Boosting Mini-Hydro Power Plant (PLTM) Business Performance by Implementing Supply Chain Management and Business Partnership – Case Study: PLTM Business Unit in West Java

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Abstract

West Java topography condition is very potential for the development of hydro power plant technology especially mini-hydro power (PLTM) and micro-hydro power (PLTMH) which is a runoff river power plant. Unfortunately, until right now the business performance of PLTM and PLTMH is not optimal yet. It was allegedly related to the supply chain management and business partnership aspect. This research aims to examine the effect of supply chain management and business partnerships aspect towards business performance of West Java PLTM business units. This research is a verificative research that use explanatory survey as method and with cross section/one shot observation time. The unit of analysis is PLTM industry in West Java and the observation unit is the company management itself. Target population is all of companies belonging to PLTM industry, which contain of 33 PLTMs. The data collection is done by census with Partial Least Square (PLS) as the analytical approach. The results showed that supply chain management and business partnership significantly influence business performance on business units of PLTM in West Java. Business partnerships have a greater impact than supply chain management in boosting business performance.

Keywords: supply chain management; business partnership; business performance; mini-hydro power plant; PLTM

I. INTRODUCTION

1.1 Research Background

The mountainous topograph in Southern part of West Java, with many small rivers flowing throughtout the year and high rain fall volumehave springs flowing to the rivers is very potential for the development of environment-friendly hydroelectric technology, which is a runoff river power plant between 1-10 MWh called Mini Hydro Power Plant (Pembangkit Listrik Tenaga Mini Hidro). The equipment used is relatively simple and easy to find. The required land is not extensive, so there is no need to open the forest to build the large scale hydroelectric power supply with big water dam and hughe power installation. Southern part of West Java has mountain topography spread all over the region. In general, mountain's texture is steep with relatively few inhabitants. The mountainous area has a large electrical energy in the form of water. The flow of water from the plateau to the lower one has potential energy that can be utilized as a source of electrical energy, especially in Sukabumi, Cianjur, Garut and Tasikmalaya that still have forests and stable water supply.

With the publication of ESDM Regulation no. 19 of 2015 on Micro Hydro Power Plants regarding the electricity tariff (Feed In Tariff) of Hydro Power Plants under 10 MW/h of 12 cent USD / KWh and the use of mini hidro

Potential of 500 MW, newly installed 86.1 MW, should increase the number of Mini Hydro Power Plants (PLTM) in West Java. Actually, the potential of Mini Hydro Power Plants for supporting to the main grid of electricity (Jawa Bali Network) and remote areas that have not reached the electricity network or areas that do not have other sources of fuel, so that the potential for the development of the Mini Hydro Power Plants is not optimal. However, the request for a Water Power Business Permit under 10 MW in Indonesia has only reached 33 Commercial Operation Date (COD) Permits from 266 Permits during 2015 to date.

Until now, the company's performance is only 65%-75% of 86.1 MW installed yet, due to the frequent down time. This problem is caused by lack of optimal partnership and also supply chain management in mini hydro power plants companies, especially in the technology to be used, expertise people and financial investor. The Previous study has not address on Supply Chain Management and Strategic Partnership during the operation phase of Mini Hydro Power Plant. The form of partners relationship proposed by Cravens (2013) that includes a vertical relationship consisting of relationships with suppliers and customers and the relationship horizontally consisting of lateral and internal partnerships. In the era of decentralization of the energy sector in Indonesia, the key to sustainability success is extensive coordination with private parties, local government offices, state electricity company, and communities. On the other hand, Clement, Clement, Joseph (2013) suggests that the performance of a company with partnership is better than a single-ownership company. In addition, Agus and Hassan (2012) demonstrate that the product quality performance and business performance dependence on practices of strategic suppliers partnerships.

Another factor that is alleged to have an impact on the optimum business performance of micro hydro power plant companies is regard to the aspects of the supply chain. Turban, Rainer & Porter (2004) mentions supply chain includes 3 components ie upstream supply chain, internal supply chain management, and downstream supply chain. Lia, Ragu-Nathan, Ragu-Nathan, Rao (2006) found that higher levels of SCM practice lead to increased competitive advantage and improved organizational performance.

