

## IDENTIFICATION OF SUPPLY CHAIN PERFORMANCE INDICATORS AND STRATEGIC OBJECTIVES USING THE BALANCED SCORECARD

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### ABSTRACT

*This research proposes implementation of the Balanced Scorecard as a framework for performance measurement system in supply chain collaboration. A supply chain connecting two companies namely PT. X and PT. Y as supplier and buyer is investigated. The research identifies strategic objectives, key performance indicators and develops a strategy map of the supply chain for the two companies. Semi-structured interviews with management representatives of both companies are conducted. From the interviews, the supply chain's key performance indicators are identified, then used to define strategic objectives and the strategic map. The final result of this research is a framework to measure and improve collaboration between companies in the chain.*

*Key words: performance measurement, supply chain collaboration, Balanced Scorecard.*

## 1. INTRODUCTION

### 1.1. Sub Title for Introduction

Supply chain is a chain of activities involving raw materials and component suppliers, manufacturers, distributors, and retailers so that the finished product reaches the end customer (Ramanathan et al., 2011). Companies nowadays are not only engaged in their internal activities like production and distribution, but also involved in supply chain collaboration with their partners. Supply chain management is an important part in today company's activities.

In supply chain, a company can not be separated from other companies to support its business processes. Cooperative activities with other companies are usually called collaboration. Collaborative supply chain of the company relates generally to suppliers who work together and support the core business activities. Ramanathan et al. (2011) reveal that companies have been collaborating in general for decades in different forms for different purposes. In addition to generating competitive advantages, these activities also affect the company's performance. One of key supply chain management activities is to establishment a solid collaboration between members in a series of supply chain.

Kwon and Taewok (2004) find that company's performance is determined by the quality of the company's supply chain network. Companies that do not have goodsupply chain collaboration may have an imbalance in running business processes. Besides, greater supply chain goals may be fail to achieve if of collaboration quality in the chain is not improved.

Performance measurement is the process of assessing work progress against the goals or objectives that have been defined before, including the information of resource use efficiency in producing goods and services, goods and services quality, activity results compared with the intended meaning, and the effectiveness of action in achieving the objectives (Robertson, 2002). Meanwhile, according to Lohman (2004), performance measurement is assessment of specific targets achievement derived from the strategic objectives of the organization.

PT. X is a company engaged in production of plastics and telecommunication devices. PT. X is a make-to-order company which performs production only when there is an order from customer or partner company. PT. X is currently working with PT. Y as a supplier to the PT. Y in optical fiber products. In this case, PT. X acts as a supplier of fiber optic products and PT. Y as customers to PT. X. This research is

intended to develop performance measurement system for the supply chain of PT. X and PT. Y, and then to measure it.

## 2. THEORETICAL BACKGROUND

Companies now have found the key to change the traditional supply chain of traditional processes into a network-adaptive supply chain network. Collaboration means cooperation undertaken by some companies to achieve common goals. According to Simatupang and Sridharan (2005), supply chain collaboration is the cooperation relations between companies based on mutual trust, openness, and sharing risks and benefits produces a strategic competitive advantage better than the company that runs itself. Essentially, supply chain collaboration is a partnership of companies involved in a part of the supply chain to improve performance, profitability, improvement and increase revenue, reduce cost, and flexible ways of working.

Supply chain collaboration among which producer-supplier collaboration, internal collaboration, producer-customer collaboration, and integrated collaboration. According to Simatupang and Shidaran (2005), index among which the collaborative information sharing, decision synchronization, and incentive alignment.

One collaborative business processes performed by the company ie collaborative planning, forecasting, and replenishment (CPFR). CPFR is a collaboration of business processes carried out jointly by the two companies to increase efficiencies in their supply chain activities. Clients and suppliers will connect their computer systems to communicate information that suppliers have inventory that can be viewed by clients and forecasting together for the items involved in the cooperation. Information on the activities of the introduction of the goods will be shared (share) with the supplier.

