SUPPLY CHAIN PERFORMANCE EVALUATION IN THE IT INDUSTRY

Mohammad Taghipour¹*, MehrnazBagheri², Mahbube Khodarezaei² & Farjad Farid²
¹Department of Industrial Engineering, RobatKarim Branch of Islamic Azad University, Tehran, Iran
²M.S. student of Industrial Engineering, ABA institute of higher education, Abyek, Qazvin, Iran

ABSTRACT
The appraisal of several performance measure agendas and metrics already accessible proposes that supply chain performance measure can be detected under different categories such as cost and non-cost; strategic and operational level; financial and business process perspective; customer, financial, internal operation, learning and growth perspective. Lack of appropriate knowledge in supply chain management that touches project success can lead to increased cost and delays. Hiring supply chain management in IT industry, with respect to their huge size and large investments, may help to elevate use of resources and implementation time. For this purpose, supply chain management may be used to evaluate chain performance, set future performance goals, and draw appropriate path for project success. This requires a comprehensive means and measures to assess different aspects of supply chain and make systematic evaluation possible. In this study, we have developed supply chain of IT industry based on BSC from existing decision making models. Then, industrial projects performance and performance evaluation measures have been determined using a designed questionnaire. Finally, project performance evaluation measures are proposed based on lean thinking principles and ranked using Expert Choice software.

Keywords: Supply chain, BSC model, Project management, Lean thought, AHP

1. INTRODUCTION
Business organizations need to capitalize on Supply Chain (SC) capabilities and resources to bring products and services to the market faster, at the lowest possible cost, with the appropriate product and service features and the best overall value (9). Performance measures are important to the effectiveness of SC. Companies can no longer focus on optimizing their own operations to the exclusion of their suppliers' and customers' operations. Supply Chain Performance Measures (SCPM) serve as an indicator of how well the SC system is functioning. Measuring SC performance can facilitate a greater understanding of the SC and improve its overall performance (3). Supply chain can be defined as integrated set of processes involving business entities such as: supplier manufacturer distributor retailer customers. The processes involve acquiring raw materials, converting these raw materials into finished products and delivering these products to customers. According to (2), there is a forward flow of materials and backward flow of information in a traditional supply chain. The objective of a business organization is to capitalize on supply chain management practices in order to ensure timely delivery of products and services to the customers at the lowest cost possible. Since supply chain management has a major impact on the overall operations of the organization therefore, its performance measurement becomes an integral part of the organization. Performance measure not only serves to measure effectiveness and efficiency of an existing process but also helps in comparing alternatives. Supply chain performance measurement helps in greater understanding and improvement in the overall performance as suggested by (3). In the ever changing environment it becomes necessary for the company to keep a check on its supply chain performance by using metrics and framework suitable for the particular business organization. Supply chain performance measure can be observed under various categories such as cost and non-cost; strategic and operational level (9); financial and business process perspective (2); customer, financial, internal, and learning and growth perspective (13).

The performance measurement process has evolved since the mid-eighties of last century when its foundations were formalized and integrated into the management of organizations, have developed various models of performance measurement structures to reach metrics intra-organizational or inter-organizational performance (5). Inter-organizational system focuses on measuring the performance of SC. The performance measurement system in the SC, is important in the joint efforts of the stakeholders in the logistics system under the premise that generates added value to customers in the short, medium and long term, better-looking global local optima and not SC. According to (22), improving the performance of the SC is a continuous process that requires an analytical system for measuring performance and a mechanism for the implementation of KPI’s. (11)proposed several metrics to measure performance in the SC organized around three main pillars: services, activities and speed, other authors such as Lambert &Pohlen (2001) propose indicators that are established on the basis of financial performance indicators and economic the entire SC. From another perspective, the other
researchers suggest that measuring the performance of a SC should consider the fact that each company is a particular economic system and a different legal entity. The need to develop performance measurement systems at different levels of organizational decision making led to (13) to develop and propose the Balanced Scorecard, BSC as a means to evaluate corporate performance from four perspectives: financial, internal processes, customer and learning and growth. However under the new market trends in environmental terms (Green Supply Chain), Information and Communication Technologies (ICTs), leanness (LeanSupplyChain) Collaborative models (CSC Collaborative Supply Chain) and SC agile (Agile Supply Chain), among others, bring contemporary perspectives oriented and future of SC, under the overall dynamism and the era of information technology (IT).

