

Success Model of Cloud-Based ERP using Six Sigma Method (Case Study of PT Gamma – Food & Beverage Company in Indonesia)

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Abstract

Enterprise Resource Planning (ERP) has become essential as a result of the acceleration of digitalization and the necessity of companies to integrate their business processes. ERP has various models depending on the system scalability e.g. for small and medium entities (SME) and enterprises. PT Gamma is one of the food and beverage chains with massive growth in Indonesia which uses Oracle NetSuite (ERP for SME). Due to non-scalability, management decided to migrate to the enterprise ERP not so long after usage. This research follows the roadmap of six sigma (DMAI: define, measure, analyze and improve): (1) define the root cause of non-optimum implementation of ERP using in-depth structured interviews with key users; (2) measure the sigma value based on projects document; (3) analyze and code interview result to define which Critical Success Factors (CSFs) are more dominants then distribute questionnaire (1-10 scale) to define the Risk Priority Number (RPN); and (4) formulate solutions for dominant issues and ask key users for verification. Sigma value showed 3.234 (moderate level) through calculations number of outstanding issues compared to all issues rose during January-August 2022. Dominant factors identified by decision-makers are technological (71%) and organizational factors (19%), meanwhile supporting users are technological (42%), organizational (25%) and external party factors (17%). Suggestions for management are the alignment of ERP selection with the long-term company's strategic vision, avoiding over-customization, performing regular checkpoints, and selecting the best consultant for re-migration. Suggestions for further research are a longer research period and a more extensive method of six-sigma.

Keywords

Enterprise Resource Planning (ERP), Implementation Success Model, Six Sigma, Food and Beverage Company

1. Introduction

ERP systems play an important role in modern business technology enabling organizations and companies to gain a competitive advantage in today's demanding business environment. These companies and organizations made significant investments in the ERP system to help synergize the "4M (man, money, material, and machines)". More than 60% of companies registered as "Fortune 500" companies use ERP to integrate business data and support critical business functions (El-Telbany & Elragal, 2017). According to Bain & Company, the main operational business processes managed by the ERP system consist of: (1) inventory and materials; (2) manufacturing; (3) sales and distribution; and (4) accounting.

According to Abugabah (2015), recent industry reports and academic studies indicate that many organizations are realizing that ERP system implementation is not as effective as expected. There is a mismatch between the application and the practical assistance expected by the user, which results in the user still having to use and combine the old method or manually. The ERP implementation process can be challenging, time-consuming, and costly and puts a lot of pressure on the company. It is estimated that 60-90% of ERP implementation projects fail to meet the main implementation objectives (Bekhet & Sofian, 2018). According to Casanova et al. (2019), two out of three companies fail in their ERP transformation projects and have negative ROI (Return on Investment) due to various reasons.

PT Gamma, one of food and beverage companies in Indonesia who is facing massive growth also found the necessity of ERP implementation. PT Gamma uses Oracle NetSuite (one of cloud-based SME ERP). PT Gamma faced the same challenges in the implementation process which can be shown by shifting in PT Gamma's cloud-based ERP implementation schedule in the following table below.

Table 1. Shifting in PT Gamma's Cloud-Based ERP Implementation Schedule (Author, 2022)

Explanation of Target Time	Expectation (Month-Year)	Reality (Month-Year)
Upload the initial balance as of April 30, 2020 and Go live ERP (all business functions)	April-2020	June-2021 (main business functions have gone live, except for 2 modules namely inventory and income)
All business functions are integrated and able to be recorded in the ERP	June-2020	October-21 (1 module has not been integrated e.g. inventory)
Handover from consultant to PT Gamma	December-2020	Has not yet happened
Additional projects (beyond the initial blueprint) with additional costs	Not applicable	February-2021 up to July-2022 (especially for new business units)

The development of Oracle NetSuite finally shut down due to PT Gamma finally decided to upscale their ERP system through re-migrating to enterprise level of ERP, which is SAP Cloud Hana since the scalability of SME has no longer met the requirement of company to grow into enterprise level.

1. 1 Objectives

This study is divided by two main objectives: (1) understand the main factors (from technological, organizational, external parties, human resource or project management perspectives) which becoming root cause (dominant factors) of non-optimum implementation of Oracle Netsuite according to PT Gamma's key users' point of view (decision makers and supporting users); (2) determine success model (solution formulation) from the dominant factors with highest RPN numbers voted by key users (highest priority to be solved), then confirming the solution to them. Since PT Gamma will re-migrate to enterprise level ERP from SME level ERP, the suggestion may be useful to spotlight areas for improvements for the upcoming project.

2. Literature Review

2.1 Six Sigma Model

According to (Bowen, 2016), six sigma is a system or statistical tool, technique, and methodology designed to eliminate errors and errors in products and services by minimizing variability in the process. The six sigma model is designed to produce consistently excellent products and services. Sigma comes from the Greek letter "σ" which means "to measure variability". Each process must have an average value (mean value). The standard deviation of the mean value is usually measured in an index of 1-6 with a value of 6 getting closer to the perfection of the results. The six sigma method was first introduced by Bill Smith at Motorola in the 1980s and became more popular when it was implemented by John F. 'Jack' Welch at General Electric in the 1990s. Based on the type of process, six sigma has two main methods: DMAIC (define, measure, analyze, improve and control) suitable to increase existing business process and DMADV (define, measure, analyze, design and verify) suitable for new business launch.

According to Roderick et al. (2020), DMAIC stands for define, measure, analyze, improve and control. This methodology is the most widely used in the world for the improvement of existing business processes.

