

Analysis of Selecting Local Vendors System Application Product Pt. Panasonic Manufacturing Indonesia Using Analytic Hierarchy Process Method

Ahmad Shibghatullah Shiddieqy¹, Pipit Dewi Arnesia²

¹(Master of Technology and Engineering Study Program, Gunadarma University, Depok Indonesia)

²(STMIK Jakarta STI&K)

Abstract:

PT.Panasonic Manufacturing Indonesia needs to utilize information technology to be able to run business processes faster and can process data more accurately. To help with this problem, PT.Panasonic Manufacturing Indonesia requires a system that can meet the needs of information and business that runs and integrated so that can provide information in real time to its users. SAP (System, Product and Application) answered the need. With the SAP system, the company also needs a reliable local SAP vendor to assist its implementation. This research will select the best local SAP vendor to assist the implementation of SAP system in PT.Panasonic Manufacturing Indonesia, with AHP (Analytical Hierarchy Process) method. It starts from defining the problem and determining the desired solution, then creating a hierarchical structure, sub-goals, possible alternatives, and a comparison matrix based on the judgment of the decision maker by assessing the importance of an element over other elements.

Key words: SAP; Vendor; AHP; Manufacturing;

Date of Submission: 07-05-2020

Date of Acceptance: 21-05-2020

I. Introduction

Along with the increasing complexity of processes and operational functions within the company, another need arises, namely the need for an integrated information system that can provide information in real time to its users. This impulse is what ultimately demanded that PT Panasonic Manufacturing Indonesia needs a new ERP (Enterprise Resource Planning) system, which is a system specifically designed to obtain, manage, and produce information needed by its users. These needs are answered by choosing SAP (System, Product and Application), which is a system designed to integrate all functional areas in an organization in order to achieve the highest point of effectiveness and efficiency. SAP is a software product or software that is useful to help companies plan and carry out various daily activities ranging from business processes related to aspects of operations, production and distribution in the company. In SAP consists of a number of modules / applications and each application works in relation to one another. This system is expected to be able to make the company solve previous problems and is expected to increase the productivity of the manufacturing process, logistics, distribution, inventory (inventory), shipping, payment and corporate accounting. In line with research conducted by Wafi, et al (2013) which explains that with a manufacturing system in the company it will be easy to process all of the company's resources and display all required reports so that the company's daily activities will be smooth. The method that I chose is AHP (Analytical Hierarchy Process). AHP is a functional hierarchy with the main input is human perception. With hierarchy, a complex and unstructured problem is solved into groups. Then the groups are arranged into a hierarchical form.

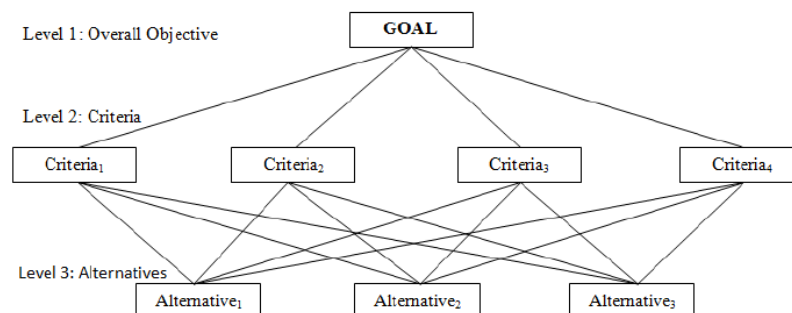


Figure 1. General Hierarchy Structure of AHP

II. Literature Review

The Analytic Hierarchy Process (AHP) is a multi-criteria decision making (MCDM) method. The oldest reference that we have found dates from 1972 (T. Saaty, 1972). Then, a paper in the journal of Mathematical Psychology (T.Saaty, 1977) precisely described the method.