1.1. Definition and Objectives of SCPMS
(20) defined Performance Measurement System (PMS) as a balanced and dynamic system that enables support of decision-making processes by gathering, elaborating and analyzing information. (24) further elaborated this definition by commenting on the concept of ‘balance’ and ‘dynamicity’. ‘Balance’ refers to the need of using different measures and perspectives that tied together give a holistic view of the organization. The concept of ‘dynamicity’ refers instead to the need of developing a system that continuously monitors the internal and external context and reviews objectives and priorities. Bititci et al. (1997) defined SCPMS as the reporting process that gives feedback to employees on the outcome of actions. Stefan (23) proposed that performance be defined as the efficiency and effectiveness of action, which leads to the following definitions: (i). Performance measurement is defined as the process of quantifying the efficiency and effectiveness of action; (ii). A performance measure is defined as a metric used to quantify the efficiency and/or effectiveness of an action; and (iii). Performance Management System is defined as the set of metrics used to quantify the efficiency and effectiveness of an action. Effective supply chain management (SCM) has been associated with a variety of advantages including increased customer value, increased profitability, reduced cycle times and average inventory levels and even better product design (26). The objective of SCPM therefore has to facilitate and enhance the efficiency and effectiveness of SCM. The main goal of SCPM models and frameworks is to support management by helping them to measure business performance, analyze and improve business operational efficiency through better decision-making processes (23). An effective, integrated and balanced SCPMS can engage the organisation’s performance measurement system as a vehicle for organisational change. SCPM can facilitate inter-understanding and integration among the SC members. It makes an indispensable contribution to decision making in SCM, particularly in re-designing business goals and strategies, and re-engineering processes (3).

2. LITERATURE REVIEW
The literature available in this field describes the need for supply chain performance measure while it establishes various approaches and framework of measurement. The literature related to SCPMS belongs to two major orientations. They are: (i). Conceptual articles and (ii). Empirical articles. The conceptual works tend to focus on measurement constructs and prescriptive methodologies. Topics normally covered in conceptual articles are related to performance definition, theoretical evaluation criteria, models and issues with measures. The empirical works tend to focus more on performance content than on measurement process. Empirical articles include descriptive studies, methods, taxonomies, benchmarking and prescriptive performance improvement activities. (14) Performance measurement literature of the past twenty years can be classified into five general phases of evolution. This classification of PMS literature is related to evolution of PMS. Table 2 shows the five phases in Performance Measurement literature.
Table 1. Phases in Performance Measurement Literature (20)

<table>
<thead>
<tr>
<th>Category</th>
<th>period</th>
<th>characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>1980-1990</td>
<td>Dominant theme was a discussion of the problems of performance measurement systems; recognising and discussing the weaknesses of measurement systems and their organisational impact.</td>
</tr>
<tr>
<td>Phase 2</td>
<td>1990-1995</td>
<td>Potential solutions – e.g. measurement frameworks such as the BSC were being proposed; search for “frameworks” that might provide useful ways of addressing the previously identified problems.</td>
</tr>
<tr>
<td>Phase 3</td>
<td>1996-2000</td>
<td>The search for ways in which the proposed frameworks could be used; processes and methodologies for populating measurement frameworks were being developed and discussed.</td>
</tr>
<tr>
<td>Phase 4</td>
<td>2000-2005</td>
<td>Robust empirical and theoretical analysis of performance measurement frameworks and methodologies; analysis of impact of PMS on organizations</td>
</tr>
<tr>
<td>Phase 5</td>
<td>2005 onwards</td>
<td>Theoretical verification of frameworks; application and impact on supply chains; focus on multi-firm performance.</td>
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2.1. The concept of leanness

