CHAPTER 2: LITERATURE REVIEW

A review of literature related to this study is presented in this chapter. Based on the literature review, research gaps are identified which helped in framing the objectives for this study. The literature review addresses research conducted in the areas of supply chain integration and supply chain performance. The research gaps identified in the literature are presented at the end of this chapter.

2.1 Supply Chain Integration

Stevens (1989) highlighted the need to have an integrated supply chain. He stated that, “the objective of supply chain management is to synchronize the requirements of customers with the flow of materials from suppliers in order to affect a balance between the conflicting goals of high customer service level, low inventory investment and low unit cost”. He postulated a four stage progression of a firm moving from no integration, to functional integration, to internal integration and finally to external integration.

Frohlich et al. (2001) investigated the effect of the level of supplier and customer integration on operational performance of firms. They first identified eight integrative practices which companies apply to integrate with customers and suppliers. The extent of the level of integration was measured using an eight-item scale. Operational performance was measured with 19 performance indicators. These measures related to the perception of high-ranking people like CEO, VPs, etc. within these companies. A questionnaire survey of companies yielded 322 usable responses. Using the quartiles of integrative practices for customers and suppliers, the authors identified five groups which were named as ‘inward facing’, ‘periphery facing’,
‘supplier facing’, ‘customer facing’ and ‘outward facing’. The upper quartiles of integration with both customers and suppliers were ‘outward facing’, while lower quartiles of integration were, ‘inward facing’. The mean levels of performance for these 5 groups were compared using ANOVA and found to be significantly different. The ‘outward facing’ group which a higher degree of supplier and customer integration has showed highest performance. This study provided empirical support to the conjecture that supply chain integration improves firm performance.

Vickery et al. (2003) investigated the relationship between supply chain integration strategy, customer service and financial performance of the firms. They observed two constituents of supply chain integration which are integrative information technologies (technologies that facilitate the free flow of information within and outside of firm (such as implementation of EDI, MRP I and MRP II) and supply chain integration (practices used to achieve integration within and outside the firm such as close customer relationships, supplier partnering and cross functional teams). The constructs integrative information technology, supply chain integration and financial performance were captured using three items each and customer service was captured using five items scale. These measures related to perception of CEO’s of companies. A questionnaire survey of first tier suppliers to Ford, General Motors and Chrysler yielded 57 usable responses on a 7-point Likert scale. Confirmatory factor analysis was used to test the measurement model which showed good convergent and discriminant validity and hence the construct validity was established. Structural equation modeling (SEM) was used to test the relationship between supply chain integration strategy, customer service and financial performance of the firms. The result showed a positive relationship between integrative information technology and
supply chain integration, supply chain integration and customer service, customer service and firm performance. However, when the impact of supply chain integration was tested on firm performance the result was found to be insignificant showing that the relationship between supply chain integration and firm performance is fully mediated by customer service.

Rosenzweig et al. (2003) investigated the mediating role of manufacturing capabilities (quality, flexibility, delivery and cost) between supply chain integration intensity (a proxy variable for SCI) and business performance. They also investigated the direct impact of supply chain integration on manufacturing capabilities. To measure supply chain integration intensity a four-item scales was developed. While manufacturing capabilities and business performances were measured using existing scales presented in the literature. These measures related to the perception of VPs of the companies. A questionnaire based survey of consumer product manufacturers yielded 238 usable responses on a 5-point Likert scale. The responses were factor analyzed which confirmed the unidimensionality of the supply chain integration intensity measure. The relationship between supply chain integration intensity on manufacturing capabilities, manufacturing capabilities and business performance and supply chain integration intensity and business performance were tested using hierarchical regression analysis. The size of the organizations (operationalized by number of employees) was used as a control variable. The result showed that high integration intensity directly leads to superior product quality, process flexibility, delivery reliability and cost leadership. Organization size was found to have significant impact only on product quality. Further, integration intensity was found to have a direct positive impact on two measures of business performance, namely,
return of assets (ROA) and the percentage of revenue derived from new products. Integration intensity was found to have no direct impact on sales growth and customer satisfaction, but the relationship was partially mediated by cost leadership and delivery reliability, respectively. Investigation of the direct impact of manufacturing capabilities on business performance showed mixed results.