- (1) Define: stages of problem identification and alignment of process goals with company's goals
- (2) Measure: data collection stage as the basis for determining performance standards
- (3) Analyze: the stage of finding solutions to the root problems that have been identified
- (4) Improve: stages of improvement of existing problems and trials as a form of optimizing solutions so that they can solve problems
- (5) Control: the upper control stage to maintain the process that has been improved to prevent problems from occurring in the future

2.2 Critical Success Factors (CSFs)

According to Kouriati et al. (2020) one of the categories of critical success factors is the orientation of ERP system implementation consisting of:

- (1) Organization: company's structure, general administration, processes, goals, culture, and business environment, e.g. business process re-engineering; well defined budget of project; business plan, goals, scope, mission and vision; change management; communication, collaboration and trust; communication plan; competitive and external pressure; knowledge management; organizational culture; and controlled ROI on ERP implementation (Return on Investment) (Utomo & Budiastuti, 2019).
- (2) Projects: the composition of the capabilities and balance of the project team, e.g. existence of empowered decision-makers; performance, monitoring, evaluation and feedback; presence of project champion and adequate role; project management; composition of a capable and balanced project team; and recognition of qualifications, rewards and motivation.
- (3) Human: relationship with users in the form of characteristics and abilities, as well as participation and support for ERP implementation, e.g. Top Management Support and Commitment; Company-Wide Support and Commitment; Training; Users and Other Stakeholders' Involvement in Evaluation, Modification and Implementation of the System; and Users' Characteristics, Skills and Capabilities.
- (4) Technology: functionality of the system and the characteristics of the technology, e.g. Implemented Modules; IT Infrastructure; Software Testing, Customization and Troubleshooting; System Quality; Accuracy, Quality and Data Integrity; ERP Package Selection; Minimum Customization; ERP, business and business process alignment; and System Support/ Maintenance and Further Training
- (5) External Parties: relationship between the company (client), ERP system and external parties (consultants), e.g. partner organization (Utomo & Simatupang, 2019), service quality; use of consultant; and ERP vendor selection.

3. Methods

This research is analytical in nature by using a qualitative paradigm and a single holistic case study approach to identify the factors that are the root cause of the implementation of a cloud-based ERP system and the discovery of a success model for the implementation of the system based on the six sigma framework (DMAI).

The subject of this research is PT Gamma which is a food and beverages companies in Indonesia and the key actors involved in it. The object of this research is Oracle NetSuite which is a cloud-based ERP used by PT Gamma. Purposive sampling taken to obtain quality information it was necessary to determine the accuracy of the respondent which could be determined according to the researcher's considerations in accordance with the development of the research process which can be seen in *Figure 1. Research Process Flowchart*.

The 2 propositions in this research aimed to be answered:

P1: Organizational factors, projects, human resources and technology as well as external factors from consultants can be perceived as less than optimum in the implementation of PT Gamma's cloud-based ERP

P2: The discovery of PT Gamma's cloud-based ERP success model which was observed using the six sigma method

Data collection is a process that must first be done before conducting data analysis. After data collection is done, the data analysis process is then carried out. According to Marshall and Rosman (1995) cited in Ghauri, et al. (2020), the data that has been collected will be dissected, reduced, sorted, and rearranged to gain understanding, clarify problems, and test propositions. The stages of qualitative data analysis: (1) Data reduction; (2) Data display; and (3)

Conclusion: drawing and verification. The process of collecting and analyzing data in qualitative research is continuous and interactive (Ghauri, et al., 2020).

