

Supply Chain Performance Approaches for Indian Manufacturing Organizations

¹Amit Kumar Marwah, ²Dr. Girish Thakar, ³Dr. R.C. Gupta, ⁴Dr. A.C. Shukla

^{1,2,3}Department of Industrial & Production Engineering, SGSITS, Indore (MP)-452001

⁴Department of Mechanical Engineering, UEC, Ujjain,

4

Abstract

Financial performance has been the primary measure of success in most organizations. The organizations have developed reporting systems and financial statements for measuring their supply chain performance on a monthly, quarterly and annual basis. Companies, however, have not done a good job developing effective real-time supply chain performance measurement and systems. Present day companies are operating their business in an ever-changing and unpredictable environment and facing global competition at the same time. Hence, the concept of supply chain management (SCM) has gained importance at strategic level. Research work done so far has established that many companies of present era have not succeeded in maximizing their supply chain's potential because they have often failed to develop the performance measures needed to fully integrate their supply chain. Indian manufacturing organizations are no different. In this paper, the authors intend to suggest the suitability of any particular approach in the context of Indian manufacturing organizations. Efforts have been made to incorporate all the necessary factors affecting the supply chain performance of a company and suitability of supply chain measurement approaches particularly to manufacturing organizations would be suggested. Data was collected from 100 manufacturing organizations across India and a scale was developed for supply chain performance approaches. The outcomes of the research work are expected to provide valuable implications for the Indian manufacturing organizations to understand determinants helpful in successful SCM operations.

Keywords: Supply chain management (SCM), Supply chain performance, Manufacturing

1. Introduction

The manufacturing sector is growing rapidly in India and has shrunk in most advanced economies. According to a report on global manufacturing sector, western companies have progressively downsized over the past decades, which has resulted in increase in manufacturing productivity and lean manufacturing techniques are almost universally adopted. Emerging markets concentrate on mass manufacturing and competing on price. The top three countries in the Global Competitiveness Index are Asian, namely China, India & Korea [1]. Many manufacturing executives (49 percent globally; 54 percent U.S.) admit that their companies currently do not have visibility of their supply chain beyond tier-1 suppliers [2].

In an annual survey of global supply chain trends with 300 international participants, answers are sought related to areas of critical concern, which included designing the future configuration of supply chain networks in the face of increased globalization and outsourcing, maintaining product quality and safety while managing numerous internal and external channel partners across the globe and setting new priorities on the company's agenda to ensure supply chain flexibility and to shape the requirements for high performance supply chains [3]. The survey is designed to provide critical insight into how industry leaders were globalizing their supply chain operations to achieve competitive advantage in today's challenging business environment. The survey reveals numerous strategies used by companies to manage their supply chains on a global basis. Few major trends driving innovative supply chain design and configuration across all industries are noticed. The trends include: accelerating pace of globalization, leading to large structural shifts for global supply chain organizations and new challenges to successfully manage supply

chain performance and company's agenda across industries and geographic regions is converging on improving supply chain flexibility and performance.

In manufacturing organizations today, competition parameters have changed from manufacturing site versus manufacturing site to supply chain versus supply chain. Improvement in the supply chain is critical to a company's bottom line in the current era of global sourcing and global competition. Going a step further, the maturity of the supply chain governs a company's performance, affecting the top line as well as the bottom line. Indian industry is facing competition both from multinational companies and imports in the domestic markets. The new competition is in terms of improved quality, products with higher performance, reduced cost, a wider range of products and better service; all delivered simultaneously [4].

It is an established fact that many companies have not succeeded in maximizing their supply chain's potential because they have often failed to develop the performance measures and metrics needed to fully integrate their supply chain to maximize effectiveness and efficiency [5]. A worldwide study of contemporary manufacturing practices reported fair uptake and perceived effectiveness of supply chain management [6]. While observing these modest levels of uptake and effectiveness, one would expect attention in developing measurement systems and metrics for evaluating supply chain performance to be growing. Likewise, it has been argued that measuring supply chain performance can result in understanding of the supply chain and improve overall companies' performance [7].

Today, the approach has already moved from simple supply chains to complex networks of organizations working together to create competitive advantage and value, i.e. value networks or we can call them 'external supply chain'. Consequently, there are developments taking place of networks which criss-cross organizational boundaries and there is a shift from inter- to trans-organizational networks.

