Impact of market orientation, learning orientation, and supply chain integration on product innovation

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Abstract: In this research, we have identified and tested important drivers of product innovation. Our study has analysed two important drivers: organisational orientation (learning and market) and SCI [supply chain integration – internal integration and external integration (supplier and customer)]. The study was conducted among 202 manufacturing companies in Malaysia. The structural model was tested using structural equation modelling (SEM). The key findings of our research are: 1) learning orientation and market orientation synergistically drive internal integration and customer integration; 2) internal integration drives external integration and product innovation; 3) customer integration drives supplier integration and product innovation; 4) internal integration mediates the relationship between organisational orientation and product innovation; 5) customer integration mediates the relationship between organisational orientation and product innovation. This research has been able to explain the process of product innovation by analysing the direct and indirect effects of market and learning orientations and SCI.

Keywords: organisational orientation; supply chain integration; SCI; product innovation; PI; Malaysia.


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1 Introduction

Numerous studies indicate that companies focus on product innovation (PI) to sustain competitive advantage and achieve growth and profit in a highly competitive environment (Chapman and Hyland, 2004; Koufteros et al., 2005; Drucker, 2001). Innovation, in this research, is defined as “the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace” [Baregheh et al., (2009), p.1334]. According to Whelan et al. (2011), companies that have tapped and exploited knowledge outside their own R&D structures have been successful in innovation. Researchers have recognised that supply chain integration (SCI) is an effective approach to improve PI through collaboration and sharing of information among supply chain members (Flynn et al., 2010; Koufteros et al., 2005; Scott, 2000). However, the research on understanding the impacts of SCI on PI is in an inchoate stage (Wong et al., 2011). It is well known in the supply chain literature that cultural factors play a significant role in achieving integration. However, the effects of cultural antecedents of SCI in the operations management literature, including PI, are less researched and understood (Braunscheidel and Suresh, 2009). These significant gaps have been addressed in this research. The context of the study is the manufacturing firms in Malaysia.

SCI is defined as “the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organization processes. The goal is to achieve effective and efficient flows of products and services, information, money, decisions, and to provide maximum value to the customer at low cost and high speed” [Flynn et al., (2010), p.58]. According to these researchers, supplier integration (SI), customer integration (CI) and internal integration (II) engenders SCI. SI and CI are termed as external integration. External integration refers to unified control of functions and processes across supply chain partners (suppliers and customers). II refers to unifying functions and processes within the firm.

Literature on marketing and strategy has addressed the roles of market orientation (MO) and learning orientation (LO) as important cultural antecedents that impact organisational performance, SCI, innovation performance, and sustainable competitive advantage. The two orientations (market and learning) are termed as organisational
Impact of market orientation, learning orientation

orientation (Braunscheidel and Suresh, 2009). These researchers argue that culture is manifested in learning and MOs and therefore, must be treated as cultural antecedents. MO is defined as “the organizational culture that creates the behaviors necessary for creation of superior value for customers, and it can be conceptualized as the set of behaviors that exhibit: (1) customer orientation, (2) competitor orientation and (3) inter-functional coordination” [Braunscheidel and Suresh, (2009), p.122]. LO is defined as an “organizational value that influences the tendency of an organization to create and use knowledge, and hence to learn and adapt” [Braunscheidel and Suresh, (2009), p.122]. According to Hurley and Hult (1998, p.43), “deepest manifestations of market and learning orientations are at the cultural level, where over time, stories, reinforcement of behaviors, and the creation of organizational processes produce a basic assumption among employees that customers and learning are important.” Therefore, in this research, market and learning (organisational) orientations are treated as cultural antecedents.

Our research investigates the relationships between these cultural antecedents, SCI, and PI. Besides, this research analyses the inter-relationships within the cultural antecedent and SCI. According to Wong et al. (2011), impact of SCI on PI is less understood. They further argue that internal and external integrations must be studied together to understand the effect on PI through exploitative and explorative innovations. According to Braunscheidel and Suresh (2009), more research is required in operations management literature and specifically, supply chain literature to understand the impact of organisational culture. This is because the supply chain efforts require cultural changes such as establishment of trust, commitment, and communication and a shift from adversarial relationships to more of collaboration and strategic alliances between supply chain partners (Sambasivan et al., 2011, 2013). Few studies have analysed the impact of culture on supply chain elements. For example, Sambasivan and Yen (2010) have studied the role of organisational culture on strategic alliances in a supply chain.

The contributions of this research are threefold. First, this is one of the first papers that brings together cultural antecedents (LO and marketing orientation) and SCI (II and external integration) to study PI. We believe that our study will enhance the literature on PI by specifically highlighting the roles of cultural antecedents and SCI. Second, researchers in the past have researched the three constructs (cultural antecedents, SCI, and PI) in a limited manner. For example, Braunscheidel and Suresh (2009) have studied the impact of cultural antecedents and SCI on firm’s supply chain agility; Wong et al. (2011) have studied the impact of SCI on PI. But these researches have not looked at the inter-relationships between all the dimensions of the constructs. Our research studies all the relationships. Third, as indicated earlier, the context of the study is Malaysia. Since the learning and marketing orientations are cultural antecedents, their impacts can be different according to cultural contexts. The analysis of relationships in this context can lead to significant findings.

