7-Construct Supply Chain Management Framework

Peter Robertson PhD

Faculty of Business, University of Wollongong, Australia

Email: peterrob@uow.edu.au
ABSTRACT

Private sector companies have been developing and applying supply chain management (SCM) concepts for over 30 years now. Companies using SCM formally have developed distinct competitive advantages over companies that have not adopted such concepts or were slow to do so. But what are the SCM practices that build such competitive advantages? This work proposes a 7-construct SCM framework that has been derived empirically in an attempt to answer that question. Research of available literature was undertaken to test the support for the proposed framework. Whilst it was found that the frequency of comprehensively researched articles on SCM frameworks is fairly low, high levels of statistically significant support exist for the proposed 7-construct SCM framework within the articles available.

Keywords – Supply chain management, 7-construct framework, level of support.

A preliminary (interactive) paper on this subject was delivered at the ANZAM 2013 conference in Hobart. This paper represents an expansion and continuation of that earlier work.

Supply Chain Management (SCM) has developed quite rapidly between the mid 1980’s (when the term was first used in literature (Cohen & Roussel, 2005)) and today. Over those 30 years of development, SCM activities, management techniques and practices have become quite complex and in some cases considerably advanced technically (Barros, 2012). Additionally, there is no ‘one-size-fits-all’ as an approach that may work well in one particular supply chain, may not work at all in a different chain (Cohen & Roussel, 2005).

For experienced and competent people directly involved in such challenges and supply chain developments, the proper running of supply chains may well be obvious. For the uninitiated however, the whole SCM issue is not only confusing but also confronting. So just what does it take to apply SCM well and how does an enterprise (indeed a common chain of enterprises) go about achieving, in a sustainable way, a distinct competitive edge via the application of modern SCM principles and techniques to their supply networks? The intent of this paper is to answer the specific research question: Does the published literature support the assertion that the competent
application of groups of supply chain capabilities (i.e. as defined by the 7-constructs framework) actually improves supply chain performance?

**LITERATURE REVIEW**

Supply chain management (SCM) as a concept widens the scope of focus from individual entities alone to one that encompasses the entire chain (Heikkila, 2002, pp. 3). The objective of SCM is to improve the value offered to customers in a profitable and sustainable way (i.e. economically, environmentally and socially sustainable) by improving the entire supply chain performance rather than optimising local performance of individual units along the chain (Heikkila, 2002, pp. 3), (Ellinger, Shin, Northington, Adams, 2012).

Supply chain management therefore matters because its underlying mission is to satisfy customers from a product and service delivery point of view. Thus, reliable, on-time, low cost delivery of quality products and services, with reduced customer order cycle times and reduced time-to-market for new products, better inventory management, proper handling of reverse logistics, heightened visibility of information, all enhance customer satisfaction, customer trust and loyalty (Lummus and Alber, 1997, pp. 15). These aspects, delivered in a sustainable way, are the true utility of SCM.

But what really are the key imperatives for SCM? It would seem from the literature that there are three key challenges faced by present-day SC practitioners i.e.:

   - The customer base (number of, identity of and location) and customer needs, wants, desires and buying preferences
   - Products, services, processes and technologies
   - Partners (suppliers and service providers)
   - Competitors and competitive activity
- Economic factors
- Environmental factors, especially the need for sustainability
- Risks from chronic supply chain problems (e.g. constraint management, batch sizes, changeover times, product/service quality, equipment reliability).
- Risks from acute supply chain problems (e.g. earthquakes, tsunamis, floods, conflicts).
- People and personalities
  ii. The specific type and levels of Focus required (Porter, 1987; Snow, 1992):
      Focus on customers, suppliers, service providers, other stakeholders, internal issues and performance imperatives with limited resources (especially time).
  iii. How-to-do-it (Fawcett, 2007):
      How to get ‘traction’ and deliver the required results via enabling a SCM management system using strategic choice and tailored-for-purpose technical and social capabilities.

What SCM practices therefore can SC managers adopt to be able to respond appropriately to the above challenges and how is such a set of practices structured? Stadtler (2002) attempts such a description with his supply chain ‘house’ analogy as displayed at Figure 1.

The goals are shown on the roof of the house supported by the two pillars ‘integration’ and ‘coordination’ and resting on a foundation of key functional competencies. The proposed 7-constructs SCM framework described below, is an extension Stadtler’s work. Specifically, the goal of applying the 7-constructs in practice i.e. competitiveness via delighting customers, is represented on the roof of Stadtler’s house. The groups of capabilities that are represented by the 7-constructs are then part of the support columns and foundations of the house.

