

## **On differences in how operations and supply chain managers approach quality management**

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In this research, we administered surveys to operations and supply chain managers from different companies to better understand how they approached quality management. The underlying research question was whether the increased emphasis in supply chain management in the workplace had implications for how quality management is practiced and how quality-related values are emphasised. We found that those who identified themselves as supply chain managers utilised and emphasised quality tools and values to a greater extent than those who identified themselves as operations managers. The tools emphasised by supply chain managers included benchmarking, complaint resolution, design for the environment, ERP, supplier development, focus groups, and supply chain management. The primary theoretical implication of this study is that there exists an emerging field that we can term ‘supply chain quality’. This study provides a preliminary outline of the domain of this field.

*Keywords:* Supply chain quality; Quality management; Production management; Operations management; Supply chain management

### **1. Introduction**

Operations management researchers have long been interested in the contingencies and theories associated with quality management (Benson *et al.* 1991). Research streams have emerged investigating areas such as quality management and contingency theory (Foster 2006), the effects of quality practices on organisational performance (Kaynak 2003), and quality theory development (Anderson *et al.* 1994). In addition, the field of operations management has been heavily influenced by the related field of supply chain management (Flynn and Flynn 2005). This is evidenced by several major universities having replaced or supplemented operations management programs with supply chain management programs (Fawcett and Cooper 1998). The question then remains, with the movement of operations managers toward a stronger emphasis on supply chain management, what are the implications

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for quality management? Additionally, it can be asked, do operations managers and supply chain managers approach quality management differently?

According to the APICS dictionary (Cox and Blackstone 1998, p. 62), operations management is defined as 'the planning, scheduling, and control of the activities that transform inputs into finished goods and services'. Alternatively, the Institute for Supply Management defines supply chain management as 'a system management concept employed by some organisations to optimise the factors of material costs, quality, and service' (Raedels 2001, p. 224). Implicit in these definitions is the traditional focus of operations management on conversion processes (Hayes *et al.* 1988). However, increasing the operational emphasis on supply chain management focuses operational energies on the entire system of production, including upstream (suppliers and suppliers of suppliers) and downstream (intermediaries and customers) processes and flows.

Earlier supply chain literature has addressed quality-related concerns such as supplier development, supplier evaluation, and customer relationship management (Choi and Hartley 1996). In this paper, supply chain quality management refers to planning and direction associated with improving supply chain system performance. Often in the past, quality engineering has been criticised for being too internally oriented (Robinson and Malhotra 2005). A supply chain management emphasis necessitates externalising the outlook of those planning quality improvements. Granted, operations managers have long been encouraged to externalise their view of quality improvement by focusing on customers and developing suppliers (Choi and Hartley 1996). However, it is not clear if emphasising supply chain management will change how quality is viewed or practiced.

The purpose of this research is to study the relationship between supply chain and quality management to begin to construct an understanding of supply chain quality. First, we examine whether quality practices employed by supply chain managers differ from those of operations managers. Next, we look at the philosophical underpinnings of supply chain management to determine whether supply chain managers' perceptions of key quality concepts emphasised in the Malcolm Baldrige core values differ from those of operations managers. The fundamental research question is whether there are perceptual differences in how operations and supply chain managers approach quality management. This is an important issue as we will show that the supply chain and operations management literatures approach quality management differently. They also emphasise differing approaches. Among other things, we find that supply chain management professionals emphasise quality management values to a greater extent than do operations managers. Specific findings and their implications will be discussed in detail.

## **2. Literature review and hypothesis development**

### **2.1 *Quality management approaches***

Traditionally, quality management has been the domain of operations managers and has focused primarily on processes inside the organisation. Supply chain management, on the other hand, has been developed and championed by those in charge of

purchasing and logistics functions who spend much more of their time and energy dealing with external customers and suppliers. More recent definitions of operations management and supply chain management have started to show a merging of these two approaches: those who handle purchasing and logistics functions have gained a more quality-minded approach, and operations managers have increased their external focus on customer satisfaction (Mehta 2004). However, some authors have argued that this merging is still far from complete and that quality practices must advance even further from a traditional firm-centric and product-based mindset to an inter-organisational supply chain orientation involving customers, suppliers, and other partners (Robinson and Malhotra 2005).