The concept of 'enabling performance management' is also mentioned [8]. Emphasis is given on the need for involvement of people at all levels, starting with the determination of the metrics. The issues like the

challenges of performance measurement, need of developmental approach in performance measurement, importance of delegating the performance measurement at every level of hierarchy and the idea of 'metrics for people' were addressed. It has been also suggested that human factor is significantly affecting the SCM effectiveness [9]. The human factors affect management at various stages and processes in a supply chain as employees are the key asset to drive supply chain performance [10].

It has also been suggested that companies should understand that, for a balanced approach, while financial performance measurements are important for strategic decisions and external reporting, day to day control of manufacturing and distribution operations is often handled better with non-financial measures [11]. Another area where inequality persists is deciding upon the number of metrics to be used. Quite often companies have a large number of performance measures to which they continue to add based on suggestions from employees and consultants. They fail to realize that performance assessment can be better addressed using a trivial few—they are not really trivial, but instead are those few areas most critical to success. Few other problems in performance measurement were also pointed out [5][12].

2. Literature Review

In this paper, the authors propose a conceptual model by linking the relationships with supplier-buyer relations, external supply chain, environmental factors, human metrics, information sharing, performance measurement approaches; and SCM performance in a single study in the context of Indian manufacturing organizations. However, in this paper major emphasis is given to performance measurement approaches.

2.1. Performance Measurement Approaches

A supply chain (SC) is a network of organizations to perform a variety of processes and activities to generate value in the form of products and services to end consumers [13]. Supply chain management (SCM) is one of business strategy increasingly being used in the business world today and has become the focus of academic as well as corporate attention in recent

years[14]. As the concept of SCM is still in development, several theoretical frameworks and research methodologies are needed to be developed. However, many articles have been published in various disciplines to try to define the SCM and discuss future directions and the corresponding empirical research methodology [15][16][17].

Supply chain management practices as a multi-dimensional construct that encompasses upstream and downstream sides of supply chain [18]. Practices like outsourcing, supplier partnership, information sharing, cycle time, compression and continuous process flow, are part of SCM [19]. SCM involves an integrated and process-oriented approach to the management, design and control of the supply chain, with the aim of producing value for the end consumer, by both customer service and reduce cost [20].

There are few SCM challenges faced by the manufacturing companies. For instance, there are always variable demands from customers and demand changes are hard to anticipate [21]. Customers are used to requiring products in a short time frame whenever they increase demands without prior alignment with the company. Besides that, there is high supplier dominance in the manufacturing company. This means that companies have no power to shape the relationship with the supplier and must accept quality, price decision and terms and conditions that are dictated by the supplier [22]. Apart from that, there is lack of integrated software and system, both inside and outside the company [23]. Some of the suppliers are unable to access the company's supplier portal because they have incompetent technology.

There are many articles published in the literature on qualitative-based Performance Measurement (PM) in SC systems. For example, a conceptual model of integrated business process by means of a qualitative study of the integration of SC has been developed [24]. Researchers in 1990's began focusing on SCM as a whole and promoted customer satisfaction, collaboration of buyers and suppliers, information sharing [13] [25] [26] [27]. The importance of measuring intangibles in SCs is also highlighted [28] and the significance of innovative strategies and other

nonfinancial measures such as teamwork and lead times on organizational performance is explained [29]. It is also pointed out that measuring external, consumer, value based competition, network performance, and intellectual capital may lead to SC productivity [30]. Thus, enhancing supply chain performance is a critical approach for achieving competitive advantages for companies [31].

Researchers [10] have also identified the following main guidelines for future research:

- More research on the performance measurement tools for 21st century business models, need for the development of more precise frameworks and empirical testing of the performance measures, action research.
- Validation of developed performance measures, determination of KPI's for partnership; and development of models to cover virtual and e-commerce environments.
- Developing measurement and performance systems in the form of new maturity models supported by SCOR, to enable benchmarking.
- Need for cross-industry studies.
- Need for development of metrics for measuring the performance and suitability of IT in SCM.
- Performance measurement and metrics for responsive SC.

