**ISSN** 1816-6075 (Print), 1818-0523 (Online)
**Journal of System and Management Sciences**
Vol. 5 (2015) No. 1, 1-22

# An Application of Product Service System Board for Service Evaluation (A Case Study in Temporary Power Provider)

Christian Natasaputra [1], Tanika Dewi Sofianti [1] and Tutuko Prajogo [1]
[1] Industrial Engineering Department of Swiss German University, Indonesia

**Abstract.** Temporary power generation industry provides a similar product between competitors. It has made a tight competition between providers; therefore the right strategy to improve the service quality is needed to win the competition. The purpose of this study is to evaluate the provided service using Product Service System Board. The evaluation of Temporary Power Provider services is based on the idea of service strategy implementation. A concept that can approach the service strategy is Servitization. The concept of Servitization can be implemented in the real cases with Product Service System methodology. The Product Service System is a rising business model to respond a competitive modern market. The approach of this methodology can be done through Product Service System Board, which has aim to visualize the current provided service. The visualization brought to the understanding of each provided services to support the current products. These services are evaluated through performance, importance and capability survey. The survey leads to the idea of the improvement of the current services. This research needs further studies in improving the implementation of Product Service System Board. The sensitivity analysis and influencing factors identification are also needed to measure the effect of each component for the output of business.

**Keywords:** Servitization, Product Service System, Product Service System Board, Diesel Power Plant.

## 1. Introduction

In the modern world, the needs for reliable electricity supply are critical to the development of a country. The reliable electricity can support the business and

industry to achieve their top productivity and profit. At the same time, the national business and industry able to compete in the global market. Reflecting the high demand of electricity especially and low capability of government to establish an Independent Power Plant (IPP) in the short time, government has decided to allow temporary power plant to run their business. In an emerging country, government makes temporary power plants become a central plant rather than emergency unit or nursery station (APR Energy, 2013). The regulation to open private sector to this line of business, made many companies compete each other to provide reliable electricity with a low cost. In order to keep off the price war competition, many companies start to improve their product supports, service, and adopt sustainable energy to satisfy stakeholders' requirements. Due to competitive market in the modern world, power generation companies in protecting the common resources, companies are required to implement sustainable business model to answer those challenges. The concerns about common resources protection, sustaining, and enhancing the human and natural resources become a central issue to solve reduce the cost of production, increase life-cycle and improving the relation with stakeholders.

The delivery of service component as an added value which comes together with products (servitization) can be the right approaches to win achieve the competition in delivering commodity products and create a more sustainable business (Baines, 2013). Servitization comes first to develop company strategy to shift their direction to focus on service. As an addition Servitization can also come together with Business Sustainability concept, because Servitization brings the life cycle concept to the practice, and also can be found in the concept of Business Sustainability. In order to support the idea, Product-Service System (PSS) concept was introduced to industry. The PSS is the object of this research, and will be implemented a methodology namely PSS Board. This board has aim to identify customer goal and break down it into discrete process steps. The deconstructing process gives a complete view all the points at which a customer might desire more help from a product or a service. It also helps company to understand their incapability. A PSS consists of tangible products and intangible services, designed and combined so that they are jointly capable of fulfilling specific customer needs (Brandstötter, 2003).

Bridging the customer needs with the capability of the company to satisfy them is an important role to gain a good perception in the market. The servitized company is able to deliver a unique value which has integrated between product and service into single system. A customized product-service system for a specific market can be developed by breaking down the task the customer wants

done into series of discrete process steps (Bettencourt & Ulwick, 2008).The customization of PSS can be done in several ways of evaluation. The evaluation of PSS opens the possibility to do improvement to find the drawbacks in the provided services as a proper methodology to do improvement PSS can assists to fill the gap between marketing and engineering department to create one vision to develop a product-service system to satisfy clients. The evaluation of existing PSS can give the idea of improvement for company. The improvement of holistic model can be developed by the implementation of PSS Board.

# 2. Literature Review

## 2.1 Manufacturing and Services Organizations

Organizations can be divided into two broad categories: manufacturing organizations and service organizations, each posing unique challenges for the operations function. There are two primary distinctions between these categories. First, manufacturing organizations produce physical, tangible goods that can be stored in inventory before they are needed. By contrast, service organizations produce intangible products that cannot be produced ahead of time. Second, in manufacturing organizations most customers have no direct contact with the operation. Customer contact is made through distributors and retailers (Reid & Sanders, 2005) mentioned definitions to depict the difference between manufacturing organizations and service organizations:

*"Manufacturing organizations are organizations that primarily produce a tangible product and typically have low customer contact.*
*Service organizations are organizations that primarily produce an intangible product such as ideas, assistance, or information and typically have high customer contact".*

However, the differences between manufacturing and service organizations are not as clear-cut as they might appear, and there is much overlap between them. Because most manufacturers provides services as part of their offering, and many service manufacture physical goods that they deliver to their customers or consume during service delivery (Reid & Sanders, 2005) . On the figure stated below depicts the differences between manufacturing and services. Pure manufacturing and pure services are shown, as well as the overlap between them.

## 2.2 Servitization

Servitization is the process of company strategy from product oriented to product-service oriented. It is a business model innovation wherein manufacturing companies embrace a service orientation and expands the scope of transactions with customers by offering product related services and, hence more encompassing solutions, with the aim to satisfy customer needs, enhance the firm's performance and achieve competitive advantages (Steunebrink, 2012). It is also an option of business strategy to gain a sustainable business development. In a simple understanding, the servitized company adds service to existing product. Servitization gives many advantages in customer and company sight in its implementation.