Choosing the right SAP local vendor based on the AHP method, it takes the right steps so that a vendor that really has value for the company will be chosen, the following are the steps taken:

- 1) Form a team consisting of Managers in each BU (Business Unit) of PT. Panasonic Manufacturing Indonesia and the research team looking for information relating to SAP vendors.
- 2) Identification of vendor factor criteria (Wei, et. Al, 2004) from information obtained from point number one.
- 3) Create a criteria structure from identifying vendor criteria (Wei, et. Al, 2004) point number two.
- 4) Extract the criteria obtained from point number three, so we get the criteria that represent each function (Wei, et. Al, 2004).
- 5) Screen SAP local vendors by conducting interviews with managers in each business unit of PT. Panasonic Manufacturing Indonesia
- 6) After point one to point five is done, then evaluate the selection of SAP local vendors using the AHP method obtained from the results of surveys and interviews.
- 7) After the SAP local vendor is evaluated using the AHP method, the results of the SAP local vendor selected from each section are given to each Manager from PT. Panasonic Manufacturing Indonesia

III. Methodology

The AHP encompasses six basic steps as summarized as follows:

Step 1. AHP uses several small sub problems to present a complex decision problem. Thus, the first act is to decompose the decision problem into a hierarchy with a goal at the top, criteria and sub-criteria at levels and sublevels of and decision alternatives at the bottom of the hierarchy.

Step 2. The decision matrix, which is based on Saaty's nine-point scale, is constructed. The decision maker uses the fundamental 1–9 scale defined by Saaty to assess the priority score. In this context, the assessment of 1 indicates equal importance, 3 moderately more, 5 strongly more, 7 very strongly and 9 indicates extremely more importance. The values of 2, 4, 6, and 8 are allotted to indicate compromise values of importance.

The Fundamental Scale for Pairwise Comparisons		
Intensity of Importance	Definition	Explanation
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment moderately favor one element over another
5	Strong importance	Experience and judgment strongly favor one element over another
7	Very strong importance	One element is favored very strongly over another; its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order of affirmation
Intensities of 2, 4, 6, and 8 can be used to express intermediate values. Intensities of 1.1, 1.2, 1.3, etc. can be used for elements that are very close in importance.		

Figure 2. Saaty Scale

Step 3. The third step involves the comparison in pairs of the elements of the constructed hierarchy. The aim is to set their relative priorities with respect to each of the elements at the next higher level. The pairwise comparison matrix, which is based on the Saaty's 1–9 scale where A represents the pairwise comparison matrix, W the eigenvector and max the highest eigenvalue. If there are elements at the higher levels of the hierarchy, the obtained weight vector is multiplied with the weight coefficients of the elements at the higher levels, until the top of the hierarchy is reached. The alternative with the highest weight coefficient value should be taken as the best alternative. If $n(n - 1)/2$ comparisons are consistent with n is the number of criteria, then the elements $\{a_{ij}\}$ will satisfy the following conditions: $a_{ij} = w_i/w_j = 1/a_{ji}$ and $a_{ii} = 1$ with $i, j, k = 1, 2, \dots, n$. In the comparison matrix, a_{ij} can be interpreted as the degree of preference of i th criteria over j th criteria. It appears that the weight determination of criteria is more reliable when using pairwise comparisons than

obtaining them directly, because it is easier to make a comparison between two attributes than make an overall weight assignment.

Step 4. AHP also calculates an inconsistency index (or consistency ratio) to reflect the consistency of decision maker's judgments during the evaluation phase. The inconsistency index in both the decision matrix and in pairwise comparison matrices could be calculated with the equation: $CI = (\max - n) / (n - 1)$. The closer the inconsistency index is to zero, the greater the consistency. The consistency of the assessments is ensured if the equality $a_{ij} - a_{ik} = a_{ik}$ holds for all criteria. The relevant index should be lower than 0.10 to accept the AHP results as consistent. If this is not the case, the decision-maker should go back to Steps 2 and 3 and redo the assessments and comparisons.

		Scope & Approach																		
Kriteria		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Kriteria	
Soltius												X							Deloitte	
		Execution Proposal																		
Kriteria		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Kriteria	
Soltius												X							Deloitte	
		Commercial																		
Kriteria		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Kriteria	
Soltius												X							Deloitte	
		Risk																		
Kriteria		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Kriteria	
Soltius												X							Deloitte	
		Others																		
Kriteria		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Kriteria	
Soltius												X							Deloitte	

Figure 3. Random Indices

Step 5. Before all the calculations of vector of priorities, the comparison matrix has to be normalized. Therefore, each column has to be divided by the sum of entries of the corresponding column. In that way, a normalized matrix is obtained in which the sum of the elements of each column vector is 1.