Most of the companies are following financial and non-financial performance measures approaches, however they are not representing them in a balanced framework. The basic question is where the financial and non-financial PMs would be suitable to evaluate the performance of a SC system. For example, strategic level PMs are mostly based on financial metrics. PMs at tactical level can be evaluated using both financial and nonfinancial indicators. Operational level performance evaluation is mostly based on nonfinancial indicators. However, we may not be able to generalize this perception and therefore, this choice should be based on individual organizational characteristics. While some companies concentrate on financial performance measures, others are concentrating on operational measures [25]. Such an inequality does not lead to metrics that can present a clear picture of performance of the organization.

Researchers suggested that an appropriate performance measurement system is a critical requirement for the effective management of a supply chain [32]. There are studies about the performance measurement systems and metrics of supply chains by critically reviewing the contemporary literature and suggesting possible avenues for future research [33]. SCM needs to be assessed for its performance in order to evolve an efficient and effective supply chain [34].

Another finding suggests that customer satisfaction is increasingly being recognized as an appropriate measure for determining how well a particular organization is accomplishing its mission and while customer satisfaction surveys provide valuable information and may be used to improve the entire operation. But, there are a number of important problems have not been yet addressed [33]. They include: the factors influencing the successful implementation of performance measurement systems for supply chains, the forces shaping their evolution over time and the problem of their ongoing maintenance.

New organizations have to deal with various kinds of performance pressures and suitable approaches are needed [35]. The study is also the direct justification for the need of a new performance measurement and costing system. Supporting the idea of new performance measurement system, few other approaches have been proposed. There is an integrated approach for measuring supply chain performance, combining economic value added (EVA), the balanced scorecard (BSC) and activity based costing (ABC), clearly emphasizing the need of overhead handling and a balanced approach. Other approaches focuses on ERP-based supply chain performance and proposes an integrated method, total related cost measurement, to evaluate supply chain performance of a three-echelon, ERP-based supply chain system [36].

Financial performance has been the primary measure of success in most organizations. The organizations have developed reporting systems and financial statements for measuring their supply chain performance on a monthly, quarterly and annual basis. Companies, however, have not done a good job developing

effective real-time or near-real-time supply chain performance measurement and systems. The tracking of financial performance is insufficient to measure the supply chain performance of today's logistics organizations for the following reasons:

- The measures do not provide any forward-looking perspective.
- The measures do not relate to strategic, non-financial performance, such as customer service or product quality.
- The measures do not directly tie to effectiveness and efficiency.
- The measures do not focus on process oriented and cross-organizational aspects.

The metrics that are used in performance measurement and improvement should be those that truly capture the essence of organizational performance. A measurement system should facilitate the assignment of metrics to where they would be most appropriate. For effective performance measurement and improvement, measurement goals must represent organisational goals and metrics selected should reflect a balance between financial and non-financial measures that can be related to strategic, tactical and operational levels of decision making and control.

The following main problems are pointed out in performance measurement [5] [12]:

- Incompleteness and inconsistencies in performance measurement and metrics.
- Failing to represent a set of financial and non-financial measures in a balanced framework, some concentrating on financials, others concentrating on operational measures.
- Having a large number of metrics, making it difficult to identify the critical few among trivial many.
- Failing to connect the strategy and the measurement.
- Having a biased focus on financial metrics.
- Being too much inward looking.

For effective management in a SC, measurement goals must consider the overall SC goals and the metrics to be used. These should represent a balanced approach

and should be classified at strategic, tactical and operational levels, and be financial and nonfinancial measures, as well [34].

With all these problems highlighted, there seems to be no universal consensus regarding suitable measures of supply chain quality performance, and commonly implemented supply chain measurements are fragmented and virtually unknown [37]. Since many measurement systems lacked strategy alignment, a balanced approach and systemic thinking, they have difficulty in systematically identifying the most appropriate metrics [31]. The work of [31] also states that these measurement systems do not provide a definite cause-effect relationship among numerous and hierarchical individual KPIs. The fact that 'since many measurement systems are static, they lag the trend' is also mentioned. The importance of hierarchy and dependence among different KPIs are highlighted [38].

