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An Evaluation of Integrating ERP System to Develop a Strategy Business

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Abstract—The digital changes business patterns that require companies by using an integrated system for strategic decision-making. ERP system is one technological innovation that enable to have a competitive advantage. But the fact is that only a few companies have succeeded in implementing the ERP system. The objective of this research is to integrate the ERP system with business strategy in implementing ERP systems. The research focuses on developing an ERP system integration model for implementing the SAP ERP success. The methodology is based on previous research for the ERP implementation. This research examines quantitative data to determine indicators using entropy and conducts case studies in the industry. The research results prove that the management support indicator is an essential factor in integrating ERP systems to develop the company's strategic business. The output research is the design of the integration model development of the ERP system.

Keywords—*business strategy, ERP implementation, integration, process business, SAP.*

I. INTRODUCTION

In technological transformation, a company Enterprise Resource Planning (ERP) system is essential to improve work efficiency and company performance. Especially for company management that chooses to SAP ERP as a system that integrates business processes from various business units within a company that automatically demands changes to current business processes to follow the integration of the SAP ERP system. Even though previous research has discussed the critical factors determining the success of implementing ERP SAP, the company still needs to integrate the SAP ERP system. Users are even resistant to running SAP ERP in conducting business-related transactions. This indicates that the company is still experiencing difficulties in implementing ERP SAP. For this reason, this study discusses the strategic process for integrating with the standardization of the SAP ERP system with the research questions answered in this study, namely as follows:

1. What are the critical factors for integrating ERP systems effectively?
2. What kind of SAP ERP system integrating model to develop a strategic business?

This research produces an ERP system integrating model that can be developed to create an ERP integrating prototype used by users (consultants, practitioners, academics) as a tool to build a strategy business. Understanding the overall business processes of the ERP system is essential before migrating to the SAP ERP system. A significant contribution of ERP implementation is reducing the time to complete business processes and the sharing and collaborative information to help leaders with strategic decision-making [1]. SAP is included in the ERP system used to integrate running business processes and existing resources together in the ERP used [2]. The business process model can explore components, definitions, and value creation in enterprise performance, technology innovation, and management [3]. The business process model describes e-business processes using information technology and strategic business issues, such as increasing competitive advantage, company performance, and technological innovation [4]. For this reason, management support is needed to achieve successful SAP ERP implementation. Management support is the most significant factor in determining ERP integration [5], [6], [7], [8], [9], [10], [11]. IT governance is essential in ensuring the success of ERP implementation [12]. Good integration with the legacy system is critical in migrating to the ERP system used [13]. The project manager ensures that the implementation stages go according to the budget and time specified for a successful ERP implementation. Organizations should have extra public accountability to ensure the standardized use of ERP [14]. System Analysis Program (SAP) software is an application for managing aspects related to business, such as financial transactions, sales distribution, procurement, logistics, and HR. SAP is a software developer that provides solutions to increase efficiency with simplified end-to-end processes and adapt to the way ERP works [15]. SAP can provide solutions such as improving business agility, gaining control and insights, and supporting business growth. ERP is a tool to integrate business processes in several departments in a company. ERP makes it possible to use various modules to incorporate the company's internal business processes. ERP consultants with high capacity are needed to control the course of ERP implementation [16], [17]. So, SAP ERP offers a single system solution by integrating business processes designed to manage and incorporate functions on core business processes.