Frohlich (2002) investigated the impact of e-integration on operational and business performance of firm. Further they investigated the barriers that prevent implementation of e-integration. They developed 4-items scales to measure customer and supplier Internet integration, 3-items scales to measure each of supplier barriers, customer barriers and internal barriers, 2-items scales to measure e-Business performance and a 3-item scale to measure operational performance. These scales were pre-tested with 30 companies to gauge their validity. The measures related to perceptions of VPs of operations or general managers of companies. A web-based survey of manufacturing companies across 13 regions of the U.K yielded 486 responses on 5-point Likert scale. Structural equation modeling was used to test the research model. The study revealed that the supplier, customer and internal barriers were found to have a negative impact on e-Integration. Further e-Integration was found to have a positive impact on the e-Business performance and operational performance.

Germain et al. (2006) investigated the impact of internal and external integration in the supply chain on logistics performance and organizational performance (measured through financial performance). They also investigated the moderating role of internal integration on the relationship between external integration and logistics performance. The scales were adopted from the literature to
measure the constructs used in this study. The measures related to the perception of managers, directors and vice-presidents of the companies. The mail and fax based survey of manufacturing companies listed in the Council of Supply Chain Management Professionals (CSCMP) yielded 152 usable responses on a 7-point Likert scale. Confirmatory factor analysis was carried out to test the measurement model which showed good convergent and discriminant validity and hence the construct validity was established. Structural equation modeling was used to test the research model. The result suggested that internal integration and external integration has a positive impact on logistical performance. Internal integration was found to moderate the relationship between external integration and logistical performance. Further, internal integration and external integration were found to have no direct impact on financial performance, but the relationship was mediated through logistical performance.

Li et al. (2009) investigated the relationship between IT implementation, supply chain integration and supply chain performance. To measure supply chain integration and IT implementation scales were adopted from Chen and Paulraj (2004) and supply chain performance scales were adopted from Stank et al. (2001). These measures related to the perception of CEOs, vice presidents or senior managers of the companies surveyed. A questionnaire survey of manufacturing companies in China yielded 182 usable responses on a 5-point Likert scale. Structural equation modeling was used to test the model. The result showed that there is no significant relationship between IT implementation and supply chain performance, but the relationship is mediated by supply chain integration. Further when tested, direct significant
relationship was found between IT implementation and supply chain integration and between supply chain integration and supply chain performance.

Prajogo et al. (2012) extended the research framework of Li et al. (2009) by incorporating strategic relationships with suppliers as a potential antecedent of IT implementation. To test link between information flow and material flow in the supply chain, they considered two dimensions of SCI- information integration and logistics integration. Further, they added both the technological aspect (information technology) and social aspect (information sharing) of information integration to provide a more comprehensive framework. The scales were adopted from the study Chen and Paulraj (2004) to measure long term relationship, information technology, information sharing and logistics integration. Measures related to perceptions of managers. A mail survey of Australian manufacturing companies yielded 232 usable responses on a 7-point Likert scale. Confirmatory factor analysis was conducted to validate the measures of all variables used in the study which confirmed unidimensionality and convergent validity. Structural equation modeling was used to test the research model. The result suggested that both information sharing and information technology have significant effects on logistics integration. Long term relationships with suppliers have both direct and indirect effects on performance. The indirect effect is via the effect on information integration and logistics integration.