Barriers to this CPFR is on information security that can hinder progress. Some large companies like Procter & Gamble has successfully used this CPFR. A survey of 21 companies in the USA conducted by Sliwa in 2004 reported profits CPFR as follows:

1. Improving relations with trading partners

2. Improving service
3. Reduce shortages or overstocks
4. Increase sales
5. Reduce inventory
6. Accurate Forecasting
7. Improve internal communications
8. The use of corporate assets better

Balanced Scorecard is usually used to measure performance of a company. But in this research, the the Balanced Scorecard is used to measure the quality of supply chain collaboration between two companies. It is expected that this research will improve performance of the two companies. Additionally, the research is expected to contribute to the theory by implementing the performance metrics proposed in Ramanathan et al. (2011) and Zimmermann and Seuring (2009).

Zimmermann and Seuring (2009) propose supply chain performance metrics based on the Balanced Scorecard, but offer no performance metrics for the learning and growth perspective. Meanwhile, the performance metrics proposed by Ramanathan et al. (2011) has no metrics for financial perspective. Therefore, performance metrics proposed by Zimmermann and Seuring (2009) are combined with those proposed by Ramanathan et al. (2011) so that the four perspectives in the Balanced Scorecard have performance metrics for indicators.

Ramanathan et al. (2011) propose standard performance metrics for evaluating the performance of supply chain collaboration which are based on practice and literature of supply chain collaboration. Meanwhile, Zimmermann and Seuring (2009) discuss the development and implementation of the Balanced Scorecard performance measures that focus on cross-organizational supply chain management. However, Zimmermann and Seuring's (2009) metrics are resulted from investigation on the studied cases.

Table 1 shows the combination of performance metrics proposed by Ramanathan et al. (2011) and Zimmermann and Seuring (2009).

Table 1. Supply chain performance metrics

No	Performance metrics (Ramanathan et al., 2011)	Performance metrics (Zimmermann and Seuring, 2009)
1	-	Cash-to-cash cycle
2	-	Credit notes
3	-	Complaint quota
4	-	Sales Index
5	Front End Agreement	-
6	Business Strategy Profit or Cost	-
7	Processes	-
8	On time production	-
9	Forecast accuracy	Forecast accuracy
10	Timely replenishment	-
11	Handling product returns	-
12	Capacity utilization	-
13	Adherence to plan	-
14	Availability of material on time	-
15	Inventory stock outs/excess	Stock outs
16	Service rate	-
17	Feedback	-
18	Use of technology	-
19	Decision making sharing	-
20	Investment on technologies IT and communication	-
21	Information sharing	-
22	Information quality accuracy	-
23	Forecasting	-
24	Product availability	Availability

### 3. METHODOLOGY

This research is started by determining the object of the research, that is a company involved in a collaboration with other companies, which a company supplies product(s) to another. Respondents are selected using quota sampling method, which has been used in previous research. Then, question items for interviews to collect performance indicators information are determined. The performance indicators are referred to as performance metrics.

The supply chain performance metrics used in this research use those are proposed by Zimmermann and Seuring (2009) and Ramanathan et al. (2011). Performance metrics from the two papers are combined then selected to eliminate duplication and overlap. Selected

performance metrics will be the basic to develop interview question items. This method is similar to what is used by Zimmermann and Seuring (2009).

#### 3.1. Case and Respondent Selection

Basically, in the selection of study case, the research looks for a supply chain in which a company supplies product(s) to another, and there is collaboration between these companies. The most ideal case for this study is to use a complete supply chain from upstream to downstream. However, finding this complete supply chain is quite difficult, so this study will only investigate a supply chain consists of two companies that collaborate which is called as "dyad". Therefore, the research object is the dyad of PT. X and PT. Y. PT. X is a major supplier of fiber optics for PT. Y. PT. Y needs the fiber optics to improve its service quality.

Respondent selection in this study uses quota sampling approach, which is applied by determining criteria and the number of subjects first, what or who can be selected as sample (Supriyoko, 1988). Respondents are selected according to their position in the company, which is related to cooperation between the two companies. Respondents selected are the ones who understand and know the collaboration that occurs in the two companies.

In this case, three respondents from PT. X are selected i.e. the marketing manager, planning and control manager, and the head of production who deal directly this collaboration. Meanwhile, from PT. Y, two respondents are selected which consists of general manager and purchasing staff.