2 Theoretical framework and hypotheses development

Our research addresses the impact of cultural antecedents (market and LOs) and SCI (internal and external integrations) on PI. Based on the resource-based view (RBV) of the firm, competitive advantage can only be obtained when both resources and capabilities
work together (Baker and Sinkula, 2005) and these must be valuable, rare, inimitable, and non-substitutable (Barney, 1991). Researchers argue that market and LOs are equal to firm resource in the context of organisational culture (Hunt and Morgan, 1995; Baker and Sinkula, 2005; Brettel and Cleven, 2011). Companies that innovate, by understanding the needs of the customers, have a better competitive advantage when compared to companies that do not innovate. Wong et al. (2011) have used organisational information processing (OIP) theory to explain how market information and information processing capability translates into a competitive advantage (such as PI). These two theories (RBV and OIP) together explicate how market intelligence and novel ideas emanating from integrative efforts can be exploited and explored for successful PI (Wong et al., 2011). Figure 1 shows the theoretical framework used in this research.

**Figure 1** Theoretical framework used in this research (see online version for colours)

Note: Firm size and firm age are control variables.

### 2.1 MO and PI

MO is a key differentiating resource for a firm. It is idiosyncratic to the firm, creates value in the marketplace, is built over time with heavy reliance on tacit knowledge and skills, and involves complex interrelationships with other resources. These important factors create sustainable competitive advantage (Narver and Slater, 1990). Based on RBV, MO is a rare, inimitable, non-substitutable, and a valuable resource for improving firms’ capability on PI (Barney, 1991; Hunt and Morgan, 1995). Researchers maintain that MO plays an important role in generating necessary actions for producing superior value for customers (Narver and Slater, 1990). A market oriented firm is likely to enhance customer value through customised and unique features of products and discover more conscious ways to improve products which fit their market needs (Day, 1994). According to Braunscheidel and Suresh (2009, p.122), “a market-driven culture supports the value of market intelligence and the necessity of functionally coordinated action directed at gaining competitive advantage.” Atuahene-Gima (1996) and Mavondo et al. (2005) confirm the direct positive effects of MO on PI. As indicated earlier, impacts of market and LOs can vary depending upon the cultural context. Therefore, we hypothesise as follows:

**H1** MO of a firm has a positive relationship with PI.
2.2 LO and PI

Learning is an ongoing process and organisations must continuously strive to learn to survive in this dynamic environment (Slater and Narver, 1995). According to Baker and Sinkula (2002, p.5), “in addition to a strong market orientation, a firm must also be able to institutionalize higher order learning processes, the type of learning that enables radical innovation.” Based on RBV, an organisation’s capability to learn and adapt becomes its unique resource that translates into competitive advantage that is sustainable (Barney, 1991). A learning organisation is adept at challenging the underlying assumptions of its business and modifying its behaviour in response to what has been learnt (Braunschweidel and Suresh, 2009). According to Sinkula et al. (1997), the three main characteristics of a learning organisation are: commitment to learning, open-mindedness and shared vision. Learning and MOs have a significant impact on new product success and overall performance (Baker and Sinkula, 2002). A critical factor that enhances a firm’s innovative capabilities is the ability to recognise, assimilate and apply new knowledge to develop new products and improve performance. A learning organisation has unique abilities that enable it to innovate better than organisations with poor learning abilities (Cohen and Levinthal, 1990). Based on the above arguments, we hypothesise as follows:

H2 LO of a firm has a positive relationship with PI.

2.3 MO and SCI

MO is associated with important organisational practices to generate necessary actions to produce superior value for the customers (Narver and Slater, 1990). Market oriented firms may adopt external integration as several authors have confirmed its benefits (Frohlich and Westbrook, 2001; Braunschweidel and Suresh, 2009). Firms that discover ways to improve suitable products to meet market needs (Day, 1994) through external integration provide more values than independent firms (Dyer, 1996). Based on RBV, Tseng and Liao (2015) have shown that MO has a positive impact on SCI by studying the container shipping firms.

In practice, market oriented firms adopt SI to synchronise production activities with key suppliers and speed up development process. Consequently, this approach will enable customers to obtain superior products (Rosenzweig et al., 2003). According to Martin and Grbac (2003), market oriented firms can solve customers’ problems more successfully than their competitors through a strong supplier relationship. Using resource-dependence theory, Kibbeling et al. (2013) have argued that MO and SI can lead to high degree of innovativeness in the supply chains. Likewise, a firm with high levels of MO is likely to grab opportunities to integrate with customers more closely and comprehend their needs to provide value-added products and services. Based on RBV, this unique capability of the firm becomes its resource which translates into competitive advantage. A study by Braunschweidel and Suresh (2009) shows that MO is positively related to external integration. Thus, the following hypotheses are proposed:

H3 MO of a firm has a positive relationship with external integration.
H3a MO has a positive relationship with SI.
H3b MO has a positive relationship with CI.
II (inter-functional and inter-departmental) is essential in an organisation to respond effectively to changes and disruption in the marketplace. MO helps an organisation to understand the specific needs of the customers. Unless the organisation aligns and coordinates its efforts to meet the customer needs, there is no way it can match the demands of the customers (Braunscheidel and Suresh, 2009). According to Kahn (2001), MO cannot lead to superior performance without the assistance of II. Therefore, II plays a key role in satisfying the customer demands obtained through MO of the organisation.