The advantages of servitization are divided into two perspectives. The first perspective comes from customer, in business marketing context, the customer of PSS service is a company, and the second comes from provider's perspective. The benefits of Service Strategy to customer and company are classified into two sides of improvements. The first side comes from internal side (defensive) and external side (offensive).

Table 1 : Benefits of Service Strategy Implementation (Servitization) for Customers and Providers (Baines, 2014)

| | **Customers** | **Providers (OEM)** |
|---|---|---|
| **Defensive** Improvements in business efficiencies, cost savings, and predictability | **Improved Financial, Risk, and Asset Management, through:**<br>Initial cost savings<br>On-going cost reduction<br>Transfer of fixed costs into predictable variable costs<br>Improved asset security<br>Improved asset reliability<br>Improvements in safety<br>Environmental improvements<br>Organizational change | **Improved Commercial Viability through:**<br>Response to customer demand<br>Competitor lock out<br>Smooth revenue stream<br>Response to legislation<br>Product Life-Cycle extension |
| **Offensive** Improvements in business competitiveness, focus, and growth | **Improved focus, investment, and performance, through:**<br>Focus on core competences<br>Higher capital investment<br>Advanced technology adoption and access to associated skills<br>Improved service quality to the end user | **Improved Growth through:**<br>Greater customer intimacy<br>Market adoption of product innovations<br>Market adoption of business process innovation<br>Growth customer<br>New market entry |

| | | |
|---|---|---|
| | | Improved Product design |

The services strategies (servitization) which are implemented by providers make customers can improve their asset reliability, safety, security, and also give environmental improvements. At the same time the customer able to do cost savings, and cut unnecessary cost. The customer also can step ahead in competition because they can focus to gain market rather than waste their resources in internal problems.

## 2.3 Product Service System

PSS is a business model which has aimed to create sustainability between consumption and production. A business model designed according to PSS concepts is referred to as PSS and the design process as PSS design process (Komoto & Tomiyama, 2008).

A PSS is a pre-design combination of products and services in a market that can fulfil consumer's needs; a dematerialized solution to customer needs and preferences, and a result of rethinking of the product value chain and ways of delivering utility to customers that will have a smaller environmental impact than separate products and services outside the system (Mont, 2000).

PSS also can be defined as an innovative strategy to shift the business focus from product oriented only, to designing and selling a system of products and services which are jointly capable of fulfilling specific client demands (Manzini & Vezolli, 2003).

For consumers, PSS mean a shift from buying products only to buying services and solution that ensure environmental protection, enhance environmental awareness and satisfy customer needs. For company, the responsibility to extend the product life-cycle, the involvement of customer in design phase of product, and the integration of service system to product design. For both consumer and company, PSS give more attention to the usage phase of the product's life cycle, than other methods of environmental policy and management (Tukker, 2004).

Based on Mont (Mont, 2000) Komoto et.al (Komoto & Tomiyama, 2008) Manzini et.al (Manzini & Vezolli, 2003) and Tukker (Tukker, 2004), the understanding of PSS can be concluded as an integrated methodology between business, service, and product. The integration of them generates an innovative added value for the current system. The purpose of PSS development is to enhance customer satisfaction, that can't be fulfilled by traditional production. It

makes manufacturers to reshape their business strategy from mass production concept to service oriented, and from product oriented to product-service oriented.

PSS can be classified as the resultants of servitization process. In the beginning every company only focuses in the product or service, depends on the basis of added value process. The product oriented company did servitization of their product, and create product and service but in the separate way. The evolution of product and service creates an integration of them, called PSS. The service company in the productization creates a product too, but the product and service are not in the same spectrum. By the end of the evolution, the product and service results the integration of them. (Baines, 2013)

The benefit of service involvement in a manufactured product results a long term relation between company and their customer, sustainable relationship in competitive environment, and the differentiation of provided solution to customer through the integration of product and service. In company perspective, PSS helps company to invent the new business strategy, see a new market opportunities, and break through the normal perceptions and routines of a company. PSS is able to extend the offering to customer. For customers, they get the greater of varieties of offers on the market. Customers also get more added values and satisfaction, because PSS helps producer to customize the offer based on customer preferences. (Baines, 2013)

There are several elements which separated into three themes to ensure the sustainability of business through PSS:

- Development of Innovative Business Models
- Integration of Products and Services
- Innovative value added creation

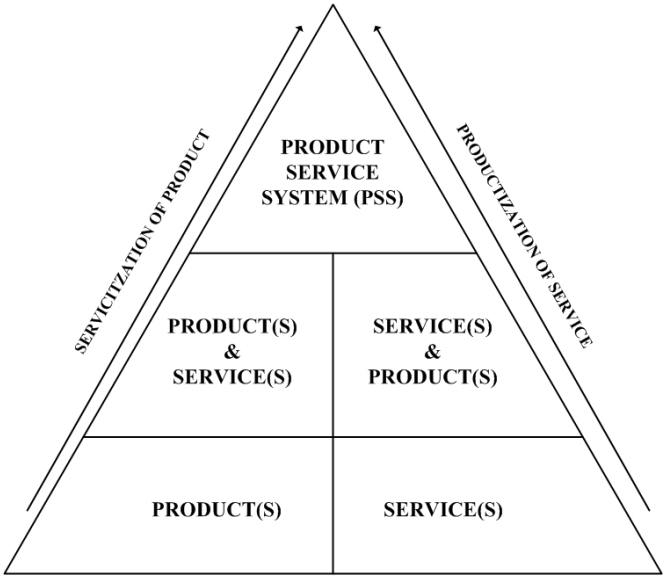


Fig. 2.1 : Evolution of PSS (Baines, et al., 2007)

## 2.4 PSS Board

In the common world, customers used to pay a product or service to finish their job in a specific target. People pay for transportation to transport him from one place to another place, while office worker use copy machines to produce exact number of copies. The innovation journey makes many companies sustain in the competitive environment, and it gives opportunities to growth bigger.

