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an Agile implementation model for ERP

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Abstract – **The growing impact of industrial dynamics will be a challenge to increase productivity. Productivity is a demand for improving organizational performance. ERP systems are a way to increase productivity. Therefore, ERP implementation is important to ensure that ERP runs well. Critical factors in ERP implementation must get serious attention to project management. Even so, the reality of ERP implementation is slowly, even tends to experience failure, resulting in highly expensive. The previous research that carried out ERP implementation showed that the failure reached 40%, and the achievement of the benefits of ERP implementation in Indonesia is still not optimal. It can be said that ERP implementation is a complexity project. For this reason, it is necessary to consider other implementation methods that can overcome the problem in implementing ERP. An agile method is a proactive and reactive alternative to handle the problem in implementing of ERP. The development of an agile ERP model is one way to achieve success in ERP implementation. This research methodology is a survey approach to the study of literature. This research will propose an agile ERP model which will be used as an effective guide for achieving the success of ERP implementation.**

Keywords– *agile method, agile ERP model, ERP implementation*

I. INTRODUCTION

The rapid technological developments will lead to changes in device methodology from the waterfall model to incremental and iterative models. This incremental and iterative model will make it possible to develop agile frameworks, project team structures, share tasks and responsibilities, develop active communication and training implementation plan according to user needs, develop effective feedback processes in each iteration related to focusing on system integration and do iterations in stages to test system integration. The software methodology is one tool that can be used to develop system. The software methodology has undergone developments and has difficulty dealing with possible changes.

Many company have failure in ERP implementation. The results of a survey of 117 industries that the rate of failed in implementing an ERP system reached 40%. The main critical failure factors in implementing of ERP is project management issues [4, 12, and 21]. Thus, it can be said that enhance the success of implementing of ERP is managing project management. In the 1990s a new methodology was introduced which was known as an agile method. The word of agile means something is fast, light, free to move and alert. The agile method is a method that prioritizes flexibility in changes of business processes that occur in the process of developing a system. Besides that, the agile model is one approach that needs to be considered to reduce gaps and failures in implementing ERP. The agile practice will end at each iteration with a demonstration of software that is functioning optimally. The agile ERP implementation makes it possible to use iterations to show that configuration without customization will truly help business processes and work flow to be more efficient in order for improving organizational performance. According to previous research, shows that the agile method is one approach for improving the quality and reducing the failure factors of ERP implementation. Thus, the authors conducted a survey recent literature on the subject relate to the agile implementation model for ERP.

The purpose of this research addresses to the find gaps and the solution in reducing failure risk in ERP implementation, the authors suggest that this assessment provide detailed answers to the questions:

a. What is the agile implementation model suitable for ERP use?

b. What kind of agile ERP model is suitable for implementation in the industry?

II. LITERATURE SEARCH

A. The agile method

One of the biggest critical failure factors in ERP implementation is poor project management effectiveness. For this reason, other methods need to be considered to improve the quality of ERP implementation for the industry [20]. Organizations find it difficult to implement ERP to meet business needs, because most organizations still use traditional implementation models. For this reason to consider the agile model in implementation. The comparison of the results of applying traditional and agile models in ERP implementation for the industry, showing that agile models can be considered for reducing the failure of ERP implementation can be shown in the following table: [16]

TABLE I. COMPARISON OF THE SUCCES RATES OF ERP IMPLEMENTATION
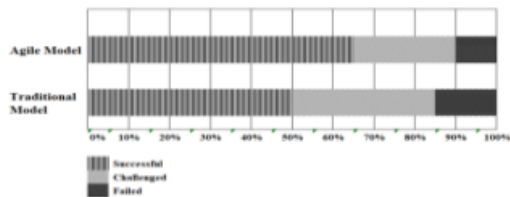
The development of an agile method is a follow-up of the traditional method that causes the system development process not to meet business requirement. The agile concept in software development was coined by Kent Beck along with 16 colleagues "agile manifesto" which agile software development is a way to building software to get involved in building software. The agile method is one of several methods used in system development that requires rapid flexible of the changes. Besides that, the interaction and personnel activities are the key factors. The function of application is more important than complete documentation. The communication with people and responsiveness to change are the critical factors than following a plan [7].

