



EXPLORING THE NEXUS BETWEEN SUPPLY CHAIN AMBIDEXTERITY, SUPPLY CHAIN AGILITY, SUPPLY CHAIN ADAPTABILITY AND THE MARKETING SENSING OF MANUFACTURING FIRMS IN INDONESIA

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Abstract

Purpose: Majority of times, it is argued that firm could face difficulty to reconfigure its processes and capture opportunities within the marketplace, without even suspecting such opportunities earlier.

Methodology: Market sensing shows the routines of organization which are associated with quick learning about competitors, customers, business environment, and SC members, enabling to understand market conditions for the purpose of forecasting.

Results: This study is interested in examining the relationship between supply chain performance and firm performance in the presence of firm performance. To test the hypotheses we have used the SEM-AMOS statistical technique. The findings of the study have provided support to the theoretical foundation and proposed hypothesis of the current study. Current study will be helpful for policymakers and practitioners in understanding the issues related to supply chain risk, supply chain integration and supply chain performance. In the author's knowledge this is among very few pioneering studies on this issue.

Key words: flexibility, agility, supply chain, Indonesia.

INTRODUCTION

Nowadays, companies are competing under increasingly unpredictable and unstable marketplace and are expected to utilize existing efficiencies and identify market opportunities, within their processes. Such exploration involves discovering flexibility and innovative ideas and looking for new potential and possibilities. Exploitation is defined as refining, implementing, and selecting standardized procedures for accomplishing efficiencies in the processes of organization. Scholars have long been discussed that operation managers face a reciprocation among efficiency and flexibility, however giving preference to one can be harmful for the other one (Khan *et al.*, 2016; Prajogo *et al.*, 2016; Keskin and Akdeniz, 2018). It is argued that firms must incorporate either a differentiation strategy, that is supported through flexible operations or a low-cost competitive strategy through firms' operational activities (Hong *et al.*, 2018). A group of researchers stated that reconciling flexibility and efficiency leads to bonded SC operations, which results in greater switching costs.

Still another group (Handfield *et al.*, 2015) argued that firms can both be efficient and flexible at the same time, through establishing an ambidexterity capability. An ambidextrous firm are the ones which are both efficient and are aligned in managing business demands of today's world, as well as become adaptive to rapid environmental changes to stay in the market. For instance, a case was explained by (Masteika and Čepinskis, 2015) i.e. Toyota subsidiary by separating its operation, has been able to enjoy cost advantages that are related to repetitive tasks besides exploring new manufacturing systems at the same time. Other research scholars of operations management discovered that firms having operational ambidexterity capabilities possesses the ability to exploit and explore existing processes at the same time, leading to better operational performance. The operational ambidexterity concept has long been extended across an organizations' boundaries towards SC (McAdam *et al.*, 2017). Supply chain ambidexterity is defined as a strategic choice of an organization to simultaneously undertake supply chain exploration and exploitation processes. The idea of this concept was presented by scholars, who declared that firms must choose the right kind of supply chain having particular functional commodities. These products are expected to get through innovative products and efficient supply chain processes. Therefore, SC ambidexterity signifies that managers do not encounter with either/or decision (McAdam *et al.*, 2017; Khan and Mingyi, 2018; Khemili and Belloumi, 2018) although, in the case of some specific goods, they can be faced with efficient and flexible supply chain, at the same time.

For achieving such kind of goals, successful organizations need supply chain which could quickly act in response to short-term demand fluctuations i.e. agility and adapt in response to long-term market fluctuations through supply chain restructuring i.e. adaptability (Krci and Seifert, 2015). Where, supply chain agility refers to an organizational ability to react in response to market variations, for instance, demand variations with respect to variety, quantity, and quality, and variations in supply with respect to disruptions and shortages. Moreover, supply chain adaptability is an ability to undertake changes in supply chain design which are long term and much radical than the variations that come under the concept of supply chain agility. As supply chain adaptability and agility are renewed and established to changing customer

