DECISION ANALYSIS ON SURVEY AND SOIL INVESTIGATION PROBLEM IN POWER ENGINEERING CONSULTANT

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Abstract - The study aims to gather and organize information for decision making against the problems arising in Power Engineering Consultant's survey and soil investigation product due to new policy in production cost efficiency that is implemented in 2012. The study conducted using Kepner and Tragoe's analytical process that consisted of four stages analytical process such as situation analysis, problem analysis, decision making analysis and potential problem analysis. As for the decision making analysis, the analysis will be conducted using Mix Method research. Starting with the qualitative method that involving detailed exploration from interview session with selected person and followed by a quantitative method, in which SMART analysis method is implemented. As the input of decision making analysis, there are five alternatives solution for Power Engineering Consultant's problem, such as: fix the problem and continue to cooperate with third party institutions, establish cooperation with external surveyor team, establish internal surveyor team, acquisition of one selected surveyor company, and establishing "umbrella contract" with selected surveyor company. After the decision making analysis is conducted, the alternative to establishing "umbrella contract" with selected surveyor company is selected as the best alternative solution for Power Engineering Consultant's problem. The result is considered as the best solution since the decision makers are involved in the entire decision making process. Based on this result, the implementation plan then made to be in line with Power Engineering Consultant's current condition

Keywords: Problem Analysis, Decision Making Analysis, Umbrella Contract, Surveyor Company

I. Introduction

In the service industry, customer satisfaction is one of the deciding success factors for the company. The same goes for Power Engineering Consultant as a company that provides engineering services in the field of electricity, where customer satisfaction is one of the core value implemented in the company. Besides being trained to fulfill the customer's need, Power Engineering Consultant's employees are also equipped with the ability to respond to all forms of complaints submitted by the customers. This concept was proven effective by the fact that Power Engineering Consultant has never received any complaints letter from its customer since the establishment until May 2012. In May 2012, Power Engineering Consultant received a complaint letter from its user regarding the Survey and Soil Investigation report for Transmission Line and Substation. This letter is than become a trigger to identify the root of the survey and soil investigation problem. Base on the identification result, the alternative solutions then provided and continue with the best alternatives selection.

II. Business Issues Exploration

As one of Power Engineering Consultant's product, Survey and Soil Investigation report possesses the important role as initial data for other products, such as feasibility study, basic design and bid document for both power plant and transmission and distribution division. Not only does it provide the initial data for other product process, but also in several projects, survey and soil investigation became the main project. This happens because in Indonesia there are only a few companies who are capable of conducting survey and soil investigation for electricity purposes, especially for transmission line projects. Experience of the engineers is really needed in this activity, and again in Indonesia this resource is still limited. Power Engineering Consultant itself only have less than 3 engineers who have background and experience on doing the survey and soil investigation. This lack of expertise and the consideration that the survey and soil investigation product is not Power Engineer Consultant's core competence are two of the reasons why since its development Power Engineering Consultant always gives the project to other local surveyor company.

As Power Engineering Consultant outsources the survey and soil investigation product to the third

party, the contract arrangement become important, so is the quality control. If user reported bad experience for the result, Power Engineering Consultant should immediately investigate the problem and improve. So, the problem not interfere the company's sustainability in the future.

For those reasons, the Kepner-Tregoe analytical process will be used in this study to gather and organize information for decision making against the problems arising in Power Engineering Consultant. According to the Kepner-Tregoe's book "The New Rational Manager" (1981: 20), in handling of problems and decisions there is an analytical process that consisted of four distinct routine or patterns of thinking. Those patterns of thinking are reflected in the four kinds of questions that managers ask every day, i.e.: What's going on? Why did this happen? Which course of action should we take? And what lies ahead? Those pattern could be describe in 4 analysis as follows

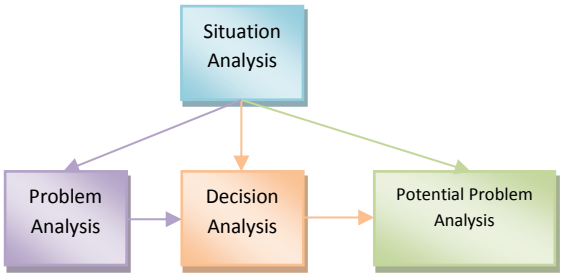

Figure 1 Kepner & Tregoe's Four Thinking Pattern

Situational Analysis

From its establishment, Power Engineering Consultant's project number is increasing, include the survey and soil investigation project. As the survey and soil investigation project increased, the three CEOs in different era have their own strategy to meet the customer need.