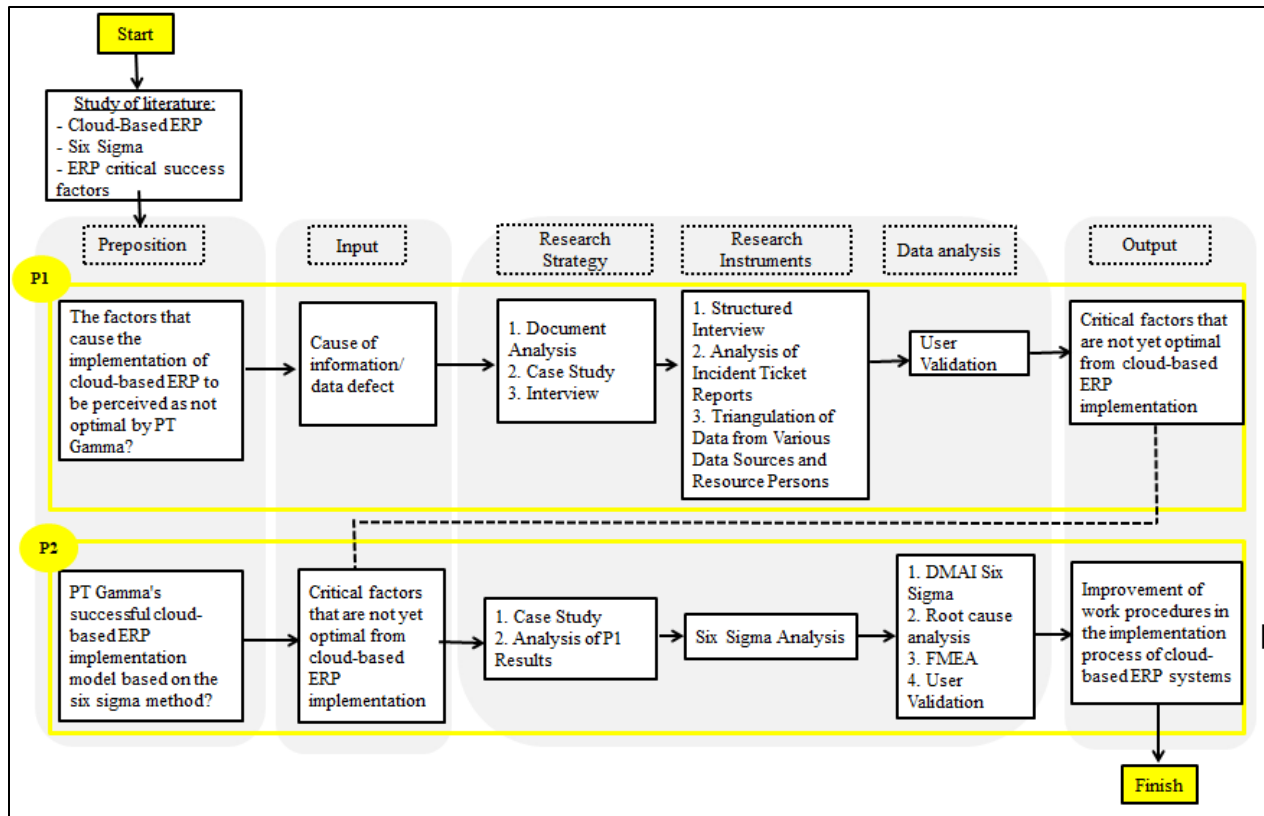


Figure 1. Research Process Flowchart (Author, 2022)

3.1 Data Analysis (Proposition 1)

- (1) Define stage: the phase of collecting primary and secondary data
 - Primary Data: Observation and Interview: map the current condition of the project as well as the factors of which dimensions are perceived to be the pain-points in ERP implementation, e.g. structured interviews with key users (video/ audio recordings) and questionnaire
 - Secondary Data: the data analysis stage begins by using the analysis of project documents provided by key users related to system implementation, e.g. IT infrastructures and issue logs.
- (2) Measurement stage
 Measurement stages can be measured from incident ticket reports (issue logs) in the last 8 months (January-August) which are calculated using Defect Per Unit (DPU) and Defect per Million Opportunities (DPMO) with the following formula:

$$DPU = \frac{\text{number of defect}}{\text{number of unit} \times \text{number of defect opportunity}}$$

$$DPMO = \frac{1.000.000 \times \text{number of defect}}{\text{number of unit} \times \text{number of defect opportunity}}$$

Figure 2. Formula of DPU and DPMO (Simamora & Pramesti, 2021)

- Number of defects describes the number of tickets (issues that occur) during the current month
- Number of units describes the number of tickets for implementation work carried out in the current month

- Number of defect opportunity describes the possibility of defects in sub-activities in 1 ticket (for this study, because 1 ticket describes only 1 activity, number 1 can be used)

The higher the sigma value (closer to number 6), it means that the quality control over the work is getting better because it has a smaller defect rate. Sigma table can be seen as follows (Simamora & Pramesti, 2021).

Table 2. Sigma Value Table (Simamora & Pramesti, 2021)

Yield	DPMO	Level Sigma
31%	691,462	1 Sigma
69.20%	308,538	2 Sigma
93.32%	66,807	3 Sigma
99.379%	6,210	4 Sigma
99.977%	233	5 Sigma
99.9997%	3.4	6 Sigma

- (3) Analysis Stage: carried out after obtaining reduced interview data to see which factor was more dominant and become root cause of the non-optimal implementation of cloud-based ERP. The analysis was carried out after obtaining reduced interview data to see which factor was more dominant and becoming the main factors of the non-optimal implementation of cloud-based ERP. The next stage is to perform data analysis.

The stages of data analysis use FMEA (Failure Mode and Effect Analysis) and Pareto diagrams when a cause-and-effect analysis has been collected with the aim of evaluating the existing failure rate of the system based on the provision of RPN (Risk Priority Number) to each problem input source. RPN is calculated from:

$$RPN = \textit{severity} \times \textit{detection} \times \textit{occurrence}$$

Figure 3. Formula of RPN (Simamora & Pramesti, 2021)

- Severity is an index (1-10) that describes the level of severity
- Detection is an index (1-10) that describes the absence of control over the source of the problem
- Occurrence is an index (1-10) that describes frequency as a source of problems

A high RPN value indicates a higher level of urgency to complete. Pareto charts can set priorities in solving problems. This method is used to index/rank the pain-points (factors that have not been implemented effectively) by PT Gamma so that they can refer to priorities in solving problems and formulating solutions.

3.2 Data Analysis (Proposition 2)

At this stage the research uses 5W1H (What, When, Who, Why, Where, and How) to determine improvement activities based on the main root causes from define, measure and analysis stages. This method is used to formulate input from research on current conditions as well as asking research respondents as users whether the input provided can be used as a solution to the problems that occur.

4. Result and Discussion

4.1 Define

PT Gamma has several different platforms that are integrated with each other starting from: (1) Sales initiation from the POS (Point of Sales) system is entered into the Internal Database (DB); (2) Internal Database (DB) integrates cash sales data (Direct to Customer) in real time into Oracle NetSuite as a corporate ERP system; (3) PT Gamma develops an internal supply chain system that is used by all stores which is also integrated with Oracle NetSuite as the company's ERP system; and (4) PT Gamma uses the services of a 3PL (warehouse managed by a third party) for storage of goods which is also integrated with Oracle NetSuite as the company's ERP system. As the system migration process progresses, PT Gamma records issue logs (problems that occur and the need for additional modules/changes and system customization) needed to support the company's business processes. The issue logs data become basis measurement of sigma value.