requirements, therefore, these abilities are considered as dynamic capabilities (Eltantawy, 2016). Whereas, dynamic capabilities refers to the higher-order potential capabilities which represents ability of an organization to sense potential threats and opportunities within a marketplace, particularly for capturing opportunities as well as transforming organizational structures and assets, as a market requirements alters and firm grows (Tece, 2007). Furthermore, according to (Chowdhury and Quaddus, 2017) supply chain agility is considered to be a grasping dynamic ability helping firms in identifying threats and opportunities in market and responding to agile supply chain. On the other hand, supply chain adaptability is taken to be a transforming dynamic capability, as both supply chain structure and resource base are translated over a longer time period as a result of market changes (Eckstein *et al.*, 2015). SC adaptability and agility coordinates and integrates with SC partners, which give rise to complex adaptive system that could sense market changes, capture new opportunities then modify the SC practices according to market needs (Zhan *et al.*, 2018).

Prominently, it is argued that firm could face difficulty to reconfigure its processes and capture opportunities within the marketplace, without even suspecting such opportunities earlier. Market sensing shows the routines of organization which are associated with quick learning about competitors, customers, business environment, and SC members, enabling to understand market conditions for the purpose of forecasting (Li and Mathiyazhagan, 2018). However, recent researches have explored the indirect and direct influence of supply chain adaptability and agility upon various firm performance measures (Li and Mathiyazhagan, 2018). In spite of such commendable attempts, the role of market-sensing ability has always been ignored during the research studies (Song *et al.*, 2016) Therefore, to abridge the existing literature gap, the current study aims to answer the research questions. The research questions for this paper are as follows:

RQ. How does supply chain ambidexterity is affected by supply chain adaptability, supply chain agility, and market sensing?

The research question is addressed by analyzing the sample of 277 manufacturing companies operating in Indonesia. Empirical studies on Indonesian firms are quite limited due to difficulty to collect data; however, dynamic SC capabilities perform a crucial role for the survival of firms because of uncertainty in the economic system (Thornton *et al.*, 2016). Therefore, it is assumed that Indonesia is one of the excellent areas just like other dynamic markets, for observing dynamic SC capabilities as compared to other mature markets, under which firms less often adjust in response to considerable changes. Structural equation modeling is employed for analyzing the data.

LITERATURE REVIEW

Relation among Supply Chain Adaptability, Agility and Market Sensing

The study suggests that in order to be agile, the supply chain ambidexterity needs supply chain for an organization to respond quickly against short-term fluctuations and remain adaptable to reconfigure the structure and resource base of supply chain, for achieving efficiency gains in the long run. We emphasize that adaptive or agile response is not required if the SC managers failed to sense any potential threats or opportunities in the first stance, within the marketplace. In this context, it is hypothesize in this study that market sensing is an antecedent of supply chain adaptability and agility. The theoretical ground for this association can be traced from the dynamic capability perspective suggesting that sensing market opportunities or threats correctly is a pre-requisite for deployment and development of various capabilities. Organization having advanced market sensing capabilities has considerable chances to become agile as they become fully aware about the activities of SC partners, which enables to respond proactively against market changes (Basheer *et al.*, 2019). Surely, these market sensing capabilities enable organizations to develop technologies, policies, and structures and be prepared to efficiently perform in accordance to changing market requirements (Dhaigude and Kapoor, 2017).

Sensing market fluctuations is an essential aspect of supply chain agility which makes it necessary for the firms to quickly and adequately respond to uncertain market variations. (McAdam *et al.*, 2014) stated that such quick response is not possible for the firms, unless they have a sound understanding regarding the future results of these opportunities. More accurate and faster responses against business opportunities which retain customers and prevent competition occur because of the ability to spread market information and better sensing these. On the basis of the above reasoning, we propose a hypothesis as:

H1. *Supply chain agility is in significant relationship with market sensing.*

(Aslam *et al.*, 2018) suggested that an ability of an organization to understand and quickly adjust with the changing market conditions largely depends upon adaptive capabilities. Supply chain adaptability is expected to get positively influenced by market sensing as understanding the business environment variations and magnitude of this variation is a pre-requisite in developing efficiency and flexibility under the design of supply chain. Similarly, (Altay *et al.*, 2018) also supported this argument by stating that the constraint on the response of an organization with changing service and product requirements can be reduced through supply chain adaptability, identifying new resources and performing the role of problem solving i.e. launching and commercialization. (Basheer *et al.*, 2019) made a major contribution by mentioning the way through which supply chain adaptability translates into supply chain design as a result of structural shift. However, for achieving such transformation, structural shift must be recognized in advance, to make required adjustments in the decision making of long-term SC design. Such adjustments in long term decision-making requires sensing of market changes by activities like separating noise, observing key patterns, and capturing market data. The firm on the basis of this data decides about

supply source changes, relevant outsource production, and facility relocation. Therefore, (Eckstein *et al.*, 2015) stated that the ability of SC manager to scan, comprehend, and respond against changing market signals acts as a driver of supply chain adaptability. Thus, we hypothesize as:

H2. Supply chain adaptability is in significant relationship with market sensing.

Association between Supply chain ambidexterity, adaptability and agility

Supply chain agility is argued to be an ability of an organization to quickly respond with market disruptions and changes, both externally and internally. Supply chain agility enable organizations to timely capture the market opportunities and to reform their routines in accordance with the market conditions, without altering the inherent design of supply chain (Dubey *et al.*, 2018). Achieving agility needs to cater a few conflicting demands, such as efficiency versus innovation and satisfying local versus global demand. However, supply chain agility enhances responsiveness of an organization through adopting sensitivity in market fluctuations, having potential to timely and flexibly utilize firms' resources against the market fluctuations. Though unreasonably, supply chain agility enable firms to become more efficient in terms of cost. Although, these are somehow contradictory objectives For instance, to complement demand and supply, organizations advance investments for customizing products, manufacturing a variety of products, and adjusting production volumes (Hafeez *et al.*, 2018). Thus, collaboration among the SC partners occurs by tracking these goals, and encouraging total resource inputs and transaction costs to reduce, resulting in the decline in SC costs. Furthermore, agility through effective supplier integration and inventory reduction also decreases costs besides enhancing firms' responsiveness, by rapid adaption with demand changes (Tuan, 2016). Thus, efficiency and agile gains from ambidextrous supply chain can be obtained through supply chain agility. The hypothesis is proposed as:

H3. Supply chain ambidexterity is in significant relationship with supply chain agility.

However, pre-eminently, supply chain agility is not expected to positively influence ambidexterity supply chain. Contrary to supply chain agility that is based on short-term market responses, SC adaptability thus requires resource base and structural changes in a firm's supply chain, in the long run (Altay *et al.*, 2018). It helps organizations to deal with long-term challenges in the form of markets served, product mix and range, profit margins, and service levels (Gligor *et al.*, 2013). The present study hypothesized that SC adaptability poses positive long term effects upon supply chain ambidexterity. Furthermore, supply chain adaptability positively affects the ambidextrous supply chain in two ways. Firstly, it affects efficiency as the inherent flexibility within the SC requires fixed cost to transform into variable cost that has the ability to decrease total SC costs over a specified time period. In addition, (Gligor *et al.*, 2015) argued that designing various products with higher component commonality minimizes the costs of carrying inventory. Secondly, responsiveness is positively affected by supply chain adaptability, since establishing supply bases through relocation, facilitates in maintaining quality and ensuring steady service under changing economies and markets. Besides, diversification also facilitates in improving delivery performance and service levels. In a similar manner, innovativeness helps to reduce design cycles, flexible design capabilities, and development lead times (Juffe-Bignoli *et al.*, 2014) Supply chain adaptability together with agility positively affects the supply chain flexibility and efficiency, the fact is the former focuses upon restructuring in the long run, while the latter only caters the short-term response. In fact, this reasoning provides foundation to our stated argument that acquiring ambidexterity supply chain refers that no either/or decisions are faced by SC managers, but can be faced with efficient and flexible SC for a similar good. Therefore, it is hypothesized:

H4. Supply chain ambidexterity is in significant relationship with supply chain adaptability.