TABLE I.   MAPPING PREVIOUS RESEARCH

ID	No	Critical Factors	Definition	Ref
OG	1	Accounta-bility	Organizations should have extra public accountability to ensure standardized use of ERP.	[6]
OG	2	Business plan and vision	A clear business plan and vision must be derived and communicated to the project	[10]

			team to support the ERP implementation.	
OG	3	Innovative project strategy	The project team must have an implementation strategy with a shared consensus, thereby providing an innovative strategy for ERP project success.	[6], [17]
OG	4	Management support	Top management support has been recognized as very important and a major factor for achieving successful ERP implementation.	[5],[6], [7],[8], [9], [10]
OG	5	Organizational change	Reducing the complexity of ERP implementation requires fundamental organizational changes.	[6], [10]
PE	6	Commitment of all the resources	High commitment from all the resources involved in the ERP project will increase the motivation to achieve the ERP implementation success.	[6], [11]
PE	7	Perceived usefulness and satisfaction	Perceived usefulness and satisfaction in implementing ERP is proven by increasing company efficiency and performance.	[5]
PE	8	Project manager role	The project manager plays an important role in ensuring that the implementation stages go according to the budget and time specified for a successful ERP implementation.	[2],[6], [10]
PE	9	Project team	The project team must have strong commitment and competence to achieve a successful Implementation	[7], [10]
PE	10	Strong capability of consultant	ERP consultants who have high capacity are needed to control the course of ERP implementation.	[6],[12] [17]
PE	11	User attitudes	The attitude of users who are willing to run the ERP system as sufficient support to achieve successful ERP implementation.	[5],[7], [10]
PR	12	Business Process Improvement	Business Process Improvement is needed to improving accuracy and speeding up processing time, making it easier for users to run ERP and reducing waste.	[1][7], [10]
PR	13	Effective communica tion	Effective communication within the project team is able to overcome problems related to ERP implementation.	[1],[7], [10]
PR	14	Monitoring of performance	Monitoring and assessing the integration of ERP systems into operations is very important to ensure that ERP is used optimally.	[7], [10]
PR	15	Training and education	Training and education as important factors in ERP implementation to ensure users understand the use of the ERP system properly	[1],[6], [7], [10]
PR	16	Good user guidance	The availability of user guidance in running the ERP system is a supporting tool in achieving successful ERP implementation.	[1], [5]
PR	17	Fit with business processes	Fit with business processes is to ensure the use of the ERP system meets the company's needs.	[1]
TH	18	Adequate testing	System testing, software development, and problem solving are key elements of success in implementing ERP.	[10]
TH	19	Appropriate business IT legacy systems	Good integration with the legacy system is important in migrating to the ERP system used.	[5],[10], [13]
TH	20	Database quality	Data quality helps improve efficiency in migrating data from running systems to ERP systems.	[1]
TH	21	ERP system functionality	System functions as a tool to measure the fast response, stability, ease of use and flexibility of the ERP system used.	[1]
TH	22	IT governance	IT governance is important to ensure implementation and improve the quality of ERP implementation goes well.	[12]
TH	23	Technology innovative	Innovative technology is important in running an ERP system according to IT trends	[1]

Many companies still need to integrate business processes into SAP ERP. such as finance, HR, Supply Chain, Procurement, etc. For this reason, there needs to be a breakthrough to determine the steps that must be taken to integrate the SAP ERP business processes. And find critical factors as determinants in integrating SAP ERP business processes to develop a strategic business.

This research conducts a mapping of previous research related to determining critical factors associated with ERP SAP implementation by dividing the four knowledge areas into organizational, people, process, and technology. The previous research mapping analysis, 23 key factors or

instruments determine ERP system integration. Results of the definitions of these critical factors served as the basis for compiling a listing questionnaire for distribution to the respondents.

Different SAP ERP products can integrate company business processes in accounting, sales, production, HR, and finance activities, in an integrated environment, with data from each module stored in a central database, which aims to enforce control strictly [18]. Based on the results of previous research mapping related to ERP integration, management support is an important indicator indicated by more opinions. Then this research compiled a list of questionnaire statements based on the definitions from the previous research mapping results. In addition to this research conducted of the prior research, the evaluation of ERP SAP needs to be done to make the implementation successful for better improvement [19]. The SAP ERP implementation approach that most companies choose is the vanilla approach. Many companies adopt the vanilla approach in implementing ERP SAP by making some adapts according to the needs of the company's business processes.