PSS Board is a 45 cells matrix board showing the four components and customer activities in rows and general PSS Process steps in columns (Lim, et al., 2012). It gives a visualization of PSS process itself, and help company to get the deep insight of customer's activity and mental model from customer perspective.

The matrix of PSS Board consists of four components of PSS, that is inextricably interwoven in nature (Lim, et al., 2012). There are products, services, dedicated infrastructures, and provider network. These components are connected each other in the PSS process to finish a specific job. This visualization gives a simple representation and a standardized approach to gain a complete view of what customers might desire from a product or service. This advantage covers the limitation of Service Blueprint which only highlights particular aspects of PSS.

The first row of PSS Board shows partners of the PSS Provider. The example of partners in PSS provider is a repair workshop for the car rental company. In this context, the repair workshop acts as partners, and the rental company as a PSS provider which give services to customers. The second row of PSS Board is dedicated infrastructures. It defines as any article specifically required providing products and services (e.g. technological devices, IT Infrastructure). The car rental company must have parking space, an information system, and reservation to support the product-service system. The third row is state of products. It shows the relevant information and issues of PSS from a product standpoint. The activity of customer and PSS provider might change the state of product. In the define step, the customer do reservation, and make the state of car is changed to be reserved. When the customer do execution step, the state of car is changed to transporting. The forth row presents the services. The car rental company provides service to support the reservation of cars by informing the customers about the available cars, and managing the reservation. The company also give assistant for customer during the rental, when the customer are facing problem with rented car. The last row is customer activities. The customer activities are the main object of PSS Board which needs to be broke down into several points.

The PSS Board takes general steps of The Customer-Centred Innovation Map (Bettencourt & Ulwick, 2008), and focus on the customer needs that needs to be fulfilled, the PSS Board breaks customer activities into nine steps. There are (Lim, et al., 2012):

- **Define**: Define product(s) and related plan directly to ensure success in the overall job.
- **Locate**: Locate or gather product and needed input to ensure success in the overall job.
- **Prepare**: Prepare things which required finishing the job.
- **Confirm**: Confirm requirements and criteria to proceed with the job execution.
- **Execute**: Execute the job.
- **Monitor**: Verify the on-going job and the result of job execution.
- **Resolve**: Resolve the problems of product which caused by job execution.
- **Modify**: Make modifications or adjustments necessary to ensure the success.
- **Conclude**: Conclude the process and prepare the next job execution.

There are also four components of PSS that interact between component to satisfy customer activities (Lim, et al., 2012):

- **Partner** : PSS provider and its partners
- **Dedicated Infrastructure** : Any artifacts specifically required to provide products and services
- **Service** : Intangible activities to achieve a certain range of desired outcomes
- **State of Product** : Tangible commodities to get a job done