The concept of leanness originated from the Japanese manufacturer Toyota Motor Corporation in the 1950s (18; 21; 25), and became influential because of the scarcity of resources and intensive domestic competition in the Japanese automobile market. The steady growth of Toyota, from a small company to being one of the world’s largest automakers, has focused attention on how its success has been achieved. The term “lean production” was first defined by (27) in their book “The Machine That Changed the World”. The basic idea of lean production is that the expenditure of resources for any goal other than the creation of value for the end customer is wasteful, and thus a target for elimination. Ultimately, this entails the quest for preserving value through performing less work. A particular theme in the early studies of lean is its impact on and relation to learning in organizations. The initial articulation of lean by (27), arguing that one of its benefits was that of promoting organizational learning. In essence, the argument was that a standardization of work procedures under lean production enables the setting of benchmarks against which performance can be measured and meaningfully diffused within and across work groups. This instance of learning thus guaranteed a mechanism for organization-wide learning.

In the 1990s, lean was mainly viewed as a plant level manufacturing approach, including a set of operational tools that assisted in the identification and elimination of waste (muda), improving quality and reducing costs. This attracted criticism for its narrow application on the shop-floor and the lack of strategic perspective. As the lean concept developed, its focus and scope has greatly changed and now lean embraces wider concerns and is more comprehensive in its scope. (12) suggest that there are now two levels of lean approach: the operational level and the strategic level, which are different in terms of objectives, focuses, ways of achieving results, and how the results are measured, etc.

The operational level of lean stresses efficiency improvements and cost reductions in the manufacturing process with short-term goals focusing on improvements in current manufacturing. Specific techniques are identified,
including just-in-time manufacturing (JIT), high-levels of employee problem-solving/automated mistake proofing, total quality management (TQM), pull-based systems and so on (12). As lean evolved it began to embrace new elements such as lean supply chains and customer value (28). The latter is defined on the basis of cost, product functions, etc. from the customers’ perspective and is mainly captured by simply following specific customer requirements, i.e., lower price, higher quality, and shorter delivery times, etc. The objective is to leverage existing resources as much as possible and achieve “operational excellence”. At the strategic level, lean has a more comprehensive and wider content. It is viewed not as a tool but a way of thinking, going beyond the pursuit of production excellence and emphasizing customer value and the entire system flow. Focusing solely on manufacturing efficiency is not enough to create long-term success for a business, therefore the objective is to build not just a “lean organization” but also “lean solutions” to achieve long-term success (29). “Lean thinking” and “lean solutions” both entail a collective awareness of lean across the organization: its advocates call for collective cognition about lean that is commensurate with the notion of organizational culture. The development and establishment of such a culture is equivalent with what some see as organizational learning (Cook & Yanow, 1993).

2.2. Performance measurement framework
A number of frameworks and models for performance measurement have been developed, since 1980s (Bititci et al., 2000). These frameworks all have their relative benefits and limitations. Literature review indicates that empirical and theoretical validity of some of the frameworks are established whereas information about others is not available. Among these frameworks, BSC proposes that a company should use a balanced set of measures that allows top managers to take a quick but comprehensive view of the business from four important perspectives (Figure 2). These perspectives provide answers to four fundamental questions (23): (i). How do we look to our shareholders (financial perspective)? (ii). What must we excel at (internal business perspective)? (iii). How do our customers see us (the customer perspective)? (iv). How can we continue to improve and create value (innovation and learning perspective)?

![Figure 1. Balanced Score Card (Source: 23)](image)

The BSC includes financial performance measures giving the results of actions already taken. It also complements the financial performance measures with more operational non-financial performance measures, which are considered as drivers of future financial performance. By giving information from four perspectives, the BSC minimizes information overload by limiting the number of measures used. It also forces managers to focus on the
handful of measures that are most critical. Further, the use of several perspectives also guards against sub-
optimisation by compelling senior managers to consider all measures and evaluate whether improvement in one area
may have been achieved at the expense of another. According to (7), the main weakness of this approach is that it is
primarily designed to provide senior managers with an overall view of performance. Thus, it is not intended for (nor
is it applicable to) the factory operations level. Further, they also argue that the BSC is constructed as a monitoring
and controlling tool rather than an improvement tool. Furthermore, (20) argue that although the BSC is a valuable
framework suggesting important areas in which performance measures might be useful, it provides little guidance on
how the appropriate measures can be identified, introduced and ultimately used to manage business. They further
conclude that the BSC does not consider the competitor perspective at all. It does not specify any mathematical
logical relationships among the individual’s scorecard criteria. It is thus difficult to make comparisons within and
across firms using BSC (Soni et al., 2010). BSC is more like a strategic management tool, rather than a true
complete PMS (8).