II. METHODS

This research examines the effects of ERP SAP implementation. in an industry as a case study on using ERP SAP applications. The research methodology uses a literature study by conducting a survey of previous research, testing the respondent's data quantitatively by distributing questionnaires to the respondents, data qualitatively with FGD experts, and reviewing the results of ERP SAP implementation in an industry as a case study. This research data uses the entropy method for ranking indicators.

Before the respondents fill out the questionnaire, the respondents need to fill in the respondent criteria. Respondent criteria for filling out the questionnaire by the respondents are as follows: Gender to consider the level of behavior of the respondents in giving opinions. Age To consider the age maturity level of the respondents, which will affect the maturity level of the respondents in giving opinions. Education level to Consider the respondents' intellectual level in giving opinions regarding this research. Work Experience to consider the respondents' experience in understanding project management knowledge, how to work and use ERP. using ERP Systems to consider the respondents' experience in understanding project management knowledge, how to work and use ERP applications to complete work and obtain information for decision making. Level to consider the related operational positions of the respondents in providing opinions according to the position. And Industry type to consider the suitability of the characteristics of the industry or company from the respondents to the object of this research.

The results of the analysis of the opinions of the respondents became the basis for compiling the characteristics of the respondents. The profile characteristics of the respondents are as follows: Gender male is 79 and female is 26. Age 21-30 years is 34, 31-40 years is 43, 41-50 years is 17, and 51+ years is 11. Education bachelor's degree is 75 and undergraduate is 30. Work experience using ERP for 1-3 years is 55, 3-5 years is 35, 5-7 years is 8, and 7+ years is 7. The level of staff is 50, manager is 47,

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and director is 8. The industry type of industry is 84, and project management is 21.

There is still a lot of resistance from users in companies implementing SAP ERP. Resistance of users to make process changes to the way of work is the main reason for the ERP SAP implementation failure. The Internet invoked a technological revolution that required changes to SAP's business model and the development of internet-based solutions. These changes require using various resources that transform the structure into a value network to adapt to meet the needs of the company's business processes [20].

Based on the mapping analysis results from previous research, this research designed an ERP system integrating the model in terms of organizational, people, process, and technology dimensions. Then this study determines the indicators of each dimension based on a literature survey conducted in this research. The hierarchy of the ERP system integrating model can be seen in the following figure 1.
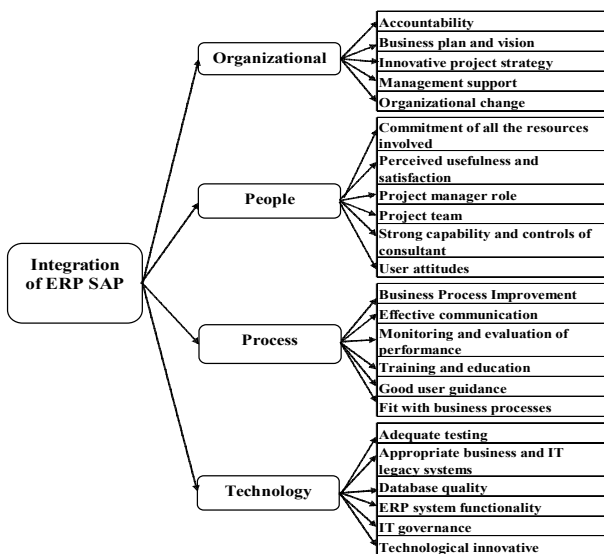
Fig. 1.   Hierarchy of the ERP system integrating model

