Abstract

The aim of this study is to investigate the relationship between organizational practices and supply chain agility. Data collection instrument used was a questionnaire which was administrated to a total sample of 150 executive officers, directors, presidents, vice presidents, managers, and senior staff from 40 manufacturing firms in Malaysia. In order to contact of respondent in efficient and cost effective manner, it was decide to distribute questionnaires to respondents through mail. The response rate was 70% while 63% was usable questionnaires. Sample selection was based on convenience sampling. The data were analyzed using mean, standard deviation and correlation between independent and dependent variables. The analyses involved statistical methods such as reliability and validity tests and multiple regressions. The finding showed that supply organizational practices have a significant relationship with supply chain agility. This research also shows that supporting technology moderate the relationship between organizational practices and supply agility do exist.

Keywords: organizational practices, manufacturing industry, supply chain agility, supporting technology

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1. Introduction

The organizational practices are complex and multi-dimensional. For the construct of external integration it is necessary that integration with key suppliers and key customers occur simultaneously. It is not sufficient for a firm to show either integration with key customers or key suppliers. It must be with both suppliers and customers. Otherwise the firms do not have external integration [9]. In the growing competitive global economy, most of the firms are trying to focusing on delivering better customer value against the competitors. Doing business today is in the processes of building more interconnected and interdependent than before. The business marketplace has become very agile with customers demanding lower prices, faster delivery, and better quality products and services and increasing variety[4][10][12][18][9]. In order to respond the increasing complexity, the uncertainty of business environment, and demand for value is now increasingly recognized that the inter-related and supply chain should consciously incorporate each other into the supply chain agility in which they participate [20]. Agility is the concept of management that focuses on responsiveness to dynamic and turbulent markets and customer demand [16] Supply chain agility has been identified as a strategic factor and agility of the supply chain may impact the survivability of the firm [11][17].

The main purpose of this research is to find out the effect of organizational practices in terms of internal firm integration, integration with suppliers and integration with customers on supply chain agility. The paper is organized as follows. Relevant literature is reviewed and synthesized first to develop a conceptual model, followed by research methodology. The results are then presented along with discussion. Conclusion and implication are discussed finally.

2. Literature Review and Hypotheses

Christopher and Towill [2002] cited in [9] suggested that the emphasis on supply chain management in the future must be on agility due to the shift in markets away from cost as the order winner to that of customer responsiveness. The supply chain agility is tools of competitive advantage in uncertain and changing business environment [1].

Internal integration refers to the coordinated management of the company's internal operations. Most companies have the same functions as marketing, finance, human resources, production / operations, logistics, etc. each of these functions should be well integrated to achieve the goals and objectives. Internal integration is related to easy access to key operational data from integrated databases, information systems are integrated to connect to various internal departments within an organization, access inventory information throughout the supply chain, taking inventory status in real time, using computer-based systems planning between marketing and production, and with a high level of integration of information systems for the production process [3].

[14] [9] described the internal integration as an important step that must be done before the external integration can be easily achieved. Internal integration is the first step to achieving supply chain integration [6][13][14][9]. Effective internal integration is important for supply chain integration [13]. This internal integration is also necessary to supply chain agility. If the internal process is integrated, there may be some effect on supply chain agility as well. Internal integration suggested achieving supply chain agility.

External integration is the integration of a firm with key suppliers and customers [8][9]. It has been empirically demonstrated that there is a high correlation between integration practices with suppliers and customers and firm performance [5][13]. There is also a growing recognition that individual businesses no longer compete as stand-alone entities but rather as supply chains [2][4]. For the construct of external integration it is necessary that integration with key suppliers and key customers occur simultaneously. It is not sufficient for a firm to demonstrate either integration with key customers or key suppliers. It must...
be with firm-supplier and firm-customer integration. The level of external firm integration will be able to generate supply chain agility. [9] Stated that the terms of external firm integration, an idea to see the coordination of the supply chain from the perspective of the entire system, with each of the tactical flow distribution activity seen in the context of broader strategic terms to replace the SCM as a management philosophy.

Agility is a construct in operations and supply chain management literature. [16][9] Began the process by developing scales for supply chain agility. While [16] argued that for an agile supply chain framework that includes market sensitivity, network integration, virtual integration and process integration. Agility is the successful exploration of competitive bases (speed, flexibility, innovation pro-activeness, quality and profitability) through the integration of reconfigurable resources and best practices in a knowledge-rich environment to provide customer-driven products and services in a fast changing market environment [19][9] stated that the supply chain agility encompasses supply chain planning, supply chain purchasing and procurement, supply chain manufacturing, and supply chain logistic and product delivery.