#### 3.2. Identification of Performance Metrics

Performance metrics are designed to measure performance of an organisation. In a single corporate, Balanced Scorecard is started by translating corporate's vision and mission into business strategy. Then, strategic objectives and key performance indicators are identified. These steps are different with application of Balanced Scorecard in dyad. There is no vision and

mission in a dyad, as it consists of different companies. Thus, in dyad, identification of indicators is based on interview. The indicators identified are then used to determine strategic objectives for the supply chain.

The supply chain performance metrics are firstly determined individually for PT. X and PT. Y. Then, it is concluded whether the performance metrics exist on the supply chain collaboration or not.

### 3.3. Assessment of Performance Indicators

At this stage, performance indicators of the supply chain are scored based on information collected from the interview. Scores are given based on the collaboration performance between PT. X and PT. Y.

### 3.4. Determination Of Strategic Objectives

Identification of strategic objectives is based on indicators identified before. Then, strategic initiatives are determined to improve the achievement of performance indicators.

### 3.5. Development of Strategy Map

Strategy map consists of bubbles connected by arrows which are based on identified strategic objectives. Bubbles (strategic objective) connected with arrow indicate that there is a cause-effect relationship between them. This strategy map shows that the strategic objectives affect each other, in order to achieve the supply chain goals.

## 4. RESULT AND DISCUSSION

### 4.1. KPI Identification

Interviews with respondents collect information to identify key performance indicators (KPI). A KPI is said to be used to measure collaboration if it is identified as performance metric in one or both company. Contrarily, if a KPI is not found in both company, then it is not a metric for their collaboration. Interviews with respondents

find that 20 of 24 performance metrics derived from literature are used in the dyad investigated.

After determining whether the KPIs are used or not to measure the supply chain collaboration, the KPIs are scored by giving a mark for each performance metric. Table 2 shows the 'used' or 'not used' status of the KPIs and the score of each performance metric. The given score is from 0 to 4. A value of 0 indicates that the performance metric/KPI is not used in the dyad's collaboration. Meanwhile, the value of 4 indicates that the performance metric is used to measure the collaboration of both companies and has the maximum possible performance.

Table 2. Status and score of KPIs

No	KPI	Status	Score
M1	Cash-to-cash cycle	Used	3
M2	Credit notes	Used	3
M3	Complaint quota	Used	3
M4	Sales Index	Used	2
M5	Front End Agreement	Used	4
M6	Business Strategy Profit or Cost	Used	3
M7	Processes	Used	4
M8	On time production	Used	3
M9	Forecast accuracy	Used	4
M10	Timely replenishment	Not used	-
M11	Handling product returns	Used	3
M12	Capacity utilization	Used	2
M13	Adherence to plan	Used	3
M14	Availability of material on time	Used	3
M15	Inventory stock outs/excess	Used	3
M16	Service rate	Used	2
M17	Feedback	Not used	0
M18	Use of technology	Not used	0
M19	Decision making sharing	Used	2
M20	Investment on technologies IT and communication	Not used	0
M21	Information sharing	Used	3
M22	Information quality accuracy	Used	3
M23	Forecasting	Used	4
M24	Product availability	Used	3

For example, the KPI 'front end agreement', the score given for this KPI is 4. This is because the initial agreement made by PT. X and PT. Y has been in accordance with the criteria of a written agreement that

fulfills the entire agreement of collaboration agreed upon by both parties and the time of the agreement there are witnesses from both sides and there is a copy of the written agreement. This is thought as the maximum implementation of the KPI 'front end agreement'.

#### 4.2. Strategic Objectives

After identifying the performance indicators, the next step is to determine strategic objectives associated with the indicators. Strategic objective is defined as a statement about what we want to achieve (the desired output/outcome), what we want to do (the process) or what we should have (the input).