This research uses a quantitative method by processing data from respondents' opinions by filling out a questionnaire to obtain primary data directly from the respondents. This research uses a Likert scale (1 to 6) to identify the results of the answers to the level of importance of the respondents from the questionnaire statements, with the distribution of scores as follows: 1. very important, 2. important, 3. moderately important, 4. Somewhat important, 5. unimportant, and 6. very insignificant. Based on the list of questionnaire statements, this research designed the data and characteristics of the respondents before distributing them to the respondents using the Google form facility to collect data. Then this research processed the data on the data and features of the respondents, then processed the data using a quantitative method using the entropy method to determine the ranking of these indicators. This research uses the entropy method to analyze data in conducting data processing questionnaires from the respondents. The entropy method is a weighting criterion for expressing the probability distribution spread out in a questionnaire statement which is helpful for weighting criteria [21], [22]. Entropy is a multiple-criteria decision-making method. The

stages of weighting criteria in the entropy method are as follows:

1. All respondents gave a value indicating the importance of a particular criterion determined in the questionnaire statement.
2. Subtract each of these numbers by the ideal value. The result can be expressed in Xij.
3. The Xij value is obtained from the Pij matrix as follows.

$$P_{ij} = \frac{X_{ij}}{\sum_{i=1}^{m} X_{ij}}, \forall i,j. \tag{1}$$

m = number of respondents

4. Calculate the entropy value for each criterion with the following formula:

$$E_j = -k \sum_{i=1}^{m} P_{ij} \ln P_{ij}, \forall j, \tag{2}$$

Where $= K = \frac{1}{\ln m}$

Then calculate the spread of each criterion with the following formula:

$$d_j = 1 - E_j, \forall j. \tag{3}$$

5. It is assumed that the total weight = 1, so to get the weight for each criterion, the dispersion value is normalized, with the following formula:

$$W_j = \frac{d_j}{\sum_{j=1}^{n} a_j}, \forall j. \tag{4}$$

n = number of criteria

III. RESULTS

Based on the results of the opinions of the respondents, there will be a correlation in the form of scores using the entropy method. From the results of processing questionnaire data from respondents using the entropy method to determine the ranking of indicators, it was found that the three highest ranks were indicators of Management support with a score of 0.947; project team indicator with a score of 0.927; and indicators of perceived usefulness and satisfaction with a score of 0.860. The results of this data processing answer this research's first research question: The critical factors for integrating ERP systems effectively.

From the results of data processing using the entropy method by calculating the scores for each indicator grouped by organizational dimensions, people dimensions, process dimensions, and technology dimensions, it was found that the organizational dimensions reached 21,70%, the people dimensions reached 26,88%, the process dimensions reached 26,09%, and the technology dimensions reached 25,33%. Based on the score of these dimensions, it can be said that the SAP ERP system integrating model focuses more on the people dimension, with a score of 26,88% as the most dominant dimension as a measure of the level of readiness of a company to develop a business strategy. This answers this study's second research question: What kind of SAP ERP system integrating model to create a strategic business? The

organizational dimension indicator score shows that management support is the most significant in the organizational dimensions, with a score of 0.9470. Regarding data processing, the respondents' opinions proved that support management was the essential indicator in efforts to achieve successful ERP implementation. The people dimension indicator score shows that perceived usefulness and satisfaction is the most significant indicator in the people dimensions, with a score of 0.8604. User satisfaction is the basis that users use the ERP system.
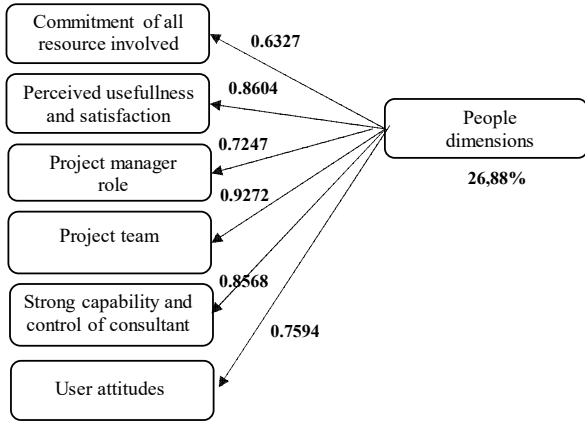
Fig. 2.   Indicators score of organizational dimensions
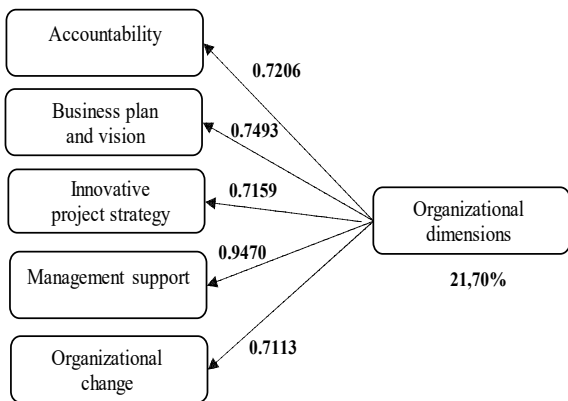
Fig. 3.   Indicators score of people dimensions