Based on this background, this study aims to examine the effect of supply chain management and business partnership on the business performance of business units of micro hydro power plant in West Java. In this case, this study are expected to be used by the Government in their policies and private sectors to boosting mini hydro power plant performance to increase electrification ratio based on renewable energy resources. And may also provide benefits to the next Mini Hydro Power Plant Business studies writing academics.

II. LITERATURE STUDY

2.1 Supply Chain Management

According to Turban, Rainer & Porter (2004), supply chain includes 3 (three) kinds of components: Upstream Supply Chain, with main activity is procurement; Internal Supply Chain Management covers all the processes of goods imported into warehouses used in transforming upstream inputs, so it main concerns include production, manufacturing and inventory control; and downstream supply chain, encompassing all activities involving the delivery of goods to end customers, so that the main concern is directed to distribution, warehousing, transportation and service.

According to Kalakota (2000), supply chain management is a major process by which products are created and delivered to consumers from a structural angle. A supply chain refers to an intricate network of relationships that maintain an organization with its business associates to gain a source of production in delivering products to consumers. Currently, conventional supply chain management is starting to be abandoned and turning to green supply chain management.

Previous study on Green Supply Chain Management (Zhu & Sarkis, 2004) point out that the success of copmanies in implementing GSCM practices and achieving the targeted performance. In this study, there is still a need to examine the influence of Green Supply Chain Management on the business performance of mini mydro power plant, since there are technology, people and water factors of supply chain management jointly impact the company performance were unexplored as an Upstream Supply Chain, Business & Technical Process as an internal Supply Chain and Electricity Out Put send to On Grid Distribution. In this study, supply chain

management is measured on the dimensions & indicator of upstream supply chain, Internal Supply Chain Management, and downstream Supply Chain is shown on the table 1 below.

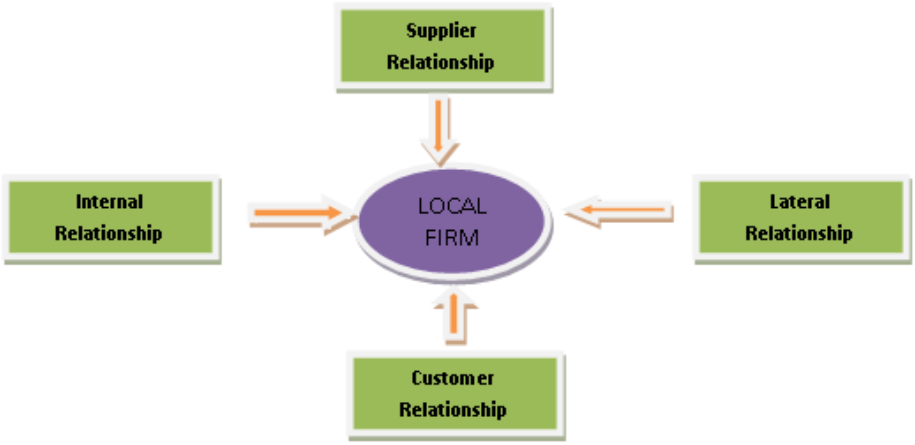
Tabel 1
Dimension and Indicator of Supply Chain Variable

Dimensions	Indicator
Upstream Supply Chain	a. Catchment Area (ha) b. Water Volume Flow Rate at intake (m3/sec). c. Water Quality (Good, Normal, Poor). d. Civil Construction (Good, Enough, Bad).
Internal Supply Chain	a. Turbin Technology (Pelton/Keplan) b. Water Transport to Turbine (m3/sec) c. Breakdown Maintenance (week) d. Expertise Engineer (Task Performace, Specific Problem Solving) e. Log Book on Business Process
Down Stream Supply Chain	a. Power Produce/hour (MWh) b. Electricity Usage (KVAR) c. Connection Capacity at Local Grid (MWh) d. Connection & Network Services (Rp/Month)

2.2 Business Partnership

According to Simo'es and Mason (2012) the company is part of a network of suppliers, customers and others involved in a relationship. Companies use collaborative business relationships with selected stakeholders to innovate and maintain market supply. There are several key factors in the success of business partnerships according to Ghzaiel and Akrout (2012) which are grouped into three categories: (1) factors related to partnership characteristics of both partners, (2) factors related to partnership behavior, and (3) factors related to the characteristics of supply.