Lee et al. (2007) investigated the relationship between supply chain linkages (a proxy for supply chain integration) and supply chain performance. The impacts of three dimensions of supply chain linkages namely supplier linkage, customer linkage, internal linkage were investigated on two well-known performance indicators of supply chain, namely cost containment and performance reliability as well as on
overall supply chain performance. Scales were developed to measure supplier linkage, customer linkage, internal linkage, cost containment and performance reliability constructs. Factor analysis was conducted to check for unidimensionality of constructs and all the constructs were found unidimensional. Multiple regression analysis was used to test the relationship between supply chain linkages and supply chain performance. Cost containment and performance reliability were used as dependent variable and customer linkage, supplier linkage and internal linkage were used as independent variables. The study revealed that all three linkages were positively related to overall performance and performance reliability. While supplier and internal linkages were found to have significant positive impact on cost containment performance, the result was found insignificant for customer linkage.

Swink et al. (2007) investigated the impact of supply chain integration on manufacturing-based business competitive capabilities and business level performance. Based on their literature review, the authors identified four dimensions of supply chain integration - strategic supplier integration, strategic customer integration, product-process integration and corporate strategy integration that were considered in the study. The scales were adopted from the literature to measure integration, manufacturing capabilities (quality, delivery, process flexibility and new product flexibility) and business performance (market performance, customer satisfaction) constructs. These measures related to the perception of managers of the companies. A web-based survey of manufacturing plants in North America yielded 224 usable responses on a 7-point Likert scale. Principal component factor analysis was conducted to check for unidimensionality of constructs and all the constructs were found to be unidimensional. Structural equation modeling was performed to test
the research model. The result showed that neither strategic customer nor strategic supplier integration was associated with manufacturing competitive capabilities. However, product-process integration and corporate strategy integration were found to be positively associated with manufacturing competitive capabilities. Further, the result showed that all the measures of manufacturing capabilities are positively associated with the business performance except for the cost capability and process flexibility.

Kannan et al. (2010) investigated the impact of span of integration on firm performance and relationship performance. Scales were developed to measure firm performance and relationship performance and four dimensions of SCI - supplier focus, customer focus, supply chain focus, information flow focus. The measures related to perceptions of managers of companies. A web-based survey of manufacturing companies from US and Europe yielded 321 usable responses on 5-point Likert scale. Information was also obtained from respondents to identify their integration with immediate or extended supply chain partners. The responses were factor analyzed which confirmed unidimensionality of constructs. Cluster analysis was used to group respondents based on the span of supply chain integration. Two clusters were obtained which were named as narrow span of integration (only with first tier suppliers and customers) and broad span of integration (integrated with tier 2 and tier 3 suppliers and customers). Independent sample t-test was conducted to investigate the difference in performance between two groups. The result showed that the group with a broad span of integration had better performance than groups with a narrow span of integration.
Flynn et al. (2010) investigated the impact of supply chain integration on performance using both the contingency and configuration approach. They investigated how individual dimensions of SCI - supplier integration, customer integration and internal integration are related to operational and business performance of firms as well as how patterns of SCI are related to operational and business performance. Scales were adopted from the literature to measure the constructs of interest. The measures related to the perception of supply chain managers of companies. A questionnaire survey of Chinese manufacturing firms yielded 617 usable responses on a 7-point Likert scale. In using the contingency approach they tested the relation between individual dimensions of SCI (supplier integration, customer integration and internal integration) and operational as well as business performance of the firms using hierarchical regression analysis. The result showed a positive relationship between internal integration and operational performance, customer integration and operational performance and no significant relationship between supplier integration and operational performance. However, for the business performance only internal integration was found to be significant. In using the configuration approach, cluster analysis was used to develop patterns of SCI, which were analyzed in terms of SCI strength and SCI balance. SCI strength is the level or extent to which SCI activities are carried out. In contrast, SCI balance is the extent to which a company pays equal attention to all three dimensions of SCI. Five groups were generated which were named as high low uniform, medium uniform, high uniform, high customer leaning and medium customer leaning. The performance of five groups was compared using ANOVA and was found significantly different. The high uniform pattern had the best operational performance followed by high customer leaning pattern. There was no significant difference in the operational
performances among medium uniform, low uniform and medium customer leaning patterns of SCI. The low uniform patterns of SCI had the worst business performance.

