

Operational Performance of an Agile Supply Chain: A Cash to Cash Approach

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Abstract— In recent business history, operational innovation has a central role in the success stories of businesses like Dell, Toyota and Wal-Mart, and firms are on their way to make the supply chains more agile. The cash conversion cycle is also playing key role in determining the supply chain performance. Therefore, the main objective of the current study is to examine the impact of agile supply chain on the supply chain operational performance of manufacturing firms operating in Indonesia. In addition to that we have also examined the direct and indirect impact of cash conversion cycle in the relationship between agile supply chain and supply chain operational performance. Of the current stud. The data is collected from the operation managers, production managers and finance managers of manufacturing firms listed in Indonesian Stock Exchange. The results of the study have shown a great deal of agreement with our proposed hypothesis. The study which is among pioneering studies on the issue will be helpful for policy makers and managers in understanding the role of agency theory in supply chain management.

Keywords: *Agile supply chain, Supply chain management, Indonesia*

1.0 Introduction

Enormous changes have been witnessed in business environment around the world, during the previous decades. The world has evolved because of the ever-changing globalization, technological development, and increased mobility of persons and freight. With reference to business, markets are also changing rapidly due to varying customer needs and industrial innovations. Companies strive to introduce and implement innovations and new management techniques in order to keep pace with the continuously changing business world. Organizations have started realizing the fact, that improving internal efficiencies is not enough for the organization rather whole supply chain is required to stay competitive in order to stay in business [1]. Supply chain management is introduced to explicitly observe the strategic

coordination among the trading partners, in addition it aims to enhance individual as well the whole performance of supply chain. The operational performance of organization is measured in order to compare its performance with other SCs [2],[3],[4]. Consequently, every company is expected to set performance metrics of their own, and every metrics demand data collection. Performance metrics of SCM can be created depending on the requirements and needs of the company.

In recent business history, operational innovation has a central role in the success stories of businesses like Dell, Toyota and Wal-Mart [5]. High levels of revenue growth, lower prices, lower inventory through responsive distribution and purchase, as well as high profits are offered as a result of operational innovation, but achieving operation is somehow difficult for the firm to achieve with it. A firm is required to implement SC practices, alter business culture, initiate lean six sigma in order to improve its operational performance [5],[4]. Incorporating practices of SC could be helpful in reducing the time of cash to cash cycle and improve cash flow, that would spare the more working capital for further investment in better processes, products, and improved financial execution, especially capital utilization, growth and profitability[6],Studies have attempted to find out the relationship among company's operating performance and liquidity management. The cash to cash concept explains that trimming of cycle time would result in operational and financial improvement. Hence, the concept of C2C presume, that reduction in the cycle time can possibly be achieved without decreasing sales and increasing costs [7, 37-39]. Thus, reducing C2C implies delaying suppliers' payment and reducing receivers' credit. The above assumption would result in increase in goods cost and decline in the attractiveness of product from the customers' point of view.

[8], observed that a number of scholars have examined the market by employing the C2C approach i.e. from shrimp suppliers from Thailand to a retailer from USA, the relationship among the

C2C and return on equity and return on asset in Taiwan and Japan [9], as well as the relation between working capital and corporate profitability in Greece by [10]. [11], also used this approach using ROE and ROA, to estimate its impact on profitability of manufacturing firms operating in Pakistan. [12], compared the cash to cash cycle of manufacturing and merchandising industries in Turkey employed it for the study in Korea. It is found to be an important liquidity ratio to measure the capability of meeting cash needs of the firm. [13] explained that conventional measures that are used to measure corporate liquidity involves quick ratio, current ratio, and net working capital, thus all are found to be static based on cash availability at given time to meet certain set of obligations. Within firms' normal operations, investors need to pay attention to the cash flows i.e. to receivable investments in firms' operations and from mobilizing inventory. However, cash flows for the operations are reactive to decline in earnings and sales.

[13] described that findings of the previous study showed, that improvement in operating performance was witnessed with the reduction of C2C for a firm, while statistical significance was observed among C2C and profitability [14]. On the other hand, a significant negative relation is found between profitability and variables of working capital management [15, 37-41]. The study has suggested that profits of companies can be increased by careful handling of C2C and placing C2C components at optimum level.

