiion to practical aspect such as data access, source and time limit (Creswell, 2014).

A qualitative researcher should directly interact with his informant, getting to know the informant's world, observing, and joining the life flow of the informant (Saunders et al., 2009). This is important to do as the researcher would study the object of study in depth and objective without taking an account on calculation, in other words the information from the sources is vital. This research was aimed to reveal data and information on challenges and benefits of ERP system as much as possible by using TOE approach at PT BPB. Although the implementation of ERP systems at PT BPB was completed in 2018, the benefits and challenges might be not experienced by the company immediately. The users as well as the organization needed to adjust to the new systems. The benefits and challenges then would be experienced afterwards. Hence, this research is conducted 3-4 years after the completion of systems implementation.

Table 1. List of informants

No.	Title	Total
1	Director	2 people
2.	Senior Manager	4 people
3.	Manager	8 people
4.	Assistant Manager	6 people
5.	Staff	11 people

Total	31 people

The data here is primary and secondary data. The informants were board of directors, senior manager, manager, assistant manager and staff as the direct users of ERP system. Table 1 shows the detail of informants.

Primary data was collected from interview, observation and documentation. In this research, the interview was conducted by using semi structured method with the director, senior manager, manager and ERP users as the informants. Sekaran and Bougie (2016) note that interview is one method to collect data, whether it is non structured or structured which can be administered by facing the informant, using telephone, or computer. Observation in this research is conducted by seeing and observing directly the object of a research which was user's activities when doing his assignment and daily tasks using ERP system.

Analyzing qualitative data will undergo three major steps which are data reduction, data presentation, and conclusion (Creswell, 2014). Data reduction includes summarizing data, coding, tracking themes and cataloging. Data presentation combines accessible information so that it is easy to trace back to evaluate whether the conclusion is correct or the other way around and whether or not a reanalysis should be done. The attempt to make a conclusion is conducted continuously in the field. The data collection method and technique of data analysis is as follows (figure 3).

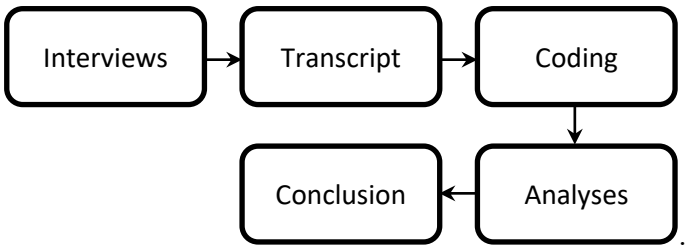

Figure 3. Research Stages

The collected data will be analyzed and tested to check the validity by using triangulation. Triangulation is the technique to check the validity of data using information from different sources as the comparison of the data themselves (Sekaran & Bougie, 2016). In principle, triangulation is the method of data checking to ensure that the research has successfully described the phenomenon of the research object. This research used source triangulation.

Results and Discussion

Challenges: Technological Aspects

The interview revealed that almost all informants need adjustment when implementing ERP application at PT BPB. The statement from informant number 3 describes it:

> *"… while ERP is originally from manufacture, we are from service company. It requires some adjustments regarding the software and computers as computer network is essential …"*

The opinion is supported by another informant who is a senior manager:

> *"…other problem related to ERP in terms of technology is that we don't have compatible hardware when ERP software surely needs speedy data process and reliable hardware…" (Informant 4)*

ERP makes a systematic document input which is previously administered manually. When using ERP, in terms of technology, the provision of internet and software matched with the line of business is the real challenge. To support the reliable software, network and hardware, investment on technology is needed in great numbers. This is mostly the challenge that a company meets especially by the small-scale enterprises (Teittinen et al., 2013). The type of challenge told by the

informants support the research by Babaei et al. (2015) which also found that the ERP system was too complicated compared to its customers' need and had limited customized software of ERP itself.

Challenges: Organizational Aspects

The most apparent challenge, in terms of organizational aspect is the difficulty on changing company's culture from manual and paper-based culture to technology-based system and paperless. Babaei et al. (2015) state that the process on organizational change is challenging as it requires a commitment of all staff to change their work style. Another challenge is the lack of competency and human resources readiness to adapt with new system. This is in line with the research by (Cao et al., 2014; Kuan & Chau, 2001).

> *"…as this system can only work with the support of all parties, then everybody needs to commit, from top management to user …"* (Informant 10)

The answer of informant 10 means that commitment of all components of an organization is needed. Osnes et al. (2018) in their research conclude that leadership style affects the duration of ERP implementation. Commitment and leadership are also of important in the context of information system, as the implementation is the momentum of changes in organizations (Thite, 2000).