Below is a list of desirable characteristics of SCPM derived from different sources [34] [39] [40] [41]. Some of these apply to all measures and some apply to a limited number of a firm's measures. It is also very difficult to fulfil all requirements suggested in literature when designing a PMS [40]. A firm's performance measures should:

- Be simple and easy to use.
- Have a clear purpose.
- Provide fast feedback.
- Relate to performance improvement, not just monitoring.
- Reinforce the firm's strategy.
- Relate to both long-term and short-term objectives of the organization.
- Match the firm's organization culture.
- Not conflict with one another.
- Be integrated both horizontally and vertically in the corporate structure.
- Be consistent with the firm's existing recognition and reward system.
- Focus on what is important to customers.
- Focus on what the competition is doing.
- Lead to identification and elimination of waste.
- Help accelerate organizational learning.

- Evaluate groups not individuals for performance to schedule.
- Establish specific numeric standards for most goals.
- It must reflect relevant non-financial information based on key success factors of each business.
- It must make a link to reward systems
- The financial and non-financial measures must be aligned and fit within a strategic framework.

Traditionally, companies have tracked performance based largely on financial accounting principles, many which date back to the ancient Egyptians and Phoenicians. Financial accounting measures are certainly important in assessing whether or not operational changes are improving the financial health of an enterprise, but insufficient to measure supply chain performance for the following reasons:

- The measures tend to be historically oriented and not focused on providing a forward- looking perspective.
- The measures do not relate to important strategic, non-financial performance, like customer service/loyalty and product quality.
- The measures do not directly tie to operational effectiveness and efficiency.

The traditional and innovative performance measurement (PMS) have been compared [42], indicating the changes required over the traditional performance measurement systems. The comparison is shown in Table 1.

Table 1. Comparison of traditional v/s innovative PMS

Traditional PMS	Innovative PMS
Based on cost/efficiency	Based on value
Trade-off between performances	Compatibility of performances
Profit oriented	Client oriented
Short term orientation	Long term orientation
Individual metrics prevail	Team metrics prevail
Functional metrics prevail	Transversal metrics prevail
Comparison with the standard	Monitoring of improvement
Aimed at evaluation	Aimed at evaluation and involvement

Source: [42].

Performance measurement is very important and is the only approach to understand whether process performance is improving or worsening and whether correction action is needed urgently [43]. Metric in performance measurement is a number for measuring and reporting a key performance indicator for business, department, team, product line and individual. Performance measurements metrics could be customer satisfaction, product quality, delivery precision and cost reduction.

It is important to measure performance [23] because it:

- (1) Provides required direction and helps in setting priorities
- (2) Gauges and monitors progress
- (3) Focuses on key issues
- (4) Identifies areas acquiring attention for groups and individuals
- (5) Helps to communicate key issues and results
- (6) Measures and rewards people and teams.

A large number of different types of performance measures have been used to characterize systems, particularly production, distribution, and inventory systems. Such a large number of available performance measures makes performance measure selection difficult [39]. These frameworks all have their relative benefits and limitations, with the most common limitations being that little guidance is given for the actual selection and implementation of selected measures [44]. Businesses rarely want to design PMS from scratch and usually managers are interested in eliminating any weaknesses in their existing system [45]. Although there were many practical implementations of these models and frameworks, literature based on systematic empirical research on the implementation of PMS was scarce [46] [47].

In response to some of these deficiencies in traditional accounting methods for measuring supply chain performance, a variety of measurement approaches have been developed (Table 2).

Table 2. List of Performance Measurement Models

Name of the model	Period of introduction
The ROI, ROE, ROCE and derivatives The economic value added model (EVA)	Before 1980s
The activity based costing (ABC) – the activity based management	1980-1990

(ABM,1988) The strategic measurement analysis and reporting technique (SMART,1988) The supportive performance measures (SPA,1989) The customer value analysis (CVA,1990) The performance measurement questionnaire (PMQ,1990)	
The results and determinants framework (RDF,1991) The balanced scorecard (BSC,1992) The service-profit chain (SPC,1994) The return on quality approach (ROQ,1995)	1991-1995
The Cambridge performance measurement framework (CPMF,1996) The consistent performance measurement system (CPMS,1996) The integrated performance measurement system (IPMS,1997) The comparative business scorecard (CBS) The integrated performance measurement framework (IPMF,1998) The business excellence model (BEM,1999) The dynamic performance measurement system (DPMS,2000)	1996-2000
The action-profit linkage model (APL,2001) The manufacturing system design decomposition (MSDD,2001) The performance prism (PP,2001) The performance planning value chain (PPVC,2004) The capability economic value of intangible and tangible assets model (CEVITA,2004)	2001-2004
The performance, development, growth benchmarking system (PDGBS,2006) The unused capacity decomposition framework (UCDF,2007)	2006-2007

Source : [48]

Many researchers have proposed new performance measures and metrics considering the changes in markets and enterprise environments. However, there are some confusion surrounding those measures and

metrics regarding their importance and specific areas of application in SCM systems. The use of new emerging metrics defined in five categories has been suggested: external, consumer, value-based competition, network performance, and intellectual capital [30]. The companies that have outperformed their competitors are found to be superior in four key operational areas: (1) delivery performance; (2) flexibility and responsiveness; (3) logistics costs; and (4) asset management [49].