2.0. Literature Review

In the twenty first century, SCM has been considered as the most effective operations tools to improved organizational competitiveness. Both agile manufacturing and SCM seem to vary in philosophical emphasis, but the goals of each complements are the same which is to improved competitiveness. Agile manufacturing is emphasized more on partnerships to achieve speed and flexibility in producing goods. While, SCM is emphasis on all aspects which includes quality, speed, flexibility, cost, and asset management. In SCM, the integration of suppliers and customers are crucial to achieve great values. In the twenty first century, SCM has been considered as the most effective operations tools to improved organizational competitiveness. Both agile manufacturing and SCM seem to vary in philosophical emphasis, but the goals of each complements are the same which is to improved competitiveness. Agile manufacturing is emphasized more on partnerships to achieve speed and flexibility in producing goods. While, SCM is

emphasis on all aspects which includes quality, speed, flexibility, cost, and asset management. In SCM, the integration of suppliers and customers are crucial to achieve great values. In short, SCM becomes a popular management tool in helping organizations to improve their performance through the ultimate goal of SCM which waste elimination and increased efficiency,

Ongoing performance measurement is an important business factor. Supply chain performance measurement practice has been using lately, but problem lies in the fact that there are abundant choices available for the organizations [16]. According to a survey, successful SCM organizations holds 40-65 percent of advantage in cash to cash cycle on average organizations, while 50-85 percent of less inventory is occupied by the top organizations against their competitors (Sheridan, 1998). The cash to cash cycle is measured by assessing inventory, accounts receivable, and payable data of the accounts. It is however referred as "the sum of days sales outstanding (DSO), plus the days of inventory (DOI), minus the days payable outstanding (DPO)"

$$\text{i.e. } C2C = DSO + DOI - DPO.$$

Days' sales outstanding usually grows with the increase in revenues and similarly shrinks with decline in revenues [17]. Paying suppliers at the earliest possible time can turn out to be profitable for the organization, for it can bring discounts because of early payments and could possibly reduce total cost.

[18] described that many companies aim to shorten the cycle of C2C but this paper intent to test the relationship between financial performance and C2C in industry to industry. However, it is a critical measure of performance and is employed as a measure having considerable impact on SC practices and on financial gains [18].

[19] studied about the 25 top firms, with respect to supply chain performance, he observed the performance of SC since 2003 by incorporating return on assets, peer opinion, growth of revenue, and return on inventory for checking the feasibility of cash to cash cycle. The rankings were assigned, on the firms' overall displaying of innovative and operational excellence based on the condition of value chains. Gartner, then identified important metrics along with total costs of supply chain and order rates, for measuring the operational excellence of the firm.

To achieve the target of operational excellence, he further recommended functional metrics in detail and mentioned that these must be in alignment with the end to end SC. C2C is used to analyze the cost of supply chain management and its perfect order.

It is an important metric to bridge between suppliers and the inbound activities, through outbound sales and manufacturing activities [20]. According to Farris et al., C2C proposes increased visibility regarding decision variables, lessen sub-optimization decisions about financing within firms, in addition it also helps the supplier in making decisions by clearing uncertainty in actions of customers.

Many authors suggested three metrics levels for the measurement of SC performance. The first tier comprises of perfect order, demand forecast, cost of SCM, the middle tier includes supplier versus customer balance and cash to cash cycle for assessing financial flows, while the bottom or the third-tier comprises of operational effectiveness involving purchasing cost of inventory and supplier quality. The top tier also focuses on demand visibility in terms of push strategies. C2C is not the only metric that encloses supply chain from end to end, though it provides diagnostic view in terms of receivable, accounts payable, and inventory.

2.1. Agile Supply Chain Management

Supply chain management assist companies to integrate business activities thorough its collaboration among other partners of value chain in order to fulfill the unpredictable need of user. A seamless supply chain, which is engineered to deal with any kind of uncertainty can successfully meet demands of the customer, on the other hand, a nonintegrated process of manufacturing having poor relationships among customers and suppliers and non-integrated processes of distribution leads to failure of the trading firms. In the modern era of increasing competition, it is the need of hour that supply chains must function efficiently, in order to meet the demand of its customers for minimum delivery time and manage supply during ups and downs. For achieving this, SC needs to be more responsive to market demand.

Responsiveness demands speed and more flexibility, also named as agility, which is a business-wide capacity containing information systems, organizational structures and mindsets [21]. The term agility means employing virtual corporation and market information to utilize profitable opportunities from an unstable market [21],[22]

In order to stay truly agile, I [21] has mentioned some of characteristics which must be possessed by a supply chain. It includes:

- Market sensitivity- it is linked closely with the end-users
- Network based- in it, flexibility can be achieved by undertaking strength of experts

- Virtual- it works on shared knowledge covering all SC partners
- Process integration- it possesses a process interconnectivity among member of the network.