To smooth the organizational practices (Internal integration, integration with suppliers and integration with customers), business organizations need technology that can support the integration called supporting technology. According to [15] supporting technology consists of resource planning related technologies, internetworking related technologies, advance manufacturing and logistics flow related technologies, computer aided related technologies, and cotemporary SCM related technologies. Supporting technology plays an important role, especially important for technologies that support internal and external firm integration and supply chain orientation. Information is the key element of integration. Therefore, the supporting technology especially for sharing of information is very important for the supply chain integration in any organization. In recent decades, the development of information technology has changed rapidly conditions for doing business around the world, with the power to provide timely, accurate, and reliable information. Information technology has brought better performance both local companies, and partners in the supply chain [7]. Organizations use technology to integrate business processes. By implementing technology that can support the flow of business process, the firms can operate smoothly and obtain better performance.

This study examines the organizational practice that consists of internal firm integration, integration with suppliers and integration with customers, and its relationship to supply chain agility. Hence, the following hypotheses will be tested:

H1: Organizational practice is positively related to supply chain agility components
H1a: Internal firm integration is positively related to chain agility components.
H1b: Integration with suppliers is positively related to chain agility components.
H1c: Integration with customers is positively related to chain agility components.

We proposed that information technology moderate the relationship between organizational practices and supply chain agility. Hence, the following hypotheses will be tested:

H2: Supporting technology moderates the relationship between organizational practices and supply chain agility.
H2a: Supporting technology moderates the relationship between internal firm integration chain agility components
H2b: Supporting technology moderates the relationship between integration with suppliers and chain agility components
H2c: Supporting technology moderates the relationship between integration with customers and chain agility components
3. **Research Methodology**

3.1 **Sampling and data collection**

The data collection instrument used was a questionnaire which was administrated to a total sample of 150 executive officers, directors, presidents, vice presidents, managers, and senior staff from 40 manufacturing firms in Malaysia. In order to contact of respondent in efficient and cost effective manner, it was decide to distribute questionnaires to respondents through mail. The data were analyzed using mean, standard deviation and correlation between independent and dependent variables. The analyses involved statistical methods such as reliability and validity tests and multiple regressions.

3.2. **Reliability Analysis**

The Cronbach’s alpha was conducted to assess the reliability of each scale. Alpha values over 0.8 indicate that all scales can be considered reliable. For each of the item scales, factor analysis was used to reduce the total number of items to manageable factor. Principal components analysis is used to extract factors with eigenvalue greater than 1. Varimax rotation is used to facilitate interpretation of the factor matrix. Sampling adequacy measurement tests are also examined via the Kaiser-Meyer-Olkin (KMO) statistics to validate use of factor analysis.

Factors analysis showed that KMO value of 0.84 indicate sampling adequacy. The factor model indicates three distinct factors loading without any misclassification: internal firm integration, integration with supplier and integration with customers. Among 18 items in the questionnaire, six items are deleted during the factor analysis. A total of 12 items were reduced to three underlying factors loadings. Four items are identified for internal firm integration (IFI), integration with suppliers (IWS), and integration with customers (IWC) respectively. These items are treated as independent factors. Cronbach’s alphas among 12 items in the questionnaires are exceeded 0.7.

A similar factor analysis was applied to the agile supply chain areas: supply chain planning (SCP), supply chain purchasing and procurement (SCPP), supply chain manufacturing (SCM), and supply chain logistic and product delivery (SCLPD). Among 25 items in the questionnaire, five items are deleted during the factor analysis. A total of 20 items were reduced to four underlying factors loadings, depicted in Table 2. Cronbach’s alphas among 20 items in the questionnaires are exceeded 0.7. Four items are identified for SCP, five items for SCPP, four items for SCM and 7 items for SCLPD. The KMO value of 0.76 indicate sampling adequacy.

Factor analysis of supporting technology, extracted five individual factors from twenty questions and the factor loading of all question were higher than 0.5. They were resource planning related technologies, internetworking related technologies, advance manufacturing and logistics flow related technologies, computer aided related technologies, and cotemporary SCM related technologies.

The first factor, resource planning related technology, composed of three questions: enterprise resource planning (ERP), material requirement planning (MRP), manufacturing and source planning (MRPII). The Cronbach’s $\alpha$ of these questions score 0.765. The second factor, internetworking related technologies, composed of: electronic data interchange, internet, intranet, extranet and the Cronbach’s $\alpha$ of these questions score 0.743. The third factor, advance manufacturing and logistics flow related technologies, composed of six questions: transportation management system (TMS), manufacturing execution system (MES), global positioning system (GPS), flexible manufacturing system (FMS), warehouse management system (WMS), radio frequency-identification (RF-ID). The Cronbach’s $\alpha$ of these questions score 0.722. The fourth factor, computer aided related technologies, composed of: computer aided design (CAD), computer aided manufacturing (CAM), and computer numerical control
The Cronbach’s $\alpha$ of these questions = 0.755. The fifth factor, contemporary SCM related technologies, composed of four questions: supplier relationship management (SRM), customer relationship management (CRM), supply chain management (SCM), supply chain collaboration (SCC). The Cronbach’s $\alpha$ of these questions score 0.714. All the Cronbach’s $\alpha$ score of supporting technology items more than 0.70 which indicate that the good reliability of these instruments.