2.3. The construction of management of supply chain

(1)states that the supply chain is an integrated process that involves from transformation of raw material in final
product to customer delivery, being divided in at least four levels – suppliers, producers, distributors and customers.
On this viewpoint, (21) reports that the SCM is a wider view of the traditional material management, now
comprehending the whole supply chain – suppliers and customers of several levels – in a strategic and integrated
way. Considering the complexity of activities in the SCM, studies of the area have been analyzing the relation
among its several practices, the integration levels and the performance of companies involved in a supply chain. (6),
for instance, reviewing the chain upstream and downstream, measured the integration level taking the following
practices into consideration: production planning sharing, combined utilization of electronic data interchange,
knowledge level and inventory mix levels, packaging customization, delivery frequency, shared use of containers,
equipment and logistic services.

Among the conclusions of the upper mentioned study, it was verified that the bigger the SCM integration level, the
stronger the association with performance improvement. Nevertheless, the same study suggests future researches
could consider this integration level as part of the operation strategy, as the manufacture needs to be properly lined
up with all the supply chain and not only within the company boarders.

Li et al. (2006), on the other hand, investigated the relation among five SCM practices (strategic partnership with
suppliers, customer relationship, level of information sharing, information quality and postponement), competitive
advantage and organizational performance. The findings of the study highlight that the implementation of practices
such as strategic leadership of suppliers, building a relationship with suppliers and postponement gave the
organization a competitive advantage concerning cost, quality, reliability, flexibility and delivery.

Following the same research line, Voss et al. (2005) evaluated four dimensions of the relationship with suppliers
(communication, commitment, cooperation and adaptation) and its impact on the operational performance in
traditional competitive priorities (quality, costs, delivery and flexibility). The research results revealed that the
dimensions of relationship are a successive phase that accumulates over time, as in the adaptation phase
improvement on the quality of the product and production cost reduction are conducted, but there are no effects on
the performance of delivery and flexibility indicators.

(17)conducted a survey with 143 purchasing, logistics and material management managers. The research aimed to
identify which performance measures the companies that adopted SCM practices were using to manage their first
tiers. The results indicated that the practices positively affected inventory (raw material, final product and storage
volume) and cycle time (inventory turnover, cycle time and order fulfillment) indicators. However, the financial
performance was not significantly affected by the SCM practices adopted by the analyzed companies.

Despite the success of studies on impact identification of the SCM practices over business and operational
performance, it is possible to perceive a great diversity of practices adopted by the researchers with different
nomenclatures, but with strong conceptual similarity, a fact that can result in a confused understanding of the
concepts. It reinforces the findings that SCM is a highly contemporary area in business management that is still in
developing and, as a consequence, still lacking some systematization, as in its terminology (21). In this context and
aiming a standardization of the terms used in the analyzed studies, a systematization of the literature was planned, as
pictured in Table 2, grouping 41 practices in a set of 9 major concepts with very similar definitions. A brief
definition of the 9 concepts presented in follows.

3. METHODOLOGY

Figure 2 shows in summary the steps taken and the path followed to achieve the objectives of our research. Each
step has one output and includes feedback to make necessary adjustment for incorrect outputs that may result from
likely deviation in identifying performance evaluation measures. To identify, measure, and collect research data,
both existing documentation and a designed questionnaire were used. Content and face validity were used to assess the validity of the research instrument by establishing a focus group consisting of industry experts and relevant academics of Iranian universities. Cronbach's alpha coefficient that was calculated as a mean to assess reliability of the questionnaire showed a figure of 0.84.

