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Just in time, total quality management, and supply chain management: understanding their linkages and impact on business performance

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Abstract

In recent years, numerous approaches have been proposed to improve operations performance. Three in particular, just in time, supply chain management, and quality management, have received considerable attention. While the three are sometimes viewed and implemented as if they were independent and distinct, they can also be used as three prongs of an integrated operations strategy. This study empirically examines the extent to which just in time, supply chain management, and quality management are correlated, and how they impact business performance. Results demonstrate that at both strategic and operational levels, linkages exist between how just in time, total quality management, and supply chain management are viewed by organizations as part of their operations strategy. Results also indicate that a commitment to quality and an understanding of supply chain dynamics have the greatest effect on performance.

Keywords: Just in time; Quality management; Supply chain management; Empirical research

1. Introduction

Numerous operations paradigms, initiatives, and practices have emerged in recent years in response to competitive pressures calling for improved product quality, increased responsiveness, and shorter lead times, but at lower cost. Three that have received particular attention in both academic and practitioner circles are just in time (JIT), total quality management (TQM), and supply chain management (SCM). The JIT philosophy advocates the elimination of waste by simplifying production processes. Reductions in setup times, controlling material flows, and emphasizing preventive maintenance are seen as ways by which excess inventories can be reduced or eliminated, and resources utilized more efficiently. The TQM movement calls for developing and implementing a corporate wide culture emphasizing customer focus, continuous improvement, employee empowerment, and data driven decision-making. Aligning product design with customer expectations, and focusing on quality at all stages of development and production processes, are seen as drivers of improved product quality and in turn improved business performance. SCM calls for the integration of buyers' and suppliers' decision-making processes with the goal of improving material flow throughout the supply chain. Effective management of the supply chain is viewed as the driver of reductions in lead times and material costs, and improvements in product quality and responsiveness.

JIT, TQM, and SCM represent alternate approaches to improving the effectiveness and efficiency of an organization's operations function. While differences in their moti-

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vations and objectives have sometimes led to them being presented as being distinct and separate, it is short sighted to view them as being unrelated. Both JIT and SCM seek improvements in quality, the former by way of improvements in production processes, the latter by integrating development and production processes throughout the supply chain. Successful JIT implementation depends on the coordination of production schedules with supplier deliveries, and on high levels of service from suppliers, both in terms of product quality and delivery reliability. This requires the development of close relations with suppliers and the integration of production plans with those of suppliers. It can be surmised that while the three approaches have certain defining characteristics, they represent elements of an integrated operations strategy. Snell and Dean [1] indeed found it hard to distinguish between JIT and TQM since the two have common elements. The concept of an integrated operations strategy incorporating elements of different but complementary manufacturing practices and strategies is not new [2–4]. 'Important strategic potential' exists from the use of integrated management, the adoption of advanced manufacturing technology in conjunction with JIT and quality management methods [5]. 'Streamlined flow of automated value added activities, uninterrupted by moving, storage, or rework' has also been claimed to be consistent with enabling goals of improvement and cost reduction to be achieved simultaneously [1].

While the idea of incorporating elements of different operations paradigms into a unified operations strategy is not without merit, only limited empirical evidence exists of the impact of such a strategy on performance. Flynn et al. [6] demonstrated that JIT and TQM practices are mutually supportive, and that their synergy contributes positively to manufacturing performance. They also found that common infrastructure factors positively influence performance. Nakamura et al. [7] also demonstrated that both JIT and TQM are necessary to improve manufacturing performance, though TQM had a stronger and more consistent impact on performance. In contrast, Dean and Snell [5] showed that while quality management methods affect performance, JIT practices do not. Sakakibara et al. [8] suggested that JIT practices affect performance only by virtue of the strategic, quality focused infrastructure needed to support them. Tan et al. [9] suggested that TQM must be implemented in conjunction with attempts to rationalize the supplier base to achieve benefits in business performance.

The apparent linkages between JIT, TQM, and SCM strategies and practices raise two questions yet to be addressed, namely which specific elements of JIT, TQM, and SCM strategies are consistent with each other, and how do they influence a firm's business performance. The objective of this study is to answer these questions. The remainder of this paper is organized as follows. The next section summarizes the literature on JIT, TQM, and SCM with particular reference to their effect on performance. Details of the survey methodology and statistical analysis are then presented, followed by discussion of the results and their implications.