The first CEO assign the survey and soil investigation project to external survey team which appointed through an agreement called "Surat Perjanjian Kerja" (SPK) or "Letter of Intent" (LOI), while the second CEO era began to be assigned the survey and soil investigation to the Surveyor Company, then-called the Sub Consultants. This arrangement is continued until the third CEO era. The difference is the condition where users are now more aware of the price that Power Engineering Consultant offered. Some of the product lines have to be cut in terms of their budget, since the users have also cut down on Power Engineering Consultant's proposals. Sub Consultant companies that have carried out the survey and soil investigation for Power Engineering Consultant was affected by the changes especially in the contract price reduction, deliverable time and quality.

As the human resource is considered, even though the project number is increasing, Power Engineering Consultant's human resource related to the survey and soil investigation product did not increase. Thus, quality control cannot be done properly, with most of document only passing through from the Sub Consultants to the user and leading to quality issues arising verbally to be followed in writing

Problem Analysis

According to Kepner-Tregoe (1981: 33-56), problem analysis is used to explain any situation in which an expected level of performance is not being achieved, and in which the cause of the unacceptable performance is unknown. The processes are as follows:

1. Definition of the problem or the deviation statement
2. Description of the problem in four dimensions:
   a. Identity - what problem is being explained
   b. Location – where was the problem observed
   c. Timing – when did the problem occur
   d. Magnitude - how serious, how extensive was the problem
3. Extraction of the key information in the problem's four dimensions to generate possible cause
4. Testing for most probable cause
5. Verification of the true case

From the process above, it could be observed that the quality of survey and soil investigation report mostly depends on the performance of the third party or Sub Consultant. The performance of the third party really depends on the contract arrangement, especially on price that is negotiated. That is why good procurement system is really needed to create contract that accommodate both parties concerned. The quality control system and the availability of Power Engineering Consultant's resources are also needed to ensure the good performance of the third party or Sub Consultant. The fact that Power Engineering Consultant couldn't provide those three requirements can be concluded as the true causes to Power Engineering Consultant's problem, which is poor quality in the survey and soil investigation reports.

III. Business Solutions

As the problem has already been defined, the sequential mixed method is selected to fit with Power Engineering Consultant's situation. The qualitative method involving detailed exploration from interview will be implemented and followed by a quantitative method, in which a SMART theory is tested.

Qualitative Research

The sources of the research are from the interview with the Senior Manager of Business Development. The Senior Manager of Business Development is selected as the representative of management team who is involved in the development of Power Engineering Consultant's Long Term Planning or Rencana Jangka Panjang (RJP) 2012 to 2017. The interview was conducted with two objectives such as follows:

1. To give an insight of the survey and soil investigation future market
2. To find out Power Engineering Consultant's chance to obtain the opportunities in the market.

As the result, the Senior Manager of Business Development explained that according to Electricity Supply Business Plan or Rancangan Usaha Penyediaan Tenaga Listrik (RUPTL) year 2009 – 2018 (PT PLN (Persero), 2009: 64-65), the need for new transmission line in Indonesia until 2018 is 44.258 km, while the need for new transformers is 103.000 units. All those needs contains chances for Power Engineering Consultant to procure more revenue since for new transmission lines and new transformers for PT PLN (Persero) will require proper survey and soil investigation as the basis for basic design and bidding document preparation. The limited number of surveyor companies in Indonesia experienced in the field of transmission line enlarges Power Engineering Consultant's opportunity to seize the market.

In the interview, the Senior Manager of Business Development also stated that there are many ways for Power Engineering Consultant to obtain this opportunity. Power Engineering Consultant has already had experience and network in many branches of PT PLN (Persero). The only thing that it still has to improve is their capability on survey and soil investigation. Capability here means equipment and human resources. To get those capabilities the Senior Manager of Business Development prefers to acquisition one selected surveyor company. The main reason for selecting this option is that in utilizing this method, Power Engineering Consultant will have more control over the quality, deliverable time and cost saving. (Slamet, Personal Communication, October 16th 2012)

Quantitative Research

As the qualitative research has been conducted, the next thing to be conducted is applying the quantitative method in which SMART analysis will be used on the decision making process. SMART analysis is selected, since it is very useful to use when the decision against problems involve a number of objectives. The method used in the SMART analysis is splitting the problem into small parts and focusing on each part separately. So, the decision makers will likely to acquire better understanding of their problems than would have been achieved by taking a holistic view.