The process dimension indicator score shows that effective communication is the most significant indicator in the process dimensions, with a score of 0.8168. Effective communication with information systems collaboration becomes more effective in integrating ERP systems. The technology dimension indicator score shows that technology innovation is the most significant indicator in the technology dimensions, with a score of 0.8018. Companies must follow technology trends to synchronize with the business strategy.
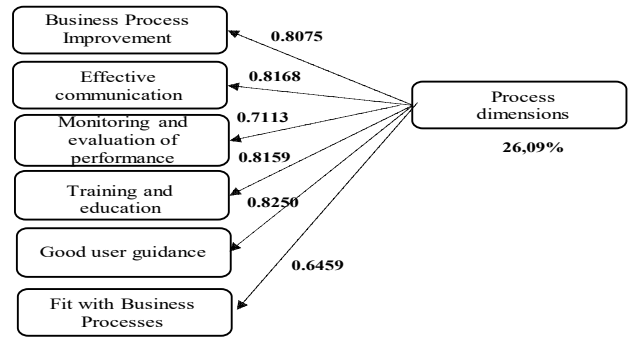
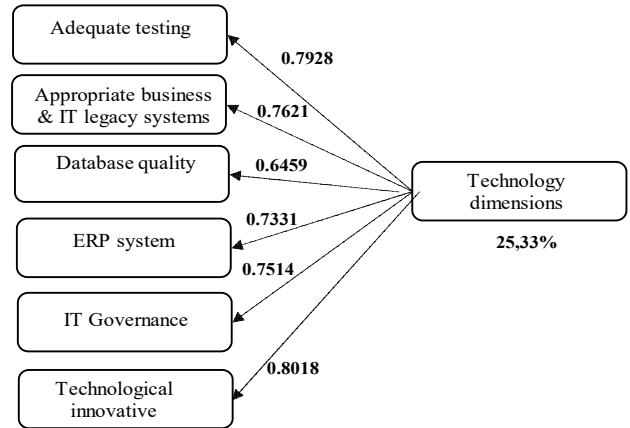Fig. 4.   Indicators score of process dimensions

Fig. 5.   Indicators score of technology dimensions

IV.   DISCUSSION

Based on the results of the Forum Group Discussion (FGD) opinion, there will be a strong correlation with indicators that influence the company's business strategy in implementing ERP SAP. The results of this FGD can be used as confirmation of the results of processing the questionnaire data from the respondents. The summary of indicators from the FGD in an evaluation of integrating ERP system that can be used to develop business strategies is as follows:

1. Management Support. To ensure that the SAP ERP implementation goes according to the timeline and is not too late to go live, management support is needed not only to approve the investment value for the procurement of the SAP ERP system but to have a level of management presence to be actively involved in the implementation process, and approach to project teams and departments involved. Getting involved is a breakthrough business strategy that should be considered in achieving successful SAP ERP implementation. Thus, motivating for users to carry out intelligence quotient tests and use the SAP application to be more effective.