4.2 Measure

PT Gamma has 2 main business lines, namely: (1) Food & Beverages and (2) Ready to Drink (RTD) during the research period, namely January-August 2022. PT Gamma has 72 issue logs for the F&B business line and 22 issue logs for the RTD business line. Of the 72 issue logs for the F&B business line, there are 2 outstanding issues in June and August which are considered as the basis for assessing the number of defects. Of the 2 outstanding issues, one of them is related to the high priority inventory module which was issued in June 2022 and the other is related to integration with low priority sales POS which was issued in August 2022 as can be seen in Table 4.12 Table of Outstanding Issues PT Gamma – F&B Business Line (June and August 2022). Meanwhile, the number of units used in research for the F&B business line is 72 issue logs which represent the number of issues raised by PT Gamma during January-August 2022 (including issues that were eventually decided to be cancelled). Meanwhile, for the RTD business line, out of a total of 22 issue logs that have been issued, there are no outstanding issue logs from January to August 2022, so it can be said that the sigma value calculation is only relevant for the F&B business line.

Table 3. Table of Outstanding Issues PT Gamma – F&B Business Line (June and August 2022)

ID	Periode	Current Status	Module	Issue Title	Issue Description	Priority [High/Medium/Low]	Date Raised DD/MM/YYYY	Issue Raised by	Assigned To	Tech	Target Date DD/MM/YYYY	Solved Date DD/MM/YYYY	Date Closed DD/MM/YYYY	Manhours
#222	Jun-22	6. Support	INV	Qty Snapshot in Stock Count is different from actual Qty On Hand	F&B/SO/AUTOADJ/0222/52, qty on hand 9 in snapshot. But in Inventory Adjustment Qty on Hand on that date -71.	High	17-Mar-22	Intentionally Left Blank	Intentionally Left Blank	Intentionally Left Blank	17-Mar-22			0
#389	Aug-22	2. In Progress	MFG	Case 2 exception quinos when it finds inactive component item there is an exception link items:	Case 2 exception quinos exception when it finds an inactive component item there is an exception	Low	06-Jun-22	Intentionally Left Blank	Intentionally Left Blank	Intentionally Left Blank	01-Jul-22			

Calculation of the sigma value for the F&B business line is obtained from the calculation of the DPU and DPMO first, as can be seen as follows.

$$DPU = (\text{number of defects}) / (\text{number of units} \times \text{number of defects opportunity})$$

$$DPMO = DPU \times 1,000,000$$

The results of DPU and DPMO calculations for PT Gamma's F&B business line can be seen in table below. According to Table 4. Table of PT Gamma's DPU and DPMO Calculations, average DPU and DPMO in January - August 2022 were 5.21% and 52.083, consecutively.

Table 4. Table of Calculation of DPU and DPMO of PT Gamma (Author, 2022)

	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Average
PT Gamma (F&B business line)									
DPU	0,00%	0,00%	0,00%	0,00%	0,00%	8,33%	0,00%	33,33%	5,21%
number of defects	-	-	-	-	-	1,00	-	1,00	0,25
number of units	5,00	13,00	16,00	10,00	6,00	12,00	6,00	3,00	8,88
number of defect opportunity	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
PT Gamma (RTD business line)									
DPU	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	>	0,00%
number of defects	-	-	-	-	-	-	-	-	0,29
number of units	6,00	9,00	1,00	1,00	1,00	3,00	2,00	-	3,29
number of defect opportunity	1,00	1,00	1,00	1,00	1,00	1,00	1,00	-	1,00
PT Gamma (F&B business line)									
DPMO	-	-	-	-	-	83.333	-	333.333	52.083
number of defects	-	-	-	-	-	1,00	-	1,00	0,25
number of units	5,00	13,00	16,00	10,00	6,00	12,00	6,00	3,00	8,88
number of defect opportunity	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
PT Gamma (RTD business line)									
DPMO	-	-	-	-	-	-	-	>	-
number of defects	-	-	-	-	-	-	-	-	0,29
number of units	6,00	9,00	1,00	1,00	1,00	3,00	2,00	-	3,29
number of defect opportunity	1,00	1,00	1,00	1,00	1,00	1,00	1,00	-	1,00

• Number of defects describes the number of tickets (issues that occur) and escalate to consultant for the month
 • Number of units describes the number of tickets for implementation work carried out for the month
 • Number of defect opportunity describes the possibility of defects in sub-activities in 1 ticket (for this study, because 1 ticket describes only 1 activity, number 1) can be used

When compared with the six sigma measurement table above, the sigma value is between 3 and 4 so that it represents a moderate condition in terms of the defect rate that occurs during the ERP implementation process in 2022. If we interpolate to get a precise sigma value, we get a number equal to 3.243 as shown in the following calculation table.