Wong et al. (2011) investigated the moderating role of environmental uncertainty on the relationships between SCI and operational performance. The scales were adopted from literature to measure three dimensions of SCI (supplier integration, customer integration and internal integration) as well as four dimensions of operational performance (delivery, production cost, product quality and production flexibility). The measures related to the perception of CEO/presidents, vice presidents, operations managers and supply chain managers of companies. A questionnaire survey of Thailand’s automotive industry yielded 151 usable responses on a 5-point Likert scale. Confirmatory factor analysis was conducted to validate the measures of all variables used in the study which confirmed unidimensionality and convergent validity. Structural equation modeling was carried out to test the research model. The result suggested that supplier integration, customer integration and internal integration have a positive impact on delivery, production cost, product quality and production flexibility. Further, the result showed that under high environmental uncertainty (EU), internal integration will have greater impact on production cost and product quality, external integration will have greater impact on delivery and production flexibility. However moderating effect of EU was not found to be significant on the relationship between customer/supplier integration and product quality and production cost.

Schoenherr et al. (2012) investigated the impact of supply chain integration strategies on quality, delivery, flexibility and cost performance. They cross validated the Frohlich et al. (2001) framework of SCI and also extended Frohlich’s study by
investigating the moderating role of internal integration on the relationship between arcs of integration and performance. The scales to measure the constructs were adopted from the literature with some modification. The measures related to the perception of supply chain managers and executives of manufacturing, retailing and distribution companies across the world. A questionnaire survey of companies yielded 403 usable responses on a 5-point Likert scale. Confirmatory factor analysis was conducted to validate the measures which confirmed unidimensionality and convergent validity. Consistent with Frohlich’s study, the authors identified 5 groups using the quartiles of integrative practices for customers and suppliers, which were named as ‘inward facing’, ‘periphery facing’, ‘supplier facing’, ‘customer facing’ and ‘outward facing’. The upper quartiles of integration with both customers and suppliers were ‘outward facing’, while lower quartiles of integration were, ‘inward facing’. The mean levels of performance for these 5 groups were compared using ANCOVA and found to be significantly different. The greater arc of supplier and customer integration were found to be associated with greater levels of quality, delivery, flexibility and cost performance. To examine the moderating role on internal integration on the relationship between external integration and performance, interaction term between external integration and internal integration was included in the ANCOVAs. The result showed that the relationship between external integration is moderated by the internal integration only for the flexibility and delivery but not for quality and cost performance.

Van der Vaart et al. (2008) carried out a comprehensive review of 33 research papers published after the year 2000 which studied the effect of level of SCI on performance of firms. He found that most of these studies showed an insignificant
relationship. From a critical review of these studies they reasoned that the insignificance of the relationship may be due to non-existence of direct relationship. This relationship may be mediated by other variables. This conclusion has support from other studies (Vickery et al., 2003; Rosenzweig et al., 2003). They inferred that it is important to relate the level of integration in a single relationship to the performance outcomes of that relationship. For example if integration is between buyer and supplier, the performance should be measured in terms of the aims of these efforts with respect to this particular relationship like reduction in reaction time, need to hold less stocks, etc. which would further impact financial performance of the firms.

Some of the other significant contributions in supply chain integration research are summarized and presented in Table 2.1. A summary of supply chain integration research focus areas is presented in Table 2.2.
Table 2.1 Significant Contribution On Supply Chain Integration