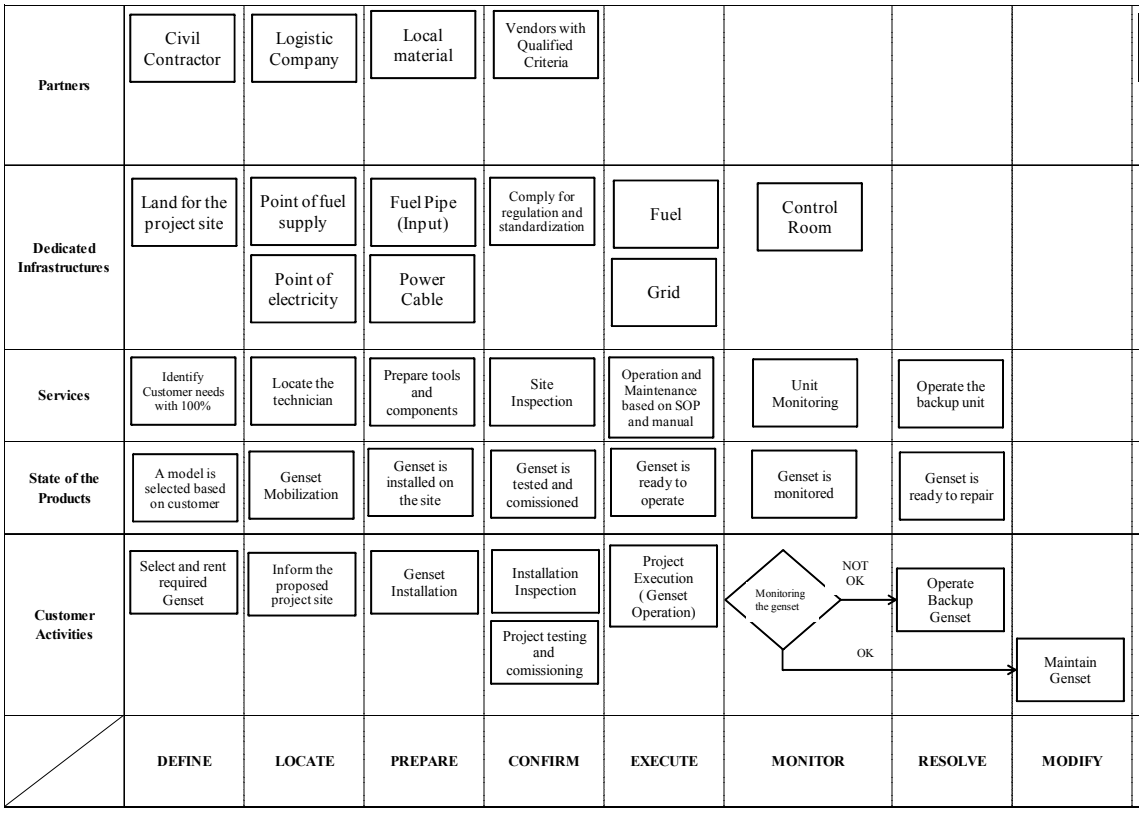


Fig. 2.2 : PSS Board in Temporary Power Provider

# 3. Research Methodology

The research method of this project was a holistic approach to gather information from interviews, and conduct analysis based on the interview result. The implementation of this methodology uses PSS Board (PSS Board) as a tool to understand the business process and how the client decides to acquire products and services.

The problem identification as a foundation of the project was constructed in the beginning of research. The problem identification defined a general problem and a suitable methodology to encounter that problem. The literature review as a foundation of this project was done after defining the problem and the proper methodology.

In order to get a better understanding of business activities, the business process was mapped, and company information, product and services were gathered also. At the same time, the PSS Board as a methodology of this research was developed. All of documents and data that have been gathered in this phase were used to define the questionnaire development.

The data gathering was obtained by the questionnaire distribution. The questionnaire consists of 8 aspects and 21 questions. Each question is divided into three dimensions which are: capability, performance, and importance. The questionnaires are distributed to 36 documents from various departments. The result of the questionnaire is used as an appraisal of current performance, importance of activities to satisfy client, and capability of respondents for each aspect.

In order to understand the drawbacks of the product and services system, the result of questionnaire is analyzed by descriptive statistics. It showed average scores in each dimension and aspect. The relationships between dimensions were considered to know the improvement urgency.

The suggestion and recommendation of new service development is based on the evaluation of PSS Board. Firstly, the team should understand the real problem, and the service development process can be done. The new service development can be done through Brainstorming process with the team from company. The various generated ideas will be selected based on the capacity of the company, and feasibility of the idea.

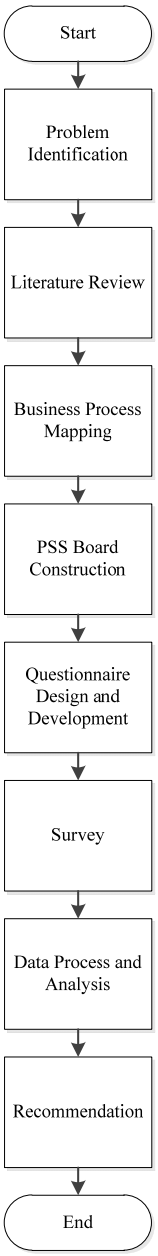


Fig. 3.1: Research Methodology

Eight services that provided is found based on focus group discussion with company management. These services support activities to satisfy client needs. There are:

- **Client Needs Identification** supports customer to select and rent the generator set.

- **Manpower Planning** supports the preparation of construction the power plant at the site.
- The delivery of **Machines, Equipment, Spare parts and Material** supports the generator set installation.
- **Site Inspection** supports project testing and commissioning to comply with standards.
- **Operation** supports the execution of project to generate electricity to client.
- **Maintenance** supports the Operational activity to ensure the availability of fleet operation.
- **Fleet Health Condition Monitoring** supports the monitoring activity to observe the condition of the fleet.
- **Back Up unit** supports operational activity when the unit breakdown or problem happens.

The measurement of each dimension is divided into three sections: capability, importance and performance. The measurement of capability aims to understand how capable the respondents were to answer each question. The measurement of importance gives a description of respondents' opinion to the importance of question in developing service development. The last measurement is the performance of the dimensions. Several dimensions can be measured instantly by using one question, they must be broken down into several question to understand the performance of this dimension. As an example, in order to measure maintenance activity the questionnaire asked the mean time between failures, the mean time to repair, and the number of interruptions in operations due to maintenance activities. These questions lead to overall performance of maintenance and also assist the author to identify the drawbacks of dimensions.

Table 3.1: Measurement Framework

| Measure | Definition | No | Formula | References |
|---|---|---|---|---|
| **Client Needs Identification Process** | The voice of clients based on clients requirements | 1 | Level of Involvement in client needs identification process | Validated PSS Board by Focus Group Discussion |
| | | 2 | Level of importance client needs identification in maintaining the relationship with clients | |
| | | 3 | Level of performance in identifying client needs | |
| | | 4 | Level of quickness to response client needs in normal condition | |
| | | 5 | Level of quickness to response client needs in emergency condition | |
| | | 6 | Level of products varieties in satisfying client | |