More recently, Jabbour, Filho, Viana and Jabbour (2011) statistically derived a SCM framework with four main constructs i.e. (i) supply chain integration for planning & control, (ii) information sharing, (iii) strategic relationships with customers and suppliers, and (iv) supporting customer
orders. Li (2006) established positive relationships between SC practices competitive advantage and organisational performance.

The issue of SC information sharing, collaboration and cooperation is important as Barrett and Barrett (2011) found in their coffee chain study. They studied the impact of SC linkages and information sharing and whilst they found external linkages to be more common than internal ones, they found in each case that linkages exhibiting high levels of visibility gave heightened business performance for the aspect they were associated with.

Barros, Barbos-Povoa and Blanco (2012) considered seven SC negative outcomes (waste, uncertainty, vulnerability, congestion, bullwhip, diseconomies of scale and self-interest) and using case analysis went on to propose mitigation practices for such unwanted outcomes. Their solutions included information sharing, SC design simplification, deep supplier and customer relationships, heightened SC visibility, relevant ICT systems (especially for planning & scheduling), cycle-time reductions, improved quality, flatter organisational structures, integration of functional activities, SC measures and alignment with employee incentives, alignment of tasks, roles and responsibilities, training and knowledge sharing.

Birasnav (2013) identified the relationship between SC performance and transformational leadership, customer and supplier relations and the sharing of quality information.

Casson and Wadeson (2013) describe the importance of taking a systems (global) view of SC design, foreign investment and point of production decisions. They stress the need for alignment of SC and business strategies and the need for collaboration in the negotiation of such strategies with SC partners along the chain. They also point out the dynamic nature of modern supply chain and the need to continually monitor the economic results likely from adoption of the various SC paths available.

Chen and Paulraj (2004) developed one of the few published comprehensive supply chain frameworks. Constructs of their framework include leadership, customer focus, competitive
priorities, environmental uncertainty, SC design, buyer-supplier relationships, buyer-supplier performance, logistics integration, ICT and strategic purchasing.

Cox (1999) raises an issue often overlooked by SC writers i.e. the power structures that exist within different types of supply chains. Cox maintains that as well as the horizontal competition that happens between competing supply chains, there also exist vertical contests over the appropriation of value between members of the same chain as represented by the value chain that runs parallel to the supply chain. In the effective management of supply chains thus, Cox recommends consideration of three key constructs i.e. physical resources (that are used to create and deliver products and services), exchange relationships (influence on flow of revenue into the chain) and SC power structure (influence over revenue sharing along the chain).

Lambert, Cooper and Pagh (1998) present a 3-Construct SC framework comprising SC structure, SC business processes and SC management components. These top-level constructs quickly explode into a wide number of sub-constructs. For example, Lambert et al. (1998) describe a comprehensive process-based SC framework where they identify eight key processes that run end-to-end along the supply chain including the information flows necessary to support each process. The authors also identify the conflicts set up in attempting to manage the eight SC processes with the traditional functional ‘silos’ that exist within most organisations.

Flynn, Huo and Zhao (2010) demonstrated, via survey-based research, that both operational and overall business performance are significantly related to the level of supply chain integration (including internal intra-firm integration) existing along supply chains.

Using data collected from 10 retailers in India, Singh, Sandhu, Metri and Kaur (2010) identified 24 supply chain ‘practices’ employed by the retailers that loaded onto 5 factors i.e. use of technology, SC speed, customer satisfaction, SC integration, and inventory management.

Spens and Bask (2002) very cleverly overlay 9 supply chain management components (planning & control, workflow, organisational structure, information flow, product flow, management methods, power & leadership structure, risk & reward structure and corporate culture and attitude) on 4 main
SC processes (customer relationship management, demand management, procurement and product development).

Tsolakis, Keramydas, Toka, Aidonis and Iakovou (2013) developed a comprehensive 9-construct framework for agri-food supply chains (technologies, investment portfolio, relationships, SC configuration, performance measurement, sustainability, quality, planning and transparency & traceability) whilst at the same time lamented their observation that there is a lack of systemic industry approach that would see the application of their preferred SC networks.

