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This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/) Peer-review under responsibility of the scientific committee of The Fifth Information Systems International Conference 2019. Available online at www.sciencedirect.com ScienceDict Procedia Computer Science 00 (2019) 000–000 www.elsevier.com/locate/procedia 1877-0509 © 2019 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/) Peer-review under responsibility of the scientific committee of The Fifth Information Systems International Conference 2019 The Fifth Information Systems International Conference 2019 Maturity Level Assessment for ERP Systems Investment Using Val IT Framework Renny Sari Dewi* Department of Information Systems, Universitas Internasional Semen Indonesia, Jalan Veteran, Gresik 61122, Indonesia Abstract The Enterprise Resource Planning (ERP) system in the last few years has become an important thing for companies to manage business easily and integrated.

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In business, IT has become the spearhead of a company in imposing transparency and accountability to its stakeholders. IT has also big role in the service and manufacturing business which expressed in the issue of industrial revolution 4.0, thus changing the pattern and business strategy. Therefore, by considering the condition and mindset of the community, companies in the service sector are required to be extra-creative in penetrating the market.

The Investment Coordinating Board (BKPM) of Republic Indonesia predicts that by 2020 investment in the IT sector will increase to US $ 130 Billion [1]. From the nominal above, companies are competing to upgrade its IT infrastructure in order to catch up with the development trend of the industrial revolution 4.0. The Business' objectives and strategies in a company also determine the value of IT investments. High IT investment should be followed by the productivity of the company in which companies are very selective in investing IT.

Based on data released by Project Management Institute [2], as many as 32% of IT project investments fail and inflict in a financial loss. From the explanation above, this study contributes to evaluate whether IT investments made by PT Semen Indonesia Distributor (Semen Indonesia Group) in the form of Enterprise Resource Planning (ERP) system is in line with the company's strategy. The developed-ERP systems by PT Semen Indonesia Distributor, namely Waru Abadi Information System (SIWA) which implemented in 2017 is a key application in running their core business.

Therefore, this research was able to answer the challenges of PT Semen Indonesia Distributor's Board of Directors whether or not the ERP systems were continued. In general, there are 2 familiar frameworks used in measuring IT performance, namely Control Objectives for Information and Related Technology (COBIT) and Val IT [3]. Both were launched by the international organisation Information Technology Governance Institute (ITGI) through ISACA. But along with its popularity, some researchers have considerations for using Val IT framework as a best practice in measuring the value of IT investments for company's productivity [4][5][6]. The latest Val IT is version 2.0

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The measurement result of IT investment in the previous researches are quite diverse. This is due to, among other things, the factors that influence the IT investment climate in addition to the Val IT's indicators. 2. Related research 2.1. Literature review Based on review of previous researches, the summary can be seen in Table 1. Val IT framework has 3 domains namely Value Governance (VG), Portfolio Management (PM), and Investment Management (IM) with a total of 22 processes used in analysing investment performance IT in services and manufacturing companies. Table 1. Previous Research.

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Nourizadeh et al, 2011 [7] Val IT strongly effects the organisation to achieve their objectives and to help enterprises optimise the realisation of value delivery from IT investment with implementing IT governance in Isfahan municipality. Val IT framework is used in measuring IT investment in a city, and researchers believe that Val IT is right in evaluating city-level IT investments in Isfahan. This research is used at the city level which is basically not profit oriented, unlike the company's business objectives and strategies that tend to prioritise profit in investing IT.

Suzangar et al, 2011 [11] This research collaborates 4 best practices, namely Val IT, Risk IT, ITIL, and COBIT comprehensively to implement IT investment management in the company by considering risk, governance, and financial aspects. Val IT framework is feasible to use to evaluate a company's IT investment. Comprehensive testing is not yet needed as the case studies in the research didn't have optimal supporting data. Kozina and Popovic, 2010 [5] Val IT framework is mapped with RACI chart hence this research produces a new theory that IT investments are influenced by key roles and areas with Val IT activities, goals, and metrics.