The literature has suggested frameworks that are based on various other features of SC agility. For instance, [23] suggested a framework of virtual teaming model for the introduction of agility within a supply chain. A conceptual model has been presented by Yusuf, Sarhadi, and Gunasekaran [24], for the purpose of designing an agile manufacturing system based on four important dimensions including system, strategies, people and technology. These dimensions are also incorporated by Meade and Sarkis [25], for measuring agility in a manufacturing system. Together these dimensions cooperate for mastering uncertainty and change, capturing impact of both people and information, improve competitiveness and enrich customers. An asynchronous collaborative technology was suggested by Basheer et al. [22], to allow manufactures to improve their SC agility. Prater, Biehl, and Smith [26] also attempted to employ case studies for exhibiting how firms can successfully handle a tradeoff between supply chain agility and vulnerability.

Responsive, lean, and agile supply chains are expected to maintain high or at least satisfactory level of trust of companies for the customers and suppliers. Some of the essential factors required for achieving agility in leading a supply chain were identified in a study by [27]. [28] also investigated the role of inventory and capacity in developing agile SC for an apparel manufacturer. In 2003, [29] established an infra-structural framework to design and develop an agile SC system, that is distinguished for its ability to deal with uncertain changes, associated with the flow of parts and suppliers' management within the production network. Moreover, [30] have developed a model, in order to assess supply chain agility, the model constitutes four dimensions namely: competitive objectives, value chain practice, business performance and impact of change drivers.

2.1.1. Market sensitiveness (MS)

Market sensitiveness is an important feature of supply chain, which makes it agile in nature [21]. Market sensitiveness means the SC is capable of understanding and responding to the customer demand [21]. Level of collaboration between the trading partners and capability of employing tools of information technology affects the market sensitiveness of SC. Collaboration among the partners enhances sense of trust between partners, hence motivating them to convey business information and to function on a same scale .

2.2.2. Delivery speed (DS)

From a markets' perspective, delivery speed refers to the ability to readily meet the delivery demand. According [31], delivery speed means ability to bring services or products with a faster speed, as compared to its competitors. It also covers time for bringing new products into the market, duration to manufacture already existing items and time that is needed to deliver that product.

2.2.3. Process integration (PI)

Information sharing among partners of supply chain can only be achieved through the process of integration. The term process integration is defined as the collaborative operations between suppliers and buyers, common systems, joint product and information sharing [21]. This kind of cooperation is becoming more prevalent across the supply chain, as companies are focusing more on effective management of their competencies as well as outsourcing other activities. Greater reliance over partners and suppliers are becoming inevitable in the new era of integration, hence a modern style of relationship is needed. New extended enterprise reflects no boundaries and demands an environment of commitment and trust. Along with this integration, there comes a buyer-supplier alliance, determination of joint strategy, open-book accounting and information transparency.

2.2.4. Cost minimization (COM)

The mechanism of cost minimization aid firms in minimizing cost through investigating ways that could help make coalition among firms efficiently and support firms and its partners to look for other ways of cutting down manufacturing cost. In most cases, management accounting practices occupy little scope within the firms' boundaries. It creates a difficulty for a firm to properly utilize the synergies of cost reduction that generally exists in traditional SC. Such alliances can be achieved through coordination of multiple firms by incorporating activities for cost reduction.

The objective of programs for interorganizational cost management, is to discover solutions for lowering cost that could only be achieved if both the suppliers and buyers try to independently initiate activities for cost reduction [32]. The supply chains are required to seek measures to manage costs that arise from the system of delivering products and services. The aim should not merely be to minimize cost of SC, rather targeting increased customer satisfaction. Cost management systems that have been using in past supports activities of supply chain resulting in cost reduction at local level that discourages supply chains' ability of catering customer needs.

H1: Market share (MS) has significant impact on the supply chain operational performance (SCOP).

H2: Delivery speed (DS) has significant impact on the supply chain operational performance (SCOP).

H3: Process integration (PI) has significant impact on the supply chain operational performance (SCOP).

H4: Cost minimization (CM) has significant impact on the supply chain operational performance(SCOP).

H5: Cash conversion cycle (CCC) has significant impact on the supply chain operational performance (SCOP).

H6: Cash conversion cycle (CCC) moderates the relationship between market share (MS) and supply chain operational performance (SCOP).

H7: Cash conversion cycle (CCC) moderates the relationship between delivery speed (DS) and supply chain operational performance (SCOP).

H8: Cash conversion cycle (CCC) moderates the relationship between process integration (PI) and supply chain operational performance (SCOP).

H9: Cash conversion cycle (CCC) moderates the relationship between Cost minimization (CM) and supply chain operational performance (SCOP).

The theoretical framework of the current study is shown in the figure 1, the study has based this study on the resource based view and theory of supply chain finance.