We hypothesise as follows:

H4 MO of a firm has a positive relationship with II.

2.4 LO and SCI

According to Hult et al. (2003), learning ability of an organisation is its strategic resource that is valuable, rare, inimitable and non-substitutable. This ability plays a crucial role in the management of supply chains and according to RBV the learning ability of a firm translates into its competitive advantage. The organisations that have a strong orientation towards learning have the tendency to question and analyse their processes and their internal and external integration mechanisms help them remain strongly connected with their suppliers and customers (Braunscheidel and Suresh, 2009). Willis et al. (2016) have argued, through knowledge-based view (KBV), that LO of the firms has a strong relationship with SCI. According to researchers, there is a dearth of research in this area that links LO with SCI (Braunscheidel and Suresh, 2009; Willis et al., 2016). We propose the following hypotheses:

H5 LO of a firm has a positive relationship with external integration.

H5a LO has a positive relationship with SI.

H5b LO has a positive relationship with CI.

H6 LO of a firm has a positive relationship with II.

2.5 SCI and PI

Based on the OIP theory, organisations need quality information and information processing capability to handle uncertainties and improve decision making. This theory suggests that information flows between the supply chain organisations can help them reduce uncertainty, make better decisions, and innovate better (Premkumar et al., 2005). Wong et al. (2011) have used ambidexterity theory to explain how SCI can help explore and exploit knowledge obtained through internal and external integration for PI.

External integration helps in the alignment of strategic business processes through information sharing and alliances with suppliers and customers. The supply chain network relationships and ‘market-driven integrative mechanisms’ can help firms understand and develop new products that match the needs of the customers [Wong et al., (2011), p.567]. According to Koufteros et al. (2005, p.99), synergistic integration helps to reduce new product development time and improve new product development performance. According to them, “cross functional and boundary spanning integration provides ways to share understanding about the different tasks underlying product
Impact of market orientation, learning orientation

... the firm improve its PI capabilities as ‘actual needs’ information becomes directly available from the customers.

External integration also favours involvement of the suppliers in the new product development process (Koufteros et al., 2005). Having strategic alliances with the suppliers may help in reducing the development time of new products (Petersen et al., 2003). The superior talent and capabilities of suppliers can assist in improving the PI performance of the firm. For example, a study on Japanese auto producers has shown that supplier involvement can substantially reduce the lead time to develop new superior products (Koufteros et al., 2005). Based on these arguments, we hypothesise as follows:

H7 External integration has a positive relationship with PI.
H7a CI has a positive relationship with PI.
H7b SI has a positive relationship with PI.

Cooperation between the internal functions in an organisation is essential to optimise the utilisation of resources and this is achieved by removing the functional barriers and exploiting the resources (Flynn et al., 2010; Wong et al., 2011). II helps knowledge transfer across functions such as marketing, purchasing, R&D and production and according to OIP theory, this can be crucial in improving new product development and performance. PI can be achieved by II process such as concurrent engineering (Droge et al., 2004). We, therefore, argue the significance of II in PI and hypothesise as follows:

H8 II has a positive relationship with PI.

2.6 Internal and external integrations

Previous research shows substantial evidence of II being established earlier than external integration (Flynn et al., 2010; Koufteros et al., 2005, 2010; Zhao et al., 2011). Specifically, II is essential to materialise and maximise the external integration with suppliers and customers. The internal and external integrations can facilitate seamless flow of information between the supply chain members. Based on OIP theory this can help the members handle uncertainty better. Zhao et al. (2011) argue that II is significantly related to external integration from the view of organisational capability and characteristics of SCI. We hypothesise as follows:

H9 II has a positive relationship with external integration.
H9a II has a positive relationship with CI.
H9b II has a positive relationship with SI.

3 Methodology

A total of 650 registered product manufacturing companies were identified from the directory of Federation of Malaysian Manufacturers (FMM). These companies represented entire machinery and equipment, electrical and electronics and automotive manufacturing firms in Malaysia. The scope of the study was limited to aforesaid product industries. The main consideration was based on characteristics of innovative product,
such as a shorter product life cycle, having a higher profit margin and the products having volatile demands (Fisher, 1997). Additionally, aforementioned industries belonged to the major manufacturing sectors in Malaysia as nearly 50% of manufactured goods were exported from these industries in 2012 according to the Department of Statistics, Malaysia.

We used mail survey and e-mail for collecting primary data and the questionnaires were sent to the 650 companies. The survey questionnaires were directed to senior product development executives, managers, presidents, or directors. Altogether, 202 completed set of questionnaires were returned, of which only 23 responding firms were removed because of the following reasons:

1. more than 50% incomplete answers
2. change of address
3. returned with blank answers
4. uninterested to participate.