The framework presented by (10) was used in developing a survey used to study performance measures and metrics used in a supply chain environment. A seven-page questionnaire was developed for collecting data. The questionnaire was divided into four basic sections. They are as follows: plan (including strategy), source/supply (order), produce (make/assemble), and delivery (to customer). These four categories correspond to the four basic activities or processes in a supply chain—plan–source–make/assemble–delivery. The questionnaires were mailed to the managers. Targeted recipients were instructed to complete the survey themselves or refer it to an appropriate person for the same.

Both descriptive statistics and decision making methods based on AHP were utilized to analyze research data. Expert Choice software was also used to finalize and rank industrial projects performance evaluation measures under lean thinking principles.

![Image](https://example.com/image.png)

**Figure 2.** Steps for identifying proper measures for performance evaluation

4. FINDINGS

**Supply chain of IT industry**

On analyzing various supply chain performance measure frameworks given different authors we find that not every method is suitable for all types of industries. Also, most of the proposed frameworks are quite generalized and needs to be customized for a particular industry. Thus, we have proposed a framework for performance measurement of IT industry. The framework describes the measurements for both hardware component and software products. The supply chain for hardware can be given as: Purchasing→ Manufacturing→ Logistics→ Customer Service/Sales.

Figure 1, shows the set of measurement parameters adopted for various sections of the IT supply chain. Purchasing stage which deals with procurement process of components required for the manufacturing of computers and other hardware components require measurements like unit purchase cost, acquisition cost for materials etc. In the manufacturing phase, the resources and materials are used to produce the semi-finished and finished hardware products such as CPU, monitor, printers, storage devices etc. The resources also include the human resources. The metrics such as product quality, cost per unit of product produced etc. are used. The logistics deals with storage and inventory of final products ready to be delivered to the customers. Here, the measurement parameters are, on
time delivery, time to market and others. The customer services deals with the delivery of finished products to the customers. We use revenues, customer satisfaction etc. to measure the performance of this phase. The various performance measurement metrics proposed for the software product development and delivery function of the IT industry is also shown in Figure 1. Software development has five stages: planning, designing, developing, testing and delivery to customer. The software is measured through indirect measures because quality features cannot be measured using a numerical scale. The first stage of planning consists of requirement specification analysis; it requires measurements such as total lead time, requirement analysis cost and time. In the designing phase, the software features and functions to be developed are considered. The development phase deals with coding of the software according to planning. In this phase the number of function points of the software can be measured through ISO standard tools for functional size measurement: COSMIC, IFPUG, FiSMA 1.1, MARK-II, NESMA. Testing phase consists of various types of tests to detect any bugs in the software. Cost per bugs, percentage of defects etc. is used for measurement. The delivery of software to customer requires total delivery time, customer query time and other parameters. Quality parameters are indirectly measured for lesser number of bugs mean reliable software. The benefit of this framework is in the post sales benefits which include: regular software updates are made available to the customers, better service is provided to the customers through keen monitoring of performance measurements, better quality products are produced by using the framework for supply chain performance measurement, better feedback from customers and timely resolution of customer complaints. This creates value for the company. All these benefits help in, not just reducing cost for the company but it helps in generating profit. Thus the customers’ need is satisfied through good post sales service which is monitored using the given performance metrics.
Figure 3. A holistic model for IT industry
Deciding proper model for supply chain performance evaluation

The business literature abounds with evaluation models for investing in IT. This is entirely reasonable, as the organizational approach starts from the premise that the effectiveness of investment in IT will be influenced by the process in which the investment was implemented.

Based on supply chain performance evaluation models, and with respect to Iran’s Navaco IT organization’s desire and expectations from supply chain, the framework presented by (10) was used in developing a survey used to study performance measures and metrics used in a supply chain environment. A seven-page questionnaire was developed for collecting data. The questionnaire was divided into four basic sections. They are as follows: plan (including strategy), source/supply (order), produce (make/assemble), and delivery (to customer). These four categories correspond to the four basic activities or processes in a supply chain — plan–source–make/assemble–delivery.