Integrating quality and supply chain management can provide many positive outcomes for organisations and supply chains. Supply chain management practices can decrease production lead times, reduce costs, speed product development, increase quality (Davis 1993, Billington 1994) and play a role in the success of quality management initiatives (Carter and Narasimhan 1994). Working with suppliers and customers to implement quality management practices along the supply chain can lead to dramatic improvements in quality and significant reductions in costs (Doshi 2004). Levy *et al.* (1995) used the term 'total quality supply chain management' in discussing associated integration issues. Other authors have pointed out that organisational performance can be enhanced through improved supply chain quality management (Kuei *et al.* 2001). Trent and Monczka (1999) examined how purchasing and sourcing activities contributed to total quality and concluded that purchasing and supply chain managers can do much more to affect supplier quality than merely providing clear specifications and maintaining open communication. Specifically, they stated, 'the purchasing and sourcing process, often by working with other functional groups, has the opportunity to create competitive advantages through the execution of effective supplier quality practices. . . . Effective management must question what their sourcing managers are doing to develop and carry out plans that will result in world-class supply base performance.' Carter *et al.* (2000) found that firms with more successful TQM programmes were more likely than firms with less successful TQM programmes to stress formal performance evaluations of purchasing employees, involve purchasing employees in key decision-making processes, support purchasing employees who took risks, provide more TQM training to purchasing employees, and reward purchasing employees for individual goal attainment. Shin *et al.* (2000) found that a supply management orientation improves quality and delivery performance more than it improves cost or flexibility performance.

The improvement is not uni-directional, with only quality managers benefiting from supply chain management practices and concepts. Sanchez-Rodriguez and Hemsworth (2005) found that implementing quality management practices can have a positive impact on purchasing and business performance. So, it appears that while supply chain management can help quality management, quality management approaches can also help supply chain management performance.

Integrating quality management and supply chain management is not easily accomplished. The structure and culture of an organisation, reward systems, and the amount or lack of communication across functions have been identified as factors that inhibit or promote integration within the organisation (Pagell 2004). Theodorakioglou *et al.* (2006) found a significant positive correlation between

supplier management practices and total quality management practices. Quality has always been one of the most important performance criteria, even with a conventional purchasing strategy. As Dickson (1966) states, the ability to meet quality requirements is one of the three most critical determinants in choosing suppliers. Choi and Hartley (1996) found that a construct they labelled the 'consistency factor' (which includes conformance quality, consistent delivery, quality philosophy, and prompt response) to be the most important supply selection criterion in the supply chain. As Bessant (1990) points out, buyer-supplier relationships that were once based on price have shifted to a number of non-price factors, with quality in first position. Many buyer-supplier relationships have evolved into partnerships at the stage of product design and development. Bevan (1987) points out that as these supplier relationships evolve, the role and definition of quality will change.

In this literature review, we have focused on the relationships between supply chain and quality management approaches. The relationships between operations management and quality management have long been established (Grant and Leavenworth 1984). However, the primary differences between operations and supply chain management is best founded in the external versus internal orientation (Foster 2007). One would expect that there will be differences in quality tool adoption between operations and supply chain managers – primarily derived from the differences in focus. In this study, we examined a variety of tools to study differences in adoption. Hence, the following hypothesis:

*H<sub>1</sub>: Supply chain managers utilise quality management tools to a different extent than operations managers.*

## **2.2 Baldrige core values and concepts**

The Malcolm Baldrige National Quality Award honours US businesses who are outstanding performers. The Baldrige core values are a series of beliefs about quality management underlying the modern quality management practices (NIST 2007). 'These values are embedded beliefs and behaviors found in high-performing organisations. They are the foundation for integrating key performance and operational requirements within a results-oriented framework that creates the basis for action and feedback' (NIST 2007).