A study based on a survey of 22 firms' SC systems, concluded that SC partners do not share a common vision of or react to the same set of metrics [50]. Recently, many research papers that deal with performance measurement in a SC context [27] have appeared in the literature. However, most of them are prescriptive and not based on historical facts and their analysis and changing market and operations environments or well grounded empirical analysis. In addition, they lack a complete coverage of all the performance measures and metrics in new enterprise environments considering different levels of decision-making. An overview of PMSs in SCMs environments highlights the justification for the selection of suitable metrics based on the current and emerging new enterprise environments.

There are not many review articles on performance measures and metrics in logistics and supply chain. An overview and evaluation of the performance measures used in SC models is presented and also a framework for the selection of PMSs for manufacturing SCs has been proposed [39]. Three types of PMs are identified as necessary components in any supply chain PMSs, viz., resources, output and flexibility. Another study suggested that traditional models for PM should be separated from more innovative non cost measures such as the time, quality and flexibility [51].

3. Proposed Conceptual Model

There is a model to examine relationship between supply chain performance and degree of linkage among supplier, internal integration and customer [52]. In line with this knowledge, the researchers propose that a model for manufacturing companies can be developed

using co-relational links between SCM performance and its determinants.

The authors are forwarding related hypotheses on the proposed relationship between the variables and a conceptual model is also proposed. The review of theoretical and empirical literature indicates that the above issues have been widely studied. However, to the best of the authors' knowledge, none of the previous studies had attempted to include all the six determinants of SCM performance, namely, the relationships with supplier-buyer relations, external supply chain, environmental factors, information sharing, performance measurement approaches and SC performance measurement into a single study. The framework of the proposed conceptual model is given below.

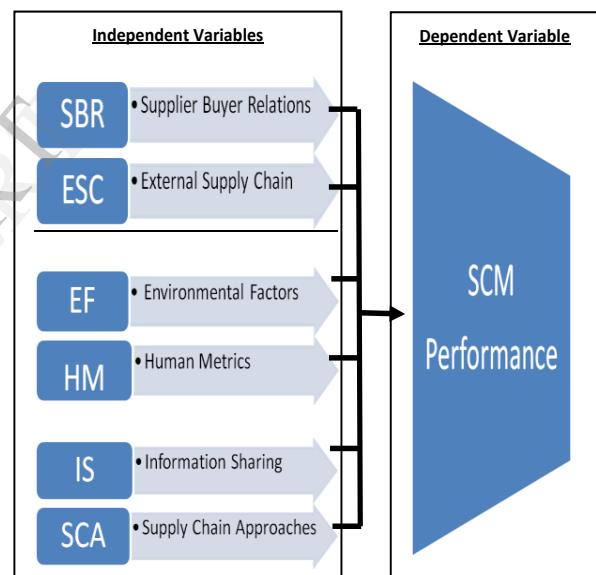


Figure-1. A proposed conceptual model

4. Methodology

Methodology used in this study is based on the views of [39] and [53], that are, PMS should develop a reliable metrics to provide feedback on various performance areas by eliminating the overlapping (duplication) metrics and to include the most important metrics of logistics and supply chain management. [39] has focused on the major metrics such as time, resource utilization, output and flexibility to provide a context for developing more detailed performance measures and metrics in new enterprise environments.

The sample of this pilot study focuses on departments of purchasing, production, logistics and distribution in the Indian manufacturing companies. Questionnaire (both online and offline) are the main instruments of this study. Questionnaire items are designed after an extensive literature review. 5–point Likert scale was used. There are total 21 items (excluding the demographic items).