According to Goodwin (2011: 34), the SMART technique has eight stages to be passed through, which are:

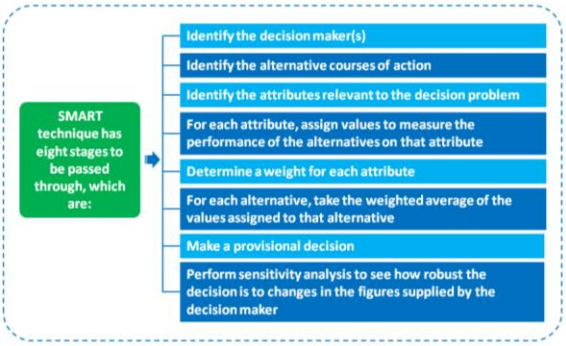

Figure 2 Eight Stages on SMART Analysis

1. Identify the decision maker(s).
   In this related problems concerning Power Engineering Consultant, the decision maker is the Management Team of PLN Engineering which are Senior Manager of Transmission and Distribution I and Senior Manager of Transmission and Distribution II. Therefore, both of those managers will be involved in the decision-making process.

2. Identify the alternative courses of action.
   There are five alternative solutions to solve Power Engineering Consultant problems, include one alternative from the Senior Manager of Business development. The alternatives are:

   a. Fix The Problem and Continue To Cooperate With Third Party Institutions
   b. Establish Cooperation with External Surveyor Team
   c. Establish Internal Surveyor Team
   d. Acquisition of One Selected Surveyor Company

e. Establishing "umbrella contract" with Selected Surveyor Company

3. Identify the attributes

The attributes are identified in order to measure the performance of courses of action in relation to the objectives of the decision maker. For Power Engineering Consultant's problem, to get more accurate and objective attribute, the Survey and Soil Investigation Engineers were involved in the attribute identifying process. Based on Personal Interview with the Engineers, the selected attributes could be constructed in the value tree as follows:

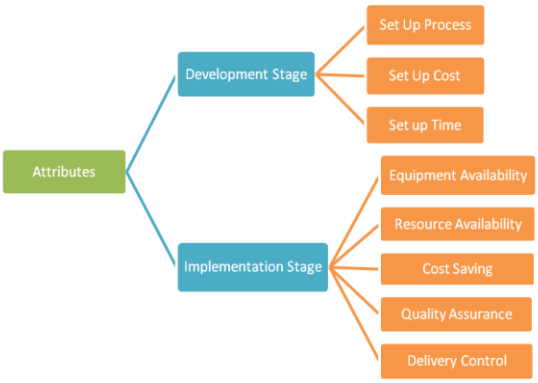

Figure 3 Value Tree

4. Attribute Ranking and Weighting

The Senior Managers of Transmission and Distributions were interviewed in this stage as the representative of the decision maker. The interview result is as enumerated below:

Table 1 Attributes Ranking and Weighting

Attributes	Average Weight	Normalized Weight
Set Up Process	330	9.7
Set Up Time	350	10.3
Set Up Cost	160	4.7
Equipment Availability	240	7.1
Resource Availability	320	9.4
Cost Saving	500	14.7
Quality Assurance	800	23.5
Delivery Control	700	20.6
Total	3400	100

5. Assigning The Value for Each Alternatives

After the weight for each attributes were defined, the next stage is to determine how each alternative shall perform by combining the eight value scores allocated to that alternative. The process is actually very simple, being that it multiplies each value by the weight attached to that attribute, summing over the six attributes, and dividing the result by 100. But there are difficulties in how to determine the value. Therefore, the Senior Engineers for Survey and Soil Investigation was then re-involved in a detailed interview to determine the value for each attribute in each alternative.