Vokurka and Lummus (2003) suggest that supply chains, like individual companies can benefit from an effective framework for performance improvement such as the Malcolm Baldrige National Quality Award Criteria and its underlying values. Vokurka and Lummus outline how each of the 11 interrelated core values of Baldrige criteria can be applied to supply chains. The core values of Baldrige provide a theoretical and practical foundation for quality practices (NIST 2007). That the Baldrige has been adopted in over 20 countries attests to its wide acceptance as an international model for performance enhancement. We focus on the Baldrige core values as they are values that have been exhibited by world-class, role model firms (NIST 2007). It is also important that these values support quality practices by providing a means for evaluating and validating these practices. In the following paragraphs, we discuss each of these core values separately. We will primarily emphasise these values from a supply chain perspective as they have already

been discussed from an operations perspective in other studies (Vokurka and Lummus 2003).

**2.2.1 Visionary leadership.** Visionary leadership is one of the constructs underlying the Deming-based definition of quality management (Anderson *et al.* 1994). Visionary leadership also plays a role in supply chain management (Wong 2001). Cooper and Ellram (1993) point out that the supply chain clearly needs to have leadership in order to develop and execute strategies. Other articles discuss different ways in which this supply chain leadership can take place (Cooper *et al.* 1997). Supply chain management research also discusses the benefits of and reasons for developing a competitive strategy and then connecting the strategies of purchasing and other functions to the main corporate strategy (Watts *et al.* 1992).

**2.2.2 Customer-driven excellence.** While customer satisfaction appears to be the end goal of many management approaches (Anderson *et al.* 1994, Flynn *et al.* 1994, Hackman and Wageman 1995, Choi and Eboch 1998), operations management has been criticised for its internal focus (Robinson and Malhotra 2005). Customer relationship management is one of the key business processes in the supply chain model (Scott and Westbrook 1991, Lambert and Cooper 2000). Due to their interactions with customers, those dealing with supply chain functions have been especially aware of the customer's needs, wants, and expectations and have played a key role in customer satisfaction.

**2.2.3 Organisational and personal learning.** The notions of learning, learning curves, or continuous improvement (at both the organisational and personal levels) have been associated with operations and quality management for a long time (Anderson *et al.* 1994, 1995, Hackman and Wageman 1995). Continuous improvement and learning are also an important component of supply chain management (Spekman *et al.* 2002, Bessant *et al.* 2003, Hult *et al.* 2003, Hyland *et al.* 2003, Kidd *et al.* 2003), especially in areas such as early supplier involvement in product development (Argote *et al.* 1990, Wasti and Liker 1999) and networks (Powell 1990).

**2.2.4 Valuing employees and partners.** Valuing employees and partners has been identified as one of the main constructs underlying the Deming-based definition of quality management (Anderson *et al.* 1994). Partnerships, strategic alliances, and cooperative relationships have also been identified as the main concepts of supply chain management (Ellram 1990, Carter and Narasimhan 1996, Lambert *et al.* 1996, Bechtel and Jayaram 1997, Cooper *et al.* 1997, Gulati 1998, Monczka *et al.* 1998).

**2.2.5 Agility.** Quick setups and flexible manufacturing have traditionally been part of the operations management function (Slack 1987, Scannell *et al.* 2000) and an integral part of quality management. Also, flexibility and the ability to adapt to constantly changing scenarios and environments has been a key element of supply chain management (Narasimhan and Das 2001, Krajewski *et al.* 2005,

Lummus *et al.* 2005, Zhang *et al.* 2005). Brewer and Speh (2000) list flexible response as one of the four main goals of supply chain management.

**2.2.6 Focus on the future.** Both operations management and supply chain management have a long-term focus. Quality management practices focus on long-term or continuous improvements in internal processes or procedures (Anderson *et al.* 1994, Alukal 2003, Talha 2004, Sower and Fair 2005). Supply chain management has traditionally been focused on long-term commitments to suppliers. Each member of the supply chain expects the relationship to continue for a considerable if not indefinite time period and that risks and rewards will be shared over the long term (Cooper and Ellram 1993, Lambert *et al.* 1996, Pearson *et al.* 1996). Supply chain management efforts are often geared toward developing future supplier capabilities rather than focusing only on current capabilities (Hahn *et al.* 1986, Ellram 1990, Watts and Hahn 1993). Supply chain management is also geared toward supporting the long-term strategy and goals of the organisation (Ellram and Carr 1994, Carr and Smeltzer 1997, Brewer and Speh 2000).