Deeper understanding of the details of the process in each domain when the author interviews company leaders related to IT investments. Val IT framework that is mapped and detailed contains only one example process, namely PM2. In this study, the entire process, both VG, PM, and IM, was evaluated and assessed. Grembergen and De Haes, 2009 [6] integrates theoretical advances and empirical data with practical

application, including in-depth discussion of such frameworks as COBIT and Val IT, which are used to measure and audit the value of IT investments and ensuring regulatory compliance.

Val IT can be used to measure and audit IT investments at the company. Many cases are explained, but this book does not provide examples of case studies of service companies that do IT investment. 2.2. Val IT framework and maturity level assessment Val IT framework is one of the best practices that are familiarly used in evaluating corporate governance for IT investment. According to ITGI, Val IT framework's last version 2.0 was launched in 2008.

In general, Val IT framework consists of 3 domains namely Value Governance (VG), Portfolio Management (PM), and Investment Management (IM), see Fig. 1. Fig. 1. Val IT Diagram. 4 Author name / Procedia Computer Science 00 (2019) 000–000 For Value Governance (VG) domain, the purpose of measuring IT investments is to ensure that the value of money invested which can produce added value for the company, as shown in Table 2.

Therefore, 6 processes that support the VG domain whose contents are dominated by alignment between the enterprise's goals and the value to be invested are accompanied by the company's financial strength. Table 2. Val IT Framework: Value Governance Domain (Source: ITGI, 2018). Val IT Domain Objective Process Value Governance (VG) To ensure that the value management practices in the company are already embedded or not, and to secure the optimum value of IT investments made, it can produce added value for the company.

VG1 : Establish informed and committed leadership VG2 : Define and implement processes VG3 : Define portfolio characteristics VG4 : Align and integrate value management with enterprise financial planning VG5 : Establish effective governance monitoring VG6 : Continuously improve value management practices At the Portfolio Management (PM) domain, IT investment measurement is focused on acquiring optimal value and increasing value added for the company (see Table 3). There are 6 processes that compose the PM domain, these domains could produce a business portfolio which can increase the value for the company. Table 3.

Val IT Framework: Portfolio Management Domain (Source: ITGI, 2018). Val IT Domain Objective Process Portfolio Management (PM) To ensure that companies with invested IT portfolios are able to obtain optimal value and increase added value for the company. PM1 : Establish strategic direction and target investment mix PM2 : Determine the availability and sources of founds PM3 : Manage the availability of human resources PM4 : Evaluate and select programmes to found PM5 : Monitor and report on investment portfolio performance PM6 : Optimise investment portfolio performance VG1 : Establish informed and committed leadership In the domain of Investment Management (IM), IT investments are measured by business objectives, namely, to ensure that companies can contribute with optimal value. IM domain consists of 10 processes as shown in Table 4. Table 4.

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above (see Table 2, 3, and 4) are detailed explanations of the Val IT framework.

IT investment performance according to Val IT framework is influenced by these 22 processes, but it does not rule out the possibility that the company's productivity is also influenced by other interrelated factors. 3. Research methods This study uses a qualitative approach. Stages carried out include collecting data and information, data validation, and maturity level justification. Explanation of each stage is as follows: 3.1. Collecting data and information Data and information collection is carried out by conducting in-depth interviews with stakeholders directly or indirectly who involved in planning, managing, and monitoring the implementation of an Enterprise Resource Planning (ERP) system at PT Semen Indonesia Distributor.

In addition to the primary data, authors also used secondary data in the form of reports on the use of SIWA as material for reviewing evaluations of core-systems in the company. 3.2. Data validation Data related to SIWA investment that were successfully obtained from stakeholder statements, are processed and analysed then carried out to multilevel validation. The first validation is from the operational level, then tactical, and after that strategical.