> *"…….. in terms of organization, the problem is mostly bureaucratic not to mention the complicated billing process, thus (to implement this) needs more time …"* (Informant 26)

The most obvious challenge in the implementation of information system is the lack of human resources' readiness. This regards to the skill readiness to operate new system and readiness for business process change (Cao et al., 2014; Pacheco-Comer & González-Castolo, 2012). Osnes et al. (2018) also state that ERP system is complex and not easy to learn. The implementation requires comprehensive trainings.

> *"…mostly the problem is on the human resources in that we don't have many who are ready and understand the procedure. The procedure has not implemented well thus it complicates the system…"* (Informant 13)

Challenges: Environmental Aspects

The interviews with informants asking about hindrance or challenge on ERP implementation system regarding environmental aspect found that vendors had inadequate understanding on new technology.

> *"…regarding the environmental aspect, it is more about our vendors. Small vendors need more information on technology and new culture. ERP implementation needs to be more disseminated and at the same time also needs more changes among the vendors"* (Informant 3)

The ERP system at PT BPB was implemented more for operational (*back office*) than for customers or other stakeholders, therefore, the impact of this implementation was experienced mostly by the vendors as they dealt with the change on business process of the company.

Benefits: Technological Aspects

The interview with some informants regarding the benefits of ERP implementation system at PT. BPB viewed from technological aspect is as follows (Informant 4):

> *"…for me there are three benefits of ERP; first, financial data integration that is to integrate financial data which enables top management observing and controlling the company financial performance in a better way. Second, standardization on operational process by implementing the best practice which increases productivity. Third, standardization on data and information. …"*

As ERP system has been implemented, data is managed integrally which generates benefits for top management in controlling the company. This is in line with the research by Kallunki et al. (2011), finding that ERP system supports controlling management system.

Benefits: Organizational Aspects

Madanhire and Mbohwa (2016) state that ERP implementation system will bring efficiency for an organization thus avoiding duplication and wasting resources. From the interview with informants, it was found that ERP system implementation at PT BPB benefited the organization.

> *"…in terms of organization, as this company is centralized, making the organization lean probably is unavoidable. Some departments may be eliminated……"* (Informant 5)
>
> *"…in terms of organization to collect data we can do it in real time and be more transparent …"* (Informant 14)

With ERP system, organization is required to plan better. Generally, ERP system facilitates operational and coordination among departments in a company. However, it is considered effective if it generates benefits in the context of planning and management control (Kallunki et al., 2011).

> *"…as the nature of ERP is about planning, then everything needs to be planned and not impromptu. Planning is the real thing we need to learn …."* (Informant 10)

Benefits: Environmental Aspects

ERP system implementation encourages a company to change which in turn will be in a better level of position than its competitors. An accomplished change will turn the company as a benchmark for other companies.

> *"… (the implementation) benefits the company as it pushes us to be more creative and innovative, especially in terms of production. The company level surely is elevated for PT BPB at this present can expand and sell system to other company …"* (Informant 1)

ERP assists management of information and communication for both a company and stakeholders. Nafeeseh and Al-Mudimigh (2011) posit that ERP does not only have tangible but also intangible benefits. The tangible benefit can be accounted from the operational efficiency and profit adding. Meanwhile, the intangible benefit is from the better condition of company culture and its image.

> *"…vendors can see our transparency, openness and trust and most importantly we accept cashless payment as well …"* (Informant 4)

As what informant 4 has said, the more open information for stakeholders' boosts trusts and promotes a long-term relation with stake holders.

Conclusion

Most of the time, an investment in information systems worth billion rupiah including investment in ERP. A big investment never guarantees its success, even Eckartz et al. (2009) believes that 70% project of ERP implementation does not receive profits as targeted. ERP implementation faces many challenges. In the case of PT BPB, the challenges were the provision of hardware, reliable network, and software (customization complexity). Another challenge was the commitment from all components of the company as the implementation should have been followed by organization change, in addition to this was the unpreparedness of human resources. The fact that vendor should anticipate the change in business process was another issue of challenge.

Though PT BPB had complicated challenges, the benefits were not a few. ERP system enabled the company to more powerfully integrate data and information. This integrated

information supported the management to make a decision faster. Other benefit was the change of organization toward efficiency and better management control. The change led to a better position of organization among industrial realms and to be a better competitor. Hence, the implementation of ERP systems at PT BPB is justified for the better future of the company.

This research has some limitations; it was based on only experience of one company. The challenges and benefits experienced by other companies may be different. Besides, it used qualitative method with semi-structured interview. Therefore, it is necessary that future research use quantitative study using more samples so that the results can be generalized. This research used TOE approach meaning that the challenges and benefits were only from the context of technology, organization, and environment. Next research should use different approach to reveal different point of view.

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