The above literature review is not exhaustive as space here precludes that, however the summary of the articles cited above is that whilst the various studies vary in terms of scope, type of industry, type of product and research approach, at the same time there are a number of similarities in their findings. The research findings presented below, attempt to describe such similarities and the level of support found for them.

METHODS

The research methodology comprised of firstly conceptually describing a 7-construct SCM framework (shown at Figure 2) from actual empirical experience. A capabilities-based SCM framework developed earlier by the author, as shown at Figure 4, was used along with known SCM methods/approaches utilised by private sector companies to compile the 7-construct framework. To be clear, the 7-constructs represent groups of capabilities, known from direct private sector supply chain experience, that when competently applied to the end-to-end supply chain, result in superior supply chain performance on key SC outcomes such as delivery in-full, on-time and error free (DIFOTEF), short order cycle-times (order lead-times), responsiveness (to changing customer requirements), low days of inventory (in the whole supply chain) and competitive supply chain costs.

In terms of boundaries, the proposed 7-construct SCM framework could be used for any given supply chain end-to-end. This may be an overwhelming task however for immature supply chains
and as such it may well be more manageable to commence with individual sections of the chain and extend the coverage as experience and competencies build.

A hypothesis was then set and tested using statistical analysis of relevant literature. On-line databases (Emerald, ScienceDirect, ABI/Inform and Proquest) were used to find relevant literature via article keyword and title searches. The search words used were “Supply Chain Management Framework”, “Supply Chain Model(s)”, “Supply Chain Theory”, “Supply Chain Management Constructs.” This yielded 100 papers that were then assessed for suitability and relevance. This screening resulted in 27 chosen relevant articles. The main reason for article discard was scant coverage of the topics under consideration, i.e. only weak evidence of research and/or any sort of definitive statement on the search words and their importance to SC performance existed within the article. The 27 chosen articles were then carefully read and frequency of quality references to the terms in the proposed SCM framework (Figure 2) were recorded and subsequently analysed. By ‘quality references’ is destined that the article contains statements that support the assertion that the practice of a given construct(s) of the 7-construct framework enables improved supply chain performance as measured by one or a number of the key SC outcome described in the paragraph above. Evidence of such for each article on each construct was recorded as a ‘YES’ if found and a ‘NO’ if not found. Table 1 shows the full result for each construct against each article. A Chi-squared test was then applied to the resultant data to test for significance between the ‘YES’ and ‘NO results. The results of this test are shown at Table 2.

In addition, frequently used SC factors in the 27 articles were recorded per the above and analysed. This was done in order to identify any factors not included in the 7-construct framework. The result is shown at Table 3. Such missing factors, if found, could thus be flagged for further research.

**HYPOTHESIS**

The hypothesis is simply that the proposed 7-Construct SCM Framework (Figure 2) is supported by available and relevant literature in that competent application of the constructs therein enables improved supply chain performance.
A brief description of the proposed 7-Construct SCM framework is as follows:

**Supply Chain Strategy**

Supply chain strategy applies to the entire end-to-end supply chain. Whether all SC partners are involved in setting the strategy depends upon the power relationships that exist along any given chain. If a dominant partner exists (e.g. Wal-Mart) then they may set the strategy for the entire chain. If the chain comprises a string of weak partners, then any SC strategy may be restricted to individual sections of the chain.

Strategy is the root construct and must come before the other seven constructs as it determines their importance and the focus required on each of them. That is, SC strategy sets direction and specific goals for the other constructs. SC strategy as such, is an explanatory variable.

As well, any chosen or designed supply chain strategy must be aligned with the overall business strategy (Gattorna 2003) and must be able to deliver the results sought by the corporate strategy and mitigate supply chain risk (Colicchia, 2012). So SC strategy comes first and sets the context and expectations for the other constructs.

Formulation a sound supply chain strategy consists of (Webb, 1989):

- a. A careful description of identity (business purpose, ambitions, capabilities, capacities, competencies, customers, products and services offered)
- b. In depth comparative analysis (key current performance results and capabilities assessed against competitors and expectations of customers, suppliers, service providers, business partners, employees and the community).
- c. Careful definition of the supply chain’s future desired state.
- d. A detailed, connected and achievable plan to deliver c. above.