<table>
<thead>
<tr>
<th>Authors</th>
<th>Research purpose</th>
<th>Sample</th>
<th>Factors/ construct developed or tested</th>
<th>Analysis Techniques</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vijayasarathy</td>
<td>To investigate the role of four relational factors- trust, commitment, mutual</td>
<td>375 usable data were collected from supply chain managers, vice</td>
<td>1. Mutual dependence</td>
<td>Exploratory factor analysis</td>
<td>The result showed that mutual dependence, trust and commitment have</td>
</tr>
<tr>
<td>(2010)</td>
<td>dependence and dependence asymmetry in facilitating or hindering SCI</td>
<td>presidents of manufacturing companies of US, Canada, Hong Kong and</td>
<td>2. Commitment</td>
<td></td>
<td>significant positive impact on SCI. There was no significant negative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>China</td>
<td>3. Trust</td>
<td></td>
<td>relationship between dependence asymmetry and SCI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Dependence asymmetry</td>
<td>Structural equation modeling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. Supply chain integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zhao et al.</td>
<td>To investigate the impact of customers’ power and relationship commitment on</td>
<td>617 usable responses were collected from managers of manufacturing</td>
<td>1. Customer power</td>
<td>Exploratory factor analysis</td>
<td>The result showed that different types of customer power (expert power,</td>
</tr>
<tr>
<td>(2008)</td>
<td>the integration between manufacturers and customers.</td>
<td>companies in China</td>
<td>2. Relationship commitment</td>
<td></td>
<td>referent power, reward power and legitimate power) impact manufacturers’</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Customer integration</td>
<td>Confirmatory factor analysis</td>
<td>relationship commitment (normative or instrumental) in different ways.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Further relationship commitment was</td>
</tr>
<tr>
<td>Authors</td>
<td>Research purpose</td>
<td>Sample</td>
<td>Factors/ construct developed or tested</td>
<td>Analysis Techniques</td>
<td>Result</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Zhao et al. (2011) | Investigated the relationship between internal integration, relationship commitment and external integration. | 617 usable responses were collected from manufacturing industry of China | 1. Supplier integration  
2. Customer integration  
3. Internal integration  
4. Relationship commitment to customers  
5. Relationship commitment to customers | Structural equation modeling  
Confirmatory factor analysis  
Structural equation modeling | The result indicated that internal integration is positively related to both customer and supplier integration. Further, for Chinese controlled companies where there is strong reliance on relationship, relationship commitment has a significant impact on external integration with suppliers and customers. While for foreign controlled companies characterized by individualistic culture relationship commitment has a significant impact on external integration with suppliers and customers. |