The concept of partnership in the opinion of Cravens (2013), includes a vertical relationship consisting of relationships with suppliers and customers and horizontal relationships consisting of lateral and internal partnerships. The types of companies partnerships according to Cravens (2013), shown as follows :



Picture 1
Types of Organizational Relationships
Sumber: Cravens (2013:196)

Vertical Relationship (Supplier Customer Relationship)

Suppliers and buyers of raw materials, substitutes and components, equipment, services and customer relationship are linked together in a vertical distribution channel. Vertical relationships can be transactional up to the business to business relationship. In the study on Mini Hydro Power Plant, water supplier from the small river is undercontrol the regional government, it is necessary to permit the utilization of small river water by the regional irrigation services for long term usage (20 years). There are also civil works contractors and overseas technical turbine suppliers ho have responsibility for construction and turbine maintenance during the operation of the plant. The only customer is PLN (Perusahaan Listrik Negara), Indonesia's Electric generation company which is marked by Price Purchase Agreement for 20 (twenty) years under Feed In Tariff Actas an Standardize Power Purchase (SPP) rates.

Horizontal Relationship (Internal & Lateral Relationship)

Internal relationship occur between business units, departments and individuals to encourage optimal operational porses. A successful internal relations strategy requires strong leadership, team work, standardize business processes which can achieve the business performace target of the plant. Usually, there are more than one mini hydro power plant in located alongside one river, mostly operated by different owner. To increase theoverall power generating efficiency of all hydro power plants alongside one river, a good communication- and cooperating concept that is called lateral relationship. The dimension and indicator of Relationship such as follow :

Dimension	Indicator
Supplier Partnership	a. Partnership with Regional Water Agency b. Partnership with community c. Partnership with civil work contractor d. Partnership with technology agency
Customer Partnership	a. Price Purchase Agreement b. Inerconnetion Capacity (MWh)
Internal Partnership	a. Functional Team Work b. Internal Colaboration c. Individual Relationship
Lateral Relationship	a. Joint Operation b. Technical Service Assistance c. Outsourcing

2.3. Business Performance

According to Hubbard and Beamish (2011), the type of organization affects the type of performance measurement. In private companies, performance measures are: market share, sales, net profit, growth, ROA, ROE, customer satisfaction, efficiency, and quality.

Matic & Jukic (2012, p.199) suggest "Business performances are indicator of how well does organization accomplish its goals (Ramanujam, 1986 in: Lin and Kuo, 2007, pp. 1069".

Table 2
The Business Performance Measurement Model

Non- Financial Business performance measure	Financial Business performance measure
1. Customer satisfaction 2. Quality of products and/or services 3. Market share 4. Growth of sales 5. Reputation of organization 6. Employees' satisfaction with their jobs 7. Organizational innovativeness	1. Return on assets (ROA) 2. Return on equity (ROE) 3. Operative profit

Source : Matic (2012, p.281)

David (2013) mesaured performance by : Return on Investment (ROI), Return on Equity (ROE), Profit Margin, Market Share, Debt to Equity, Earnings per share, Sales growth, Assets growth.

2.4 Previous Research

Lia, Ragu-Nathan, Ragu-Nathan, Rao (2006) found that higher levels of SCM practice lead to increased competitive advantage and improved organizational performance.

Clement, Clement, Joseph (2013) suggests that the performance of a company with partnership is better than a single-ownership company. In addition, Agus and Hassan (2012) demonstrate that the practices of strategic suppliers partnerships and their implementation have significant relationships with product quality performance and business performance.

III. METHODOLOGY

The method used in this study is explanatory survey. The type of research used is verifikation. Scope of observation time in this study is cross section , meaning that information or data obtained is the result of research conducted at one particular time that is in 2017.