This meant that 179 valid surveys remained for further analysis (response rate of 27.5% – 179 out of 202). In order to determine the adequate sample size for our study, we used the following guidelines recommended by Hair et al. (2006, p.742):

1. “SEM models containing five or fewer constructs, each with more than three items, and with high communalities (0.6 or higher), can be adequately sampled with samples as small as 100–150.”
2. “If any communalities are modest (0.45–0.55), or the model contains constructs with fewer than three items, then the required sample size is more on the order of 200.”
3. “If the communalities are lower or the model includes multiple under-identified (fewer than three items) constructs, then sample sizes of 300 or more is needed.”

In our study, the lowest communality was 0.44 and the highest was 0.96 and no construct had less than three items. Since the number of constructs in our model is six (firm size and age are control variables), we argue that a sample size between 150 and 200 should be adequate. Therefore, our final sample size of 179 is satisfactory. Besides, we calculated the effect size that could be achieved using our model and found it to be 0.16. According to Cohen (1988), in social sciences an effect size range between 0.1 and 0.3 is considered to be small and adequate.

3.1 Measures

MO refers to the extent to which a firm creates superior value to customer through customer orientation, competitor orientation and inter-functional coordination (Narver and Slater, 1990). It consisted of 15 items out of which, six of them assessed customer orientation, four items assessed competitor orientation and five items assessed inter-functional orientation. The used items were adopted from Narver and Slater (1990) and this construct had been used in studies by Rhee et al. (2010), Augusto and Coelho (2009) and Mavondo et al. (2005). The respondents were asked to respond using a five-point Likert scale from ‘strongly disagree’ to ‘strongly agree’. 
Impact of market orientation, learning orientation

LO refers to the extent to which a firm affects the degree to generate, apply, discover and use the knowledge (Sinkula et al., 1997). It consisted of 11 items out of which, four of them assessed commitment to learning, four items assessed shared vision and three items assessed open mindedness. These items were adopted from Sinkula et al. (1997) because they are more suitable when examining LO across diverse population as shown in many previous studies (Braunscheidel and Suresh, 2009; Nasution et al., 2011). The respondents were asked to respond using a five-point Likert scale from ‘strongly disagree’ to ‘strongly agree’.

CI was measured with a five-item scale which assessed the extent to which a firm encompasses key customers’ needs into business preparation and implementation activities (Schoenherr and Swink, 2011). The respondents were asked to respond using a five-point Likert scale from ‘strongly disagree’ to ‘strongly agree’.

SI was measured based on five items. It refers the extent a firm synchronises the preparation and implementation of business activities in accordance with suppliers’ competency (Schoenherr and Swink, 2011). The respondents were asked to respond using a five-point Likert scale from ‘strongly disagree’ to ‘strongly agree’.

II was measured with a six-item scale that captured the degree of collaboration of all functional teams in order to achieve SCI (Schoenherr and Swink, 2011). The respondents were asked to respond using a five-point Likert scale from ‘strongly disagree’ to ‘strongly agree’.

For the PI, five items developed by Jennings and Young’s (1990) were used. In this study, PI is defined as the degree to which a firm possesses special capability to present innovative products and features (Koufteros et al., 2005). Respondents were asked to indicate the level of ability of their firms to produce innovative products compared to the average in the industry. The respondents were asked to respond using a seven-point Likert scale from ‘much below’ to ‘much above’.

Company size and firm age were included as control variables. Previously, it was revealed that both variables would affect the findings in the SCI and PI study (Liu et al., 2011). Firm size was measured by using the number of employees and firm age was measured as the years since inception.

4 Results

4.1 Preliminary analyses

In order to gauge the effect of missing values, we conducted little’s MCAR (missing completely at random) test ($p$-value = 0.254) and found that the missing values accounted for 0.03%. Therefore, there was no need to be concerned about the missing data.

Given that the response rate was less than 30%, we tested for non-response bias (Armstrong and Overton, 1977). Those who responded to mailed questionnaires without any reminder (n = 99) were considered as early respondents (group 1) while those responded after a reminder (n = 80) were treated as late respondents (group 2). The results show that there are no significant differences between two groups in the mean values of the constructs marketing and LOs, SCI, and PI.

We collected responses from each company from one source. This can introduce common variance bias (Podsakoff et al., 2003). Herman’s single factor test was employed in order to assess common method bias. According to Podsakoff et al. (2003), common
method bias is a major challenge if the first factor explains for each variance in the variables. All items were entered on a single factor and results explained 32% of the variance. Since the variance explained was less than 50%, we could conclude that the effect of common variance bias was minimal.

4.2 Reliability and validity

Reliability test was conducted using Cronbach alpha on the six main constructs: MO, LO, CI, SI, II, and PI. The corresponding Cronbach alpha scores were 0.891, 0.828, 0.808, 0.818, 0.869 and 0.943. According to Nunnally (1978), Cronbach alpha of 0.70 or greater is acceptable.