Statements deemed valid are those which approved by the three level of positions above at the PT Semen Indonesia Distributor. 3.3. Maturity level justification Data that has been successfully validated then justified on the maturity level interval. Table 5 shows an explanation of each maturity level in the Val IT framework. Author using this level to adjust the scale in each item-reviewed is appropriate. Table 5. Data Collection (Source: ITGI, 2018). Maturity Level Apply when 0 (Non-existent) The enterprise sees the IT function as a supplier and a cost to be minimised.

There is limited communication between the business and the IT function 1 (Initial) Business cases are defined on a project-by-project basis and often are incomplete. Reporting is budget- and cost-driven. 2 (Repeatable) There is no formal commitment from the business owner. Process occurs repeatedly without reporting and in-depth evaluation. 3 (Defined) The business and IT functions understand the governance requirements to select and execute new investments, deliver the resulting IT services efficiently, and ensure optimal allocation of IT resources. Formal training plans and business process based on business case exist but are not consistently.

4 (Managed) There is a shared commitment between the business and the IT function to optimise the contribution of individual IT investments and services to business value. Processes and skills exist to support investment decision making and value management, and to ensure that resource allocation is consistent with the priorities. 5 (Optimised) The business and IT functions work in partnership to continually optimise and report on the portfolios of IT investments, and resulting services, assets, and other resources. Processes are continuously improved. 6 Author name / Procedia Computer Science 00 (2019) 000–000 4. Result 4.1.

Data collection The data and information obtained are the result of interviews from stakeholders related to SIWA investment in PT Semen Indonesia Distributor. There are 5 stakeholders involved in investing in the SIWA at PT Semen Indonesia Distributor, the details of which can be seen in Table 6. Table 6. Data Collection. Respondent Role Number of Respondent IT Supervisor Responsible for maintaining IT infrastructure and human resources involved in utilising IT that the company has invested 2 IT Manager Responsible for planning, managing and evaluating spending on all IT needs in the company 1 Board of Director Consist of President Director and Vice President Director in Financial to make decision based on need priorities 2 4.2.

Value Governance (VG) domain Maturity level justification for VG domain which consists of 6 processes can be seen in Table 7. Table 7. Maturity Level Assessment for VG Domain. Process Average Score VG1 : Establish informed and committed leadership 3.20 VG2 : Define and implement processes 3.33 VG3 : Define portfolio characteristics 2.60 VG4 : Align and integrate value management with enterprise financial planning 2.25 VG5 : Establish effective governance monitoring 4.50 VG6 : Continuously improve value management practices 4.00

Based on Table 7, VG3 and VG4 processes have a bit value because the SIWA portfolio is not based on the enterprise long-term strategy plan. The importance of harmony between business goals and IT goals has not been accommodated in the enterprise financial planning. So, average maturity level for VG domain is 3.31 (Defined), which means that SIWA investment in PT Semen Indonesia Distributor is in good condition. 4.3. Portfolio Management (PM) domain For the PM domain, a detailed calculation of the maturity level based on Val IT framework 2.0

consisting of 6 processes is presented in Table 8. Table 8. Maturity Level Assessment for PM Domain. Process Average Score PM1 : Establish strategic direction and target investment mix 5.00 PM2 : Determine the availability and sources of founds 5.00 PM3 : Manage the availability of human resources 4.10 PM4 : Evaluate and select programmes to found 4.80 PM5 : Monitor and report on investment portfolio performance 5.00 PM6 : Optimise investment portfolio performance 4.00

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Data validation Data related to SIWA investment that were successfully obtained from stakeholder statements, are processed and analysed then carried out to multilevel validation. The first validation is from the operational level, then tactical, and after that strategical. Statements deemed valid are those which approved by the three level of positions above at the PT Semen Indonesia Distributor. 3.3. Maturity level justification Data that has been successfully validated then justified on the maturity level interval.

Table 5 shows an explanation of each maturity level in the Val IT framework. Author using this level to adjust the scale in each item-reviewed is appropriate. Table 5. Data Collection (Source: ITGI, 2018). Maturity Level Apply when 0 (Non-existent) The enterprise sees the IT function as a supplier and a cost to be minimised. There is limited communication between the business and the IT function 1 (Initial) Business cases are defined on a project-by-project basis and often are incomplete. Reporting is budget- and cost-driven. 2 (Repeatable) There is no formal commitment from the business owner.