2. Literature review

2.1. Just in time

Since its introduction in the English language literature [10] and early articles on its core elements such as setup time reduction, small lot production, the use of kanbans, level production scheduling, and preventive maintenance [3,4,11], numerous studies have examined issues related to the implementation of JIT. These include the relationship of JIT to other manufacturing practices [12,13], vendor and customer relations [14–17], and JIT implementation [18–23]. The impact of JIT strategy on performance, and in particular manufacturing performance, has also been the subject of a number of studies. These have consistently found the use of JIT methods to be consistent with gains in inventory [7,24–27], quality [7,21,25,28], and throughput [6,7,21,25,28,29] performance. Several studies have also found evidence of improved business performance associated with the use of JIT methods. Gains in both financial [24–27,30], and market performance [26,30] have been observed.

2.2. Quality management

While the TQM literature base is extensive, until recently, much of it has been descriptive or anecdotal in nature [31] and of little help in guiding the deployment of quality management programs. Not until the late 1980s was an attempt made to identify the underlying constructs of quality management [32]. Within the last several years however, several studies have examined linkages between quality and performance. Anderson et al. [33] identified visionary leadership, internal and external cooperation, process management, and employee fulfillment as key constructs of quality management. Moreover, they demonstrated that these constructs are drivers of customer satisfaction. Similar constructs have been identified in other studies and been shown to positively affect product quality [34,35] and broader measures of manufacturing performance [31,36]. Evidence of the impact of quality management practices on business performance is more limited [37–39]. Wilson and Collier [40] demonstrated that the underlying premise of the Malcolm Baldrige National Quality Award [41] that leadership drives the quality management system, which drives business performance, is valid. Studies have also shown that the MBNQA framework not only provides a valid representation of constructs generally referred to under the label TQM [42], but that the constructs are consistent with those found in other studies [43].

2.3. Supply chain management

While several definitions of supply chain management have been proposed [44], an underlying thread is the integration of processes throughout the supply chain with the goal of adding value to the customer. Despite the fact that this suggests the need to integrate transportation, logistics, and purchasing functions with manufacturing processes, in practice and in the literature, supply chain management has typically reflected either the management of logistics or the supply base. The logistics focus views SCM as the coordination of the logistics operations of firms in the value chain [45]. Pulling materials through the supply chain in response to demand patterns rather than pushing them in response to forecasts, allows organizations to respond to demand uncertainty more effectively, improve flows within the supply chain, manage inventory more effectively, and improve service levels [46–49]. This is synonymous with the concept of integrated logistics systems [50–52]. The supply focus is synonymous with rationalization and streamlining of the supply base, and integration of suppliers into product development and manufacturing activities. Managing the supply chain implies reducing and streamlining the supplier base to facilitate managing supplier relationships [53], developing strategic alliances with suppliers [54,55], working with suppliers to ensure that expectations are met [56], and involving suppliers early in the product development process to take advantage of their capabilities and expertise [57,58]. It reflects growing recognition that outsourcing non-core activities and focusing on core competencies allows firms to not only better utilize their own resources and remain more flexible and responsive to changing needs, it allows them to exploit the capabilities, expertise, technologies, and efficiencies of their suppliers.

Both the logistics and supply management literature provide evidence of the impact of SCM practices on performance. The logistics literature suggests that inter-firm coordination [59–61], functional integration, for example of logistics or purchasing functions [59], a customer focused logistics strategy [59,61], and the management of logistics as an integrated activity [61] are all positively associated with operational performance. From the supply perspective, supplier development [62], supplier partnerships [62,63], supplier involvement [64], and strategic sourcing [65] all positively influence the buying firm's operational performance. In addition, supplier partnerships [9], supplier development [66], and supply chain flexibility [67], all positively impact the buying firm's business performance.

3. Survey methodology

Firms adopt operations strategies not only to improve operations performance, but to use these improvements to drive broader measures of business performance. However, while it is apparent that JIT, TQM, and SCM practices and strategies independently impact operational performance, how they interact and how they impact business performance is not as well understood. To aid in understanding these issues, an empirical study was carried out. In addition to a review of the literature, discussions with practitioners, and company manuals were used to identify practices commonly associated with JIT, TQM, and SCM. Eleven JIT, 18 TQM, and 18 SCM practices were identified (Appendix A). Five commonly used measures of financial, market, and product performance, were also identified (Appendix A). For each item, a five point Likert scale (5 = high) was developed seeking information on the importance the responding firm placed on the item in its operations efforts, or in the case of performance measures, performance relative to that of major competitors. Questions were worded with a view to achieving a high degree of content validity and to reducing the risk of common method bias. The instrument was pre-tested by 30 senior purchasing and materials managers, and where necessary questions re-worded. The target population for the study was senior operations and materials managers in North America and Europe. Institute for Supply Management (ISM) and American Production and Inventory Control Society (APICS) membership lists were used to identify target respondents.