| | | | | |
|---|---|---|---|---|
| | | | needs | |
| **Manpower** | The people that are directly involve directly in the fleet preparation, operation, and maintenance | 7 | Level of Involvement in preparing and scheduling manpower | |
| | | 8 | Level of importance in manpower's quality in maintaining the relationship with clients | |
| | | 9 | Level of performance in locating and preparing site manpower | |
| | | 10 | Level of capability of site manpower | |
| **Machines, Other Equipment, Spare parts and Materials** | The artifacts that needed to be prepared | 11 | Level of Involvement in providing tools, components, and unit to the project site | |
| | | 12 | Level of importance tools and components qualities in maintaining the relationship with clients | |
| | | 13 | Level of availability of machines, other equipment, spare parts and materials to supply | |
| | | 14 | Level of reliability of machines, other equipment, spare parts and materials in the project site | |
| | | 15 | Level of quickness to deliver and commission machines, other equipment, spare parts and materials to project site | |
| **Site Inspection** | The examination of pre-operational system based on requirements and regulations | 16 | Level of Involvement in site inspection after installation | |
| | | 17 | Level of importance in site inspection quality in maintaining the relationship with clients | |
| | | 18 | Level of performance in inspecting site | |
| **Operation** | The central activities in business that generates value to the clients | 19 | Level of Involvement in fleet operation | |
| | | 20 | Level of importance in the operation performance in maintaining the relationship with clients | |
| | | 21 | Level of performance in Temporary Power Plant operations | |
| | | 22 | Level of industrial waste and emissions produced compared on environmental standards | |
| | | 23 | Level of performance in handling industrial waste in the project site | |

Table 3.1: Measurement Framework (continued)

| Measure | Definition | No | Formula | References |
|---|---|---|---|---|
| **Maintenance** | The activities to ensure the optimization of unit(reliability, availability and maintainability) | 24 | Level of involvement in maintenance activity | Validated PSS Board by Focus Group Discussion |
| | | 25 | Level of importance the maintenance performance in maintaining the relationship with clients | |
| | | 26 | Level of hours between unit breakdown | |
| | | 27 | Level of hours between unit repair | |

| | | | | |
|---|---|---|---|---|
| | | 28 | Level of quickness to replace the breakdown unit | |
| | | 29 | Level of quickness to replace the breakdown components or parts | |
| | | 30 | Level of frequency power plant interruptions in operational maintenance | |
| **Fleet Health Condition Monitoring** | The activities to observe the condition of unit | 31 | Level of involvement in fleet monitoring | |
| | | 32 | Level of importance the fleet monitoring activities in maintaining the relationship with clients | |
| | | 33 | Level of performance in fleet monitoring | |
| | | 34 | Level of implementation of latest technology to monitor unit | |
| **Back Up** | The activities that provide the reinforcement of the breakdown unit | 35 | Level of involvement in operating back up unit | |
| | | 36 | Level of importance the availability of back up unit in maintaining the relationship with clients | |
| | | 37 | Level of performance in operating back up unit to response a breakdown | |

Table 2.2 Loading Factor and Reliability Analysis for Capability and Importance

| **No** | **Questions** | **Loading Factor** | **Corrected Item to Total Correlation** | **Cronbach's Alpha** |
|---|---|---|---|---|
| **Client Needs Identification** | | | | |
| C1 | The performance level of company to respond the client demands | 0.813 | 0.965 | 0.968 |
| C2 | The performance level to respond the emergency situation (e.g. earthquake, electricity blackout) to its client | 0.759 | 0.863 | |
| C3 | The variety of company's product offerings to meet client demands | 0.813 | 0.965 | |
| I1 | The performance level of company to respond the client demands | 0.762 | 0.986 | 0.988 |
| I2 | The performance level to respond the emergency situation (e.g. earthquake, electricity blackout) to its client | 0.762 | 0.986 | |
| I3 | The variety of company's product offerings to meet client demands | 0.752 | 0.946 | |
| **Manpower** | | | | |
| C4 | The capability level of manpower skills to do operation and maintenance at the site | 0.797 | 0.959 | 0.979 |
| C5 | The company performance to prepare and locate Site Manpower | 0.804 | 0.959 | |
| I4 | The capability level of manpower skills to do operation and maintenance at the site | 0.814 | 0.735 | 0.846 |

| | | | | |
|---|---|---|---|---|
| I5 | The company performance to prepare and locate Site Manpower | 0.652 | 0.735 | |
| **Machines, Equipment, Spare Parts and Other Material** | | | | |
| C6 | The availability level of machines, other equipment, spare parts and materials to fulfill the client requirements | 0.724 | 0.961 | 0.986 |
| C7 | The reliability level of provided machines, other equipment, spare parts and materials at the site | 0.712 | 0.962 | |
| C8 | The quickness level to deliver and commission machines, other equipment, spare parts and materials to the site | 0.726 | 0.985 | |
| I6 | The availability level of machines, other equipment, spare parts and materials to fulfill the client requirements | 0.911 | 0.993 | 0.994 |
| I7 | The reliability level of provided machines, other equipment, spare parts and materials at the site | 0.883 | 0.971 | |
| I8 | The quickness level to deliver and commission machines, other equipment, spare parts and materials to the site | 0.911 | 0.993 | |
| **Operation** | | | | |
| C10 | The performance level of temporary power plants operation activities | 0.919 | 0.958 | 0.969 |
| C11 | The level of produced emissions compared to environmental standards | 0.919 | 0.922 | |
| C12 | The performance level of handling industrial waste (e.g. oil spill) | 0.919 | 0.923 | |
| I10 | The performance level of temporary power plants operation activities | 0.887 | 0.6 | 0.806 |
| I11 | The level of produced emissions compared to environmental standards | 0.809 | 0.661 | |
| I12 | The performance level of handling industrial waste (e.g. oil spill) | 0.887 | 0.725 | |