Questionnaire is emailed to various responded and out of 108 responses which are received, 100 responses are complete in all respects and therefore taken for this pilot study. Factor analysis is performed on each construct using SPSS to reduce unnecessary items from the questionnaire and reliability analysis is also done to test how well the items in a set are positively correlated to one another.

5. Results

The factor analysis reduces total number of items from 21 to 7. The summary of items before and after the factor analysis is shown as below (Tables 3 and 4).

Table 3. Initial Items

S.No.	Items	Details
1	SPA1	Sales
2	SPA2	Cash flow
3	SPA3	Profit / Sales
4	SPA4	Quality of accounting policies
5	SPA5	Customer complaints
6	SPA6	Percent of missed delay rates
7	SPA7	Customer Surveys
8	SPA8	Percent of products rejected by quality control
9	SPA9	Manufacturing cycle time
10	SPA10	Capacity utilization
11	SPA11	Safety record
12	SPA12	Absentee rates
13	SPA13	Employee training
14	SPA14	Customer diversification
15	SPA15	Percent of sales from proprietary products
16	SPA16	Environmental policies implemented
17	SPA17	Community involvement
18	SPA18	Experience/reputation of management

19	SPA19	Continuity of management
20	SPA20	Number of new products (last three years)
21	SPA21	Percent of sales due to new products

Table 4. Final Items

S. No.	Items	Initial	Extraction
1	SPA4	1.000	.638
2	SPA7	1.000	.536
3	SPA10	1.000	.655
4	SPA12	1.000	.626
5	SPA15	1.000	.815
6	SPA16	1.000	.334
7	SPA17	1.000	.655
Extraction Method: Principal Component Analysis			

The overall scale was tested for reliability. The internal consistency reliability will be higher if the Cronbach's alpha is closer to 1 [54]. The final questionnaire shows the value of Cronbach's alpha as 0.778, which is acceptable (Table-5).

Table 5. Reliability Scores

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.778	.777	7

6. Conclusions

The supply chain management term leaves it open to interpret a supply chain by different forms of customer-supplier relations. Obviously, there is no unique way to define the roadmap towards an optimal supply chain performance measurement. The presented methodology provides logistical networks with an innovative instrument to design a supply-chain-wide balanced performance measurement.

The proposed model provides co-relational link amongst relationships with supplier-buyer relations, external supply chain, environmental factors, information sharing, performance measurement approaches and SCM performance. The authors' intention is to fill up the gap about the lack of research in supply chain management which investigates the role of critical success factors in manufacturing organizations of India. Furthermore, the study to be carried out resulting from the proposed model is expected to investigate the critical success factors that contribute to the SCM performance in order to increase the competitive advantage of the Indian manufacturing organizations.

The real challenge for managers is to develop suitable performance measures and metrics to make right decisions that would contribute to an improved organizational competitiveness. Now the question is whether traditional performance measures can be used and out of them which ones should be given priority for measuring the performance in a new enterprise environment. It is also intended, to highlight the justification for the selection of appropriate metrics that would help managers with the right information at the right time in order to make decisions to enhance the organizational competitiveness. However, the scope of this study is limited only to select manufacturing organizations in India. It can be further extended to other organizations.