3.0. Methodology

Survey based technique of quantitative approach is employed for the achievement of certain objectives of this study. Questionnaire is employed as an instrument of research, which is designed after reviewing the literature. In order to discover relationship with the hypothesis, structural equation model is adopted. A sample size of 310 is chosen, based on the table developed by Krejcie and Morgen. However, sample size is further increased to 700, to avoid bias responses as suggested by Hai, Anderson and Tatham. A total number of 571 questionnaires are received back, out of which 560 were found to be correct. The rate of response turned out to be 80%. The next section includes discussion about results obtained from the statistical technique using AMOS.

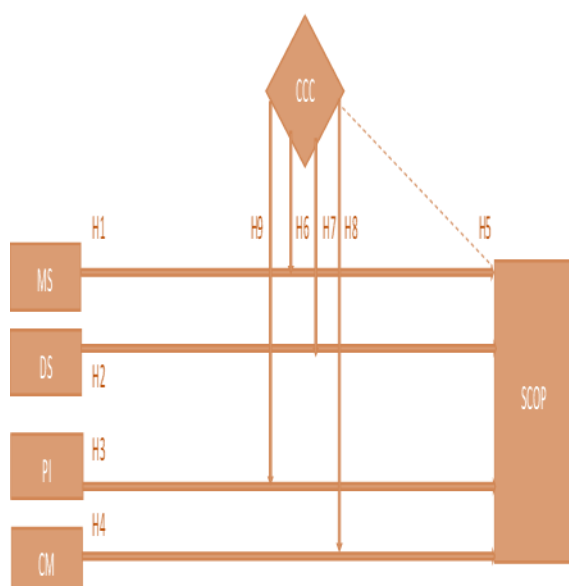


Figure 1: Conceptual framework

4.0. Research Analysis and Discussion

Based on objectives of the study and requirement of quantitative technique, the collected data for current study will be entered and analyzed through the AMOS v21 and SPSS v19 software. Structural equation model is established, which is a multivariate system of analysis, for testing direct and indirect correlation among variables. This is done by the estimation of an interdependent, separate, and multiple regression altogether. The main purpose of employing SEM is to calculate the degree to which an established model for latent and observed model is endorsed by its sample. SEM is particularly used to inspect correlation between the observed variables, i.e. variables that researchers use to define constructs or latent variables. Latent variables are named as unobserved variables or constructs, as it requires two or more measured indexes or items. Analysis of structural equation model was analyzed using most common method of estimation i.e. maximum likelihood method for creating overall estimate of SEM analysis.

The results were obtained by running data on SPSS v20. The obtained results exhibit that all estimates have higher values of reliability which ranges from 0.717 to 0.917. Sekaran and Bougies and Hair et al. declared that a coefficient value 0.60 is considered as poor, value of 0.70 is acceptable while 0.80 and above is considered as good. Moreover, George and Mallery have suggested a rule of thumb which explains that 0.50 and above value of alpha is considered as acceptable and adequate in order to test the reliability of latent variables, while value of 0.50 or less are unacceptable.

Modest reliability coefficient ranges from 0.50 to 0.60 [33]. Howitt and Cramer suggested that a 0.50 value of alpha and above is observed to be a good indication of internal consistency. Furthermore, values that ranges from 0.44 to 0.81 is adequate, as alpha is an outcome of a set of items. The present study adapted the items of measurement from the previous studies, and the standard values of alpha above 0.60 are set as acceptable.

Structural equation model consists of two steps [34]. The first step incorporates measurement model with the Confirmatory Factor analysis, where the instruments of measurement will be evaluated using CFA, while second step involves SEM that describes the structural link between the constructs or latent variables in measurement model, utilizing a path figure for hypothesis testing. Based on the items of latent variables, a measurement model of second order was established for testing the CFA. The strength of the model is determined through reliability, construct validity and dimensionality. Hair et al., [33] defined validity as the ability of a tool to measure that is presumed to estimate the latent variables. It controls the precision of measurement instruments. Construct validity particularly ensures that the extent of measuring instruments constitute variables that are supposed to be measured. The term construct validity is divided as discriminant validity and convergent validity.

Where convergent validity defines as the extent to which a unit is related to the other unit of construct. It can be measured using unidimensional of factor loadings, composite reliability and average variance extracted. Results shows that variables LM, IM, FD, and SCM are significantly and positively correlated at average level. In order to estimate hypothesized relation of the model, a multiple regression is employed incorporating structural equation modeling [35, 36-26]. SEM is an approach for measuring observed variables, in addition it determines direct as well as indirect relationship and measures goodness of fit. It is a rationale for giving preference to SEM over modern techniques of multiple regression.