2. Effective Communication. Effective communication with the steering committee, project team, and users is important in using the SAP application, such as holding regular meetings to find analysis gaps so that problems in using the SAP application can be resolved quickly and precisely. Thus, various information related to the company's business activities can be generated for strategic business decision-making.

3. Technologically Innovative. SAP ERP is one of the company's management decisions following a technologically innovative approach. Companies can enhance competitive advantage and deliver effective business by following technology trends, including choosing an ERP system for managing business transactions and making strategic decisions.

4. Project Team. The role of company's internal project team and external ERP consultants have an essential role in guiding, providing knowledge sharing, and providing problem-solving in each case during ERP SAP implementation to ensure the use of ERP SAP by users runs according to predetermined standards and best practices according to characteristics company business.

As a test of this research, this research reviews the results of ERP SAP implementation in an industry as a case study on the use of ERP SAP applications. The SAP ERP application produces financial reports that can support business strategy in knowing profit/loss in a certain period for all business unit sales sectors, thus helping management develop products. This is reflected in figure 6. It monitored production in carrying out production planning by analyzing the use of raw materials and working hours compared to finished production, thereby helping management analyze production efficiency. The SAP ERP application also provides strategic planning management reports in real-time to assist management and stakeholders in analyzing company performance and making projections to develop the company's business in the future.

Fig. 6.   Analysis of strategic profit and loss

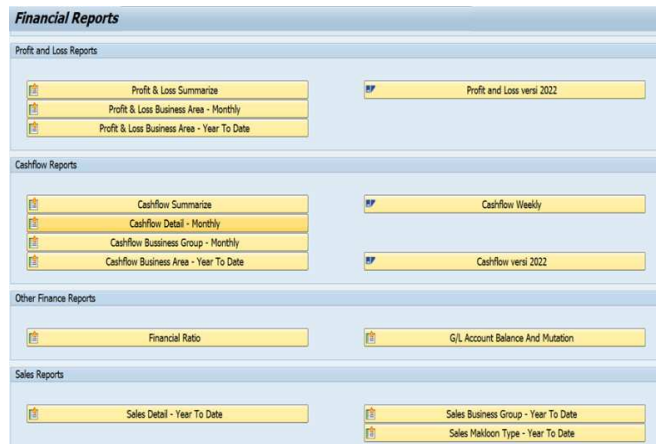Based on this explanation, to ensure that the use of the SAP ERP system runs well.

Fig. 7.   Strategic planning management report

The discussion section is where the article interprets the results to reach its major conclusions. This is also where the author's opinion enters the picture. The discussion is where the argument is made. Common features of the discussion section include comparison between measured and modelled data or comparison among various modelling methods, the results obtained to solve a specific engineering or scientific problem, and further explanation of new and significant findings.

V. Conclusions

Based on the results of this research identified 23 indicators and ranking indicators that the indicator of management support is very dominant in determining the integration of the ERP system used. Based on the results of the discussion show that the highest-ranking indicator is management support. Thus, management support within the organizational is very significant to achieve ERP system integration. Besides that, an evaluation of integrating an ERP system to develop a strategic business shows that designing an ERP system incorporating a model for four dimensions such as organizational dimensions to achieve a score of 21,70%; people dimensions to achieve a score of 26,88%; process dimensions to achieve a score of 26,09%; and technology dimensions to achieve a score of 25,33%. Thus, people and process dimensions are integrating models that can be used as an assessment tool to develop a strategic business. Thus, evaluating the integration of the SAP ERP system is a critical factor that needs serious attention from management to develop a strategic business more effectively.

The author realizes that this research only discusses the SAP ERP system as a research object, so it cannot represent other ERP systems in general. For this reason, it is a challenge for other researchers to conduct further research with a focus on developing mobile-based readiness applications on other ERP systems so that the use of this application becomes more effective for measuring the level of company readiness to increase competitive advantage and increase business value according to customer needs.

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