Five hundred and fifty-six usable surveys were returned. Firms varied in size from 10 to 200,000 employees (median = 250), and had annual sales of between $20,000 and $30 billion (median = $30 million). t tests of responses to a number of randomly selected questions as well as the size of responding firms indicated that responses from North America and Europe were homogeneous and could thus be combined. Similar tests were carried out to compare responses from early and late arriving surveys to establish whether non-response bias was an issue [68,69]. These indicated the absence of non-response bias. To ensure that items used to operationalize JIT, TQM, SCM, and performance measured the corresponding construct consistently, and were free of measurement error, reliability analysis was carried out using Cronbach's α [70]. While analysis did suggest that some items be dropped, values of α in excess of 0.70 for the resulting scales indicated that they were reliable [71] (Table 1).

4. Statistical analysis

4.1. Factor analysis

Factor analysis was carried out to reduce the JIT, TQM, and SCM scales to a smaller number of underlying factors. Principal Components Analysis was used to identify factors with eigenvalues of at least one [72], and Varimax rotation was used to obtain more easily interpretable factor loadings. In the interests of convergent and

Table 1
Reliability analysis

Scale	Items	α	Notes
Just-in-time	11	0.866	Item 10 was dropped resulting in a value $\alpha = 0.867$.
Total quality management	18	0.892	Items 1 and 15 were dropped resulting in a value $\alpha = 0.896$
Supply chain management	18	0.886	Item 3 was dropped resulting in a value $\alpha = 0.888$
Performance	5	0.724	

Table 2
Factor analysis—JIT

Factor	Scale item	Factor loading
JIT 1: material flow	Reducing lot size	0.794
	Reducing setup time	0.756
	Increasing delivery frequency	0.680
	Buying from JIT suppliers	0.533
JIT 2: commitment to JIT	Increasing JIT capabilities	0.833
	Helping suppliers increase their JIT capabilities	0.814
	Selecting suppliers striving to promote JIT principles	0.565
JIT 3: supply management	Selecting suppliers striving to eliminate waste	0.832
	Reducing supplier base	0.579
	Preventive maintenance	0.551

Table 3
Factor analysis—TQM

Factor	Scale item	Factor loading
TQM 1: product design	Modular design of component parts	0.844
	Using standard components	0.774
	Simplifying the product	0.719
	Designing quality into the product	0.637
	Considering manufacturability and assembly in product design	0.631
TQM 2: strategic commitment to quality	Employee training in quality management and control	0.830
	Empowerment of shop operators to correct quality problems	0.807
	Top management communication of quality goals to the organization	0.780
	Emphasizing quality instead of price in supplier selection	0.555
TQM 3: supplier capability	Considering commitment to quality in supplier selection	0.780
	Considering process capability in supplier selection	0.746
	Considering commitment to continuous improvement in supplier selection	0.694

discriminant validity, only items that had a factor loading of at least 0.50 and did not have a loading in excess of 0.40 on a second factor were retained [73]. The JIT scale yielded three factors, material flow, commitment to JIT, and supply management (Table 2). These factors explained 67% of total variance. Three TQM factors were obtained, product design, senior management commitment to quality, and supplier capability. The three explained 56% of total variance (Table 3). Four items (2, 4, 8, and 14) had factor loadings of less than 0.50 and were thus omitted. Four SCM factors were obtained reflecting supply chain integration, coordination, development, and information sharing (Table 4). The four explained 58% of total variance. Four items (1, 13, 15, and 18) had factor loadings less than 0.50 and were also omitted.