Table 5. Table Sigma Level Calculation (Author, 2022)

Yield	DPMO	Level Sigma
31%	691,462	1 Sigma
69.20%	308,538	2 Sigma
93.32%	66,807	3 Sigma
99.379%	6,210	4 Sigma
99.977%	233	5 Sigma
99.9997%	3.4	6 Sigma

Yield	DPMO	Level Sigma
31,0000%	691.462	1
69,2000%	308.538	2
93,3200%	66.807	3
99,3790%	6.210	4 [3]
99,9770%	233	5
99,9997%	3,4	6

DPMO	52.083
DPMO - DPMO Sigma Lv 4	45.873 [1]
DPMO Sigma Lv 3 - DPMO Sigma Lv 4	60.597 [2]
[1]/[2]	75,70%
Sigma Lv (PT Gamma)	3,243 [3]-[1]/[2]

Calculation of PT Gamma's sigma level is at a moderate level because there are not many outstanding issues until the end of August 2022 because PT Gamma decided to dispose "nice to have" customization and for several issues that were outstanding for a long time, the consultant finally sought a work around to be executed in accordance with the limitations of the existing system as well as PT Gamma's internal parties to take action manually (outside the system) as mitigating action if it cannot be done systemically.

4.3 Analyze

The results of coding interviews conducted with main and supporting informants are finally summarized to become a questionnaire with an index of 1-10 to measure the Risk Priority Number (RPN) of each problem which was put forward by respondents to find the dominant root causes in ERP system implementation.

4.3.1 Results of Interview with Key Informants – Decision Makers

The RPN summaries and Pareto diagrams from the main respondents can be seen in the following table and diagram.

Table 6. Summary RPN – Main Respondents

Group Code	Categorization	ASSPM ¹				FC ²				Average			
		Severity	Detection	Occurrence	RPN	Severity	Detection	Occurrence	RPN	Severity	Detection	Occurrence	RPN
ERP Package Selection	Technological CSF	7	4	6	168	9	8	10	720	8	6	8	384
Software Testing, Customization and Troubleshooting	Technological CSF	8	2	7	112	9	9	9	729	9	6	8	374
Accuracy, Quality and Data Integrity	Technological CSF	9	9	9	729					9	9	9	729
IT Infrastructure	Technological CSF	5	3	3	45	8	8	8	512	7	6	6	197
Implemented Modules	Technological CSF	6	4	8	192	7	6	5	210	7	5	7	211
ERP, business and business process alignment	Technological CSF	4	2	3	24	6	7	6	252	5	5	5	101
Minimum Customization	Technological CSF	6	2	3	36					6	2	3	36
Functionality	Technological CSF	8	3	4	96					8	3	4	96
System Quality	Technological CSF					9	9	9	729	9	9	9	729
Service Quality	External Parties CSF	6	2	3	36	9	9	9	729	8	6	6	248
Pre-qualification Efforts	External Parties CSF	7	1	2	14					7	1	2	14
ERP Vendor Selection	External Parties CSF	6	1	2	12					6	1	2	12
Controlled ROI on ERP Implementation (Return on Investment)	Organizational CSF	7	4	8	224	9	9	9	729	8	7	9	442
Competitive and External Pressure	Organizational CSF					8	7	6	336	8	7	6	336
Users' Behaviour	Human CSF	7	3	6	126					7	3	6	126
Users and Other Stakeholders' Involvement in Evaluation, Modification and Implementation of the System	Human CSF	8	2	4	64	-	-	-	-	4	1	2	8

¹ASSPM: Accounting, System, Policy and Procedure Manager ²FC: Finance Controller

Table 7. Table of RPN Accumulation – Main Respondents

CSFs (Critical Success Factors)	RPN	% Accumulation RPN	Categorization
Accuracy, Quality and Data Integrity	729	18%	Technological CSF
System Quality	729	36%	Technological CSF
Controlled ROI on ERP Implementation (Return on Investment)	442	47%	Organizational CSF
ERP Package Selection	384	56%	Technological CSF
Software Testing, Customization and Troubleshooting	374	66%	Technological CSF
Competitive and External Pressure	336	74%	Organizational CSF
Service Quality	248	80%	External Parties CSF
Implemented Modules	211	85%	Technological CSF
IT Infrastructure	197	90%	Technological CSF
Users' Behaviour	126	93%	Human CSF
ERP, business and business process alignment	101	96%	Technological CSF
Functionality	96	98%	Technological CSF
Minimum Customization	36	99%	Technological CSF
Pre-qualification Efforts	14	100%	External Parties CSF
ERP Vendor Selection	12	100%	External Parties CSF
Users and Other Stakeholders' Involvement in Evaluation, Modification and Implementation of the System	8	100%	Human CSF
Total	4,043		

Categorization of CSFs (Critical Success Factors)	RPN	% Accumulation RPN
Technological CSF	2,857	71%
Organizational CSF	778	90%
External Parties CSF	274	97%
Human CSF	134	100%
Project CSF	0	100%
Total	4,043	