Process occurs repeatedly without reporting and in-depth evaluation. 3 (Defined) The business and IT functions understand the governance requirements to select and execute new investments, deliver the resulting IT services efficiently, and ensure optimal allocation of IT resources. Formal training plans and business process based on business case exist but are not consistently. 4 (Managed) There is a shared commitment between the business and the IT function to optimise the contribution of individual IT investments and services to business value. Processes and skills exist to support investment decision making and value management, and to ensure that resource allocation is consistent with the priorities.

5 (Optimised) The business and IT functions work in partnership to continually optimise and report on the portfolios of IT investments, and resulting services, assets, and other resources. Processes are continuously improved. 6 Author name / Procedia Computer Science 00 (2019) 000–000 4. Result 4.1. Data collection The data and information obtained are the result of interviews from stakeholders related to SIWA investment in PT Semen Indonesia Distributor. There are 5 stakeholders involved in investing in the SIWA at PT Semen Indonesia Distributor, the details of which can be seen in Table 6. Table 6. Data Collection.

Respondent Role Number of Respondent IT Supervisor Responsible for maintaining IT infrastructure and human resources involved in utilising IT that the company has invested 2 IT Manager Responsible for planning, managing and evaluating spending on all IT needs in the company 1 Board of Director Consist of President Director and Vice President Director in Financial to make decision based on need priorities 2 4.2. Value Governance (VG) domain Maturity level justification for VG domain which consists of 6 processes can be seen in Table 7. Table 7.

Maturity Level Assessment for VG Domain. Process Average Score VG1 : Establish informed and committed leadership 3.20 VG2 : Define and implement processes 3.33 VG3 : Define portfolio characteristics 2.60 VG4 : Align and integrate value management with enterprise financial planning 2.25 VG5 : Establish effective governance monitoring 4.50 VG6 : Continuously improve value management practices 4.00 Based on Table 7, VG3 and VG4 processes have a bit value because the SIWA portfolio is not based on the enterprise long-term strategy plan.

The importance of harmony between business goals and IT goals has not been accommodated in the enterprise financial planning. So, average maturity level for VG domain is 3.31 (Defined), which means that SIWA investment in PT Semen Indonesia Distributor is in good condition. 4.3. Portfolio Management (PM) domain For the PM domain, a detailed calculation of the maturity level based on Val IT framework 2.0 consisting of 6 processes is presented in Table 8. Table 8. Maturity Level Assessment for PM Domain.

Process Average Score PM1 : Establish strategic direction and target investment mix 5.00 PM2 : Determine the availability and sources of founds 5.00 PM3 : Manage the availability of human resources 4.10 PM4 : Evaluate and select programmes to found 4.80 PM5 : Monitor and report on investment portfolio performance 5.00 PM6 : Optimise investment portfolio performance 4.00 256 Renny Sari Dewi / Procedia Computer Science 161 (2019) 250–257 Author name / Procedia Computer Science 00 (2019) 000–000 7 SIWA is a fabulous decision to invest in this enterprise. The portfolio management (PM) domain that assessed has huge score dominantly (see PM 1, PM2, PM5 in Table 8).

The results of data validation for the maturity level justification in PM domains are 4.65 (Manage-Optimised), which means that SIWA investment in PT Semen Indonesia Distributors including business and IT functions has synergised in creating a company's portfolio. This results in business processes are continuously improved. 4.4. Investment Management (IM) domain Maturity level for IM domain in Val IT framework 2.0 which consists of 10 processes can be seen in Table 9. Table 9.