Supply Chain Agility as a Mediator

Theory of dynamic capabilities states these capabilities do not stay competitive all the time. Activities of dynamic capabilities require transformation and gets imitable over time (Juffe-Bignoli *et al.*, 2014). Therefore, it signifies that sustaining long term competitive advantage requires certain short-term variations. On the basis of this rationale, it can be declared that supply chain adaptability affects the long run competitive advantage sustainability of a firm whereas supply chain agility affects it in the short-term (Colicchia and Strozzi, 2012). It is further supported as, supply chain adaptability plays the role of an enabler for supply chain agility. They particularly mentioned that reconfiguring supply chain in accordance with changing market needs, provide basis to generate the capability of SC agility. Supply chain agility needs the ability for rapidly dealing with the changes of demand side, in the form of variations in customer preferences, as well as supply changes in the form of delivery failures or delays (Christopher and Holweg, 2011).

However, an organization can deal with delivery failures only if it has gone through the process of continuous logistics infrastructure and supplier development. Therefore, a firm can only deal with such fluctuations in terms of customer preferences, if it tracks these variations beforehand. Hence, long-term structural variation for achieving dual flexibility and efficiency motivations require short-term series of SC interventions (Williams *et al.*, 2013). Thus, supply chain agility acts as a mediator in the association among supply chain ambidexterity and adaptability. We thus, propose the hypothesis as:

H5: Supply chain adaptability has significant impact on the supply chain agility.

H6: Supply chain agility mediates the relationship between supply chain ambidexterity and supply chain adaptability

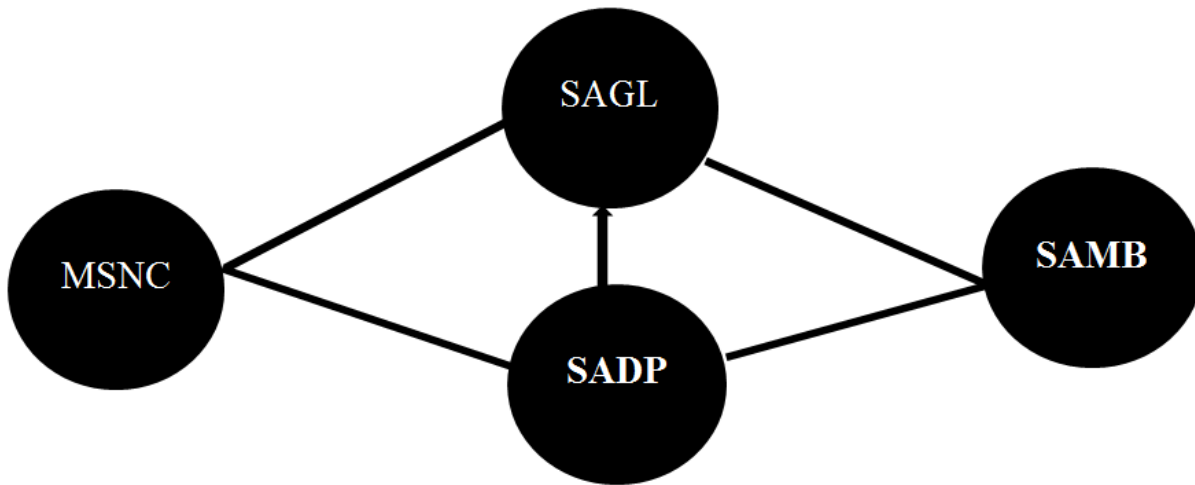


Figure 1 Conceptual Framework

METHODOLOGY

The research employed method of questionnaire survey for data collection. For this, total 431 questionnaires were distributed in various construction organizations. For achieving high response rates, several reminders were given through phone calls and SMS (Gligor *et al.*, 2015). These efforts results in 295 questionnaires. Almost 17 out of 295 were not complete or useable. These questionnaires lack important responses and information by the participants. Almost 278 questionnaires were processed for further analysis. This response rate is considered somehow sufficient for this research study. According to (Juffe-Bignoli *et al.*, 2014), the sufficient level of response rate for surveys is considered about 30 percent. The Structural Equation Modelling (SEM) is employed for the present study. It has the ability to simultaneously deal with both linear and multiple regression, assuming that the estimation of variables exhibits no errors. Although, Structural Equation Modelling undertakes factor analysis and multiple regression analysis, therefore, it exhibits more effective means to simultaneously measure the estimators of multiple regression equations (Hoyle, 1995).