The unit of analysis is the micro hydro power plant industry with Price Purchase Agreement (PPA) in West Java where the observation unit is the management of the company. The target population is all companies belonging to the micro hydro power plant industry group. Based on secondary data, there are 33 companies. Because of the small population size, the data collection method is done by census. The analytical approach used is Partial Least Square (PLS).

IV. RESULT AND DISCUSSION

4.1 PLS Result

Table 2
Test of Outer and Inner Model

Variable	R Square	Cronbachs Alpha	Composite Reliability	AVE	Q square
Supply Chain Management		0.896	0.916	0.524	0.496
Business Partnership		0.921	0.933	0.560	0.551
Business Performance	0.861	0.845	0.907	0.765	0.508

Source:SmartPLS 2.0

The table show that the value of R^2 of business performance as endogenous variable in the srong/high criteria (>0.67), and the value of Q square is in the large criteria (>0.350), so it can be concluded that the research model is supported by the empirical condition or the model is fit.

The result of measurement model of dimensions by its indicators show that the indicators are valid which the value of t<2.04 (t table at α = 0.05). The result of measurement model of latent variables on their dimensions show to what extent the validity of dimensions in measuring latent variables.

Following figure show the complete path diagram:

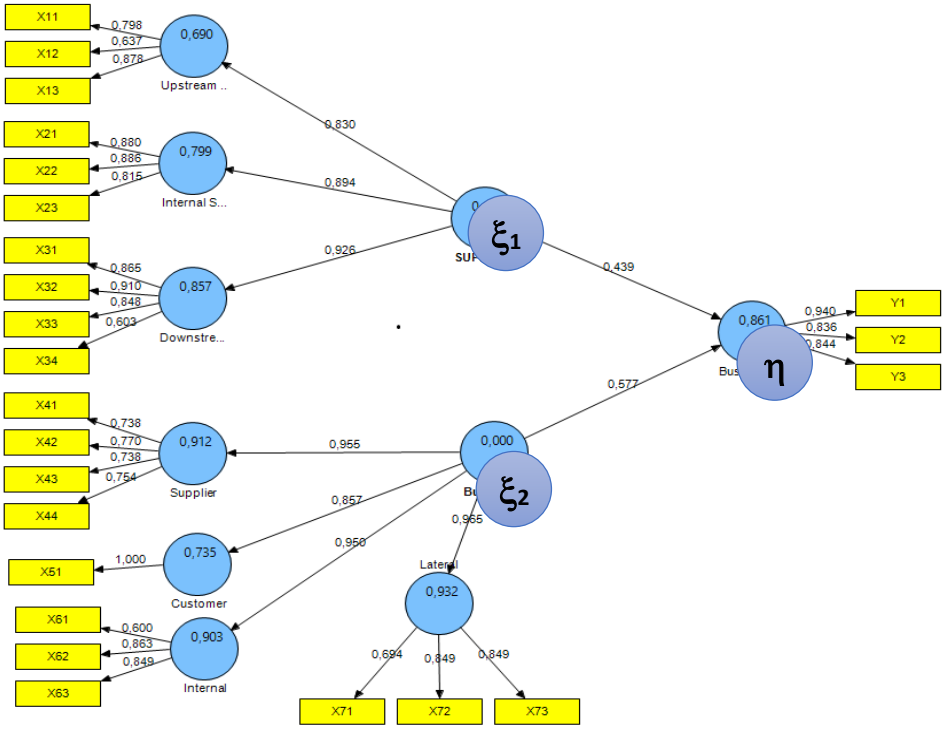


Figure 1
Complete Path Diagram of Research Model

4.1.2 Structural Model

Based on the research framework, then obtained a structural model as follow :

$$\eta = 0.439\xi_1 + 0.577\xi_2 + \zeta_1$$

Which are :
η= Business Performance
ξ_1 = Supply Chain Management
ξ_2 = Business Partnership
ζi =Residual

The table show that partially, Supply Chain Management and Business Partnership affect significantly to Business Performance, which is Business Partnership has a greater influence (50%).