**2.2.7 Managing for innovation.** Innovation means making meaningful change to improve an organisation's products, services, programs, processes, and operations and creating new value for the organisation's stakeholders. Innovation is no longer strictly the purview of research and development departments; innovation is important for all aspects of an organisation (NIST 2007).

Some research has focused on the linkage between operations management and innovation (Plsek 1998, Tidd *et al.* 1997, Presley *et al.* 2000). Supply chain literature rarely mentions innovation other than discussing the impact that certain strategies such as single sourcing (Newman 1989) and alliances or partnerships (Granovetter 1978, Gomes-Casseres 1994) can have on supplier innovation or ways to structure the supply chain for innovative products (Fisher 1997). Therefore, it is not clear in the literature whether a movement towards SCM is related to greater emphasis on innovation.

**2.2.8 Management by fact.** Organisations depend on the measurement and analysis of performance. Performance measurement should include customer, product, and service performance; comparisons of operational, market, and competitive performance; supplier, employee, cost, and financial performance; and governance and compliance. Analysis refers to extracting larger meaning from data and information to support evaluation, decision making, and improvement. Benchmarking against competitors or 'best practices' is an important part of this core value (NIST 2007).

Performance measurement is emphasised equally in both the operations management and supply chain management literature. Both streams of literature acknowledge the importance of gathering, reporting, tracking, and monitoring performance. Also emphasised is the importance of benchmarking an organisation's metrics against best-in-class companies (NIST 2007).

**2.2.9 Social responsibility.** Carter (2004) defines purchasing's social responsibilities in terms of diversity (sourcing from minority- and women-owned business

enterprises) (Dollinger *et al.* 1991, Carter *et al.* 1999), environmental purchasing (Handfield *et al.* 1997, Min and Galle 1997, Narasimhan and Carter 1998, Carter and Dresner 2001), human rights issues in terms of selecting suppliers (Emmelhainz and Adams 1999), philanthropy/community, and safety. Therefore, the literature suggests that supply chain managers need to emphasise this Baldrige core value.

**2.2.10 Focus on results and creating value.** Supply chain management focuses on adding value to the customer. Supply chain management has been defined as ‘the integration of business processes from end user through original suppliers that provides products, services and information that add value for customers’ (Cooper *et al.* 1997). Many articles in the supply chain literature point out the importance of adding value to customers as well as to suppliers (Shank 1989, Scott and Westbrook 1991, Ellram 1996, Donelan and Kaplan 1998, Brewer and Speh 2000).

**2.2.11 Systems perspective.** Successful management of overall organisational performance requires looking at the organisation as a whole and at fully integrating individual components. Supply chain management is concerned with every process, from the original raw materials supplier to the final customer, and in many cases beyond (e.g. reverse logistics, recycling) (NIST 2007).

We are interested in seeing if there are differences in importance placed on the Baldrige core values between operations and supply chain managers. Therefore, we state Hypothesis 2:

*H<sub>2</sub>: There is a difference in importance placed on the Baldrige core values between operations and supply chain managers.*

### 3. Methods

The supply chain management and operations management data for this study were gathered by inviting participants to complete a Web-based survey. The survey items were developed in four parts. The first section of the survey was developed based on the core values of the Malcolm Baldrige National Quality Award. These values underscore much of the philosophical basis for modern quality management and are widely utilised. The items for the values were developed using seven-point Likert scales (strongly disagree, disagree, moderately disagree, neutral, moderately agree, agree, strongly agree) that allowed respondents to rank the extent to which they emphasised each of the values in the course of their work. It should be made clear that these values were not identified as Baldrige core values. They were only identified as quality management values.

The second section of the survey included seven-point Likert scales that allowed respondents to rank the extent to which they utilised various quality tools or approaches in their work. The items were drawn from the most commonly applied tools in quality management and tools that were selected from a supply chain quality literature review. The sources for the quality management tools included the two most widely adopted textbooks in quality management (Evans and Lindsay 2004, Foster 2007) as well as [www.iSixSigma.com](http://www.iSixSigma.com) and [www.FreeQuality.org](http://www.FreeQuality.org), two leading,

tools-oriented web sites. These lists of tools were submitted to a panel of six supply chain and quality managers to externally validate their inclusion. As a result, one tool was removed from the survey and two were added.