B. Principle of the agile method

The agile method principle is to satisfy customers and business processes reengineering that aim to provide the role of the application to work optimally. The principle of the agile method also consists of process, people, product, and practice factors, which focus on meeting business needs, sending in a timely manner, collaborating information, communicating and interacting intensively and clearly, as well as carrying out a strict supervision process in an effort to improve organizational performance [15, and 5]. The principle of the agile method will build from an iteration to iteration and new features that can be added to the next iteration. It aims to harmonize changes in business processes and increase and add value to a system development

project. The principle of the agile method can be shown in the following table:

TABLE II. THE PRINCIPLES OF THE AGILE APPROACH

The principle of the agile method will make change a process in the development of information systems. The agile principle is used as an approach to developing a responsive and dynamic system of change so that it is possible to work proactively to manage changes in business processes and work more intelligently in order to improve the effectiveness and productivity. The agile methods issues are responsive for achieving information system project success [23].

C. Differential between the agile model and not agile model

To understand of the concept of agile model and not agile model, so it is necessary to give attention to dimensions such as approach to methodology, measurement of success, project size, management style, ability to adapt to change, documentation required [17].

TABLE III. DIFFERENCE OF THE AGILE MODEL AND NOT AGILE

D. Project Management and ERP

ERP implementation success depends on solving problems in the project management process [4]. This is a challenge in ERP implementation which is to reengineer by identifying the critical factors in the project management. The challenge in implementing ERP is managing project management effectively and efficiently [1]. The building project management in ERP implementation is important, namely implementing business process management concepts that support project management activities as a business strategy to overcome complexity in ERP implementation and achieve the organizational performance. The system development approach in the agile method is different from the traditional approach. The development of agile methods emphasizes business processes that are simple and adapt dynamically [14]. However, in many cases, the ERP systems cannot provide an overall solution for carrying out business processes of the organization. This is causes the gaps need to further analyze to improve synchronizing with the

current business processes, allowing the organization's need to customization of business processes from existing ERP systems [1]. To carry out the customization process, it is necessary to approach the project management method in managing adaptive customization that fits the business requirement. The project management aims to meet the business processes as need requirement of the business. It is to make the complexity of ERP implementation. The agile project management for ERP is the project management used in ERP implementation that can provide the ability to adapt and support changes of business processes and follow technological trends [21]. The main challenges of ERP systems are change management and the driver factors to change management are people, business process and technology. [24].

E. Comparison of the previous research

The contextual factors, such as industry type, structure and organizational size will determine the enhancing success of ERP results. So, to achieve the organizational performance, needed the mapping process between the factors contextual of business and implementation processes. The implementation process that needs attention are factors such as actor, structure, technology, data and task [10].
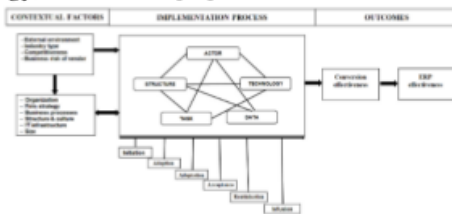
Fig. 1. Contextual framework ERP implementation

In an effort to enhance the organizational performance, so it must ensure users have used ERP systems intensively in supporting organizational activities. Ensuring ERP use is determined by 9 important factors which are grouped into 3 dimensions that are organization, process and technology. The factors from organizational dimensions are top management support, clear vision & planning, and communications. The factors of the process dimension are change management, effective project, team work and composition, training. The factors of technology dimension are data quality and integrity, IT infrastructure [17].
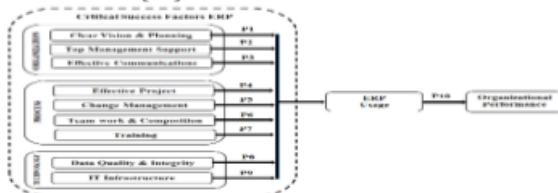
Fig. 2. Conceptual model of ERP systems usage

To achieve success in ERP implementation that it will be evidenced by factors such as user satisfaction, individual impact,

organizational impact, intended business and performance improvement. The success of ERP implementation are determined by dimensions such as organizational, user, system, ERP vendor. The factors of the organizational are top management support, company-wide support, business process reengineering, effective project management and organizational culture. The factors of user are education and training, user involvement, user characteristics. The factors of system are ERP software suitability, information quality, system quality. The factors of ERP vendor are ERP vendor quality [25].