Based on hypothesis testing result, will describe the Research Model Finding as follow:

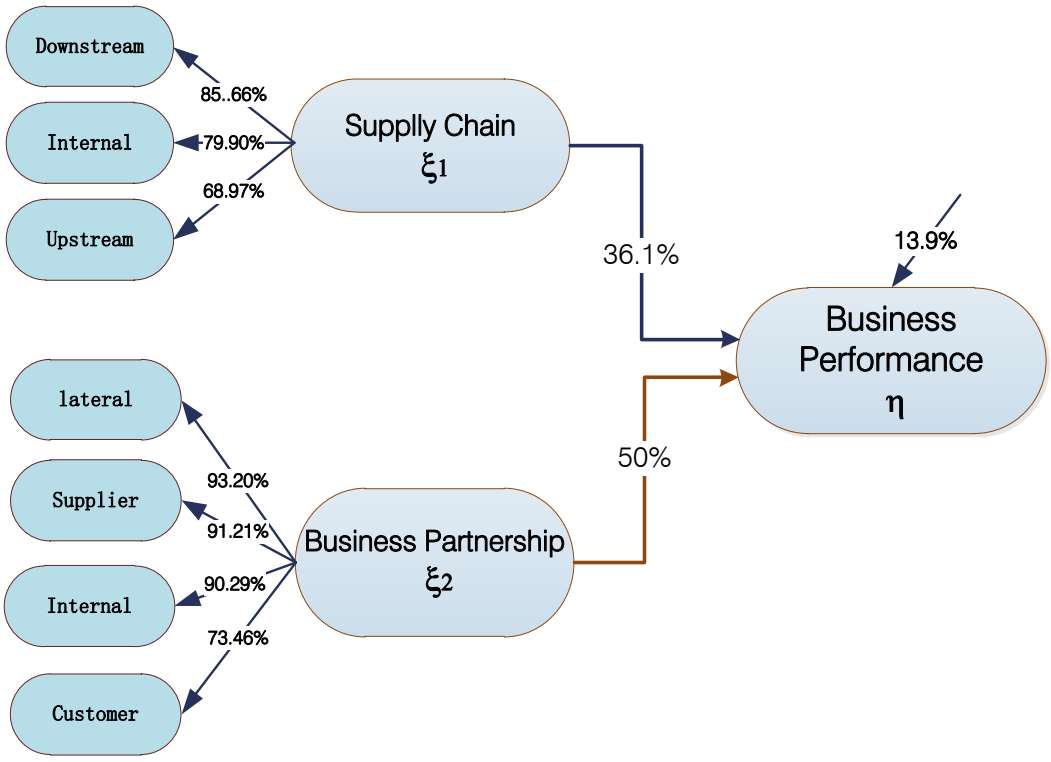


Figure 2
Research Finding

4.2 Discussion

The research findings show that supply chain management and business partnership have the effect on business performance. Business partnership has greater influence than supply chain management in improving business performance in business units of micro hydro power plant in West Java.

Lateral partnership play a major role in encouraging business performance, then supported by supplier

partnership, internal partnership and customer partnerships. Lateral partnerships can be done through joint operations, joint ventures, and outsourcing.

While on the aspect of supply chain management, it is known that Downstream Supply Chain is more dominant aspect in boosting business performance. Downstream Supply Chain covers all activities that involve the delivery of electricity to the PLN Interconnection station . In the downstream supply chain, the main concern is directed to water volume m3/second transporting to turbin and generator at powerhouse.

The findings of this study indicate that business partnership plays a dominant role in encouraging business performance, supporting Clement's Clement, Joseph (2013) which indicates that the performance of firms with partnership is better than single-ownership firms. In addition, Agus and Hassan (2012) demonstrate that strategic supplier partnership practices and their implementation have significant relationships with product quality performance and business performance.

V. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

From the result of hypothesis testing, can be concluded that supply chain management and business partnership have an effect on business performance. Business partnership has a greater impact rather than supply chain management in improving business performance in business units of micro hydro power plant in West Java.

5.2 Recommendation

For the management of the business unit of micro hydro power plant, the findings of this study can be used as input to improve business performance through the improvement of business partnership implementation especially lateral partnership supported by better implementation of supply chain management.

For those who interested in researching the micro hydro power plant business unit, the findings of this research can be used as a framework for preparing the premise.

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