Table 3.2 Loading Factor and Reliability Analysis for Capability and Importance (Continued)

| **No** | **Questions** | **Loading Factor** | **Corrected Item to Total Correlation** | **Cronbach's Alpha** |
|---|---|---|---|---|
| **Maintenance** | | | | |
| C13 | The frequency level of unit breakdown | 0.940 | 0.995 | 0.993 |
| C14 | The quickness level to repair the break down unit | 0.940 | 0.995 | |
| C15 | The quickness level to replace/swap the break down units | 0.924 | 0.973 | |
| C16 | The quickness level to replace/swap the breakdown components and parts | 0.931 | 0.932 | |
| C17 | The frequency level of maintenance activities interrupt the operation of power plants in a year | 0.940 | 0.995 | |
| I13 | The frequency level of unit breakdown | 0.894 | 0.931 | 0.932 |

| | | | | |
|---|---|---|---|---|
| I14 | The quickness level to repair the break down unit | 0.894 | 0.931 | |
| I15 | The quickness level to replace/swap the break down units | 0.894 | 0.931 | |
| I16 | The quickness level to replace/swap the breakdown components and parts | 0.683 | 0.636 | |
| I17 | The frequency level of maintenance activities interrupt the operation of power plants in a year | 0.848 | 0.766 | |
| **Fleet Monitoring** | | | | |
| C18 | The performance level of fleet health condition monitoring activities | 0.911 | 0.989 | 0.933 |
| C19 | The implementation level of latest technology in fleet health condition monitoring activities | 0.896 | 0.989 | |
| I18 | The performance level of fleet health condition monitoring activities | 0.458 | 0.937 | 0.967 |
| I19 | The implementation level of latest technology in fleet health condition monitoring activities | 0.531 | 0.937 | |
| **Backup Unit** | | | | |
| C20 | The quickness level of backup unit to back up the operation | 0.815 | 0.978 | 0.989 |
| C21 | The readiness level of backup unit to back up the operation | 0.825 | 0.978 | |
| I20 | The quickness level of backup unit to back up the operation | 0.701 | 0.559 | 0.558 |
| I21 | The readiness level of backup unit to back up the operation | 0.826 | 0.559 | |

Table 3.3 Normality Analysis Result for Performance

| **No** | **Questions** | **Kolmogorov-Smirnova** | | |
|---|---|---|---|---|
| | | **Statistic** | **df** | **Sig.** |
| **Client Needs Identification** | | | | |
| P1 | The performance level of company to respond the client demands | 0.381 | 36 | 0 |
| P2 | The performance level to respond the emergency situation (e.g. earthquake, electricity blackout) to its client | 0.428 | 36 | 0 |
| P3 | The variety of company's product offerings to meet client demands | 0.327 | 36 | 0 |
| **Manpower** | | | | |
| P4 | The capability level of manpower skills to do operation and maintenance at the site | 0.414 | 36 | 0 |
| P5 | The company performance to prepare and locate Site Manpower | 0.413 | 36 | 0 |
| **Machines, Equipment, Spare Parts and Other Material** | | | | |
| P6 | The availability level of machines, other equipment, spare parts and materials to fulfill the client requirements | 0.321 | 36 | 0 |

| | | | | |
|---|---|---|---|---|
| P7 | The reliability level of provided machines, other equipment, spare parts and materials at the site | 0.452 | 36 | 0 |
| P8 | The quickness level to deliver and commission machines, other equipment, spare parts and materials to the site | 0.283 | 36 | 0 |
| **Operation** | | | | |
| P10 | The performance level of temporary power plants operation activities | 0.229 | 36 | 0 |
| P11 | The level of produced emissions compared to environmental standards | 0.229 | 36 | 0 |
| P12 | The performance level of handling industrial waste (e.g. oil spill) | 0.250 | 36 | 0 |
| **Maintenance** | | | | |
| P13 | The frequency level of unit breakdown | 0.216 | 36 | 0 |
| P14 | The quickness level to repair the break down unit | 0.182 | 36 | 0.004 |
| P15 | The quickness level to replace/swap the break down units | 0.301 | 36 | 0 |
| P16 | The quickness level to replace/swap the breakdown components and parts | 0.250 | 36 | 0 |
| P17 | The frequency level of maintenance activities interrupt the operation of power plants in a year | 0.182 | 36 | 0.004 |
| **Fleet Monitoring** | | | | |
| P18 | The performance level of fleet health condition monitoring activities | 0.418 | 36 | 0 |
| P19 | The implementation level of latest technology in fleet health condition monitoring activities | 0.333 | 36 | 0 |
| **Backup Unit** | | | | |
| P20 | The quickness level of backup unit to back up the operation | 0.266 | 36 | 0 |
| P21 | The readiness level of backup unit to back up the operation | 0.354 | 36 | 0 |

# 4. Results

The results of survey are divided into three sections. The first section describes about capability of respondents to fill, the second section describes about importance of each questions and the last section is performance. In order to get a better understanding of performance in each dimension, the mode values are used as discussion.

The result shows a good result in the capability of each dimension. Each dimension shows result above 3.0. The highest results are shown by the Operation and Maintenance dimension with 5.0 for the mode value, which means very high. The other dimensions show 4.0 for the mode value, which means highly capable.

On the importance measurement, the result shows a uniform distribution

result than capability measurement. Almost each dimension scored mode value with 5.0, which means highly important. In the other hand, the client needs identification gave 4.0 for the mode value, which means highly important.