Confirmatory factor analysis (CFA) was used to measure validity through AMOS 18.0 statistical software. The fit indices obtained from the initial measurement model demonstrated an inadequate model fit ($\chi^2$/df = 1.684; RMSEA = 0.062; SRMR = 0.065; CFI = 0.841; TLI = 0.830). Previous research confirmed that market and LO have measurement issues and strong correlation between the dimensions (Augusto and Coelho, 2009; Hult et al., 2003). For that reason, item parceling approach (combining item scores to get a summated score) was used in order to improve goodness of fit statistics. Moreover, assessment of parameter estimates of the initial measurement model and modification indices was also performed. Based on the output, one item from LO on open mindedness (factor loading = −0.476; factor loading < 0.5) was removed. The final measurement model produced a reasonably good fit to the data ($\chi^2$/df = 1.559; RMSEA = 0.056; SRMR = 0.055; CFI = 0.947; TLI = 0.938).

Convergent validity was supported as the entire factor loading of items and construct reliability (CR) was over 0.5 and 0.7, respectively. All values of average variance extracted (AVE) exceed 0.5 (suggested cut-off value) and the individual AVE of each construct exceeds the squared correlation between other constructs, thereby demonstrating discriminant validity (Fornell and Larcker, 1981). Table 1 gives the values of factor loading, AVE, and CR of all constructs used in this study.

Table 1  Descriptive statistics, correlation, and validity result

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>SD</th>
<th>CR</th>
<th>AVE</th>
<th>MO</th>
<th>LO</th>
<th>CI</th>
<th>SI</th>
<th>II</th>
<th>PI</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>MO (five-scale)</td>
<td>4.170</td>
<td>0.460</td>
<td>0.96</td>
<td>0.96</td>
<td>1.00</td>
<td>0.45</td>
<td>0.41</td>
<td>0.20</td>
<td>0.36</td>
<td>0.07</td>
<td>0.88–0.94</td>
</tr>
<tr>
<td>LO (five-scale)</td>
<td>3.923</td>
<td>0.528</td>
<td>0.98</td>
<td>0.94</td>
<td>0.67</td>
<td>1.00</td>
<td>0.47</td>
<td>0.39</td>
<td>0.37</td>
<td>0.10</td>
<td>0.75–0.98</td>
</tr>
<tr>
<td>CI (five-scale)</td>
<td>4.098</td>
<td>0.512</td>
<td>0.90</td>
<td>0.64</td>
<td>0.64</td>
<td>0.69</td>
<td>1.00</td>
<td>0.39</td>
<td>0.40</td>
<td>0.13</td>
<td>0.67–0.71</td>
</tr>
<tr>
<td>SI (five-scale)</td>
<td>3.878</td>
<td>0.560</td>
<td>0.89</td>
<td>0.62</td>
<td>0.45</td>
<td>0.54</td>
<td>0.62</td>
<td>1.00</td>
<td>0.37</td>
<td>0.08</td>
<td>0.69–0.78</td>
</tr>
<tr>
<td>II (five-scale)</td>
<td>3.942</td>
<td>0.563</td>
<td>0.92</td>
<td>0.67</td>
<td>0.60</td>
<td>0.67</td>
<td>0.63</td>
<td>0.61</td>
<td>1.00</td>
<td>0.13</td>
<td>0.66–0.75</td>
</tr>
<tr>
<td>PI (seven-scale)</td>
<td>5.332</td>
<td>1.2</td>
<td>0.90</td>
<td>0.65</td>
<td>0.27</td>
<td>0.32</td>
<td>0.36</td>
<td>0.29</td>
<td>0.36</td>
<td>1.00</td>
<td>0.72–0.97</td>
</tr>
</tbody>
</table>

Notes: Squares of the construct correlations are above the diagonal and construct correlations are below the diagonal.

4.3 Descriptive statistics

Among the firms that responded, 37% came from electrical and electronics industry, 33% came from machinery and equipment manufacturers and 26% came from automobile industry. The size of the firm varied between eight employees and 12,000 employees and the years in operation varied between four years and 100 years. Table 1 gives the descriptive statistics of all constructs including their correlations. The mean values indicate the following:

1. the scores on LO (mean = 3.923 on a five-scale, SD = 0.528), SI (mean = 3.878 on a five-scale, SD = 0.56), II (mean = 3.942 on a five-scale, SD = 0.563) and PI (mean = 5.332 on a seven-scale, SD = 1.2) can be considered to be ‘moderate’

2. the scores on MO (mean = 4.17, SD = 0.460) and CI (mean = 4.098, SD = 0.512) can be considered to be ‘high’.