Determining performance measures based on lean thinking

Based on the research developed by (15) since 1992, the Lean Thinking philosophy has become a contemporary concept of theory and practice. Currently, academics and IT practitioners use and develop this concept in order to improve results achieved in different projects around the world, many reporting back via the International Group for Lean Construction – IGLC (www.iglc.net). In this way, LT applied to IT projects delivers continuous improvement across the entire process by understanding and delivering Value for the customer and will improve current performance. At present the focus of LT in the IT industry has not been fully extended beyond the delivery and service project, thus there is an important opportunity to expand Lean IT experience to early stages of a project, where the biggest opportunities to add Value are generated. “Lean IT literature has mainly focused on dealing with problems and challenges that arise on the IT industry. To take a holistic and integrated approach to the design and construction of hardware and software within a lean framework means getting everything right at the start—or at least getting the customer values as right as possible—thus trying to avoid unnecessary and costly changes/re-work loops later in the production process.” (Emmitt et al. 2005: 58). “Lean thinking is argued to lack an adequate conceptualization of production, which has led to imprecise concepts, such as the term of “value”.” (15:24)

However, to identify factors influencing performance at IT projects further step was taken using data collected by research questionnaire.

Customizing and ranking of measures

To identify operative measures and respective relative weights in IT projects, 50 questionnaires were distributed among managers of NavacoIT Company, an Iranian well known IT company in information technology industry of which 40 returned questionnaires were used for analysis. Demographic data of the population showed that about 50% of respondents were between 40-50 years old and the others were older than 50 up to 63. Nearly 84% were familiar with supply chain concepts, and 86% with EPC1 projects and basic concept of lean thinking, supporting their suitability for customizing and ranking of measures.

Statistics for importance coefficients of the measures are presented in table 3.
To enhance the validity of preferred measures for project supply chain performance evaluation, measures that showed conformity degree of 90% or more, received an importance degree of at least 7 out of 10, and projected standard deviation less than 2, were adopted. However, the table above does not imply the relative importance of individual performance measures. Therefore, to rank final measures, Analytical Hierarchy Process (AHP) was accepted as an appropriate technique. For this purpose, Expert Choice software was used. Critical ratio of the research data showed a figure of 0.03 which is less than 0.1 that is proposed by Saaty. Table 4 presents submeasures and their corresponding weight.
Table 4. Rank and weight of final measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Priority</th>
<th>Sub-measure weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of customer perceived value of product</td>
<td>5</td>
<td>0.142</td>
</tr>
<tr>
<td>Variances against budget</td>
<td>10</td>
<td>0.130</td>
</tr>
<tr>
<td>Order lead time</td>
<td>12</td>
<td>0.113</td>
</tr>
<tr>
<td>Information processing cost</td>
<td>16</td>
<td>0.095</td>
</tr>
<tr>
<td>Net profit Vs productivity ratio</td>
<td>19</td>
<td>0.089</td>
</tr>
<tr>
<td>Total cycle time</td>
<td>21</td>
<td>0.079</td>
</tr>
<tr>
<td>Total cash flow time</td>
<td>23</td>
<td>0.070</td>
</tr>
<tr>
<td>Level of energy utilization</td>
<td>24</td>
<td>0.065</td>
</tr>
<tr>
<td>Customer query time</td>
<td>2</td>
<td>0.165</td>
</tr>
<tr>
<td>Product development cycle time</td>
<td>4</td>
<td>0.153</td>
</tr>
<tr>
<td>Accuracy of forecasting</td>
<td>9</td>
<td>0.132</td>
</tr>
<tr>
<td>Planning process cycle time</td>
<td>14</td>
<td>0.110</td>
</tr>
<tr>
<td>Order entry method</td>
<td>16</td>
<td>0.095</td>
</tr>
<tr>
<td>Human resource productivity</td>
<td>20</td>
<td>0.082</td>
</tr>
<tr>
<td>Supplier delivery performance</td>
<td>3</td>
<td>0.155</td>
</tr>
<tr>
<td>Supplier lead time against industry norm</td>
<td>5</td>
<td>0.142</td>
</tr>
<tr>
<td>Supplier pricing against market</td>
<td>13</td>
<td>0.112</td>
</tr>
<tr>
<td>Efficiency of purchase order cycle time</td>
<td>18</td>
<td>0.092</td>
</tr>
<tr>
<td>Efficiency of cash flow method</td>
<td>21</td>
<td>0.079</td>
</tr>
<tr>
<td>Supplier booking in procedures</td>
<td>26</td>
<td>0.062</td>
</tr>
<tr>
<td>Percentage of defects</td>
<td>1</td>
<td>0.172</td>
</tr>
<tr>
<td>Cost per operation hour</td>
<td>8</td>
<td>0.133</td>
</tr>
<tr>
<td>Capacity utilization</td>
<td>11</td>
<td>0.122</td>
</tr>
<tr>
<td>Range of products and services</td>
<td>15</td>
<td>0.101</td>
</tr>
<tr>
<td>Utilization of economic order quantity</td>
<td>19</td>
<td>0.085</td>
</tr>
<tr>
<td>Quality of delivered goods</td>
<td>6</td>
<td>0.139</td>
</tr>
<tr>
<td>On time delivery of goods</td>
<td>14</td>
<td>0.110</td>
</tr>
<tr>
<td>Flexibility of service systems to meet customers' needs</td>
<td>17</td>
<td>0.093</td>
</tr>
<tr>
<td>Effectiveness of enterprise distribution planning schedule</td>
<td>22</td>
<td>0.075</td>
</tr>
<tr>
<td>Effectiveness of delivery invoice method</td>
<td>25</td>
<td>0.063</td>
</tr>
<tr>
<td>Number of faultless delivery notes invoiced</td>
<td>27</td>
<td>0.052</td>
</tr>
<tr>
<td>Information richness in carrying out delivery</td>
<td>28</td>
<td>0.045</td>
</tr>
<tr>
<td>Percentage of finished goods in transit</td>
<td>29</td>
<td>0.039</td>
</tr>
<tr>
<td>Delivery reliability performance</td>
<td>30</td>
<td>0.035</td>
</tr>
</tbody>
</table>
DISCUSSION AND CONCLUSION