Table 2 Alternatives Aggregate Value

Attributes	Average Weight	Normalized Weight	1st Alternative		2nd Alternative		3rd Alternative		4th Alternative		5th Alternative	
			Values	Total	Values	Total	Values	Total	Values	Total	Values	Total
Set Up Process	330	9.7%	60	5.8	80	7.8	40	3.9	20	1.9	100	9.7
Set Up Time	350	10.3%	60	6.2	80	8.2	40	4.1	20	2.1	100	10.3
Set Up Cost	160	4.7%	60	2.8	80	3.8	40	1.9	20	0.9	100	4.7
Equipment Availability	240	7.1%	100	7.1	100	7.1	60	4.2	80	5.6	100	7.1
Resource Availability	320	9.4%	100	9.4	100	9.4	60	5.6	80	7.5	100	9.4
Cost Saving	500	14.7%	40	5.9	100	14.7	20	2.9	80	11.8	60	8.8
Quality Assurance	800	23.5%	40	9.4	20	4.7	100	23.5	80	18.8	60	14.1
Delivery Control	700	20.6%	40	8.2	20	4.1	100	20.6	80	16.5	60	12.4
	3400	100%		54.8		59.8		66.8		65.2		76.5

Table 2 gives a summary of the values obtained for all alternatives and their aggregate values. The result of the calculation is that Alternative 5, establishing "umbrella contract" with selected surveyor company has the highest value, while the Alternative 1, to fix the problem and continue cooperate with institutional third party has the lowest value. It means that based on the SMART Analysis, Alternative 5 is the best option that Power Engineering Consultant has.

6. Perform sensitivity analysis

According to interview with both Senior Manager of Transmission and Distribution, the management of Power Engineering Consultant is concerned about the weight of cost saving (i.e. 14.7) relative to over the rest of the attributes. The management of Power Engineering Consultant would like to know what would happen if these weights were changed. According to Goodwin (2010: 48-49) there is an analysis tool that could be used to examine how robust the choice of an alternative is to change the figures used in the analysis, called the Sensitivity Analysis. In order to fulfill the managements' need, it was then decided to implement the sensitivity analysis. The result is as enumerated below:

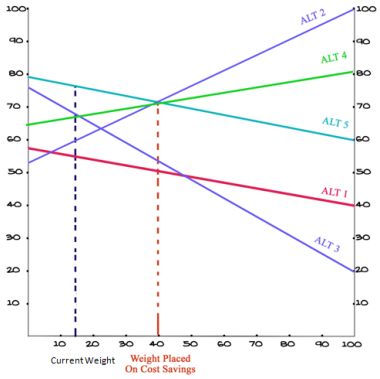

Figure 3 Sensitivity Analysis for Weight Placed On Cost Saving

From the figure 3 above, it can be seen that alternative 5 gives the highest value of benefit as long as the weight placed on cost saving is less than 40. If the weight is above this figure, then the alternative 2 has the highest value of benefits. As the management in the interview has assigned a weight of 14.7 to cost saving, it will take a fairly large change in this weight before alternative 2 is worth considering and the management can be reasonably confident to the alternative 5.

As the cost saving is more attractive than the current condition and management has reconsidered to make the weight higher, the sensitivity analysis could be used to investigate the effect of changing one weight at a time.

IV. Conclusion and Recommendation

Conclusion

Based on Kepner and Tregoe's theory and SMART analysis result, there are five alternatives solution for Power Engineering Consultant's problem in survey and soil investigation such as:

1. Fix the Problem and Continue To Cooperate With Third Party Institutions
2. Establish Cooperation with External Surveyor Team
3. Establish Internal Surveyor Team
4. Acquisition of One Selected Surveyor Company
5. Establishing "umbrella contract" with Selected Surveyor Company

From those alternative solutions, the best alternative solution is establishing "umbrella contract" with selected surveyor company. The implementation plan for the selected alternative solution will be explained in Chapter 5.

Potential Problem Analysis

It was stated in Power Engineering Consultant's vision; Power Engineering Consultant is very concerned of its sustainability, which also encompasses their future in the fields. It is in line with the Kepner and Tregoe's (1981: 139) statement that organizations are forever concerned with the future. The problem now is how to predict such a future. According to Kepner and Tregoe's theory, there is a procedure that enables a management team to step into the future, see what it may hold, and then return to the present to take action now, called the Potential Problem Analysis. As the result of the analysis process, the Potential Problem for Power Engineering Consultant decision to establishing "umbrella contract" with selected surveyor company is as follows:

1. The selected surveyor company terminated the agreement
2. Dissatisfaction on the Surveyor Company's performance
3. The surveyor company could not keep the confidential document
4. The unit price stated in the contract with the selected surveyor company is too high

That Potential Problem appears since Power Engineering Consultant still outsourcing the survey and soil investigation product to the third party. As the solution to minimize the risk, Power Engineering Consultant shall conduct strict procurement process. Power Engineering Consultant shall also state their requirement clearly in the bidding document and conducts the evaluation process orderly. Last but not least, Power Engineering Consultant shall make contract that accommodate both parties concerned.