The survey was pre-tested with an MBA class ( $n=30$ ) in one of the authors' universities and with 12 members of a western United States Association for Operations Management (hereafter referred to as APICS) chapter. Cronbach alpha was computed with  $\alpha > 0.95$  for each of the items, providing evidence of internal content validity. Comments were received from the initial respondents. While some minor adjustments were made to the form of the survey, no items were added or deleted as a result of the pre-test. While the MBA responses were not used in any further analysis beyond the pre-test, the APICS member responses were included in the final results.

The population for the survey initially included professional members of APICS and the Institute of Supply Management (ISM). The respondents were from chapters in two states in the US Intermountain West region. To increase the number of supply chain respondents, the survey was also administered to members of a Western Round Table of the Council of Supply Chain Management Professionals (CSCMP). As will be seen, there were differences in how the survey was administered within each organisation, largely because each chapter's leadership wanted to protect its members from unwanted contact.

The survey was administered according to the Dillman (1999) method for administering web-based surveys. The board of directors for the local APICS chapter provided members' email addresses to the researchers. An email was sent to 82 members of the chapter, explaining the purpose of the survey and inviting the members to respond to the survey. We emphasised that by responding to the survey, the organisational members would be providing an important service for the state university. We also promised to share a summary of the responses with the chapter members. Two weeks after the first email, a follow-up email was sent to the members. Of the 82 potential respondents, 44 responded to the survey.

The ISM chapter would only allow us to circulate a sign-up list for those who would volunteer to respond to the survey at an ISM monthly chapter meeting. After the volunteers provided their email addresses to the researchers, the email was sent to the ISM members, asking them to participate in the survey. Two weeks after the mailing, a follow-up was sent; of 41 members who initially signed up to participate in the survey, 33 responded.

To increase the number of responses, we contacted the Utah/Idaho CSCMP round table and were allowed to attend a day-long seminar. The leadership of the CSCMP requested that we administer the survey on paper the day of the seminar to avoid emailing their members. To encourage participation, we included survey respondents in a drawing for a \$50 Amazon.com gift certificate. Of the 44 people attending the conference, 25 participants filled out the paper survey. While the survey was administered at the beginning of the day, the gift certificate was awarded at the end of the day to provide ample time to thoughtfully complete the survey. Combining the three groups, we totalled 102 respondents (though surveys from two of these were discarded as unusable) out of 167 potential respondents, for a 60% response rate. The high response rate was the result of working closely with the chapters to maximise the success of our research efforts. This approach was also very time consuming and required good relations and trust with the local chapters as their



members receive many Web-based surveys, and board members can be criticised for allowing members to receive unwanted solicitations to complete surveys. T-tests showed no differences in mean responses between operations and supply chain managers for the three organisations. Therefore, there does not appear to be significant sampling bias resulting from the variation in sampling techniques.

For our analysis, we compared the responses of operations managers and supply chain managers. The organisations we selected for this study are relevant to the study of differences in perceptions between operations and supply chain managers. APICS identifies itself as the 'global leader and premier source of the body of knowledge in operations management'. ISM was formerly named the National Association of Purchasing Managers and identifies itself as 'the largest supply management association in the world as well as one of the most respected'. CSCMP was known as the Council of Logistics Management (CLM) from 1985 to 2004 and identifies itself as 'the pre-eminent worldwide professional association of supply chain management professionals'. In this research, the respondents were given a choice to identify if their jobs were primarily operations management oriented or supply chain management oriented. The responses of the two groups of managers were compared in our analysis. It should be noted that the two sample groups were mutually exclusive in that no particular respondent responded to the survey more than once. In analysing our results, we discarded respondents from the same company to avoid common method bias. For this study, we do not control for firm size or industry. We primarily study the impact of differing perceptions between operations and supply chain managers.

## 4. Results and discussion

### 4.1 *Quality tools*

Our analysis was performed using SAS statistical software. We examined differences in the utilisation of quality tools between operations managers and supply chain managers. For each quality tool, the items were worded in this manner: 'Within the context of your organisation, the following quality tools are utilised.' The respondents then rated each tool on a separate seven-point scale. The results of these items are contained in table 1.