Step 6. For the following part, the eigenvalues of this matrix are needed to be calculated which would give the relative weights of criteria. This procedure is common in mathematics. The relative weights obtained in the third step should verify $A \cdot W = \max \cdot W$

IV. Research & Analysis

Each company has its own criteria in choosing a local vendor in SAP implementation, which is caused by the company's business processes of each different company. After collecting data about local SAP vendors, the next thing to do is identify the SAP vendor factor criteria (Wei, et. Al, 2004) that PT. Panasonic Manufacturing Indonesia, after an interview with the Manager of PT. Panasonic Manufacturing Indonesia, some factors obtained from interviews include:

1. Scope & Approach Factor

The Scope & Approach factor is a factor related to the consultant's understanding of SAP software, the SGST rollout system and the method of the employment contract agreement with PT. Panasonic Manufacturing Indonesia.

2. Execution Proposal Factor

Execution Proposal Factor is a factor related to the duration of the project, number of consultants, and location of HR consultants.

3. Commercial Factors

Commercial factors are factors related to total cost, payment period, man-day rate, traveling costs and overtime.

4. Risk Factors

Risk factor is a factor related to the risk that will occur if it does not meet the agreed time and the number of consultants used during the blue print phase.

5. Others Factors

The Others factor is an additional factor that may occur such as the target mobilization of consultants HR and the possibility of implementation in Asia-Pacific in the future.

4.1 Extract Criteria Factor

After the factor criteria have been obtained, extracts of these factors (Wei, et. Al, 2004) are extracted, because in the AHP method, decision making of more than nine criteria will result in irrelevant decisions (Saaty, T. L. 1990). Therefore, extraction from the criteria of these factors is carried out so that a factor that is

representative of all these criteria is obtained. For the scope and approach factor criteria, there are three criteria that represent the overall scope and approach factor, these factors include:

1. Understanding of the Scope of Works and requirements
2. Project Manager provided by PISCAP
3. Engagement Model

For the proposal execution factor, there are four criteria that represent the proposal execution factor as a whole, these factors include:

1. Proposed Project Duration
2. Number of Consultants
3. Resource to be assessed by COE
4. Local consultants

For the proposal execution factor, there are four criteria that represent the proposal execution factor as a whole, these factors include:

1. Proposed Project Duration
2. Number of Consultants
3. Resource to be assessed by COE
4. Local consultants

For commercial factors, there are seven criteria that represent commercial factors as a whole, these factors include:

1. Total Cost (SGD)
2. Charging Model
3. Billing Period
4. Additional Resource / CR Man-day rate (SGD)
5. Traveling Cost (in Jakarta)
6. Overtime (Workday)
7. Overtime (Non working day)

For risk factors, there are two criteria that represent risk factors for the proposal as a whole, these factors include:

1. Project undertakings based on Time & Material basis
2. Resource

For others factors, there are two criteria that represent others factors as a whole proposal, these factors include:

1. Resource mobilization
2. Future Rollout in Asia Pacific

4.2 Data Trial

Questionnaire data that has been distributed to three functional management parties in six BU (Business units) of PT. Panasonic Manufacturing Indonesia which consists of Air Conditioner business unit, Audio business unit, Fan business unit, Refrigerator business unit, Laundry System business unit, Water Pump business unit, then the data obtained from the questionnaire is tested by entering the data into expert choice software. This is an example of data from the production division of the AC department. Figure 4 is the result of the questionnaire from the AC production division. Then the data is inputted into the expert choice software by taking the parameters from the questionnaire (Figure 5). Then, the performance sensitivity goal graph will also appear (Figure 6). Finally, we will attach the final result data from that section which is then totaled with other departments (Figure 7).