Subsequently, the evidence regarding measures of discriminant validity is provided. Discriminant validity is cited as the degree to which distinctive measures of constructs are different from one another. Discriminant validity for the current study is established by contrasting items of cross loadings with loadings.

For materialization, experts have suggested that all units of loadings are expected to exceed its cross loadings

However, construct validity is said to be appropriate if the fitness indices of construct

reaches the desirable level. Various indicators for checking the goodness of fit of a model are present, such as χ^2 , p-value, χ^2 to df ratio, Comparative Fix Index, Goodness of Fit Index, Root Mean Square Error of Approximation, and Tucker Lewis Index. The test for measuring goodness of fit indicates that measurement model for the study fits appropriately to the data with value of $\chi^2=1874.775$, which is significant at $p>.01$, with $df = 973$, while value for comparative fix index came out to be 0.94, PNFI equals to 0.83 and estimate for Root Mean Square Error of approximation (RMSEA) turned out to be 0.05. Also, the value for $\chi^2/ df = 1.927$, shows its acceptability for the model.

Table 1: CR, AVE, MSV, ASV

	CR	AVE	MSV	ASV
SCOP	0.833	0.403	0.436	0.389
MS	0.924	0.529	0.336	0.276
DS	0.863	0.673	0.438	0.229
PI	0.968	0.639	0.396	0.316
CM	0.955	0.508	0.227	0.208
CCC	0.957	0.631	0.323	0.259

Once the model achieves a status of goodness of fit, the model is considered as appropriate for testing hypothesis. Next step is the conversion of measurement model into a SEM in order to test the relationship among the exogenous and endogenous models. In this study, the proposed SEM is established under first order construct with an aim of testing the relationship among the latent variables. In this thesis, the relation among latent variables will be estimated through the pathway coefficient, which will be further used in decision making of the tested hypotheses. All results indicate the significant acceptance of all hypothesis.

The mediation results of the currents study are reported in table 4. The coefficient value and p value indicate that the cash conversion cycle is strong moderator in the relationship between agile supply chain management and supply chain operational performance.

The results of the current study have shown a great deal of agreement with the hypothesized results.

5.0. Conclusion

Responsive, lean, and agile supply chains are expected to maintain high or at least satisfactory level of trust of companies for the customers and

suppliers. Agile supply chain is a seamless supply chain, which is engineered to deal with any kind of uncertainty can successfully meet demands of the customer, on the other hand, a nonintegrated process of manufacturing having poor relationships among customers and suppliers and non-integrated processes of distribution leads to failure of the trading firms.

Table 2. Discriminant Validity

	1	2	3	4	5	6
SCOP	0.709					
MS	0.580	0.727				
DS	0.457	0.476	0.712			
PI	0.568	0.515	0.435	0.794		
CM	0.457	0.476	0.712	0.476	0.712	
CCC	0.568	0.515	0.435	0.794	0.435	0.794

Table 3. Direct Effect

	(β)	SD	T-value	P-Values
H1	0.321	0.435	4.211	0.000
H2	0.437	0.242	3.548	0.000
H3	0.541	0.135	4.261	0.000
H4	0.437	0.232	2.978	0.000
H5	0.641	0.143	3.261	0.000

Table 4. In-Direct Effect through Moderation

	(β)	SD	T-value	P-Values
H6	0.422	0.211	3.211	0.000
H7	0.522	0.171	5.311	0.000
H8	0.622	0.221	1.311	0.325
H9	0.654	0.323	4.311	0.000

Actually, Supply chain management assist companies to integrate business activities thorough its collaboration among other partners of value chain in order to fulfill the unpredictable need of user. In recent business history, operational innovation has a central role in the success stories of businesses like Dell, Toyota and Wal-Mart, and firms are on their way to make the supply chains more agile. The cash conversion cycle is also playing key role in determining the supply chain performance. Therefore, the main objective of the

current study is to examine the impact of agile supply chain on the supply chain operational performance of manufacturing firms operating in Indonesia. In addition to that we have also examined the direct and indirect impact of cash conversion cycle in the relationship between agile supply chain and supply chain operational performance. Of the current stud. The data is collected from the operation managers, production managers and finance managers of manufacturing firms listed in Indonesian Stock Exchange. In this study, the proposed SEM is established under first order construct with an aim of testing the relationship among the latent variables. In this thesis, the relation among latent variables will be estimated through the pathway coefficient, which will be further used in decision making of the tested hypotheses. All results indicate the significant acceptance of all hypothesis. The study which is among pioneering studies on the issue will be helpful for policy makers and managers in understanding the role of supply chain finance theory in supply chain management.

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