Maturity Level Assessment for IM Domain. Process Average Score IM1 : Develop and evaluate the initial programme concept business case 2.60 IM2 : Understand the candidate programme and implementation options 3.00 IM3 : Develop the programme plan 3.00 IM4 : Develop a full life-cycle costs and benefits 3.67 IM5 : Develop the detailed candidate programme business case 3.00 IM6 : Launch and manage the programme 4.33 IM7 : Update operational IT portfolios. 4.00 IM8 : Update the business case 5.00 IM9 : Monitor and report on the programme 4.00 IM10 : Retire the program 2.00

The IM10 process identify has a lowest value because of the retire program is never stated. SIWA, for now still relevant with the business process and still maintain to accommodate if the regulation was changed. But the top-level management in PT Semen Indonesia Distributor must estimate when the SIWA may retire or be

changed by another powerful ERP system. Reviewing the calculation in Table 9, the average maturity level for IM domain is 3.40

(Defined), which means that SIWA investment in PT Semen Indonesia Distributor including business functions and IT are understanding each other's needs and can align with IT resources. 4.5. Maturity level interpretation From the calculation of Table 7, 8, and 9, an interpretation of the overall maturity level is obtained which includes the domains of VG, PM, and IM result in average-final values (see Table 10).

This value is at the Define-Managed level, which means that the process and needs of the SIWA at PT Semen Indonesia Distributor have been supported by decision making based on priorities and alignment of business functions with IT. Table 10. Maturity Level Interpretation. Value Governance (VG) Portfolio Management (PM) Investment Management (IM) Maturity Level 3.31 (Defined) 4.65 (Managed-Optimised) 3.40 (Defined) 3.79 (Define-Managed) With a value of 3.79

as shown in Table 10, PT Semen Indonesia Distributor should also pay attention to the shortcomings that make SIWA investment not perfect. If referring to the previous table, then from the three Val IT domains, this company needs to improve and refine several processes including VG3, VG4, PM1, PM2, PM5, IM1, and IM10 which have values below 3.00. 8 Author name / Procedia Computer Science 00 (2019) 000–000 5. Conclusion The conclusions obtained from this study include: ? A case study of IT maturity level assessment conducted on the measurement of SIWA investment (ERP systems who developed by PT Semen Indonesia Distributor) using Val IT framework 2.0.

There are 3 domains, namely Value Governance, Portfolio Management, and Investment Management. The entire process found in the 3 domains are 22 processes. ? The maturity level of the SIWA is 3.79, which means it is in the Defined-Managed level. This score states that ERP system investment makes the process and needs of the ERP system at PT Semen Indonesia Distributor supported by priority-based decision making.

Acknowledgements Thank you for Research and Community Engagement Institution (as known as LPPM) Universitas Internasional Semen Indonesia (UISI) for research and publication funding at Information Systems International Conference (ISICO) 2019. References [1] CNN Indonesia. (2019) “Global Weakening, BKPM Focus Attracts Digital Economic Investment.” Available FROM: https://www.cnnindonesia.com/ekonomi/20190311135434-532-376189/pelemahan-global-bkpm-fokus-gaet-investasi-ekonomi-digital. [Accessed: 20-Mar-2019]. [2] PMI. (2018) “Success in Disruptive Times”. [3] Afsali, P., E. Azmayandeh, R. Nassiri, and G. L. Shabgahi.

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XYZﷺ, in IOP Conference Series: Materials Science and Engineering 407 (1): 12129. Renny Sari Dewi / Procedia Computer Science 161 (2019) 250ﷺ257 257 Author name / Procedia Computer Science 00 (2019) 000ﷺ000 7 SIWA is a fabulous decision to invest in this enterprise. The portfolio management (PM) domain that assessed has huge score dominantly (see PM 1, PM2, PM5 in Table 8). The results of data validation for the maturity level justification in PM domains are 4.65

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Conclusion The conclusions obtained from this study include: ? A case study of IT maturity level assessment conducted on the measurement of SIWA investment (ERP systems who developed by PT Semen Indonesia Distributor) using Val IT framework 2.0. There are 3 domains, namely Value Governance, Portfolio Management, and Investment Management. The entire process found in the 3 domains are 22 processes. ? The maturity level of the SIWA is 3.79, which means it is in the Defined-Managed level.

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