Kriteria	Intensitas Kepentingan																		Kriteria
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9		
Scope & Approach									X										Execution Proposal
											X								Commercial
											X		X						Risk
Execution Proposal												X							Commercial
								X											Risk
											X								Others
Commercial										X									Risk
												X							Others
													X						Others
Risk									X										Others

Figure 4. Result Qetionary From Department

	Scope and Approach	Execution Proposal	Commercial	Risk	Others
Scope and Approach		1,0	3,0	4,0	2,0
Execution Proposal			4,0	3,0	2,0
Commercial				3,0	3,0
Risk					4,0
Others	Incon: 0,42				

Figure 5. Result Data From Expert Choice

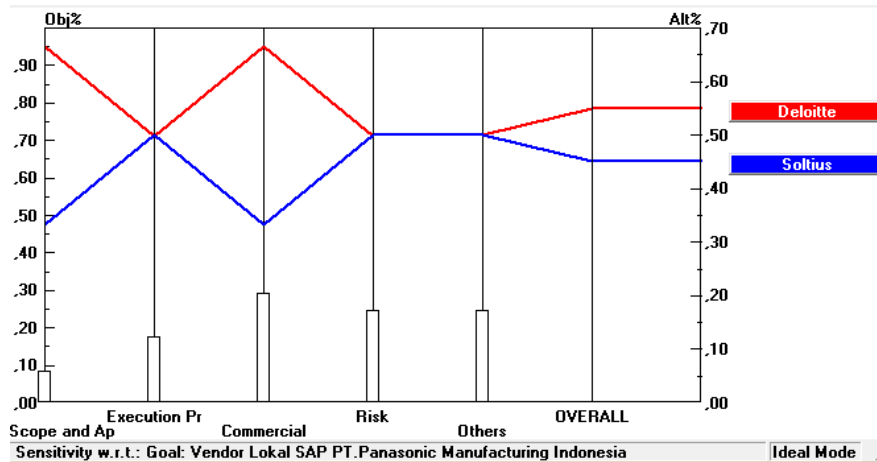


Figure 6. Performance Sensitivity Goal

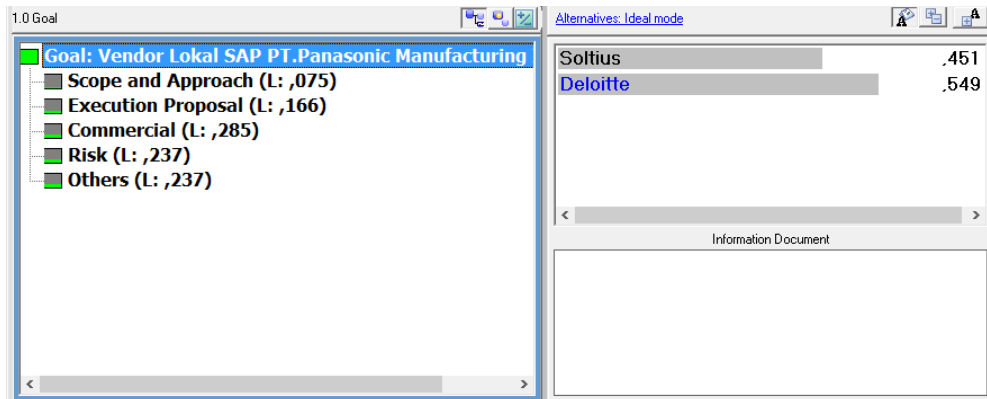


Figure 7. Final Data Result

4.3 Final Data Result

After the data is processed using expert choice, then see whether the inconsistency ratio is smaller or equal to 0.1 ($RI \leq 0.1$), if it turns out that the inconsistency ratio is greater than 0.1 then a survey must be conducted against the Manager, because if the value the inconsistency ratio is greater than 0.1 then the final result of data processing is invalid (Thomas L. Saaty, 1990). After obtaining valid results, the results are then submitted to the Manager of PT. Panasonic Manufacturing Indonesia, the results of data processing in the form of graphics and also the percentage of ERP software used as an alternative, the largest percentage is an alternative worthy of being chosen by PT. Panasonic Manufacturing Indonesia. Questionnaire data that has been processed by expert choice produces different outputs from each division because each division does not have the same needs, below this table the results of the software chosen by each division.