Fig. 3. ERP implementation success model

To achieve the success in developing agile software projects is influenced by factors such as quality, scope, time, and cost. The development of agile software projects are determined dimensions such as organizational, people, process, technical, and project. The factors of organizational are management commitment, organizational and team. The factors of people are team capability, customer involvement. The factors of process are project management process, project definition process. The factors of technical are agile software techniques, delivery strategy. The factors of project are project nature, project type, project schedule [3].
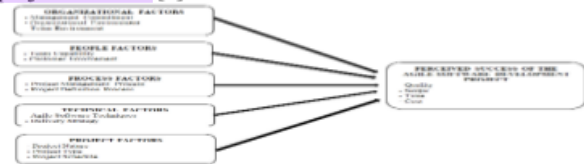
Fig. 4. Agile Software Development Project Success Model

The quality implementation of the agile method are determined by dimensions such as meeting, testing, evaluation, best practice. The factors of the meeting dimensions are daily stand-up meetings, sprint review meetings, sprint retrospective meetings. The factors of testing dimension are unit testing, automated testing. The factors of evaluation dimensions are internal/external reviews, quality standard checklist. The factors of best practice dimension are pair programming, continuous integration, dedicated product owner, proxy customer, same room for same teams [2].

Fig. 5. Agile methods for ERP implementation quality

The acceptance from users of the agile method is influenced by the dimensions of management, people, process and

technology. The factors from the dimensions of management are organization culture, management style, organizational form, management of system development and reward systems. The factors of the dimensions of people are effective work in a team. The factors of process dimension are responsive to change and people focus approach, The factors of process dimension technology are appropriateness of existing technology, tools and new skill sets refactoring configuration management [18].
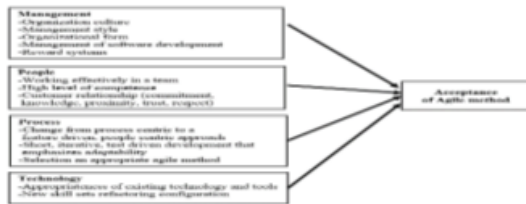

Fig. 6.   Key issue in migration to agile method

The achieving success of ERP implementation requires managing good project management, where organizations must have effective and efficient business strategies and tactics [11]. The main stages of the project management life cycle depend on the active involvement of all parties involved, which includes stages of definition, planning, executive and delivery. In all of these stages, the involvement of managerial levels will actively determine the ERP implementation process run well according to predetermined targets. Even so, many organizations have experience ERP implementation failures, which are caused by several factors, such as lack of focus on changes in business processes and change management. The change management is one of the important factors in achieving successful ERP implementation. Business process reengineering has a close relationship with ERP implementation, where changes in reengineer must be done iteratively and in harmony with the business strategy. ERP system project management is a significant challenge for success in ERP implementation. For this reason, ERP systems must meet business needs with the involvement of related parties. Therefore it becomes important to choose the best people who are members of the ERP implementation project team, ERP vendors, and consultant teams. The ERP implementation project team will be responsible for communicating actively between departments, making detailed project plans, determining project schedules, and completing target project in a timely manner. The ERP implementation project management cycle can be shown in the following figure:
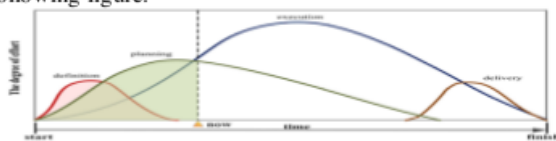

Fig. 7.   Cycle project management of ERP implementation

The implementing of ERP process is similar to business process reengineering. ERP systems aim to improve organizational performance and designed to integrate all information processes through the application of business processes and identifying operations that are relevant to the relevant departments [11].

III. RESEARCH METHOD

A. Research method

The research methodology used approach model based on the literature review. The research methodology is a survey approach to study of literature. This research will propose an agile ERP model which will be used as a prototyping tool in ERP implementation in industry for minimize the risk of the failure.

B. Agile implementation model

The agile method approach will be classified in dimensions such as strategies, technologies, systems and people [9]. The factors of strategies dimensions are virtual enterprise, supply chain, concurrent engineering. The factors of technological dimensions are hardware tools and equipment's, information technologies. The factors of system dimensions are design systems, production planning and control systems, system integration and database management. The factors of people dimensions are knowledge workers, top management support and employee empowerment, training and education. The agile classification approach can be shown as follows:

TABLE IV.   THE CLASSIFICATION OF AGILE APPROACH

Classification	Sub-classification
Strategies	Virtual enterprise
	Supply chain
	Concurrent engineering
Technologies	Hardware-tools and equipments
	Information technologies
Systems	Design systems
	Production planning and control systems
	System integration & database management
People	Knowledge workers
	Top management support & employee empowerment
	Training & education

The project management in ERP implementation can provide adaptability to support technological changes and trends. The agile method practice for ERP implementation can provide such as increase participation that has an interest; add business value incrementally and iteratively; maximum asset returns using a decision-making process. The agile method has an underlying value in managing project management which includes the following activities [1]:

- Communication is an important social activity in the project management.
- Simplicity is defining the determinants of project success by choosing a simple solution.
- Feedback is perform a feedback process to provide a solution to the problems faced.
- Courage of decision making in the management of changes to artifacts that have a contribution and added value to the organization.
- Humility is the project manager must involve parties who are interested in making decisions.