The last measurement is performance measurement. This dimension measures the execution of each dimension, and assists the author to find the drawbacks of whole process. In general almost all of dimensions have high mode value with 4.0, except the maintenance. The maintenance dimension shows a lower mode value with 3.0. The mode value 3.0 means moderate in performance. This condition means maintenance dimension needs to be improved, because the lower value in performance and very high value in capability and importance.

Table 4.1 Mode Score of Each Dimension

| Dimensions | Capability | Performance | Importance |
|---|---|---|---|
| Client Needs Identification | 4.0 | 4.0 | 4.0 |
| Manpower | 4.0 | 4.0 | 5.0 |
| Machines & Equipment | 4.0 | 4.0 | 5.0 |
| Site Inspection | 4.0 | 4.0 | 5.0 |
| Operation | 5.0 | 4.0 | 5.0 |
| Maintenance | 5.0 | 3.0 | 5.0 |
| Fleet Monitoring | 4.0 | 4.0 | 5.0 |
| Backup Unit | 4.0 | 4.0 | 5.0 |

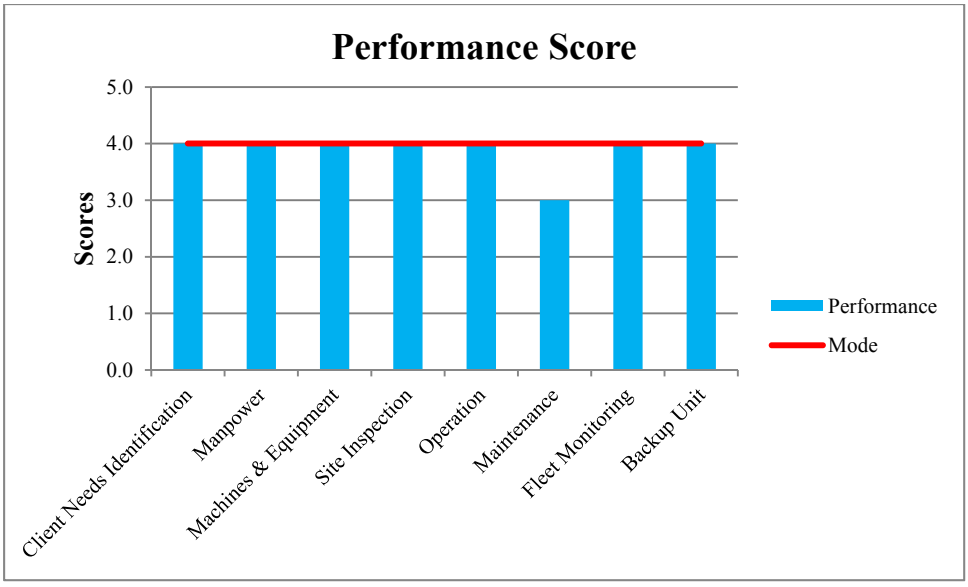


Figure 4.1 Performance Score

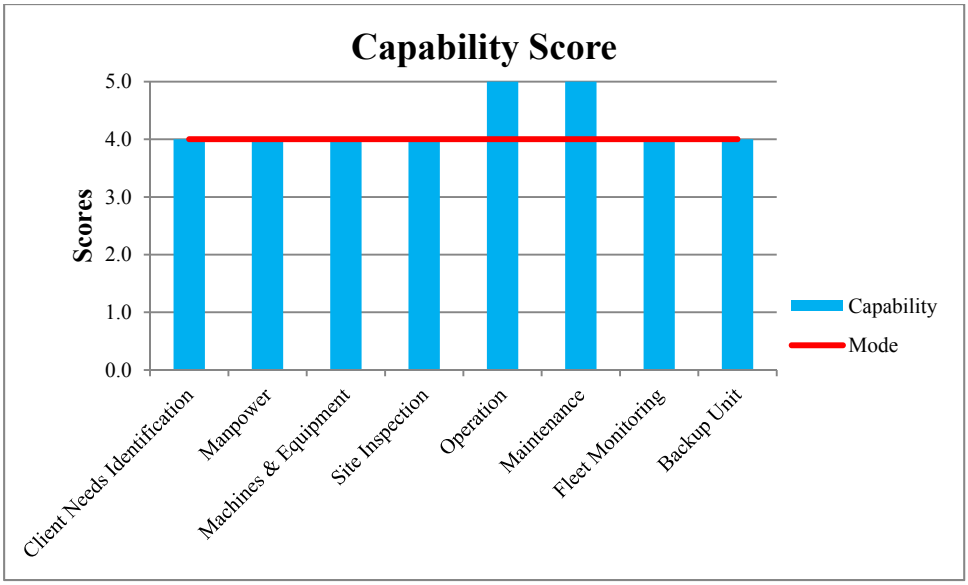


Figure 4.2 Capability Score

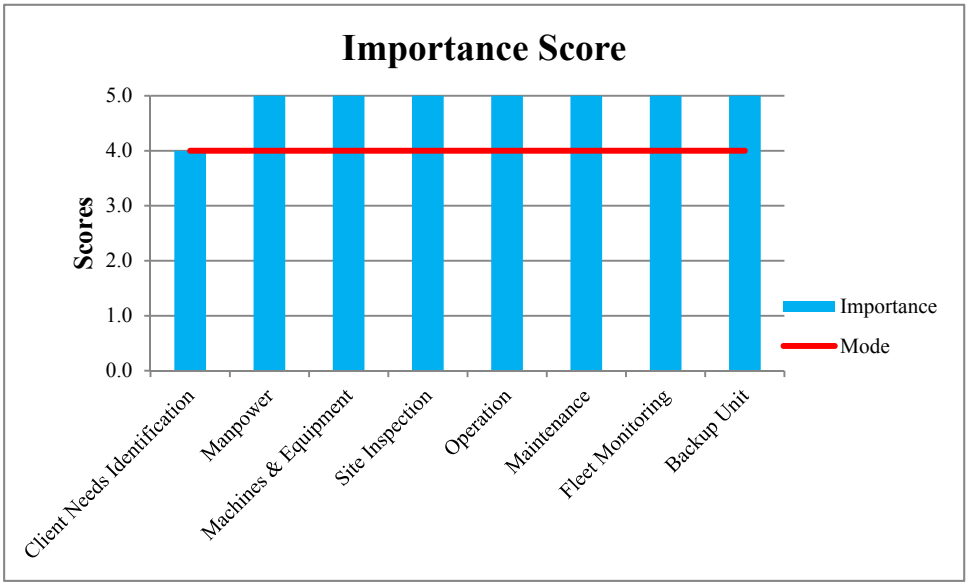


Figure 4.3 Importance Score

## 5. Conclusions

The temporary power generation industry is becoming a solution for electricity providers to cover a gap between high demand and low capacities, and also a solution for event organizer that needs 100% availability in that event. This

industry is related with the business to business (B2B) transactions, where the clients are organizations or businesses. The behavior of organization in buying a product or service is different with consumer behavior in buying influences; purchase cycles, degree of interactivity and others dimension (Coe, 2004).

This industry produces a commodity product, namely electricity. Each company provides same product to the clients, because electricity can be generated by any generators. The possibilities to make more added values to the products are adding the integrated product supports and services along with their products. This approach is the answer to get and maintain the relationship with clients. PT. XYZ as one of player in the industry also provides several services and product support to the clients. There are:

- Identify customer needs, and assure 100% availability
- Locating the technicians
- Unit, Tools, and Components preparation
- Site Inspection
- Operation and Maintenance
- Unit Monitoring
- Backup Unit Readiness.

Reflecting the characteristics of this industry, when the products and services are really correlated with each other, the author prefers use PSS (PSS) as an approach concept to increase the company performance. It is a new concept to implement that bridging the servitization idea to the real case. PSS is a concept that makes service-led competitive strategy, environmental sustainability, and the foundation to differentiate from competitors with lower price. PSS becomes an integrator between products oriented with services oriented company, and results more added value to the products.