References

- [1] CIMA (2010). CIMA (Chartered Institute of Management Accountants) Sector Report. The global manufacturing sector: current issues. Retrieved Mar 2, 2012 from www.cimaglobal.com.
- [2] KPMG (2013). A survey report on manufacturing sector. Retrieved Apr 8, 2013.
- [3] PRTM (2008). Global Supply Chain Trends 2008 - 2010: Driving Global Supply Chain Flexibility through Innovation (Sixth Annual Survey). Retrieved Aug 10, 2011 from <http://www.prtm.com>.
- [4] Dangayach, G. and Deshmukh, S. Evidence of manufacturing strategies in Indian industry: A survey. *International Journal of Production Economics*, 83, 2003, pp. 279-298.
- [5] Gunasekaran, A., Patel, C. and McGaughey, R. A framework for supply chain performance measurement. *International Journal of Production Economics*, 87 (3), 2004, pp. 333-347.
- [6] Clegg, C. W., Wall, T. D., Pepper, K., Stride, C., Woods, D., Morrison, D., et al. An international survey of the use and effectiveness of modern manufacturing practices. *Human Factors & Ergonomics in Manufacturing*, 12, 2002, pp. 171-191.
- [7] Chen, J., Paulraj, A., Lado, A. Inter-organizational communication as a relational competency: antecedents and performance outcomes in collaborative buyer-supplier relationships. *Journal of Operations Management* 26 (1), 2008, pp. 45-64.
- [8] Wouters, M. A developmental approach to performance measures – results from a longitudinal case study. *European Management Journal*, 27 (1), 2009, pp. 64-78.
- [9] Tony, W. and Kevin, H. The human factors in managing China supply chain. 92nd Annual International Supply Management Conference. May 2007, pp. 1-6.
- [10] Akyuz, G.A. and Erkan, T.E., Supply chain performance measurement: a literature review. *International Journal of Production Research*, 48 (17), 2010, pp. 5137-5155
- [11] Maskell, B., Performance measures of world class manufacturing. *Manag. Account.*, 1989, 67, pp. 32-33.
- [12] Gunasekaran, A., and Kobu. Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995-2004) for research and applications. *International Journal of Production Research*, 45 (12), 2007, pp. 2819-2840.
- [13] Christopher, M. *Logistics and supply chain management: Strategies for reducing cost and improving service*. 2nd ed. London: Pitman, 1998.
- [14] Ballou, R. H., Gillbert, S. M., and Mukherjee, A. New Managerial Challenge from Supply Chain Opportunities. *Industrial Marketing Management*, 29, 2000, pp. 7-18.
- [15] Cooper, M.C., Lambert, D.M., and Pagh, J.D. Supply chain management: more than a new name for logistics. *The International Journal of Logistics Management*, 8 (1), 1997, pp 1-14.
- [16] Lambert, D. M. and Cooper, M. C. Issues in Supply Chain Management. *Industrial Marketing Management*, 29, 2000, pp. 65-83.
- [17] Larson and D. S. Rogers. Supply chain management: definition, growth and approaches, *Journal of Marketing Theory and Practice*, 6, 1998, pp. 1-5.
- [18] Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., and Rao, S. Subba. The Impact of Supply Chain Management Practices on Competitive Advantage and Organizational Performance, *Omega*, 34(2), 2006, pp. 107-124.
- [19] Donlon, J.P. Maximizing value in the supply chain. *Chief Executive*, 117, 1996, pp. 54-63.
- [20] Bowersox, D.J., Closs, D.J., Stank, T.P. *21st Century Logistics: Making Supply Chain Integration a Reality*. Michigan State University, Council of Logistics Management, 1999.
- [21] Lummus, R. R and Vokurka, R. J. Defining supply chain management: A historical perspective and practical guidelines. *Industrial Management & Data Systems*, 99(1): 1999, pp. 11-17.
- [22] Cox, A., Ireland, P., Lonsdale, C., Sanderson, J. and Watson, G. *Supply chain management: A guide to best practice*. Great Britain: Pearson Education Limited, 2003