3.3. Correlation analysis

The correlation between independent and dependent variables: Independent variables are internal firm integration (IFI), integration with supplier (ICW) and integration with customer (IWC) and dependent variables (supply chain agility) were positive. IFI had a correlation of 0.24, p<0.01 with SCP, 0.35, p<0.01 SCPD, 0.25, p<0.01 SCM, 0.26, p<0.01 SCLPD, which mean that the respondents are more likely to evaluate IFI was positive when supply chain agility is positive. IWS had a correlation of 0.32, p<0.05 with SCP, 0.24, p<0.05 SCPP, 0.34, p<0.05 SCM, 0.32, p<0.01 SCLPD. IWC has a correlation of 0.39, p<0.01 with SCP, 0.38, p<0.01 SCPP, 0.26 p<0.01 SCM, 0.34, p<0.01 SCLPD.

3.4. Regression analysis

The parameters of this model are estimated using multivariate regression analysis. Table 1 shows coefficients of each model along with corresponding test statistics. In Model 1 where the dependent variable is overall agile supply chain (ASC), the model seem to be reliable (p-value for F<0.01 and adjusted R-square of 0.26. Model 2, dependent variable is supply chain planning (SCP). The model seem to be reliable (p-value for F<0.01 and adjusted R-square of 0.22. IFI and IWC has similar effect on SCP with p-value for t<0.01, while IWS is not significant with p-value of t>0.05. Model 3, dependent variable is supply chain purchasing and procurement (SCPP). The model also seem to be reliable (p-value for F<0.01) and adjusted R-square of 0.22. All of the predictors (IFI, IWS and IWC) has a significant relationship on SCPP with p-value for t<0.01, respectively. Model 4, dependent variable is supply chain manufacturing (SCM). The model also seem to be reliable (p-value for F<0.01) and adjusted R-square of 0.17. IFI and IWS has similar effect on SCM with p-value for t<0.01, followed by IWC with p-value for t<0.05. Model 5, dependent variable is supply chain logistic and product delivery (SCLPD). Statistically, the model also seem to be reliable (p-value for F<0.01) and adjusted R-square of 0.23. IFI, IWS and IWC has a significant effect on SCLPD with p-value for t<0.01.

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable = overall ASC</td>
<td>Dependent variable = SCP</td>
<td>Dependent variable = SCPP</td>
<td>Dependent variable = SCM</td>
<td>Dependent variable = SCLPD</td>
</tr>
<tr>
<td>Constant</td>
<td>117.223</td>
<td>22.099</td>
<td>16.214</td>
<td>18.194</td>
</tr>
<tr>
<td>IFI</td>
<td>1.632</td>
<td>0.312</td>
<td>0.28</td>
<td>0.282</td>
</tr>
<tr>
<td>(3.056)**</td>
<td>(2.367)**</td>
<td>(2.201)**</td>
<td>(2.285)**</td>
<td>(1.906)**</td>
</tr>
<tr>
<td>IWS</td>
<td>1.241</td>
<td>0.114</td>
<td>0.307</td>
<td>0.310</td>
</tr>
<tr>
<td>(2.789)**</td>
<td>(1.072)</td>
<td>(1.275)**</td>
<td>(1.284)**</td>
<td>(2.733)**</td>
</tr>
<tr>
<td>IWC</td>
<td>1.624</td>
<td>0.266</td>
<td>0.324</td>
<td>0.142</td>
</tr>
<tr>
<td>(3.513)**</td>
<td>(3.208)**</td>
<td>(2.901)**</td>
<td>(2.095)*</td>
<td>(3.268)**</td>
</tr>
</tbody>
</table>
3.4.1. Moderated Multiple Regression Analysis (MMR)

A moderator variable is the independent qualitative or quantitative variable that affects the relationship of the dependent and independent variables. Effect of moderator variables indicates variables that strengthen or weaken the relationship between independent variables with dependent variables.

Table 2 shows the regression between all integrated variable (IFIXST, IWSXST and IWCXST) to examine the moderation effect on the relationship between organizational practices on supply chain agility. Model 5 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between organizational practices and SCP. The adjusted coefficient of determination of the model is $R^2$ 0.323 with p-value <0.01. Results in model 5 appear to confirm $H_2a$.