**Supply Chain Design**

The critical constructs in SC design include:
i. Design for performance (key measures and targets)

ii. Design for quality

iii. Design for sustainability (economic, social and environmental)

iv. Design for speed and flexibility (short cycle-times and responsiveness)

v. Design for integration (process integration and information sharing along the SC)

vi. SC network design including facility locations and transport types and routes

vii. SC ICT infrastructure design (including software and information visibility requirements).

Build, Maintain and Grow Profitable Customer Relationships

Key customer buying decisions for products/services are influenced by (Kotler, 2000) (i) suitability of the product/service, (ii) the degree of innovation on offer, (iii) quality levels, (iv) order lead-time, (v) delivery performance, (vi) price and (vii) flexibility.

There are social factors at play also such as trust, honesty, respect, reputation and genuine listening skills (Kotler, 2000).

The above are underpinned of course by the competent and timely planning and management of order flows and product/service flows to ensure that the right product/service, of the right quantity, of the right quality is delivered to the right place at the right time for minimum cost and with no ecological damage. This construct includes all of the SC processes involved in achieving the above faultless offer-delivery and also the particular SC operating practice to be adopted (e.g. ‘Lean’, ‘Agile’, ‘Hybrid’).

Engaging Suppliers

Supplier engagement implies the active participation and collaboration with suppliers to achieve desired and mutual SC goals in an environment of respect. Reality is often time different to such an ideal world however due to the existence of power bias along supply chains (Cox, 1999).

Collaboration, Coordination and Integration
This construct deals with the critical issues of supply chain collaboration, relationships and levels of supply chain process integration. Because no clear and agreed definition of SC integration exists and because much hype exists around its benefits (Naslund, 2012), it is crucial to establish a clear understanding of who is responsible for what and who has the accountability for delivery of desired results.

The intent is to ensure that the supply chain acts as a coordinated and orchestrated set of activities, with key measures consistent along the end-to-end supply chain (no dysfunctional KPIs or targets), with people making decisions to maximise global optima and not local optima.

**Technology**

ICT infrastructure and software systems exist today to support and enable many supply chain processes. Examples of such systems are customer and supplier relationship management (CRM) and (SRM), demand and capacity management including advanced planning & scheduling (APS), materials requirements planning (MRP), supply chain planning (SCP), inventory management (IMS), material/product tracking, transport planning & scheduling (TPS), manufacturing management (MES) and warehouse management systems (WMS), delivery confirmation and invoicing and information capture, storage, mining/analysis and visibility.

**People (Social Issues)**

These are the end-to-end SC people (e.g. SC managers, SC planners and schedulers, SC customer relations people, SC order managers, SC operations researchers, SC transport controllers) and thus under an umbrella of competent leadership (per Figure 3), this construct includes the key people sub-constructs of (a) administration, (b) skills and competencies and (c) values (culture i.e. mindset, alignment, motivation, teamwork, maturity, adherence to standards, responsibility and accountability.). All such sub-constructs are required to be designed, shaped and managed in order for a high performance-ethic to exist along the chain.

---

Insert Figure 3 about here
The above-described 7 constructs represent groupings of individual capabilities that were identified earlier by the author and as shown at Figure 4.

RESULTS

The results of the analysis of the 27 articles are presented in Tables 1, 2 and 3. Table 1 shows the detailed result for each article against each construct. Where the article supported the assertion that application of the construct in actual practice resulted in improved SC performance then the result recorded was a ‘YES’. Where such evidence did not exist then the result recorded was a ‘NO’.

Table 2 shows the result of a Chi-squared test to ascertain if the observed difference between the ‘YES’s and ‘NO’s is significant. As can be seen, the 4 constructs SC strategy, customers, suppliers and collaboration/coordination each occur in >85% of the articles. Interestingly, supply chain design and technology were covered in 59% and 63% of the articles respectively.

The chi-squared test carried out on the Table 2 data returned a $\chi^2$ value of 0.0003. As this is considerably less than the 0.05 level, it can be stated that the observed differences between the ‘YES’ and ‘NO’ scores in Table 2 are significant.

The opportunity was also taken to assess the frequency of the main SC factors covered in the 27 articles. These are presented at Table 3 and of the 14-factors shown, 11 are explicitly included in the proposed 7-construct SCM framework and the remaining 3 (uncertainty, SC linkages and SC capabilities) are implicitly included.
DISCUSSION

The results indicate support for the assertion that real-world application of the constructs contained in the proposed framework, does improve supply chain performance on the measures listed. Indeed, support for 4 of the constructs (SC strategy, customers, suppliers and collaboration/coordination/integration) occurs in >85% of the articles. It needs to be borne in mind of course that these 4 constructs are closely related in that SC strategy covers the other 3 in formulation and the setting of expectations, plus customers and suppliers are key SC partners that by necessity need to be collaborated with, coordinated between and integrated.