4.4 Hypotheses testing

The hypothesised model was analysed using a structural equation model with maximum likelihood estimation based on AMOS 18.0. The fit statistics are: $\chi^2$/df = 0.289; p-value = 0.9194; RMSEA = 0.001; SRMR = 0.009; CFI = 0.995; NFI = 0.995; GFI = 0.990. The original hypothesised framework gave poor fit statistics ($\chi^2$/df = 4.97; p-value = 0.008; RMSEA = 0.149). Therefore, we introduced additional relationships (alternate model) which are explained later in this section. Table 2 gives the summary of results. The results of hypotheses testing are as follows:

1. Hypothesis H1 that addresses the relationship between MO and PI is not supported ($\beta = –0.0227$, p-value = 0.820). The debate on the effect of MO on PI is inconclusive (Lukas and Ferrell, 2000). Some researchers have argued that MO leads to PI (for example, Jaworski and Kohli, 1993; Slater and Narver, 1995) and some researchers have argued that it does not (for example, Christensen and Bower, 1996). Empirical studies have been inconclusive (for example, Atuahene-Gima, 1996).

2. Hypothesis H2 that explains the relationship between LO and PI is not supported ($\beta = 0.0534$, p-value = 0.628). According to Calisir et al. (2013), open-mindedness dimension of LO has effect on PI but the other two dimensions, shared vision and commitment, do not. Calantone et al. (2002) have shown that LO improves the firm innovation capability. In our research, as we show later that LO indirectly affects PI through SCI.

3. Hypothesis H3 tests the relationship between MO and external integration (supplier and CIs). MO has a direct effect ($\beta = 0.258$, p-value = 0.000) on CI and no significant effect on SI ($\beta = –0.0586$, p-value = 0.461). Effect of MO on CI have been argued and validated by a few studies (for example, Braunscheidel and Suresh, 2009; Jiménez-Zarco et al., 2009). Kibbeling et al. (2013) mention that the main focus of MO is customer-related activities.

4. Hypothesis H4 that tests the relationship between MO and II is supported ($\beta = 0.274$, p-value = 0.000). Our result validates the conclusion derived by Braunscheidel and Suresh (2009).
Hypothesis H5 that addresses the relationship between LO and external integration (supplier and CIs) is partially supported. LO has a direct effect on CI \((\beta = 0.360, p\text{-value} = 0.000)\) and no significant effect on SI \((\beta = 0.082, p\text{-value} = 0.349)\). Besides a few studies (Braunscheidel and Suresh, 2009), there is dearth of research that links LO to SCI. Interestingly, Braunscheidel and Suresh (2009) did not find a significant relationship between LO and external integration.

Hypothesis H6 that argues the relationship between LO and II is supported \((\beta = 0.486, p\text{-value} = 0.000)\). Our result validates the finding by Braunscheidel and Suresh (2009).

Hypothesis H7 tests the relationship between external integration and PI and is partially supported. CI has a positive relationship with PI \((\beta = 0.221, p\text{-value} = 0.013)\) but SI does not have significant direct effect on PI \((\beta = 0.031, p\text{-value} = 0.715)\). A study by Koufteros et al. (2005) supports our finding about the effect of CI on PI. Their study on the effect of SI on PI has yielded mixed results (not significant with supplier process integration but significant with a negative relationship with supplier product integration).

Hypothesis H8 that argues the relationship between II and PI is supported \((\beta = 0.221, p\text{-value} = 0.013)\). A recent study by Wong et al. (2011) has found insignificant effect of II on PI. Studies by Braunscheidel and Suresh (2009) and by Flynn et al. (2010) have found II to be linked positively with supply chain agility and performance measures.

Hypothesis H9 that tests the relationship between internal and external integrations is supported. II is positively linked with SI \((\beta = 0.364, p\text{-value} = 0.000)\) and CI \((\beta = 0.233, p\text{-value} = 0.001)\).

Our result substantiate the findings of many studies (Flynn et al., 2010; Koufteros et al., 2005, 2010; Zhao et al., 2011). Among the control variables (firm age and firm size), only firm age has been found to have effect on only one construct, LO \((\beta = –0.173, p\text{-value} = 0.023)\). This indicates that firms that are young have a better ability to learn than firms that are old.

Besides the direct effects, we have also tested the mediating effects of:

1. II between organisational orientation (learning and market) and PI
2. CI between II and PI.

Our results indicate that:

1. II fully mediates the relationship between LO and PI (Sobel’s test t-value = 2.340, p-value = 0.019)
2. II fully mediates the relationship between MO and PI (Sobel’s test t-value = 2.086, p-value = 0.039)
3. CI partially mediates the relationship between II and PI (Sobel’s test t-value = 2.002, p-value = 0.045).
Besides the hypothesised relationships, we also explored two un hypothesised relationships: between learning and MOs and between CI and SI (elements of external integration). Our interest is motivated by the different ways researchers have treated:

1. learning and MOs
2. SI and CI.

For example, Baker and Sinkula (2002) and Choi (2014) have argued the link between learning and MOs. In our research, this relationship is very significant ($\beta = 0.670$, p-value = 0.000); Danese and Romano (2011) have studied the moderating role of SI between CI and performance; Koufteros et al. (2005) have considered these two integrations as two independent constructs without any link; Braunscheidel and Suresh (2009) have considered these two integrations as two independent dimensions of external integration; Flynn et al. (2010) have studied the role of customer and SIs as moderators between II and performance; Wong et al. (2011) have studied the effects of:

1. the interaction between internal and external integrations
2. the difference between internal and external integrations on PI.