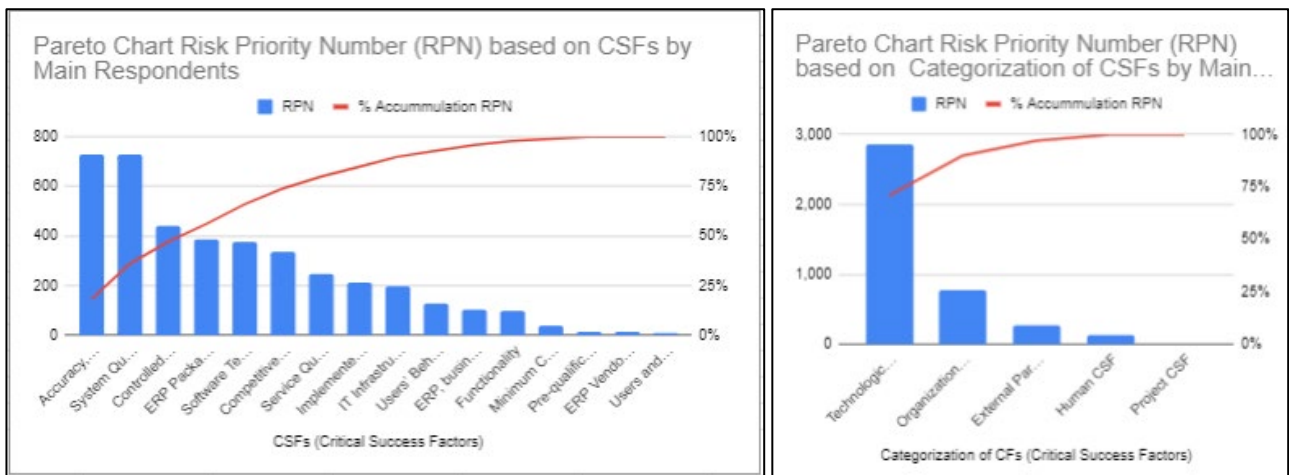


Figure 4. Diagram Pareto - Main Respondents

Technological and organizational factors have a dominant influence according to the main respondents of PT Gamma with an RPN contribution of 90%. Other factors that influence but are not dominant are external parties (consultants) and human resources, namely 10%. Meanwhile, the main respondent PT Gamma considered the factor that had no effect on the ERP system migration process was project management. Based on the results of interviews with the main respondents (decision makers), most influential factors are:

- Technological - Accuracy, Quality and Data Integrity (18% of the total RPN value)
With the complexity of business processes in the retail sector leading to the manufacturing business, Oracle NetSuite was not able to provide good accuracy and quality data for further analysis due to limitations in modules and data processing speed, for example there was insufficient control over inventory recording caused by the unreliable costing engine in the inventory module makes a large difference between the stock taking results at the end of the month and the inventory balance recorded in the ERP system.
- Technological - System Quality (18% of the total RPN value)
This is the main consideration of key informants because of the ease of customization in the Oracle NetSuite system which is considered less rigid than SAP, sometimes it can make the default modules of the system easier to modify even though this allows errors or bugs to occur when the system is run in different conditions which was not ideal according to its designation.

- Technological - ERP Package Selection (9% of the total RPN value)
Business roadmap is towards manufacturing companies whose industry best practices use SAP rather than Oracle. Oracle is considered more suitable for the service industry than manufacturing, so it was decided to switch to SAP Cloud Hana even though the estimated cost is 3 times higher. The selection of this product should be done considering the long-term scalability of the business (more than 10 years from now what the business will be like) so that it can be decided to use the right system and prevent possibility of doing re-migration in the future.
- Technological - Software Testing, Customization and Troubleshooting (9% of the total RPN value)
The migration process for the Oracle NetSuite system is continuous from the process of customization, testing, solving integration problems, to re-testing which takes place repeatedly so that it can meet the business process expectations that the company wants. There are also several processes where PT Gamma needs to wait for answers from consultant inquiries to central Oracle.
- Organizational - Controlled ROI on ERP Implementation (9% of the total RPN value)
Companies see that there is no point in maintaining the old system, namely Oracle NetSuite (for SMEs) which is no longer in accordance with the current business scale (enterprise) because after calculating the ROI (return on investment) from maintaining and upgrading the current system by migrating back to ERP level enterprise, the total costs are not much different from the benefits that are more profitable in the long term (can cater unlimited business needs in the future, while Oracle NetSuite currently has many limitations in system performance for SME businesses).
- Organizational - Competitive and External Pressure (8% of the total RPN value)
In order to get an IPO, the main focus of the business is the accounting (reporting) department, how can PT Gamma present its financial information accurately and reliably. Therefore, PT Gamma chose the best option by changing the system to enterprise ERP and choosing carefully the suitability of the ERP system to the company's best suits on future needs.

4.3.1 Results of Interview with Supporting Informants – Business Users

Table 8. Summary RPN – Supporting Respondents

Group Code	Categorization	VPSO ¹				AM ²				FM ³				Average			
		Severity	Detection	Occurrence	RPN	Severity	Detection	Occurrence	RPN	Severity	Detection	Occurrence	RPN	Severity	Detection	Occurrence	RPN
ERP Package Selection	Technological CSF	10	8	8	640	7	7	9	441	8	9	9	648	8	8	9	578
Accuracy, Quality and Data Integrity	Technological CSF	8	3	3	72	9	8	9	648	10	10	10	1.000	9	7	7	462
IT Infrastructure	Technological CSF	5	2	2	20	8	7	8	448					7	5	5	146
ERP, business and business process alignment	Technological CSF					9	9	6	486					9	9	6	486
Implemented Modules	Technological CSF									9	9	10	810	9	9	10	810
Software Testing, Customization and Troubleshooting	Technological CSF	7	7	2	98									7	7	2	98
Minimum Customization	Technological CSF	8	2	4	64									8	2	4	64
Business Process Re-engineering	Organizational CSF	4	3	3	36	5	5	5	125	8	8	8	512	6	5	5	161
Strategic Goals and Objectives	Organizational CSF									8	8	9	576	8	8	9	576
Controlled ROI on ERP Implementation (Return on Investment)	Organizational CSF	4	2	1	8					8	8	9	576	6	5	5	150
Users Awareness and Training	Organizational CSF									9	9	9	729	9	9	9	729
Competitive and External Pressure	Organizational CSF	8	1	1	8									8	1	1	8
Service Quality	External Parties CSF	10	5	8	400	9	9	9	729	10	10	10	1.000	10	8	9	696
ERP Vendor Selection	External Parties CSF					7	7	7	343					7	7	7	343
Users' Behaviour	Human CSF	5	8	5	200	5	5	5	125					5	7	5	163
Users and Other Stakeholders' Involvement in Evaluation, Modification and Implementation of the System	Human CSF					8	8	8	512					8	8	8	512
Presence of Project Champion and Adequate Role	Project CSF	7	5	5	175									7	5	5	175
Composition of a Capable and Balanced Project Team	Project CSF	7	5	5	175									7	5	5	175