It was expected that supply chain design and technology would exhibit higher results than the 59% and 63% respectively they scored. Possible reasons for these lower than anticipated results may be because of the newness of SC design as a supply chain imperative and ongoing management fear of the cost and risk of technology (specifically information system implementations). Such suggested reasons would need to be confirmed by further research of course.

The Chi-squared test result shows that a significant number of ‘YES’ results were in favour of the 7-constructs proposed. Of course the sample size of 27 articles is low and further work is needed to verify this result as suggested at ‘opportunities for future research’ below.

Table 3 shows that 14 common SC factors were identified in the 27 articles. These are factors the authors mentioned the most often as their SC study topics. Of these 14 factors, 11 are directly included in the 7-construct framework i.e. collaboration/coordination/integration, customers, strategy, suppliers, information sharing and SC visibility (part of technology construct), supply chain operational practices (part of build, maintain and grow profitable customer relationships plus supplier engagement), SC performance and measures (part of SC strategy, SC design, build, maintain and grow profitable customer relationships plus supplier engagement), SC sustainability (part of SC strategy). 3 of the common factors are indirectly related to the 7-construct framework i.e. uncertainty (is an environmental condition that applies to all constructs), SC linkages (related to all constructs) and SC capabilities (also applies to all constructs).
CONCLUSIONS

The first conclusion is that the results indicate support in the literature, for the research question posed earlier, i.e. “Does the published literature support the assertion that the competent application of groups of supply chain capabilities (i.e. as defined by the 7 constructs) actually improves supply chain performance?” The results indicate a significant difference between the ‘YES’s (do support the assertion) and ‘NO’s (do not support the assertion) in favour of the ‘YES’s. Support for SC strategy, customers, suppliers and collaboration/coordination/integration occurs in >85% of the articles, support for SC people in 74% of the articles and support for supply chain design and technology 59% and 63% respectively.

It needs to be pointed out that the 7-constructs framework diagram as shown at Figure 2, is a conceptual representation. It does not show the sub-constructs involved and is thus not a theoretical framework that could be used for testing with data describing the continuous variables that such sub-constructs are. This part represents the next phase of this work, which will be carried out via case study.

The second conclusion is that the frequency of comprehensively researched articles on SCM frameworks is fairly low. It may well be that such frameworks are complex especially across end-to-end supply chains and as such researchers rather choose research questions that are within their time and budget constraints. SCM frameworks that were found are described at the ‘Literature Review’ section above.

The third and final conclusion is that of the 14 common issues identified in the articles studied, 11 of the issues are explicitly included in the proposed 7-construct framework and the remaining 3 implicitly included.

LIMITATIONS OF THE STUDY

1. The author would have preferred to include more than 27 articles in this study. This was difficult however due to the limited number of comprehensively researched articles on SCM frameworks.
2. SCM frameworks if taken down to lower levels of detail become quite complex quite quickly. This paper is for the top level only. Therefore it is suggested that existing literature will not on its own facilitate or guide with the expansion of lower level details. It is considered that such work will require detailed data gathering via case study and even controlled experiments.

**OPPORTUNITIES FOR FUTURE RESEARCH**

Suggestions for useful future research are as follows:

1. SCM as a discipline needs coherence, quality, breadth & depth (Chicksand et. al., 2012). Such an approach will perhaps lead ultimately to a SCM theory, however it is suggested that a key precursor to such a theory is the development of a robust, agreed and detailed SCM framework.

2. Verification of the included 7-construct framework in real life via case study analysis and/or controlled experiments would be a good first step towards that detailed framework.