Since there is a dearth of studies that directly linked supplier and CIs (Zailani and Rajagopal, 2005), we explored this relationship. Our results show that there is a strong link between supplier and CI ($\beta = 0.391$, p-value = 0.000). Figure 2 gives the framework with significant relationships.

**Figure 2** Final framework with significant relationships (see online version for colours)

Note: not hypothesised.
Table 2  Summary of result

<table>
<thead>
<tr>
<th>S no.</th>
<th>Hypothesis</th>
<th>B-value/p-value</th>
<th>Supported/not supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Market orientation → product innovation</td>
<td>-0.0227/0.820</td>
<td>Not supported</td>
</tr>
<tr>
<td>2</td>
<td>Learning orientation → product innovation</td>
<td>0.0534/0.628</td>
<td>Not supported</td>
</tr>
<tr>
<td>3</td>
<td>Market orientation → customer integration</td>
<td>0.258/0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>4</td>
<td>Market orientation → supplier integration</td>
<td>-0.0586/0.461</td>
<td>Not supported</td>
</tr>
<tr>
<td>5</td>
<td>Market orientation → internal integration</td>
<td>0.274/0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>6</td>
<td>Learning orientation → customer integration</td>
<td>0.360/0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>7</td>
<td>Learning orientation → supplier integration</td>
<td>0.082/0.349</td>
<td>Not supported</td>
</tr>
<tr>
<td>8</td>
<td>Learning orientation → internal integration</td>
<td>0.486/0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>9</td>
<td>Customer integration → product innovation</td>
<td>0.221/0.013</td>
<td>Supported</td>
</tr>
<tr>
<td>10</td>
<td>Supplier integration → product innovation</td>
<td>0.031/0.715</td>
<td>Not supported</td>
</tr>
<tr>
<td>11</td>
<td>Internal integration → product innovation</td>
<td>0.221/0.013</td>
<td>Supported</td>
</tr>
<tr>
<td>12</td>
<td>Internal integration → customer integration</td>
<td>0.233/0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>13</td>
<td>Internal integration → supplier integration</td>
<td>0.364/0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>14</td>
<td>Learning orientation → internal integration</td>
<td>2.340/0.019</td>
<td>Mediation effects</td>
</tr>
<tr>
<td>15</td>
<td>Market orientation → internal integration</td>
<td>2.086/0.039</td>
<td>supported</td>
</tr>
<tr>
<td>16</td>
<td>Internal integration → customer integration</td>
<td>2.002/0.045</td>
<td>Mediation effect</td>
</tr>
</tbody>
</table>

5  Discussion

This research was set to address a fundamental question: How do organisational orientation (learning and market) and SCI affect PI and how are organisational orientation and SCI inter-related with each other? Our research has thrown some interesting results. First, there is a strong positive relationship between LO and three important constructs:

1  MO ($\beta = 0.670$, p-value = 0.000), II ($\beta = 0.486$, p-value = 0.000), and CI ($\beta = 0.360$, p-value = 0.000).

According to Baker and Sinkula (2002), LO indirectly affects organisational performance through MO. Choi (2014) has argued the movement of the firm from LO to innovation through MO. According to Braunscheidel and Suresh (2009, p.123), “learning is not a necessary outcome of firms that exhibit a market orientation; and learning orientation goes beyond a marketplace focus.” An organisation must have the ability to learn about its environment including its competitors, customers, and technologies. LO is critical to innovation and other activities in an organisation such as MO and SCI (Calantone et al., 2002). The managers must make efforts to create learning organisations by storing, disseminating and applying knowledge in an efficient way by implementing accessible knowledge management systems (KMS).
Second, there is a positive relationship between MO:

1. II (β = 0.274, p-value = 0.000)
2. CI (β = 0.258, p-value = 0.000).

Being sensitive to the marketplace enables a firm to have:

1. in depth knowledge about the needs of the customers
2. effective inter-departmental alignment and coordination (Braunschide and Suresh, 2009).

It is important that managers put a lot of emphasis on MO so that the entire firm becomes sensitive and responsive to the developments that take place in the market.

Third, our findings indicate that the II plays a crucial role in influencing the SI (β = 0.364, p-value = 0.000), CI (β = 0.233, p-value = 0.001), and PI (β = 0.221, p-value = 0.013). Our study supports the claim made by Braunschide and Suresh (2009), Koutferos et al. (2010) and Wong et al. (2011) regarding the interaction between internal and external integration. However, the study by Wong et al. (2011) does not support the link between II and PI. Contrary to the arguments put forth by Wong et al. (2011), we claim that II does play a critical role and facilitates shared information between different departments to achieve PI. We support the view that II facilitates integration with the customers and suppliers. These findings are in line with the study by Koutferos et al. (2010). However, these researchers have considered II in the form of concurrent engineering practices. Our study has showcased the pivotal role played by II and the benefits thereof. The managers of each firm in the supply chain must make efforts to remove internal barriers and encourage cooperation between internal functions. This can help firms exploit and coordinate internal resources to achieve external integration and PI.