Table 4
Factor analysis—SCM

Factor	Scale item	Factor loading
SCM 1: supply chain integration	Seeking new ways to integrate supply chain management activities	0.845
	Improving integration of activities across supply chain	0.771
	Reducing response time across supply chain	0.751
	Establishing more frequent contact with supply chain members	0.622
	Creating compatible communication/info system for supply chain members	0.525
SCM 2: supply chain coordination	Communicating customers' future strategic needs throughout supply chain	0.733
	Communicating your future strategic needs to your suppliers	0.730
	Creating a greater level of trust among supply chain members	0.669
	Identifying additional supply chains where firm can establish a presence	0.535
SCM 3: supply chain development	Participating in sourcing decisions of suppliers	0.757
	Extending supply chain membership beyond immediate suppliers/customers	0.737
SCM 4: information sharing	Using formal information sharing with suppliers and customers	0.752
	Using informal information sharing with suppliers and customers	0.728

Table 5
Correlation analysis: JIT, TQM, SCM factors

	TQM1: product design	TQM2: strategic commitment to quality	TQM3: supplier capability	SCM1: supply chain integration	SCM2: supply chain coordination	SCM3: supply chain development	SCM4: information sharing
JIT1: material flow	0.418*	0.269*	0.046	0.221*	0.112	0.056	0.177*
JIT2: commitment to JIT	0.087	0.160*	0.087	0.192*	0.084	0.203*	0.121*
JIT3: supply management	0.351*	0.165*	0.422*	0.143*	0.334*	0.317*	0.187*
TQM1: product design				0.228*	0.217*	0.197*	0.178*
TQM2: strategic commitment to quality				0.089	0.210*	0.118*	0.107
TQM3: supplier capability				0.140*	0.270*	0.105	0.280*

*Denotes significant at $\alpha = 0.05$.

Table 6
Correlation analysis: performance

Factor	Market share	Return on assets	Product quality	Competitiveness	Customer service
SCM.1: supply chain integration	0.102	0.095	0.130*	0.117*	0.053
SCM.2: supply chain coordination	−0.042	−0.025	0.050	0.031	0.205*
SCM.3: supply chain development	0.028	0.070	0.117*	0.113*	0.067
SCM.4: information sharing	0.004	0.098	0.163*	0.130*	0.115*
JIT.1: material flow	0.110	−0.020	0.061	0.038	−0.003
JIT.2: commitment to JIT	0.047	0.050	0.094	0.038	0.068
JIT.3: supply management	−0.010	0.078	0.165*	0.025	0.154*
TQM.1: product design	0.011	0.033	0.122*	0.091	0.073
TQM.2: strategic com. to quality	0.136*	0.082	0.149*	0.170*	0.195*
TQM.3: supplier capability	0.004	0.077	0.129*	0.045	0.155*

*Denotes significant at $\alpha = 0.05$.

4.2. Correlation analysis

Bivariate correlation analysis was carried out to identify which JIT, TQM, and SCM factors correlate with each other (Table 5) and with measures of business performance (Table 6). In addition, correlation coefficients were examined to identify which triads of JIT, TQM, and SCM factors (i.e., JIT.1, TQM.1, SCM.1) exhibited significant

Table 7
JIT, TQM, SCM triads

JIT factor*	TQM factor*	SCM factor*
Material flow (1)	Product design (1)	Supply chain integration (1)
Material flow (1)	Product design (1)	Information sharing (4)
Commitment to JIT (2)	Strategic commitment to quality (2)	Supply chain development (3)
Supply management (3)	Product design (1)	Supply chain integration (1)
Supply management (3)	Product design (1)	Supply chain development (3)
Supply management (3)	Product design (1)	Information sharing (4)
Supply management (3)	Strategic commitment to quality (2)	Supply chain development (3)

*Figures in parentheses represent factor number.

correlations between all triad pairs (i.e., JIT.1–TQM.1, JIT.1 –SCM.1, TQM.1–SCM.1, Table 7).

5. Discussion

In seven of 36 cases, all correlations within a triad of JIT, TQM, and SCM factors were significant. Consistently significant correlations within the material flow (JIT.1), product design (TQM.1), and supply chain integration (SCM.1) and information sharing (SCM.4) triads demonstrate that working closely with supply chain partners and designing products with manufacturing needs in mind are consistent with efforts to streamline material flow. While a defining characteristic of JIT systems is the use of techniques such as setup time and lot-size reductions to improve material flow, these efforts can be facilitated by sharing schedule information with supply chain partners and linking systems to create an integrated material flow system. This goes beyond the first-tier suppliers often discussed in the context of JIT, to include supply chain partners further upstream and downstream. Product design is significant to this process since effective product design can reduce part production needs, further simplifying material flows. Involving suppliers at an early stage in the product development process is consistent with enhancing the product development process. This in turn helps to explain consistent significant correlations within the supply management (JIT.3), product design (TQM.1), and supply chain integration (SCM.1), supply chain development (SCM.3), and information sharing (SCM.4) triads. Managing the supply chain and working closely with suppliers is facilitated by rationalizing the supplier base and focusing on suppliers committed to the ideals of lean production.