*Table 2.1 Continued...*
<table>
<thead>
<tr>
<th>Authors</th>
<th>Research purpose</th>
<th>Sample</th>
<th>Factors/ construct developed or tested</th>
<th>Analysis Techniques</th>
<th>Result</th>
</tr>
</thead>
</table>
| Richey et al. (2009) | To Investigate the factors that enable and inhibit supply chain integration.     | 581 usable responses were collected from managers of manufacturing companies. | 1. Driver of supply chain integration  
2. Barriers to supply chain integration  
3. Firm performance | Exploratory factor analysis  
Confirmatory factor analysis  
Multiple regression analysis | The result showed that drivers of supply chain integration (desire to improve and competitive environment) have a positive impact on firm performance. Further the barriers to supply chain integration (internal planning failure and external monitoring failure) moderated the relationship between Drivers of SCI and firm performance. |
| Droge et al. (2004)  | To investigate the impact of supply chain integration practices on time based performance and on overall firm performance | 57 usable responses were collected from first tier suppliers of the three big car companies in North America | 1. Strategic design integration (external integration)  
2. Design process integration (internal integration)  
3. Market share performance | Exploratory factor analysis  
Confirmatory factor analysis | The result showed that both internal and external integration are related to time based performance which in turn is related to firm performance. Further, direct relationship was also found between integration and firm performance. |
<table>
<thead>
<tr>
<th>Authors</th>
<th>Research purpose</th>
<th>Sample</th>
<th>Factors/ construct developed or tested</th>
<th>Analysis Techniques</th>
<th>Result</th>
</tr>
</thead>
</table>
| Stank et al. (2001) | To investigate the relationship between logistics integration and performance. | 186 usable responses were collected from manufacturing, wholesale/distributing and retailing firm of North America. | 4. Firm performance  
5. Time to market  
6. Time to product  
7. Customer responsiveness | Multiple regression analysis | The study showed that customer and internal integration have a positive impact on logistics performance. Further, supplier, measurement, technology and planning, and relationship integration failed to demonstrate statistical association with logistics performance. |
| Koufteros et al. (2005) | To investigate the relationship between | 1. Internal integration  
2. Customer integration | Exploratory factor analysis  
Regression Analysis | The result of the study showed that internal integration is an |
<table>
<thead>
<tr>
<th>Authors</th>
<th>Research purpose</th>
<th>Sample</th>
<th>Factors/ construct developed or tested</th>
<th>Analysis Techniques</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>internal integration and external integration (supplier and customer integration) and also test the relationship between external integration and competitive capabilities.</td>
<td></td>
<td>3. Supplier product integration</td>
<td>Confirmatory factor analysis</td>
<td>important enabler of external integration, that is, supplier and internal integration. Further, the result showed that both internal integration and external integration positively influence product innovation, quality and profitability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Supplier process integration</td>
<td>Structural equation modelling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. Product innovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. Quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7. Profitability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Focus and Theme</td>
<td>Types of Research</td>
<td>Contributors</td>
<td>Unit of Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------</td>
<td>--------------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Relationship between SCI and firm performance (Positive relationship supported) | Empirical | -Stank et al. (2001a)  
-Childerhouse and Towill(2003)  
-Gimenez and Ventura (2005)  
-Koufteros et al. (2005)  
-Kulp et al. (2004)  
-Droge et al. (2004)  
-Wang et al. (2006)  
-Li et al. (2009)  
-Kannan et al. (2010)  
-Wong et al. (2011) | Firm |
-Stank et al. (2001b)  
-Vickery et al. (2003)  
-Rosenzweig et al. (2003)  
-Germain et al. (2006) | Firm |
| Relationship between SCI and firm performance (Mixed result) | Empirical | -Prajogo et al. (2012)  
-Lee et al. (2007)  
-Swink et al. (2007) | Firm |
| Investigation of mediators in the relationship between SCI and performance | Empirical | -Salvador et al. (2001)  
-Rosenzweig et al. (2003)  
-Vickery et al. (2003)  
-Swink et al. (2007) | Firm |

*Table 2.2 continued...*
### Research Focus and Theme

<table>
<thead>
<tr>
<th>Research Focus and Theme</th>
<th>Types of Research</th>
<th>Contributors</th>
<th>Unit of Analysis</th>
</tr>
</thead>
</table>
| Investigation of moderators in the relationship between SCI and performance | Empirical | - Narasimhan and Das (2001)  
- Kim (2006)  
- Swink et al. (2007)  
- Richey et al. (2009)  
- Wong et al. (2011)  
- Schoenherr et al. (2012) | Firm |
| Investigation of antecedents and barriers to SCI | Conceptual | - Pagell (2004)  
- Aryee et al. (2008)  
- Zhao et al. (2008) | Firm |
| | Empirical | - Richey et al. (2009)  
- Vijayasarathy (2010) | Firm |

#### 2.2 Supply Chain Performance

Performance measurement is vital in strategy formulation and in forming diagnostic control mechanism by measuring actual results (Vandenabeele, 2009). Hence, identifying the appropriate measures and metrics is important for effective and efficient management of the supply chain. Researchers in the past considered various proxies to measure supply chain performance.

The most commonly used measures of supply chain performance have been cost-based measures. Dong et al. (2001) used cost-based performance to measure supply chain performance which included inventory cost, outbound transportation cost and production cost. Lee et al. (2007) used cost containment and reliability of supply chain partners to measure supply chain performance.
performance. They used inbound cost, outbound cost, warehousing cost to capture the cost containment construct. Further, safety stock, order fill rate, inventory turns and others were used to measure reliability of supply chain partners.