Fourth, among the two dimensions of external integration, our study reveals that only CI has a positive effect on PI (β = 0.221, p-value = 0.013). SI does not have a significant impact on PI. Earlier studies by Braunschide and Suresh (2009) and Wong et al. (2011) have not looked at the effects of two dimensions of external integration separately. Koutferos et al. (2010) have found the link between external integration (both supplier and CIs) and PI but have not established the effect of II. Our study provides better results. We have also shown that CI has a positive impact on SI. In summary, internal and CIs are essential to achieve SI and PI. By controlling for the effects of firm size and firm age, we have shown that only firm age has a negative effect on LO to indicate that firms that are young have a better LO capability.

Fifth, we analyse the hypothesised relationships that are not supported. To recap:

1. market and LOs do not have significant direct relationships with PI and SI
2. relationship between SI and PI is not significant.

Our results show that learning and marketing orientations impact PI and SI indirectly through II and CI. Our findings lend some credence to the notion that organisational orientation (learning and market) through organisational practices (internal and external integrations) enhances the capabilities of a firm such as supply chain agility (Braunschide and Suresh, 2009) and innovation. Chong et al. (2011) have shown that in Malaysian context the supply chain practices (including integration) have a direct impact.
Researchers have extolled the role of SI in new product development and innovation (Petersen et al., 2003). Lau et al. (2010) have argued that it is better for firms to integrate with few important suppliers for PI. In our research, we did not differentiate suppliers. According to Petersen et al. (2003, p.284), SI provides maximum benefits to new product development and innovation when the ‘technology is in its formative stages’. The plausible reason for SI not having significant impact on PI can be that the companies we sampled in Malaysia are probably using technologies that are not in their formative stages. Our sample included electrical and electronics, machinery and equipment manufacturers and automotive sectors. These three sectors have been in existence for many years and use advanced technologies.

5.1 Theoretical implications

Our findings add significantly to the body of knowledge on PI. Earlier studies on PI have either looked at the effect of SCI on PI (Koufteros et al., 2010; Wong et al., 2011) or the effect of market and LOs on performance, supply chain agility and innovation (Braunscheidel and Suresh, 2009; Mavondo et al., 2005). By linking these three major constructs (organisational orientation, SCI and PI), we have been able to better explain the process of PI by analysing the direct and indirect effects of market and LOs and SCI. Our study has shown that a firm’s orientation towards market and learning does not guarantee PI. The capability of the firm to transform market and LOs to SCI (external and internal) is critical to yield positive results. This is an important contribution since the study has established the process of PI from organisational orientation.

We specifically show that external integration is not possible without organisational orientation and II. The mediation effects of:
1. II between organisational orientation and PI
2. CI between organisational orientation and PI help us understand better the relationships between the three constructs.

In fact, we argue that organisational orientation and SCI have to be studied together to understand PI.

The inter-relationships between the learning and MOs and between external and IIs are also key contributions of this study. Our study has shown that LO leads to better MO (Braunscheidel and Suresh, 2009; Calantone et al., 2002). This study has shown that II drives the external integration and CI influences SI. These results have been supported by studies in different contexts (Koufteros et al., 2010; Zhao et al., 2011).

5.2 Managerial implications

The practical implications of our research are noteworthy. Managers must clearly understand the importance of LO, MO, and II. It is these three integrative factors that enable external integration and PI. The managers of focal firms must create an environment to instil organisational values that influence creation and usage of knowledge. This is in turn will lead to market-driven culture that helps in creating superior value to the customers (Braunscheidel and Suresh, 2009; Slater and Narver, 1995). The learning and MOs act synergistically to facilitate internal and external integrations. LO of the firm can be facilitated by implementing a KMS that can be used
to capture and disseminate knowledge. The managers can put mechanisms in place to assist internal and external integrations. II can take place when the inter-functional and inter-departmental managers work together to achieve common goals such as PI. The marketing and purchase managers can help achieve external integration by working closely with suppliers and customers. Entering into strategic alliances with suppliers and customers can be one mechanism to realise external integration (Siew-Phaik et al., 2013). The firms that have these mechanisms in place innovate better and faster.

6 Conclusions and limitations

In this research, we have identified and tested important drivers to PI. The study was conducted among manufacturing companies in Malaysia. Our study has studied two important drivers: organisational orientation (learning and market) and SCI [II and external integration (supplier and customer)]. The key findings of our research are:

1. LO and MO synergistically drive II and CI
2. II drive external integration and PI
3. CI drives SI and PI.

Our study has a few limitations. First, this is a cross-sectional study. With the study of this type, it is difficult to establish the causal relationship between the constructs (Stone-Romero and Rosapa, 2008). A longitudinal study is better suited to establish causal relationships. Second, the sample size is low. The generalisation of results must be done with caution. Third, the data for the study has been sourced from one source in each company. Even though we have tested for common variance bias and the results are within threshold, there may be some bias in the results.

References


Impact of market orientation, learning orientation


Impact of market orientation, learning orientation