Table 3. Perspectives and Strategic Objectives

Perspective	Strategic Objective	Code	KPI
Financial	Payment performance	M1	Cash to cash cycle
		M2	Credit notes
	Sales	M4	Sales index
Customer	Collaboration quality	M5	Front End Agreement
		M6	Business Strategy Profit or Cost
		M14	Availability of material on time
		M17	Feedback
		M16	Service rate
		M21	Information sharing
		M19	Decision making sharing
	Product quality	M11	Handling product return
	Collaboration satisfaction	M3	Complaint quota
	Internal process	Supply chain process quality	M7
M10			Timely replenishment
M8			On time production
M13			Adherence to plan
Forecast quality		M23	Forecasting
		M9	Forecast accuracy
Availability quality		M24	Product availability
		M15	Inventory stock outs/excess
Production quality	M12	Capacity utilization	
Learning and growth	Information quality	M22	Information quality accuracy
	Process knowledge	M18	Use of technology
		M20	Investment on technologies IT and communication

According to Kaplan and Norton (1996), ideally the Balanced Scorecard has four perspectives: financial, customer, internal processes and learning and growth. The strategic objectives that determined before are then classified into the four perspectives. For example, performance metric of 'cash to cash cycle' of the strategic objective 'to increase the profit', the metric is related to financial performance so the performance metrics is included into the financial perspective. Table 3 also shows the perspective where each strategic objective is classified.

#### 4.3. Strategy Map

Strategy map is a causal relationship that occurs between strategic objectives that had been identified (Kaplan & Norton, 1996). In Figure 1, a strategy map that illustrates the relationship between strategic objectives is shown. This strategy map is developed by the strategic objectives which have been classified in the Balanced Scorecard perspectives.

### 5. CONCLUSION

Based on data collection and analysis, some concluding remarks can be written as follows:

1. There are 23 performance metrics obtained from interviews with respondents in business collaboration PT. X and PT.Y.
2. There are 11 strategic objectives derived from the development of performance metrics.
3. From the measurements, 18 strategic initiatives for the performance metrics that have score less than 4 are proposed.
4. The scores obtained from the results of performance evaluation of supply chain collaboration are 60 of 92 maximum score or 65.22% of the maximum score.
5. From the score that has been obtained, it can not be concluded whether the collaboration between PT. X and PT. Y performs well; there should be a similar scoring case so that the score can be compared.

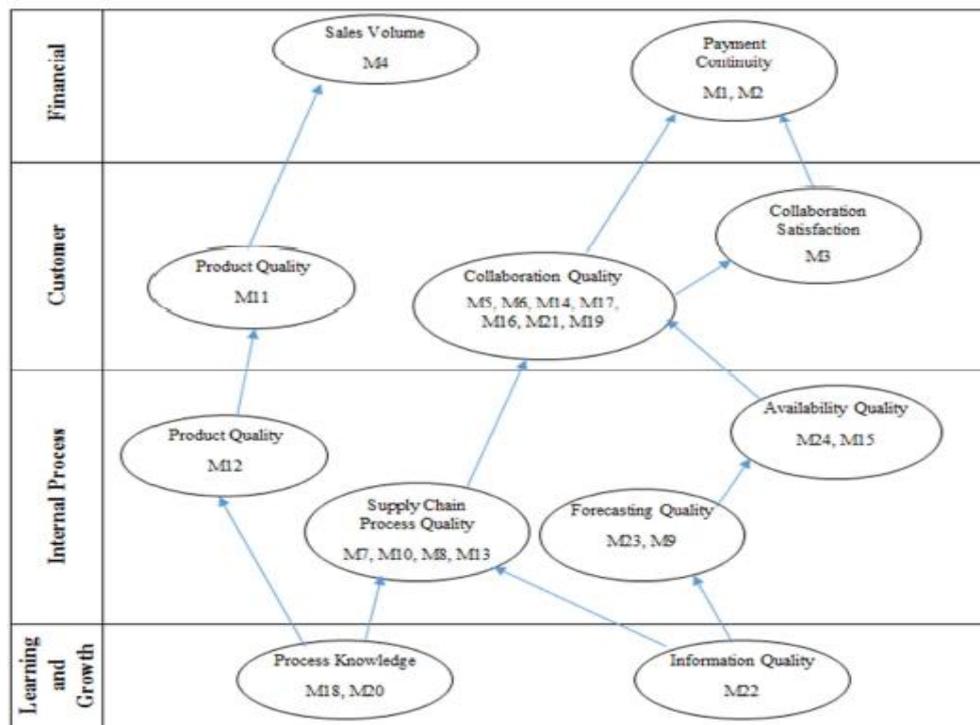


Figure 1. Strategy Map

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