To test the hypotheses relating to these items, we computed and found the differences between mean responses for operations and supply chain managers. A negative difference indicates that a particular tool is utilised to a greater extent by supply chain managers than by operations managers. Conversely, a positive response means that operations managers tended to emphasise a particular tool more than supply chain managers did.

We then performed a multiple analysis of variance (MANOVA) with the treatments being the professional orientation of the respondent (i.e. supply chain manager or operations manager). As can be seen in table 1, the overall MANOVA model was significant, with Hotelling's  $t$ , Wilks's lambda, and Pillai's trace all less than 0.05. For the individual items, we found that significant differences did exist between the extent to which supply chain managers and operations managers utilised these tools. Supply chain managers emphasised benchmarking, complaint resolution,

Table 1. MANOVA table for tools.

Variable	Operations mean	Supply chain mean	Difference	<i>F</i>	<i>Pr &gt; F</i>
Benchmarking	4.488	5.303	-0.815	5.72	0.0189*
Complaint resolution	4.261	5.087	-0.825	5.69	0.0193*
Crosby	3.023	3.690	-0.667	3.19	0.0775
Design for environment	3.534	4.218	-0.683	4.34	0.0403*
ERP	4.209	4.910	-0.701	3.48	0.0462*
Supplier development	4.380	5.000	-0.619	4.42	0.0385*
ISO 9000	4.837	4.142	0.694	3.30	0.0726
Deming	3.465	4.053	-0.586	3.79	0.0547
Change management	4.139	4.929	-0.790	4.72	0.0307*
Concurrent design	3.906	4.163	-0.256	0.29	0.5903
Teams	4.404	4.821	-0.416	0.07	0.7884
CRM	4.953	5.438	-0.485	1.59	0.2112
Surveys	4.837	5.192	-0.355	0.39	0.5325
Focus groups	3.860	4.857	-0.996	9.57	0.0026**
JIT	4.441	4.636	-0.194	0.65	0.4216
Lean	4.418	4.527	-0.108	0.24	0.6266
Project management	4.952	5.210	-0.258	0.40	0.5294
Six sigma	3.534	4.070	-0.535	1.24	0.2677
Single sourcing	3.790	4.157	-0.367	0.69	0.4075
Supplier development	4.380	5.000	-0.619	3.53	0.0635
Supplier evaluation	4.744	4.857	-0.112	0.10	0.7497
Supply chain management	4.930	5.543	-0.613	4.26	0.0418*
Systems thinking	4.023	4.482	-0.458	2.36	0.1283

Notes: Wilks's lambda 0.70105 ( $p < 0.0330$ ). Pillai's trace 0.29894 ( $p < 0.0330$ ). Hotelling's  $t$  0.42642 ( $p < 0.0330$ ).

\* $p < 0.05$ . \*\* $p < 0.01$ .

design for the environment, enterprise resource planning, supplier development, change management, focus groups, and supply chain management more than operations managers did ( $p < 0.05$ ). It is interesting to note that the only tool emphasised more by operations management professionals was ISO 9000. However, this was weakly supported ( $p < 0.10$ ).

These results have some intuitive appeal. It is important to remember that for this study we emphasised tools that have been supported in the supply chain literature. It appears that supply chain management is in a state of flux with many firms emphasising the improvement of their supply chain. Recent literature has shown that best-in-class supply chain firms outperform median cost performance by up to 300% (Fawcett and Cooper 1998). Implicit in these studies is an emphasis on benchmarking best-in-class and best-of-the-best performance levels.

Complaint resolution approaches are important for supply chain management. As companies work through the upstream and downstream effects of process change, conflict is a natural result. To overcome such differences requires structured methods for resolving conflict (Thomas and Schmidt 1976).

Design for the environment is emphasised by supply chain managers as they consider life-cycle costs of the supply chain. These costs include environmental performance costs and losses due to poor environmental performance.

Supply chain management is facilitated by enterprise resource management systems (ERP). ERP systems are used in purchasing materials, controlling the flow

of materials throughout the entire supply chain, and managing after-sales processes. These functions are all central to supply chain management.