Model 6 shows the regression between all integrated variable to examine the moderation effect on the relationship between organizational practices and SCPP. The adjusted coefficient of determination of the model is $R^2$ 0.294 with p-value <0.01. Results in model 6 appear to confirm $H_2b$. Model 7 shows the regression between all integrated variable to examine the moderation effect on the relationship between organizational practices and SCM. The adjusted coefficient of determination of the model is $R^2$ 0.249 with p-value <0.01. Results in model 7 appear to confirm $H_2c$. Model 8 shows the regression between all integrated variable to examine the moderation effect on the relationship organizational practices and SCLPD. The adjusted coefficient of determination of the model is $R^2$ 0.282 with p-value <0.01. Results in model 8 appear to confirm $H_2d$.

<table>
<thead>
<tr>
<th>Model</th>
<th>Dependent variable</th>
<th>Coefficient</th>
<th>t-value</th>
<th>Adj $R^2$</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>SCP</td>
<td>26.641</td>
<td>(21.976)**</td>
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<td></td>
<td></td>
<td>23.021</td>
<td>(18.437)**</td>
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<td>11.013**</td>
</tr>
<tr>
<td>6</td>
<td>SCPP</td>
<td>24.019</td>
<td>(18.593)**</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>25.156</td>
<td>(23.332)**</td>
<td>0.17</td>
<td>8.510**</td>
</tr>
<tr>
<td>7</td>
<td>SCM</td>
<td>0.259</td>
<td>(3.687)**</td>
<td>0.23</td>
<td>23.667**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2534</td>
<td>(2.633)**</td>
<td>0.28</td>
<td>21.424**</td>
</tr>
<tr>
<td>8</td>
<td>SCLPD</td>
<td>0.349</td>
<td>(3.444)**</td>
<td>0.29</td>
<td>0.323</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.342</td>
<td>(3.051)**</td>
<td>0.29</td>
<td>0.294</td>
</tr>
</tbody>
</table>

*p value <0.05, **p value <0.01
4. Results

In this study, the following outcomes were obtained: The correlation analysis showed that organizational practices that encompass internal firm integration, integration with supplier, and integration with customers are related to supply chain agility components. This study also shows that supporting technology does moderate the relationship between organizational practices and supply chain agility.

For hypothesis 1, this study found a significant relationship between organizational practices and agile supply chain. Hypothesis 1a assessed the relationship between IFI and SCP, SCPP, SCM, SCLPD; finding show there is a significant relationship. Hypothesis 1b, considered the relationship between IWS and SCP, SCPP, SCM, SCLPD. Testing found that there is a significant relationship. Hypothesis 1c investigates the relationship between IWC and SCP, SCPP, SCM, SCLPD. Research finding also showed that there is a significant relationship.

Hypothesis 2, considered the relationship between moderating effect of supporting technology on relationship between organizational practices and supply chain agility components and testing found that there is significant correlation suggests that supporting technology does moderate the relationship between IFI, IWS, IWC and SCA.

5. Implications

The purpose of the study presented in this paper was to add to the knowledge on supply chain management field by exploring the relationship between organizational practices and supply chain agility. This study also investigates whether supporting technology moderate the relationship between organizational practices and supply chain agility. By developing and testing a research framework of organizational practices and supply chain agility constructs and conducting an analysis a number of manufacturing firm organizations with valid and reliable instrument, this study represented one of the investigate the relationship between organizational practices in form of internal integration, integration with supplier, integration with customer and supply chain agility components. Overall, this study contributes to the knowledge of the role of supply chain supply chain management in organizational practices. First, it proposed a theoretical organizational practices framework that identified IFI, IWS, IWC. Second, this study provides a practical and useful tool for manager and assesses organizational practices in order to generate the performance of the firms. For instance, the organizational practices can be used to evaluate the extent to which supply chain agility that has been implemented, and their impact on the competitive capability of the firm. Third, this study provides conceptual and prescriptive literature regarding organizational practices and supply chain agility. Fourth, the results lend support to the claim that better organizational practices lead to higher levels of supply chain agility.

6. Limitation and future research

There are a number of limitations that influence the generalizability of this study. First, this study limited only on manufacturing industry. Future studies replicating this study across multiple industries and sector would increase the understanding of supply chain agility. Second, the sample represented a limited number of the firm in limited industry. Third, the study is based on a self-reported questionnaire. Therefore, there is a possibility of respondents answering questions in a way that is perceived to be more desirable or acceptable than what is actually experienced or believed. Thus, the results of this study should be considered indicative rather than definitive based on these limitations.
References