As for the contract price, it was stated in chapter 3 that the cost saving for the "umbrella contract" arrangement is less than the cost saving that Power Engineering Consultant will get from acquisitioning a company or from cooperation with the external surveyor team. Therefore, Power Engineering Consultant shall maintained their personal expense as low as possible, while also maintain the product quality together with the third party, so the customer are willing to pay higher for premium quality offered. The Senior Manager of Business Development idea to acquisition one selected surveyor company could also be the solution for the potential problem that might arise in applying the "umbrella contract". The fact that acquisition gives Power Engineering Consultant more control over quality, deliverable time and price is the reason. But, according to the interview session with the Geodetic Engineer, if Power Engineering Consultant acquisition one selected surveyor company, there are two important thing that they have to considered.

First, Power Engineering Consultant has to decide which kind of Surveyor Company that they want to acquisition. Based on the engineer's experience, generally there are two kinds of Surveyor Company i.e. big and small surveyor company. One big surveyor company already has a brand image, permanent employee, sufficient equipment, extensive network and ISO certified. While the small one usually only has complete legal aspect of the company establishment with less of permanent employee and insufficient equipment. They also do not have standard procedure for their activity.

Based on those company profiles, the Geodetic Engineer predict that there will be difference in addressing Power Engineering Consultant's offer for acquisition. Small surveyor company will respond the offering positively. They look the offer as the opportunity to develop their company. Meanwhile, big surveyor company will have less interest to respond the offering since their company has been well-establish. (Yayan, Personal Communication, October 19th 2012)

Aside from the difference in addressing Power Engineering Consultant's offer, the other thing that has to be considered by Power Engineering Consultant is the acquisition cost. As the big company has been well-establish, the acquisition cost will much higher than the small surveyor company's acquisition cost. But, Power Engineering Consultant has to be also considered that if Power Engineering Consultant acquisition the small surveyor company, there will be extra cost for investment in equipment and people, since they have less permanent employee, have insufficient equipment and standard procedure. And whatever the company that Power Engineering Consultant selected, Power Engineering Consultant has to be also considered the extra cost that might occur due to the transition process, such as cost for upgrade the IT system, certification renewal, salary and benefit adjustment, etc.

Due to those complexities of the set up process and large investment cost, from the qualitative research it could be seen that acquisition is the third option for Power Engineering Consultant. The best solution for Power Engineering Consultant's problem is establishing. The "umbrella contract" is considered could solve the survey and soil investigation problem faster, simpler and cheaper, as the customer is waiting for their product to arrive. The concept of "umbrella contract" as part of strategic procurement that not only buying the goods or services, but also engaging in the supplier improvement process could make this option implemented in a long time.

As if survey and soil investigation is considered as one of the core competence of Power Engineering Consultant, the second option to establish the internal surveyor team or third option to acquisition one selected surveyor company could become the best option for the survey and soil investigation problem. The future investigation on the market size shall be conduct, followed by the best alternative election process which in accordance to the Power Engineering Consultant financial condition.

V. Business Implementation Plan

Since Power Engineering Consultant has conducted the pre-qualification process for procurement process year 2013, Power Engineering Consultant could utilize the process as the preliminary selection means for establishing the "umbrella contract" with selected survey and soil investigation companies. As the prequalification material concerns legal and administrative matters, the next step for Power Engineering Consultant shall be to conduct technical evaluation, cost evaluation, and negotiation process. The sequences of Power Engineering Consultant's next step are as follows:

As the Board of Director Decree regarding the procurement system not including the umbrella contract, the first thing that Power Engineering Consultant should do is to renew that decree and add the clause that supports the umbrella contract. A team should be formed for the process and shall operate under the supervision of the Board of Director. The team shall include procurement experts, legal personnel, and representatives from engineering and finance department. This team will be tasked to draft a new decree, which shall consist but not limited to:

a. Definition of "umbrella contract"
b. The authorities and their limits
c. Provision of the procurement process
d. Stages in the procurement process
e. The evaluation process
f. The duration of the contract and the arrangement of the contract price. The contract duration shall be determined while keeping in mind strategic issues related to the price that bidders will offer. The contract price arrangement shall also be determine, as the "umbrella contract" is different from a project contract. The volume of the contract couldn't be determined beforehand, since it will depend on the survey and soil investigation that Power Engineering Consultant obtained from user. The only thing that could be negotiated with the bidder is the unit price and guarantee number of km survey and point on soil investigation that Power Engineering Consultant will pay with or without the project obtained from the user. For this guaranteed number, Power Engineering Consultant shall conduct the study from RUPTL or others data to discover the minimum km survey and point on soil investigation that Power Engineering Consultant gained in one year

Parallel with the decree renewal process, Power Engineering Consultant shall continue the prequalification process until they are ready to announce the qualified bidders.

After the decree renewal, the next step shall be to implement such by Power Engineering Consultant is to link the pre-qualification process with the new procurement process. It begins with the announcement of the qualified bidders for the pre-qualification process, continuing with the bidding stage, and ends in the signing of the contract. It shall be considered that in the bidding stage the entire process has to be aligned with the new Board of Director Decree. Individuals who were involved in the process (the procurement team) should be disseminated about the change in the provisions of the procurement process. It shall also be considered that the criteria of the technical requirement play an important role. Power Engineering Consultant must be very careful in determining the requirement. Too many details in the technical requirement could limit the number of bidders who would pass the bidding process, while too lenient could make the evaluation process harder. The cost evaluation process is highly dependent on this requirement arrangement. Limited number of bidders passing the technical evaluation process means that Power Engineering Consultant only has a limited range of price in the cost evaluation stage. Essentially, there are two processes in the cost evaluation process: the evaluation process and the negotiation process. In the negotiation process, the procurement team shall negotiate with the bidder's price proposal so that Power Engineering Consultant could obtain the most competitively priced survey and soil investigation's production cost.

After the procurement team has selected the nominated bidders to pass the technical and cost evaluation process, the team then proposed the nominees to the Board of Director. If the Board of Directors agrees, then the process is continued to the contract preparation. It should be kept in mind by the team that the entirety of the clauses drafted needs to cover all of the needs of Power Engineering Consultant, and thus should be written clearly as such in the contract document. Minimizing the dispute that could happen in the future is the main assignment for the team.

With this arrangement, based on the interview with the procurement expert, it was predicted that Power Engineering Consultant will need approximately one month to renew the decree and two months to complete the procurement process. Apart from the team's performance, the duration for establishing the "umbrella contract" shall also depend on the management's will and whim.

Requirement of Resource

To establish the "umbrella contract", Power Engineering Consultant needs resources to prepare the Board of Director's Decree renewal and conduct the procurement process. One team for each task is needed. As for the decree renewal, the procurement experts, legal personnel, and representatives from engineering and finance department are needed, while for the procurement process, Power Engineering Consultant needed to form another team consisting of legal personnel, finance staff, geodetic engineers and civil engineers.

For the operational purposes, Power Engineering Consultants need to hire more geodetic engineer since Power Engineering Consultants has only hired one experienced workforce asset and one fresh graduate workforce asset. The improvement in the recruitment process is then needed so it became attractive enough to obtain more survey and soil investigation experience workforce assets.

Reference

1. Direktorat Perencanaan dan Teknologi PT PLN (Persero), 2009. Rencana Usaha Penyediaan Tenaga Listrik PT PLN (Persero) 2009-2018. Jakarta: PT PLN (Persero).
2. Fitzsimmons., 2011. Service Management. New York: McGraw-Hill
3. Goodwin, P., & Wright, G., 2004. Decision Analysis for Judgment West Sussex: John Willey & Sons Ltd.
4. Kepner, C. H., & Tregoe, B. B., 1981. The New Rational Manager. Princeton: Princeton Research Press.
5. Slamet, Personal Interview by Amy Maulany Setyaman, Jakarta : October 16th 2012
6. Yayan, Personal Interview by Amy Maulany Setyaman, Jakarta : October 19th 2012