Time-based performance measures have also received much attention in supply chain management literature. The key dimensions of time-based performance identified from the literature include new product development time, new product delivery time, delivery speed, new product introduction, manufacturing lead time and customer responsiveness (Vickery et al., 1995; Handfield, 1995; Safizadeh et al., 1996).

Vickery et al. (1995) empirically investigated the relationship between time-based performance and overall business performance in the furniture industry in UK. Based on literature they identified four dimensions of time based performance- new product introduction, product development cycle time, production lead time and delivery speed. These dimensions of time based performance were found to be positively related to overall firm performance measured by return on investment (ROI), growth, and return on sales. Droge et al. (2004) used two different factors namely “time to market” and “time to product” to capture time-based performance. Time to market includes product development time and product introduction time. Time to product includes manufacturing lead time, procurement lead time and delivery speed.

Beamon (1999) developed a framework for the selection of performance measures for supply chain. This framework has three essential components of supply chain performance measurement that are resource, flexibility and output. Resource measures are related to the efficiency in using resources in a supply chain system. It includes the costs of using several resources, inventory levels in the supply chain and also the return on investment. Flexibility has
been defined as the ability to respond to changes. Supply chain flexibility includes the ability to respond to any changes in the products, volume, delivery time and the supply chain. Flexibility measure includes delivery flexibility, new product flexibility, mix flexibility and volume flexibility. Output measures include customer satisfaction measured in terms of order fill rate, response time and on time delivery; sales quantities and profit.

Gunasekaran et al. (2001) highlighted the need for a more balanced performance measurement in a supply chain. They observed that companies often use either financial measures or operational measures to assess supply chain performance. Further, there is no clear metric to measure supply chain performance at the strategic, tactical and operational levels. Therefore, authors developed a framework for measuring the strategic, tactical and operational level performance. In developing the framework authors emphasized on performance measures dealing with suppliers, delivery performance, customer service, and inventory and logistics costs in a supply chain. Further, the authors categorized both financial and non-financial performance measure at strategic, tactical and operational levels of management, and related these measures to the four links- “plan, source, make, and deliver” of an integrated supply chain leading to customer service and satisfaction. This framework presented by Gunasekaran et al. (2001) was validated in another study (Gunasekaran et al. 2004). They developed a questionnaire to obtain information on the level of importance of the financial and non-financial measures in the four identified links viz plan, make, source and deliver. The questionnaire was administered to CEOs of large companies in UK which yielded 21 usable responses. The authors categorized these performance measures into highly important, moderately important and less important group based on the mean score of the responses.
Chen and Paulraj (2004) advocated the inclusion of performance of both suppliers and buyers to measure supply chain performance, considering financial and non-financial measures. They stated that financial performance reflects the assessment of firms by factors outside of firm’s boundary while operational measures reflects the effectiveness and efficiency of operations within the firm. Hence, they suggested that both operational, i.e., non-financial, and financial indicators should be used to capture the performance of a supply chain.

Sambasivan et al. (2009) consolidated all the measures of supply chain performance developed by researchers in the past. The authors address the following issues related to supply chain performance measures.

1. Identify measures and metric related supply chain performance suggested by past researchers.
2. From among those identified measures, suggest the measures and metrics which are perceived important and are used by practitioners.
3. Procedure to be adopted by companies to identify relevant measures and metrics to measure performance of their supply chain.