It is a dynamic tool for modeling and analyzing interlinkages and is capable of handling the analysis involving multiple and non-linear latent independents, correlated independents, measurement errors, latent dependents having multiple determinants, and interrelated error terms. While considering the simultaneous estimation of dependent relationships, it is a powerful tool to deal with measurement errors and can precisely determine the degree of association among the factors. In addition, confirmatory factor analysis is preferred over exploratory factor analysis. Therefore, employing Structural Equation Model for analyzing the invariability of data enables researchers to incorporate a number of measures to represent the constructs and carefully handling the specific errors, thus making it easier to prove the validity of a construct.

The present study determines the multiple variables in the form of indirect paths, path analysis, and predictor variables (Hair *et al.*, 2011). The questionnaire is designed by including ratio and interval scales as well as adding the measures of constructs, both conceptual and hypothetical in nature. For instance, the selection of SEM was inevitable for the present study. Moreover, it also helps to observe the causal relation among the variables and highlights the unobserved variables and complexity in the analysis.

RESULTS

Following a study (Ghozali, 2005) a new variable has been generated in SPSS numbering as Response from the start to the end i.e. 1-502 variables. After running the regression analysis, outliers are deleted from the multivariate analysis using SPSS. Regression analysis was performed by taking respondent number as a control or dependent variable generating a residual statistic which indicated a Mahanobis reading (D2) with 2.464 and 277.074 as minimum and maximum values, respectively. The Mahalanobis reading that is higher than the value of χ^2 is known as outliers. The χ^2 value for a model having 4 variables is 103.442.

The purpose of determining the overall fit of the model is to assess the degree by which the hypothesized model fits the data well or in accordance with the data. The goodness of fit discovers the validity of the hypothesized model and is considered as an important element of Structural Equation Modeling. It confirms whether the covariance matrix of the model is related to the observed covariance. Three goodness of fit indicators has been proposed by the scholars namely, parsimonious fit, incremental fit, and absolute fit. According to majority of the scholars (Ghozali, 2005; Tabachnick *et al.*, 2007), one or more estimators must be utilized for assessing the goodness of the fit from the available types.

Confirmatory factor analysis is performed on the endogenous and exogenous variables, and on the individual constructs. Afterwards, the model is measured involving combined variables. The measurement model involves four endogenous and five exogenous variables namely green purchase intention, environmental consciousness, perceived behavioural control, and green trust and government regulations, perceived green value, perceived green knowledge, green availability, and

green price sensitivity. Appendix I indicates the models and discussion of these variables. After undergoing the Confirmatory factor analysis, the goodness of fit is estimated resulting in following indices: $\chi^2= 205.3$, degrees of freedom=173, CFI=0.993, Ratio=1.187, GFI= 0.959, PNFI= 0.715, TLI= 0.990, RMSEA=0.21 with $p=.047$. Therefore, the estimates show the models' compatibility with the data as all the indices are in accordance with the acceptable thresholds (Hair Jr *et al.*, 2014).

The discriminant validity of the model is discovered using average variance extracted and correlation analysis. The measured values of AVE for two variables must be higher than the square of correlation values between the constructs. In order to check the indirect effect, bootstrapping is employed. Bootstrapping is considered as a much stronger and rigorous test as compared to Sobel (Hair Jr *et al.*, 2014) While conducting stimulation studies, a few authors have suggested that bootstrapping is more powerful as compared to Sobel and the causal steps for assessing the mediating effects of the variable.

According to (Tabachnick *et al.*, 2007), it directly explains how a particular model recreates an observed data. The absolute fit indices give the basic assessment about how accurately the researchers' model explains the data i.e. the degree to duplicate the actual correlation between the constructs. The goodness of fit for other models are not compared and every model is estimated independently. Such fit index contains insignificant χ^2 with associated degrees of freedom, root means square of approximation, and root mean square error, and goodness of fit. However, absolute fit indices for this study are reported as Goodness of Fit, Root Mean Square Error of Approximation and Chi-Square with associated degrees of freedom.