**REFERENCES**


**DIAGRAMS**

*Figure 1. House of SCM (Stadtler, 2002, pp. 10, as in Stadtler, 2005, pp. 576)*
Figure 2. Proposed SCM 7-Constructs Framework - (Author, 2015)
Figure 3. People Considerations for a Modern SCM Practice (Author, 2015)

Leadership

Administration
Requisite Organisation Structure,
Right Number of People,
Position Descriptions,
Selection, Induction, Training &
Assessment Processes

People

Values (Culture)
Mindset
Alignment, Diligence,
Motivation,
Teamwork,
Ownership,
Responsibility,
Accountability

Skills/Competencies
Individual
Competencies
Skills, Capabilities,
Qualifications &
Experiences
Figure 4. Capabilities Based SCM Model (Author, 2005)

**Technical Capabilities:**
- Customer orders delivered in-full, on time and error free (DIFOTEF)
- Fit for purpose products with reliable quality
- Short lead times to market
- Flexibility to changing customer demands
- Low ‘days-of-inventory’ (high-velocity, lean supply chains)
- Consolidation of customer: supplier bases
- Elimination of unnecessary process steps
- Elimination of all forms of waste
- Competitive supply chain costs
- Continuous replenishment methods
- Visibility of information
- Integration of supply chain processes
- Synchronised supply chains
- Manufacturing, transport, warehousing and distribution capabilities

**Social Capabilities:**
- Satisfied, loyal and competent employees
- Customer service focus is a ‘way of life’, an ethos, a culture
- Understanding customer needs
- Organisational & supply chain alignment with customer needs and wants
- Continuous improvement focus
- Collaboration along the supply chain
- Regular and quality communications along the supply chain
- High quality people support and development systems

**Goal**
*Business Survival, Business Success (margin/profit & growth)*

**Reinforcing Loop**
- Building customer relationships
- Creating & delivering customer value
- Before, during & after sales service

**Supply Chain capabilities**
### Table 1: ‘YES’ ‘NO’ Result For Each Article For Each Construct

<table>
<thead>
<tr>
<th>Construct</th>
<th>Author</th>
<th>YES</th>
<th>NO</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SC Strategy</td>
<td>Barrett</td>
<td>23</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>2 SC Design</td>
<td>Bamatia</td>
<td>16</td>
<td>11</td>
<td>27</td>
</tr>
<tr>
<td>3 Satisfying Customers</td>
<td>Caterer</td>
<td>27</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>4 Engaging Suppliers</td>
<td>Cogliano</td>
<td>26</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>5 Collaboration, coordination</td>
<td>Cox</td>
<td>23</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>6 Technology</td>
<td>Foyreti</td>
<td>17</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>7 People</td>
<td>Halloran</td>
<td>20</td>
<td>7</td>
<td>27</td>
</tr>
</tbody>
</table>

### Table 2: Chi-squared Test on Article Analysis Results

<table>
<thead>
<tr>
<th>Element</th>
<th>YES</th>
<th>NO</th>
<th>Totals</th>
<th>Actual</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC Strategy</td>
<td>23</td>
<td>4</td>
<td>27</td>
<td>23.0</td>
<td>21.71</td>
</tr>
<tr>
<td>Design</td>
<td>16</td>
<td>11</td>
<td>27</td>
<td>16.0</td>
<td>21.71</td>
</tr>
<tr>
<td>Satisfying Customers</td>
<td>27</td>
<td>0</td>
<td>27</td>
<td>27.0</td>
<td>21.71</td>
</tr>
<tr>
<td>Engaging Suppliers</td>
<td>26</td>
<td>1</td>
<td>27</td>
<td>26.0</td>
<td>21.71</td>
</tr>
<tr>
<td>Collaboration, coordination</td>
<td>23</td>
<td>4</td>
<td>27</td>
<td>23.0</td>
<td>21.71</td>
</tr>
<tr>
<td>Technology</td>
<td>17</td>
<td>10</td>
<td>27</td>
<td>17.0</td>
<td>21.71</td>
</tr>
<tr>
<td>People</td>
<td>20</td>
<td>7</td>
<td>27</td>
<td>20.0</td>
<td>21.71</td>
</tr>
</tbody>
</table>

| Totals                           | 152 | 37 | 189    | 152.0  | 189.0     |

| p = 0.000304                      |     |    |        |        |          |

### Table 3: Ranked Frequency of Main SC Factors Covered in 27 Articles

<table>
<thead>
<tr>
<th>#</th>
<th>Factor</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Collaboration/Cooperation</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Customers</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>SC operational practices</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Leadership</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Strategy</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>SC perf &amp; perf measures</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Integration</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Uncertainty</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Suppliers</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>SC Linkages</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Information Sharing</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>Sustainability</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>SC capabilities</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>SC Visibility</td>
<td>1</td>
</tr>
</tbody>
</table>