In the first stage, authors consolidated all the metrics and measures used to capture supply chain performance by an exhaustive literature survey, analysis of web sites, and interviews with practitioners from the manufacturing industry. This yielded a consolidated list of 838 performance measures which were further classified into six metrics which include fund flow, internal process flow, material flow, sales and service flow, information flow, and partner relationship process flow.
In the second stage, the list of performance measures was forwarded to 26 experts from the electronics industry to identify the important measures. The result of filtering process yielded 159 important measures. The authors developed a questionnaire consisting of four parts (one each for suppliers, manufacturers, distributors and customers) based on 159 measures, to gauge the importance and frequency of use of these measures. The questionnaire was administered to supply chain members of electronic companies in Malaysia which yielded 120 usable responses. The respondents were asked to indicate the importance and extent of usage of performance measures related to fund flow, material flow, and information and document flow on a 5-point Likert scale. The authors used ANOVA to test whether there was any significant difference amongst suppliers, manufacturers, distributors and customers regarding use and importance of performance measures. The result showed that there was significant difference between the supply chain members regarding the importance of measures in the information flow category but not for material flow and fund flow categories. The analysis showed that 135 measures out of 159 were used in industry. To validate the classification of measures into fund flow, internal process flow, material flow, sales and service flow, information flow, and partner relationship process flow, confirmatory factor analysis was performed on the 135 measures. The result of CFA confirmed the validity of classification scheme. Further, a case study was conducted in a hard disk manufacturing company to demonstrate the process of identifying the relevant measures and metrics from the 135 measures to ensure that supply objectives are met. The managers identified 94 measures that matched their supply chain objective.

Deshpande (2012) proposed a conceptual framework postulating the relationship between dimensions of supply chain management, supply chain performance and organizational performance. The author highlighted that measuring supply chain performance is a complex
phenomenon as it involves suppliers, manufacturers, wholesalers and customers. Based on a literature review three dimensions of supply chain management were identified which include concurrent engineering, strategic purchasing and long term relationship. The author also identified three important indicators to measure supply chain performance and organization performance. The indicators of supply chain performance identified are- supply chain delivery flexibility, customer responsiveness time and inventory cost, and indicators of organization performance identified are- customer satisfaction, and, financial and market performance. Table 2.3 gives the summary of supply chain performance categories used in the SCI literature.

**Table 2.3 Summary of Performance Measures Used in SCI literature**

<table>
<thead>
<tr>
<th>Performance measures used</th>
<th>Contributors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational measure</td>
<td>- Shin et al. (2000)</td>
</tr>
<tr>
<td></td>
<td>- Dong et al. (2001)</td>
</tr>
<tr>
<td></td>
<td>- Duffy and Fearne (2004)</td>
</tr>
<tr>
<td></td>
<td>- Jayaram et al. (2004)</td>
</tr>
<tr>
<td></td>
<td>- Benton and Maloni (2005)</td>
</tr>
<tr>
<td></td>
<td>- Tan et al., (2006)</td>
</tr>
<tr>
<td>Customer service measures</td>
<td>- Ramdas and Spekman (2000)</td>
</tr>
<tr>
<td></td>
<td>- Stank et al., (2001)</td>
</tr>
<tr>
<td></td>
<td>- Vickery et al. (2003)</td>
</tr>
<tr>
<td></td>
<td>- Bagchi et al. (2005)</td>
</tr>
<tr>
<td></td>
<td>- Kaufmann and Carter (2006)</td>
</tr>
<tr>
<td>Performance measures used</td>
<td>Contributors</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Time based measures</td>
<td>-Droge et al. (2004)</td>
</tr>
</tbody>
</table>
| Mixed measures (combination of operational, financial and other measures of performance) | -Frohlich and Westbrook (2001)  
- Frohlich and Westbrook (2001)  
- Prahinski and Benton (2004)  
- Das et al. (2006)  
- Li et al. (2006)  
- Li et al. (2009)  
- Devaraj et al. (2007) |

2.3 Gaps in the Supply Chain Integration Literature

The literature review on the relationship between SCI and performance shows that there is a need to:

1. To identify the immediate performance outcomes of different dimensions of SCI— supplier integration, customer integration and internal integration.

2. To examine the relationship between different dimensions of SCI and their immediate performance outcomes.

3. To examine the relationship between immediate performance outcomes and the financial performance of the firm.

To investigate the impact of SCI on firm performance in context of emerging economies such as India as the earlier studies were all conducted within the context of developed economies.