Business Unit	Data Result Expert Choice	
	Soltius	Deloitte
Finance Division BU Air Conditioner	0,357	0,643
Finance Division BU Audio	0,458	0,542
Finance Division BU Fan	0,447	0,553
Finance Division BU Refrigerator	0,441	0,559
Finance Division BU Laundry System	0,462	0,538
Finance Division BU Water Pump	0,372	0,628
Total Result All Division	0,423	0,577

Table 1. Total Result Finance Division

Bussiness Unit	Data Result Expert Choice	
	Soltius	Deloitte
Purchasing Division BU Air Conditioner	0,547	0,543
Purchasing Division BU Audio	0,415	0,585
Purchasing Division BU Fan	0,413	0,587
Purchasing Division BU Refrigerator	0,458	0,542
Purchasing Division BU Laundry System	0,437	0,563
Purchasing Division BU Water Pump	0,408	0,592
Total Result All Division	0,446	0,569

Table 2. Total Result Purchasing Division

Bussiness Unit	Data Result Expert Choice	
	Soltius	Deloitte
Production Division BU Air Conditioner	0,415	0,549
Production Division BU Audio	0,435	0,547
Production Division BU Fan	0,512	0,488
Production Division BU Refrigerator	0,398	0,602
Production Division BU Laundry System	0,487	0,513
Production Division BU Water Pump	0,488	0,512
Total Result All Division	0,456	0,535

Table 3. Total Result Production Division

V. Conclusion

Based on the results and discussion of data processing standardization design analysis and determination of priorities in determining the local SAP vendor PT. Panasonic Manufacturing Indonesia then made several conclusions, including:

1. By using Soltius and Deloitte as an alternative to local SAP vendors, Deloitte is chosen by almost all Division Managers in all Business Units, because Deloitte can meet the needs assessed in terms of functionality, flexibility and ease in implementing SAP at PT Panasonic Manufacturing Indonesia.
2. The Finance Manager Division chose Deloitte because the price was lower than Soltius and also able to meet the business needs of the financial division in terms of functionality and ease of use.
3. Deloitte is the priority of SAP's local vendors selected from three divisions of six Business Units at PT. Panasonic Manufacturing Indonesia. The results of data processing using expert choice produce SAP local vendor weights for the financial division by 0.462, from the purchasing division 0.694 and from the production division 0.797.

References

- [1]. Forman, E. H., T. L. Saaty., M. A. Selly, R. Whitaker, J. Saaty dan F. Ruffing., (1986). Expert Choice; User Manual. Expert Choice, Inc., Pittsburgh.
- [2]. Saaty T.L. (1990), "The Analytic Hierarchy Process", New York: McGraw Hill.
- [3]. Brunelli, M. (2015). Introduction to the Analytic Hierarchy Proces. New York: Springer.
- [4]. O'Brien, J. A. (2000). Introduction to Information Systems (edisi 11). New York: McGraw-Hill Irwin.
- [5]. Brady, J., Monk, E., Wagner, B. (2001). Concept in Enterprise Resource Planning. Canada: Thomson Learning.
- [6]. Seto, Bagus Dwi. 2013. Definisi SAP (System Application and Product in data processing), (Online), (<http://bagusdwiseto.blogspot.com/2013/04/definisi-sap-system-application-and.html>), diakses 5 Februari 2018.
- [7]. Yii. 2009. Modul, (Online), (<http://www.yiiframework.com/License/>), diakses 24 Februari 2018.
- [8]. Wei, C. C., Chien, C. F. dan Wang, M. J. J. (2004). "An AHP based approach to ERP system selection". *International Journal of Production Economics* 96,47-62.

Ahmad Shibghatullah Shiddieqy, et. al. "Analysis of Selecting Local Vendors System Application Product Pt. Panasonic Manufacturing Indonesia Using Analytic Hierarchy Process Method." *IOSR Journal of Computer Engineering (IOSR-JCE)*, 22(3), 2020, pp. 07-12.