The significant correlations between commitment to JIT (JIT.2), strategic commitment to quality (TQM.2), and supply chain development (SCM.3) is of particular interest. This provides evidence that at a strategic level, there is a relationship between JIT, TQM, and SCM. Whether this is the result of conscious reflection on the part of senior management or is an unplanned outcome cannot be concluded. However, even if the latter is true, it provides food for thought for those charged with developing operations strategy and deploying resources.

Closer examination allows conclusions to be drawn regarding the impact of specific JIT, TQM, and SCM practices. All JIT factors correlate significantly with a strategic commitment to quality (TQM.2), supply chain integration (SCM.1), and information sharing (SCM.4). While a quality strategy has many elements, the adoption of JIT methods is a means to achieve the strategy's goals at an operational level. The result also suggests that the use of a JIT strategy requires the alignment of internal goals and objectives with those of supply chain partners. This does not preclude the adoption of specific JIT practices independently of close supply chain relationships. For example, internal efforts to improve material flow by reducing setup times do not require, nor are they affected by, close supply chain relationships. However, if a broader JIT strategy is to be implemented, the needs and capabilities of supply chain partners must be compatible and supportive of internal JIT initiatives and vice versa.

All TQM factors correlate significantly with supply chain coordination (SCM.2) and supply management (JIT.3), and all SCM practices correlate with supply management (JIT.3) and design quality (TQM.1). These results are an indication of the importance to a quality strategy of effective supply base management and of ensuring that the supply chain is in fact responding to customer defined needs. It also provides further support for the need to involve supply chain partners in the product development process.

A strategic commitment to quality appears to be the most consistent driver of business performance, correlating significantly with all performance measure except return on assets. Information sharing (SCM.4) correlates significantly with three performance measures, and four factors, supply chain integration (SCM.1), supply chain development (SCM.3), supply management (JIT.3), and supplier capability (TQM.3) each correlate significantly with two performance measures. These results suggest that while a strategic commitment to quality has the greatest impact on performance of any individual factor, managing the supply chain is a major driver of performance. Of the six factors correlating significantly with at least two measures of performance, three are SCM factors, and two more are related to managing the supply chain. In contrast, neither of the two remaining JIT factors, material flow (JIT.1) and commitment to JIT (JIT.2) correlates significantly with performance. While this is consistent with the results of previous studies that suggest that JIT has limited if any effect on business performance [7,8], it would be short sighted to reach the conclusion that JIT practices are unimportant. As suggested by Snell and Dean [1], there is overlap between some JIT and TQM practices. This makes it difficult to isolate the specific contributions of JIT and TQM to performance. Moreover, focusing on business performance may have had the effect of precluding the influence of JIT from being fully appreciated. Including performance measures such as cycle time and inventory turnover may well have made the impact of JIT more evident.

Of the five performance measures considered, product quality was the most consistently affected by the 10 JIT, TQM, and SCM factors. Only three factors, supply chain coordination (SCM.2), material flow (JIT.1), and commitment to JIT (JIT.2) failed to correlate significantly with product quality. Customer service and competitiveness correlate significantly with five and four factors, respectively. Each of these factors again directly or indirectly reflects supply chain relations as well as a strategic commitment to quality. These results support one of the key arguments of SCM advocates, namely that aligning the objectives and capabilities of supply chain partners around a shared vision of customer focused value creation is a driver of product quality and the ability to meet customer needs. In contrast, market share and return on assets exhibit significant correlations with one and zero factors, respectively. The conclusion to be reached is that while JIT, TQM and SCM can impact measures of business performance over which the operations function has a large degree of control, they may not be good indicators of broader measures of financial and market performance. This is not to say that operations strategy does not affect these performance measures. Performance measures such as return on assets and market share are affected by a large number of non-operations related factors. This may have the effect of diluting operations factors' impact on these measures. It should however be noted that the only factor that does correlate with market share is a strategic commitment to quality.