This approach requires a proper methodology to develop the right strategy for the company to give more added values to clients through services. The methodology that has been used by author is PSS Board (PSS Board). This methodology gives a visualization of customer activities and what company has been done to satisfy them. This visualization helps company to easily understand the current activities, and find improvement gaps.

The disadvantage of this method that has been covered by author is complicated method to assess in a valid manner the current PSS Board. Therefore, the author discussed with the advisor to measure the current PSS Board of PT. XYZ through a descriptive survey that has a basis from PSS Board. Based on this condition, the author distributed questionnaires to 36 respondents from various departments. The descriptive results are consists of several

measurement that can be analyzed directly.

The other important result is performance. The performance dimension measures current operations activity in each aspect. Based on this research, as shows on Table 3, There is one aspect that urgently needed to improve, maintenance. Maintenance has one of high score of importance but low score in the performance.

# References

APR Energy, (2013). Asia Temporary Power Growth, Jacksonville: *APR Energy.*

Baines, T., (2013). Servitization Impact Study: How UK Based Manufacturing Organisations are transforming themselves to compete through advanced series, Birmingham: *Aston Center for Servitization Research and Practice*.

Baines, T., (2014). Sustainablity and Growth: The Impact of Servitization. *Manufacturing Leadership*, January, 45.

Baines, T. S. et al., (2007). State-of-the-art in product service-systems. *Engineering Manufacture.*

Bettencourt, L. A. & Ulwick, A. W., (2008). The Customer-Centered Innovation Map. *Harvard Business Review*, 1 May.

Brandstötter, M., (2003). IT on demand-towards an environmental consicious service system for Vienna. Tokyo, *EcoDeNet*, 799-802.

Coe, J. M., (2004). Fundamentals of Business-to-Business Marketing. s.l.:McGraw-Hill.

Komoto, H. & Tomiyama, T., (2008). Integration of a service CAD and a life cycle simulator. *CIRP Annals-Manufacturing Technology*, Volume 57, 9-12.

Lim, C. H., Kim, K. J., Hong, Y. S. & Park, K., (2012). PSS Board: a structured tool for product-service system process visualization. *Journal of Cleaner Production,* 42-53.

Manzini, E. & Vezolli, C., (2003). A strategic design approach to develop sustainable product service systems: examples taken from the 'environmentally friendly innovation' Italian prize. *Cleaner Production*.

Mont, O., (2000). Product-Service Systems, Stockholm: *Swedish Environmental Protection Agency*.

Reid, R. D. & Sanders, N. R., (2005). Operations Management. s.l.:Wiley.

Steunebrink, G., (2012). Servitization in Product-Oriented Companies, Enschede: University of Twente.

Tukker, A., (2004). Eight Types of Product Service System: Eight Ways to Sustainability? Experiences from SUSPRONET. *Business Strategy and the Environment*, 246-260.