These explain the association among two constructs with a single path creating a linkage between them, and is commonly known as direct effect. The probability value and critical ratio are employed for proving that the paths within the model are in line in to estimate it. The estimate of CR is divided by its standard error, which is only acceptable at 1.96 value (Williams and MacKinnon, 2008). In other words, the hypothesis and path is accepted only when the value of CR parameter turns out to be 1.96 or above. According to (Williams and MacKinnon, 2008), p-value is another determinant to discover whether it proves to have statistically significant direct impact or not.

Table 1. Reliability

	CR	AVE	Cronbach Alpha
MSNC	0.975	0.872	0.885
SAGL	0.934	0.843	0.874
SADP	0.702	0.737	0.924
SAMB	0.960	0.871	0.893

The next stage is the assessment of the structural model after ascertaining the measurement model in the present study. The procedure for the bootstrapping through a number of 5000 bootstrap samples and 331 cases to assess the significance of the path coefficients was applied. Structural model, according to (Williams and MacKinnon, 2008), illustrates the reliance and dependence of relationships in the hypothesized model. In partial least squares (PLS), structural model takes before the directional relationships between the variables, their t-values and the path coefficient. The PLS approach is similar to the standardized beta coefficient estimated in the regression analysis (Christopher and Holweg, 2011). This research study has highlighted the model of evaluation. After this, the hypotheses have been tested for finding the correlation among the variables.

Table 2. Direct Effect

	(β)	SD	T-value	P-Values
H1	0.321	0.178	3.321	0.000
H2	0.342	0.165	3.234	0.000
H3	0.453	0.187	3.768	0.000
H3	0.556	0.197	3.368	0.000

Parsimonious models are supported in PLS-SEM approach in the structuring of hypothesis. For maintaining the model estimation quality, the parameters are kept to be low as possible. Different layers of constructs are involved in the HCM (Hierarchical component model), which is usually a second order structure and has high abstraction level. According to (Williams and MacKinnon, 2008; Kip'netich *et al.*, 2018; Kojo and Paschal, 2018; Köse, 2018), HOC contains a high order component concerning two or more lower-order components (LOCs) in a formative way. Various reasons are there for the addition of Hierarchical component model in PLS-SEM. This supports in reducing the number of structural model relationships when the constructs have high correlation, the HCMs come out to be impressive. However, relationship estimates may become biased because of multi-collinearity issues. These issues can be eliminated through a second order construct.

Table 3 indirect results

	(β)	SD	T-value	P-Values
H5	0.211	0.135	3.211	0.000
H6	0.357	0.152	3.678	0.000

CONCLUSION

Majority of times, it is argued that firm could face difficulty to reconfigure its processes and capture opportunities within the marketplace, without even suspecting such opportunities earlier. Market sensing shows the routines of organization which are associated with quick learning about competitors, customers, business environment, and SC members, enabling to understand market conditions for the purpose of forecasting. Thus, this study is interested in examining the relationship between supply chain performance and firm performance in the presence of firm performance. To test the hypotheses we have used the SEM-AMOS statistical technique. The findings of the study have provided support to the theoretical foundation and proposed hypothesis of the current study. Current study will be helpful for policymakers and practitioners in understanding the issues related to supply chain risk, supply chain integration and supply chain performance. In author knowledge this is among very few pioneering studies on this issue. The research question is addressed by analyzing the sample of 277 manufacturing companies operating in Indonesia. Empirical studies on Indonesian firms are quite limited due to difficulty to collect data; however, dynamic SC capabilities perform a crucial role for the survival of firms because of uncertainty in the economic system. Therefore, it is assumed that Indonesia is one of the excellent areas just like other dynamic markets, for observing dynamic SC capabilities as compared to other mature markets, under which firms less often adjust in response to considerable changes. Structural equation modeling is employed for analyzing the data.

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