¹VPSO: VP Strategic Operations ²AM: Accounting Manager ³FM: Finance Manager

Table 9. Table of RPN Accumulation – Supporting Respondents

CSFs (Critical Success Factors)	RPN	% Accumulation RPN	Categorization
Implemented Modules	810	13%	Technological CSF
Users Awareness and Training	729	24%	Organizational CSF
Service Quality	696	35%	External Parties CSF
ERP Package Selection	578	44%	Technological CSF
Strategic Goals and Objectives	576	54%	Organizational CSF
Users and Other Stakeholders' Involvement in Evaluation, Modification and Implementation of the System	512	62%	Human CSF
ERP, business and business process alignment	486	69%	Technological CSF
Accuracy, Quality and Data Integrity	462	77%	Technological CSF
ERP Vendor Selection	343	82%	External Parties CSF
Presence of Project Champion and Adequate Role	175	85%	Project CSF
Composition of a Capable and Balanced Project Team	175	88%	Project CSF
Users' Behaviour	163	90%	Human CSF
Business Process Re-engineering	161	93%	Organizational CSF
Controlled ROI on ERP Implementation (Return on Investment)	150	95%	Organizational CSF
IT Infrastructure	146	97%	Technological CSF
Software Testing, Customization and Troubleshooting	98	99%	Technological CSF
Minimum Customization	64	100%	Technological CSF
Competitive and External Pressure	8	100%	Organizational CSF
Total	6,332		

Categorization of CFs (Critical Success Factors)	RPN	% Accumulation RPN
Technological CSF	2,644	42%
Organizational CSF	1,624	67%
External Parties CSF	1,039	84%
Human CSF	675	94%
Project CSF	350	100%
Total	6,332	

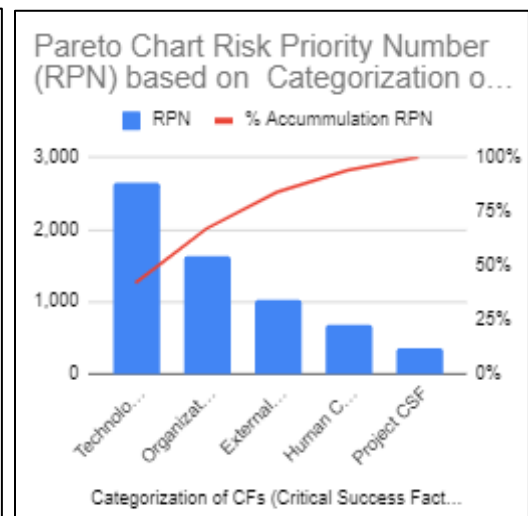
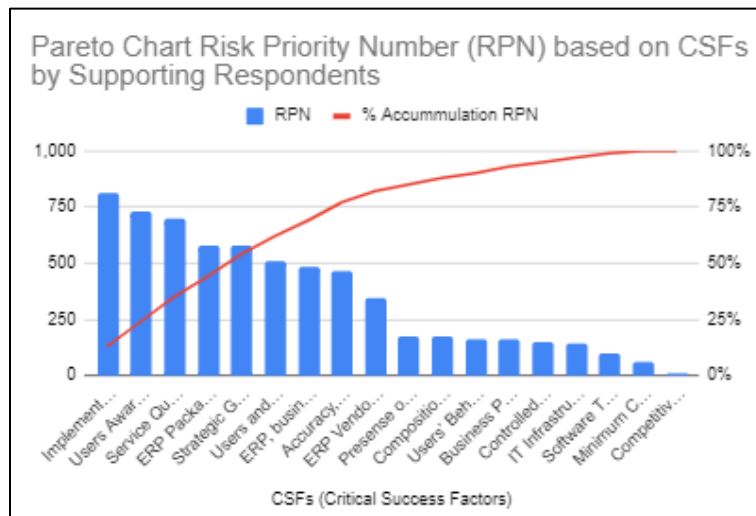


Figure 5. Diagram Pareto - Supporting Respondents

Technological, organizational and external factors have a dominant influence according to the main respondents of PT Gamma with an RPN contribution of 84%. Another influential but not dominant factor is human resources and project management, which contribute 16% of total RPN. Based on the results of interviews with the supporting respondents (main users), most influential factors are:

- Technological - Implemented Modules (13% of the total RPN value)
There are several obstacles in using the existing modules in Oracle NetSuite, including the incompatibility of ERP with the company's in-house apps (SCM Apps) so that good receipts for inventory cannot be done in a timely manner. Also, existing modules also do not accommodate the need for recording using the latest accounting standards, for example PSAK 73 (Lease).
- Technological - ERP Package Selection (9% of the total RPN value)
Companies must be able to choose an ERP system that can accommodate a long-term business roadmap (not just the next 1-2 years). The respondents were not involved in selecting SAP over Oracle as the more suitable enterprise ERP for the company. However, they agreed that the selection must be made based on suitability and industry benchmarking in accordance with the company's business roadmap.