The reasons for failure in SCPM are varied and of diverse nature. (19) suggests following reasons for failure of SCPM systems: (i). Preoccupation with dyadic relationships and a lack of supply network focus and strategy. Current SC relationships are of network nature and not just dyadic. ‘Supply Chains’ are usually not supply chains but supply networks. In these networks relationships are difficult to define; (ii). Inability of many organizations to create SC visibility because of technical and system problems; (iii). Poor connections between marketing and supply network activities; (iv). A general lack of managerial awareness of the need to engage the organisation’s performance measurement system as a vehicle for organisational change. Bourne et al., (2003) lists four barriers to implementation of performance measurement systems. These were identified through individual cases. These barriers are: (i) Vision and strategy are not actionable; (ii) Strategy is not linked to department, team and individual goals; (iii) Strategy is not linked to resource allocation; and (iv) Feedback is tactical and not strategic. He also suggests three important factors for the success of a performance measurement system; they are: (i) Developing information architecture with supporting technology; (ii). Aligning incentives with the new measurement system and (iii).The lead given by the CEO. Those companies which already have a sophisticated IT infrastructure and well developed corporate information architecture are likely to find their ability to develop and support SCPM greatly enhanced.

This paper reaffirms the need for supply chain performance measurement in an IT organization. Many authors have given different frameworks with certain limitations in each one of these frameworks. Thus, any one of them may not be sufficient for measuring the performance of supply chains of IT Industry. In this paper we have also proposed a framework for IT Industry which helps in increasing profits while reducing their cost. This framework suggests measurement parameters for both hardware supply and software supply function of IT industry. It shows that holistic measurement of performance leads to a better post sales service which helps in satisfying the needs of the customers. The measures that were ranked by decision team members indicated that percentage of defeat bearing a weight of 0.172 has the highest priority while delivery reliability performance with a respective weight of 0.035 indicated the lest priority for attention in supply chain.

Throughout this study, we realized the importance of proposing and prioritizing measures for theentire process of IT projects. This is particularly important in integrating measures for the whole supply chain performance evaluation. Future studies may also consider just in time philosophy as a basis for determining alternative measures for performance in supply chain.

REFERENCES