- [23] Ayers, J. B., Handbook of supply chain management. United States of America: CRC Press, 2001.
- [24] McAdam, R. and McCormack, D., Integrating business processes for global alignment and supply chain management. *Business Process Management*, 2001, 7, pp. 113–130.
- [25] Kaplan R. S. and Norton D. P. The Balanced Scorecard – Measures That Drive Performance, *Harvard Business Review*, Jan-Feb 1992 issue.
- [26] Lee, R.G. and Dale, B.G., Business process management: a review and evaluation. *Business Process Re-engineering Management Journal*, 4, 1998, pp. 214–225.
- [27] Van Hoek, R.I., Measuring and improving performance in the supply chain. *Supply Chain Management*, 3, 1998, pp. 187–192.
- [28] Bechtel, C. and Jayaram, J., Supply chain management: A strategic perspective. *International Journal of Logistics Management*, 8, 1997, pp. 15–34.
- [29] Scapens, R.W., Management accounting and strategic control, implications for management accounting research. *Bedrijfskunde*, 70, 1998, pp. 11–17.
- [30] Basu, R., New criteria of performance measurement. *Measuring Business Excellence*, 5/4, 2001, pp. 7–12.
- [31] Cai, J., Liu, X. D., Xiao, Z. H. and Liu, J. Improving supply chain performance management: A systematic approach to analyzing iterative KPI accomplishment, *Decision Support System*, 46(2), 2009, pp. 512.
- [32] Liang, L., Yang, F., Cook, W. D, and Zhu, J. DEA models for supply chain efficiency evaluation. *Springer Science + Business Media*, 145, 2006, pp. 35–49.
- [33] Shepherd, C. and Gunter, H. Measuring supply chain performance: Current research and future directions. *International Journal of Productivity and Performance Management*, 55(3/4): 2006, pp. 242–258.
- [34] Gunasekaran, A., Patel, C. and Tirtiroglu, E. Performance measures and metrics in a supply chain environment. *International Journal of Operations & Production Management*, 21(1/2): 2001, pp. 71–87.
- [35] Gunasekaran, A., Williams, H. J., & McGaughey, R. E. Performance measurement and costing system in new enterprise. *Technovation*, 25(5), 2005, pp. 523–533.
- [36] Ho, C. Measuring system performance of an ERP-based supply chain. *International Journal of Production Research*, 45(6), 2007, pp. 1255–1277.
- [37] Robinson, C.J. and Malhotra, M.K. Defining the concept of supply chain quality management and its relevance to academic and industrial practice. *International Journal of Production Economics*, 96 (3), 2005, pp. 315–337.
- [38] Hwang, Y., Lin, Y., and Lyu Jr, J. The performance evaluation of SCOR sourcing process –the case study of Taiwans TFT-LCD industry. *International Journal of Production Economics*, 115 (2), 2008, pp. 411–423.
- [39] Beamon, B. M. Measuring supply chain Performance. *International Journal of Operations & Production Management*, 19 (3), 1999, pp. 275–292.
- [40] Tangen, T. Insights from research: Improving the performance of a performance measure. *Measuring Business Excellence*, 9 (2), 2005, pp. 4–11.
- [41] Thakkar, J., Deshmukh, S.G, Gupta, A.D., and Shankar, R. Development of a balanced scorecard: An integrated approach of Interpretive Structural Modeling and Analytic Network Process. *International Journal of Productivity and Performance Management*, 56 (1), 2007, pp. 25–59.
- [42] McCormack, K., Ladeira, M.B., and Oliviera, M.P. Supply chain maturity and performance in Brazil. *Supply Chain Management: an International Journal*, 13 (4), 2008, pp. 272–282.
- [43] Roussel, J. and Cohen, S. Strategic supply chain management: The 5 disciplines for top performance. United States of America: The McGraw-Hill Companies, 2005.
- [44] Medori, D., and Steeple, D. A framework for auditing and enhancing performance measurement systems. *International Journal of Operations & Production Management*, 20 (5), 2000, pp. 520–533.
- [45] Neely A, Powell S. The challenges of performance measurement. *Management Decisions*. 42(8), 2004, pp. 1017–1023.
- [46] Neely A, Mills J, Platts K, Richards H, Gregory M, Bourne M, Kennerley M. Performance measurement system design: developing and testing a process-based approach. *International Journal of Operations and Production Management*, 20(10), 2000, pp. 1119–1145.
- [47] Bourne M., Mills J., Wilcox M., Neely A. and Platts K. Designing, implementing and updating performance measurement systems. *International Journal of Operations and Production Management*, 20 (7), 2000, pp. 754–771.
- [48] Morgan, C. Structure, speed and salience: performance measurement in the supply chain. *Business Process Management Journal*, 10 (5), 2004, pp. 522–36.
- [49] Stewart G. Supply chain performance benchmarking study reveals keys to supply chain excellence. *Logistics Information Management*, 8 (2), 2005, pp. 38 – 44.
- [50] Spekman, R. E., Kamauff, J. W. and Myhr, N. An empirical investigation into supply chain management: A perspective on partnerships. *Supply Chain Management: An International Journal*, 3(2): 1998, pp. 53–67.
- [51] De Toni, A. and Tonchia, S., Performance measurement systems. *International Journal of Operations and Production Management*, 21, 2001, pp. 46–70.
- [52] Lee, C. W., Kwon, I. G. and Severance, D. Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer. *Supply Chain Management: An International Journal*, 12(6): 2007, pp. 444–452.
- [53] Dumond E. J. Applying value-based management to procurement. *International Journal of Physical Distribution & Logistics Management*, 26 (1), 1996, pp. 5 - 24
- [54] Sekaran, U. *Research methods for business: A skill-building approach*. Canada: John Wiley & Sons, 2003.