- Technological - ERP, Business and Business Process Alignment (7% of the total value of RPN)
Oracle NetSuite is made for Small, Medium Enterprise (SME) scale with limitations in the form of a maximum tier (data processing speed). If it has exceeded the processing capacity, the input process becomes hampered and slow to execute, e.g. after processing sales data for a certain batch, Oracle NetSuite will allow a 15-minute delay before processing the next batch so this delay can hinder the need to analyze information in real-time.
- Technological - Accuracy, Quality and Data Integrity (8% of the total RPN value)
The data that enters the ERP should be real-time, but due to bottlenecks (integration problems, insufficient bandwidth to process data, etc.), a lot of manual reconciliation is required which causes a high error rate that can occur, additional work to perform manual reconciliation, etc.
- Organizational - User awareness and training (11% of the total RPN value)
Changes in the company's business processes that quickly often become a challenge for consultants and the company itself to quickly adapt to the use of new modules in the system. This is then also related to the need for system understanding and in-depth training which can result in non-optimal use of the system by the user and the occurrence of input errors in the system.
- Organizational - Strategic goals and objectives (10% of the total RPN value)
Determining the selection of an ERP system should be in line with the company's long-term vision. The current implementation of Oracle NetSuite cannot accommodate the needs of companies that have grown very quickly.
- External Parties - Service quality (9% of the total RPN value).
The company sees the need for and the role of consultants in translating business requirements into the system is still not optimal (consultant's understanding is limited to common practice, while in companies there are more specific business cases that require special modules or customization).

4.4 Improve

Based on previous root-caused analysis, 5W+1H table on proposed solutions can be summarized into 3 actions (whys):

1. Re-migrating to enterprise level of ERP (from Oracle NetSuite to SAP Hana)
2. Select ERP based on long-term strategic vision of company (SAP Hana instead of Oracle Fusion)
3. Select best consultant and product (1st tier) despite of number of cost bear by company

Table10. Table of Proposed Improvement (5W+1H)

CSFs (Critical Success Factors)	Why	What	When	Where	Who	How	Agreed by Respondents?
Technological CSF	1. Accuracy, Quality and Data Integrity	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Detail UAT for Costing Engine Data Cleansing	Yes
	2. System Quality	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Benchmarking needs based on similar industry (manufacturing and retail companies)	Yes
	3. ERP Package Selection	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Best choice of ERP - based on suitability instead of cost and select ERP that can reduce customization in future.	Yes
	4. Software Testing, Customization and Troubleshooting	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Detail blue print and UAT for all business processes Consider future practicability when making customization	Yes
	5. Implemented Modules	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Best ERP selection for long-term company's goal and roadmap	Yes
Organizational CSF	1. Competitive and External Pressure	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Best ERP selection for long-term company's goal and roadmap	Yes
	2. Controlled ROI on ERP Implementation (Return on Investment)	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Perform post-implementation audit (checkpoints) to control ERP re-migration process	Yes
	3. User awareness and testing	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Make user manual book, deliver proper training for new modules and select champion in each department.	Yes
	4. Strategic Goals and Objectives	1,2	Go Live SAP Hana in 1 January 2023	Head Office	All Users	Best choice of ERP - based on suitability instead of cost and select ERP that can reduce customization in future.	Yes
External Parties CSF	Service Quality	2,3	- Go Live SAP Hana in 1 January 2023 - New Vendor Selection (1st Tier)	Head Office	All Users	Consultant's background check of service quality	Yes

5. Conclusion and Future Research

Based on the results of the evaluation of project documents (issue logs) during January-August 2022, PT Gamma's sigma value is moderate, namely at 3,243 because the company has minimized unnecessary customizations and is looking for workarounds if there are implementation limitations on the system. Based on the coding of interviews and questionnaires to measure the RPN index from the results of these interviews, the dominant factors in implementation are: (1) technological (2) organizational; and (3) external factors. Another factor that is also influential but not dominant is the human resource factor. The less influential factor is project management because both the decision makers and the main users feel that the existing project management is good, the communication between the consultant and PT Gamma is good and progress is updated regularly.

PT Gamma chose a good decision to replace the current ERP system (Oracle NetSuite) with a Small Medium Entity (SME) business scale to an ERP system for a larger business scale of ERP (SAP Cloud Hana) after considering the return on investment (ROI) of both decisions. PT Gamma has also made a good decision to consider the selection of an enterprise ERP system according to the long-term needs and roadmap of the company (manufacturing company). SAP (more suitable for the manufacturing industry) than Oracle (more suitable for the service industry) after benchmarking against similar industries that have succeeded in using the system. PT Gamma chose to use a premium (first tier) consultant who is a top player in system migration and has realized the importance of qualified consultants in the successful implementation of the system. With this, risks such as re-migration due to changing consultants can be minimized.

Based on interviews with decision makers and business users, the suggestions that can be given are: (1) conduct a detailed review for the blue print and consider future practicability for system customization; (2) coordinate with consultants to make detailed user guides/manual books according to the company's business processes; (3) conduct regular training whenever there is a new module to be implemented; (4) perform UAT (User Acceptance Test) using data as real as possible in the sandbox; (5) perform data cleansing before data is entered into production; and (6) conduct regular post implementation audits, to check whether the objective of a system modification is in accordance with the company's goals. Due to the limited time of the study and also the object of research, the researcher recommends further research to use DMAIC method – Define, Measure, Analyze, Improve, and Control (not only DMAIC – Define, Measure, Analyze, and Improve) and extends the research period to get more robust research results.

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