The stages of agile implementation consist of the baseline and sprint realization stages, which allow them to be able to

supervise each stage [4] The components of the agile implementation approach can be seen in the following table:

TABLE V.   AGILE IMPLEMENTATION APPROACH

Phase	Component	Descriptions
Baseline	Project preparation	Responsibilities, documentation standards & hardware requirements are discussed
	Envision	All operating processes & process dependant conditions such as master data, conversions, security, authorizations, & interfaces are identified
	Function baseline system	Based on standard ERP software
	Evaluation phase	The business value determines priority of the additional requirements & functionalities the called Delta
Sprint realization	Sprint planning	The target for the sprint is defined the process owner & the implementation team
	Delta realization	Implementation team realizes the delta requirements & includes testing & documentation
	Daily status	The progress of project is recorded & any obstacles the team encounter are discussed
	Sprint demo session	The users & IT can immediately determine whether the processes developed meet the set requirements
	Sprint review	The held to see what can be improved in the following sprint

IV. DISCUSSION AND RESULT

A. What is the agile implementation model suitable for ERP use?

The build information success, needed attention to the relationship and relevance of the factors, such as structure, task, technology and people [13].
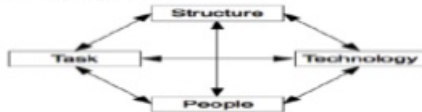

Fig. 8.   The organizational interaction diamond model

The building an agile implementation model, therefore need consider that the model allows iterations to occur at each stage, starting from the stages of agile assessment, train team, project plan, and implement. The agile method is one alternative approach that can be used to provide solutions in achieving success in ERP implementation. The factors of complexity in ERP implementation are managing the project management. The ERP system is an integrated system according to business processes that has been tested and said to be best practices in general. The ideal ERP system implementation process is to run the ERP system by following the business process of an ERP system in a practical manner. For this reason, the ERP system implementation process requires planning in good project management and does not make significant business process changes from the ERP systems that are available. The results of the explanation that the authors did before show that the agile model is suitable to assess and help for enhance success of ERP implementation. Therefore, the agile model can be used as an alternative approach in achieving ERP implementation success.

B. What kind of agile ERP model is suitable for implementation in the industry?

The results of analyze and mapping the previous research related to the discussion of agile implementation models for ERP which the agile ERP model is categorized by the stages of planning, project, and enhancement. At the planning stage, it is necessary to pay attention to factors: environment, business risk, current business process, and organization readiness. At the project stage, you need to pay attention to factors: process, people, organization and technology. These factors will be consolidated with the agile process. At the stage of enhancement, it needs to attention to the factor such as organizational performance. The authors propose an experimental research model which focuses on analyzing success in implementing ERP. For this reason, the authors propose the agile ERP model that can be used as a breakthrough to achieve success in implementing ERP for the organizations. The agile ERP model can be seen in the following figure:
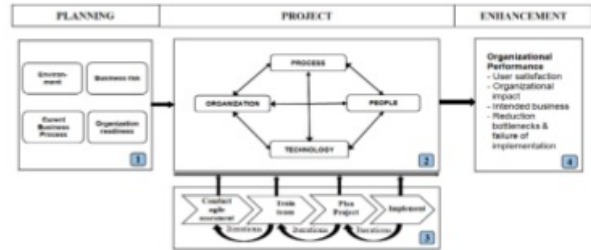

Fig. 9.   Agile ERP success model

The definition of each factor and component of the Agile ERP model can be described as follows:

TABLE VI.   THE DEFINITION OF AGILE ERP MODEL

Feature	Feature Definition	Reference
Environment	Evaluate the quality and performance of ERP vendors	Zhang et al., 2005
	Evaluate the education and experience of the project team	
	Mobilize the project team; prepare a work environments, set work equipment, form a project team, start iterations	
Business risk	Anticipating uncertain events to avoid risks that occur in ERP system implementation	Zhang et al., 2005
	Analyzing gap factors in order for improving organizational performance	
	Exploring company resources in an effort to reduce business risk	
Current business process	Evaluating organizational readiness in making changes of business processes following business processes of the ERP systems available	Baig et al., 2017; Nofal et al., 2016
	Analyzing workflows of business processes running and developing business strategies that are aligned with business processes of ERP systems	
Best practice	Understand the best ways of working by focusing on the function and integration of each module, so as to improve organizational efficiency and performance	Chow & Cao, 2008; Baig et al., 2017
	Develop the agile framework, project team structures, tasks and responsibilities, and test documentation	
	Identify agile practice scope to support business processes.	
Incremental	Developing an agile framework, project team structure, roles and responsibilities, and testing documentation	Chow & Cao, 2008
	Developing communication and planning training according to user needs	
	Iteration builds effective feedback in each iteration related to focusing on system integration. Gradually iterating to test system integration	
Change management	Analyzing the suitability and gaps of business processes is run by defining & redesigning workflows by maintaining organizational alignment	Nofal et al., 2016
	Effective communication with management according to the scope of the project and identifying the impact of change by maintaining organizational harmony	
	Identify and develop effective and appropriate techniques to help management overcome and adapt to new technologies	
Project Management	Developing an agile ERP model as a solution to overcome difficulties in ERP implementation	Kraljic et al., 2014
	Planning effective business strategies and tactics will be a critical factor in supporting good project management	
	Simplification of work methods and feedback from management to achieve effectiveness in ERP project implementation	
Communication and Collaboration	Improve the smooth communication and information collaboration in the project team in achieving successful ERP system implementation	https://agilemanifesto.org, Alleman, 2002
	Optimize the workings by following the practicalities of the agile method by communicating intensely related to project management	
	One step to adopting the workings of the agile method is to communicate intensely related to project management	
	Improve team-work, need to build a work culture of one team & develop pro-active business communication	
Organizational	Completing work becomes more effective and efficient without doing it two times	Kraljic et al., 2014; Chow & Cao, 2008; Nofal et al., 2016; Zhang et al., 2005
	Organizational readiness to make changes to business processes following the business processes of the ERP system	
	Managerial level readiness performs the change process following the business processes of the ERP system	
Project team	Formation of Unit Testing team for UAT implementation at the implementation stage	Kraljic et al., 2014; Zhang et al., 2005
	Provide feedback on requests for ERP system customization that are at the risk of ERP implementation failure	
	Explain the risk of the influence of customization on the failure of ERP system implementation	
	Actively involving key users and making the users use ERP systems	
Training	Set the main objectives for training, planning and developing training materials to support agile framework	Kraljic et al., 2014; Chow & Cao, 2008; Nofal et al., 2016
	Provide sufficient training for users about how to work using an ERP system to understand the business processes of the ERP system	
	Actively involve users in the intensive training	
Integration	The use of ERP systems that focus on perfecting integrated business processes to manage data into information needed for management decision making	Chow & Cao, 2008
	Reducing costs that are inefficient and easy to get various information according to needs that support decision making	
	The ERP systems that are suitable for business characteristics will have quality information as a proof of the quality system	
Infrastructure	Support the workings of an ERP system by providing IT infrastructure to increase the capacity and quality of infrastructure as needed	Kraljic et al., 2014; Zhang et al., 2005
	Build a flexible business to support current and future business processes	

C. *Limitations and future research*

This research has a limitation, because the discussion about the issues of agile implementation model for ERP based on survey model to study literature only. Therefore, needed to improve future research to proving with the real case in business by focusing on case studies with questionnaire and making the prototyping system for verify and implementing of many different industries as the objects for development of the agile implementation model for ERP.

V. CONCLUSION

ERP implementation success depends on managing project management similar to business processes reengineering by identifying the critical factors and important components. Managing project management in ERP implementation by applying the concept of business process management as a business strategy to overcome the complexity in ERP implementation, by applying agile method. Applying values from the principle of the agile method can enhance the success of ERP implementation and minimizes the risk of failure of ERP implementation. Development of the agile implementation model for ERP can be done based on a simpler and faster moving work method and improving the application operation functions as quickly as possible, to support changes in business processes. This minimizes the risk of failure in implementing ERP. The agile method prioritizes flexibility in changes of business processes that occur in the process of developing a system. For this reason that the ERP agile model is one approach that needs to be considered to handle the gaps and the factors of failures in implementing ERP. The agile model will end at each iteration with a demonstration of software that functions optimally. The implementing of agile ERP concept allows iterations to show that configuration without customization can make business processes and work flow to be more efficient and enhance productivity and organization performance. This is the purpose of this study that the build of agile ERP implementation model are important and impact as a breakthrough to achieve success in implementing ERP for the organizations.

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