6. Conclusions

Three conclusions can be drawn from this study. At a strategic level, linkages exist between JIT, TQM, and SCM. While some companies may understand the inherent relationships between the three and actively exploit their synergy, those that do not may be inadvertently achieving the benefits of synergy. By explicitly and effectively integrating JIT, TQM, and SCM practices into operations strategy, the potential exists to add value and to better position oneself to respond to competitive pressures. At an operational level, JIT, TQM, and SCM practices can be deployed together to create value. The extent to which various practices correlate with each other and with performance is evidence that while the three may have distinct characteristics and goals, there are elements of each that are common and which can be successfully reinforced by each other. Lastly, in addition to having a focus on quality, understanding supply chain relationships is a key driver of performance. Whether it is by coordination and integration of activities throughout the supply chain or by recognizing the capabilities of immediate suppliers, understanding supply chain dynamics has a significant impact on performance. As the trend towards outsourcing and focusing on core competencies increases, organizations will be under greater pressure to effectively leverage supplier and customer relationships. The results demonstrate that doing so be a significant driver of a firm's success.

Appendix A. Survey items and summary statistics

		Mean	Std. Dev.
A.	JIT		
1.	Reducing lot size	3.45	1.23
2.	Reducing setup time	3.71	1.24
3.	Reducing supplier base	3.48	1.11
4.	Preventive Maintenance	3.52	1.11
5.	Buying from JIT suppliers	3.25	1.15
6.	Increasing delivery frequency	3.62	1.09
7.	Reducing inventory to expose manufacturing and scheduling problems	3.47	1.25
8.	Increasing JIT capabilities	3.72	1.06
9.	Helping suppliers increase their JIT capabilities	3.46	1.13
10.	Selecting suppliers striving to eliminate waste	3.35	1.05
11.	Selecting suppliers striving to promote JIT principles	3.40	1.06

B.	Quality management		
1.	Inspection	3.92	1.09
2.	Using benchmark data	3.47	1.09
3.	Simplifying the product	3.29	1.14
4.	Statistical process control	3.50	1.20
5.	Using standard components	3.46	1.10
6.	Designing quality into the product	4.14	1.02
7.	Modular design of component parts	3.17	1.17
8.	Process improvement (modification of process)	4.04	0.98
9.	Employee training in quality management and control	3.97	0.99
10.	Empowerment of shop operators to correct quality problems	3.84	1.09
11.	Top management communication of quality goals to the organization	4.07	0.98
12.	Emphasizing quality instead of price in supplier selection	3.64	1.04
13.	Considering manufacturability and assembly in product design	3.48	1.20
14.	Using Quality Function Deployment in new product development	3.20	1.19
15.	Considering quality in supplier evaluation	4.69	0.60
16.	Considering commitment to quality in supplier selection	4.62	0.68
17.	Considering process capability in supplier selection	4.09	0.84
18.	Considering commitment to continuous improvement in supplier selection	4.08	0.93
C.	Supply chain management		
1.	Determining customers' future needs	4.43	0.84
2.	Participating in the sourcing decisions of your suppliers	2.86	1.18
3.	Participating in the marketing efforts of your customers	2.87	1.30
4.	Using informal information sharing with suppliers and customers	3.60	0.95
5.	Using formal information sharing agreements with suppliers and customers	3.66	1.02
6.	Improving integration of activities across supply chain	4.13	0.88
7.	Seeking new ways to integrate supply chain management activities	4.01	0.95
8.	Establishing more frequent contact with supply chain members	3.86	0.81
9.	Communicating your firm's future strategic needs to your suppliers	3.91	0.92
10.	Communicating customers' future strategic needs throughout supply chain	3.69	1.06
11.	Creating a greater level of trust among supply chain members	3.99	0.88
12.	Identifying additional supply chains where firm can establish a presence	3.31	1.07
13.	Creating supply chain mgt teams with members from different companies	2.97	1.12
14.	Reducing response time across supply chain	4.33	0.81
15.	Involving all members of supply chain in your product/service/marketing plans	3.41	1.07
16.	Extending supply chain membership beyond immediate suppliers, customers	2.87	1.14
17.	Creating compatible communication/info. system for supply chain members	3.64	1.10
18.	Considering willingness to integrate SCM. relationship in supplier selection	3.81	1.12
D.	Firm performance		
1.	Market share	3.85	0.96
2.	Return on assets	3.63	0.89
3.	Overall product quality	4.30	0.70
4.	Overall competitive position	4.04	0.77
5.	Overall customer service levels	4.04	0.78

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