Of course, one of the primary tasks performed by supply chain managers is supplier development. Supplier development includes activities such as training, evaluating, and narrowing the numbers of suppliers. That supply chain managers emphasise supplier development more than operations managers do could relate to the centrality of this task to the supply chain manager's job.

That supply chain managers emphasise change management more than operations managers could be a result of rapidly changing supply chain practices. Operations managers emphasise maintaining a process in steady state, while supply managers are seeking new levels of performance, which requires effective change management.

Supply chain managers utilise focus groups more than operations managers. This could be because operations managers tend to be buffered from the customer. The effect of this buffer is to reduce the need for direct feedback from customers and other stakeholders whose feedback could be better obtained in focus groups. It is interesting that supply managers and operations managers both use surveys to nearly the same extent, and the use of surveys is more prevalent than focus groups for both types of managers.

Finally, we did ask about supply chain management in general, and it is clear that operations managers are more internally oriented, while supply chain managers are focusing their efforts on the supply chain. This is a potentially important finding, as training in supply chain management should be focused on more than glorified operations management.

The sum of these findings supports the first hypothesis that quality practices are utilised to a different extent by operations and supply chain managers. It appears that training in quality management should follow these cues to better focus on tools that are effective for supply chain managers.

#### **4.2 Core values**

Respondents to the survey were asked to respond to the following prompt: 'In your organisation, the following quality values are emphasised.' In table 2, mean responses are provided for operations managers and supply chain managers. Once again, a negative difference indicates that supply chain managers perceive that they emphasise particular core values more than operations managers do. Table 2 also shows the MANOVA results for core values with job orientation of the respondent as the treatment. The overall MANOVA was significant with Hotelling's  $t$ , Wilks's lambda, and Pillai's trace ( $p < 0.0001$ ).

For every core value except future orientation and social responsibility, supply chain managers perceived that their firms emphasised these values statistically more than operations managers did. This suggests that supply chain managers emphasise Baldrige core values more than operations managers. It is important to recognise that this does not imply more support for the Baldrige criteria, because the word Baldrige was not used in the survey to define or describe the core values. Only those very familiar with the Baldrige Award would have recognised the origin of these values. Therefore, we must focus our analysis on the values themselves.

Table 2. MANOVA for core values.

Variable	Operations mean	Supply chain mean	Difference	F	Pr > F
Visionary leadership	4.581	5.526	-0.945	16.52	0.0001**
Customer driven quality	5.581	6.192	-0.611	8.77	0.0039**
Organisational learning	4.500	5.701	-1.201	27.83	0.0001**
Personal development	4.674	5.696	-1.022	15.31	0.0002**
Value of employees	4.720	5.280	-0.560	4.11	0.0454*
Value of partners	4.930	5.543	-0.613	5.37	0.0227*
Organisational agility	4.627	5.245	-0.618	6.35	0.0135*
Future orientation	4.906	5.263	-0.357	1.92	0.1686
Focus on innovation	4.853	5.571	-0.718	7.75	0.0065**
Social responsibility	5.069	5.421	-0.352	1.96	0.1653
Results orientation	5.761	6.192	-0.431	4.08	0.0462*
Creative value	5.325	5.894	-0.569	6.51	0.0124*
Systems orientation	4.697	5.456	-0.759	6.43	0.0129*

Wilks's lambda 0.6186 ( $p < 0.0001$ ). Pillai's trace 0.38137 ( $p < 0.0001$ ). Hotelling's  $t$  0.6165 ( $p < 0.0001$ ). \* $p < 0.05$ . \*\* $p < 0.01$ .

## 5. Conclusions

The underlying research question was whether the increased emphasis in supply chain management in the workplace had implications for how quality management is practised and how quality-related values are emphasised. The most surprising finding of this study was the extent to which those who identified themselves as supply chain managers utilised and emphasised quality tools and values compared to those who identified themselves as operations managers. This is surprising because the field of operations management has traditionally emphasised quality management. However, those who identified more closely with supply chain management in this study placed even higher emphasis on many quality tools and values than did operations managers.

The tools emphasised by supply chain managers included: benchmarking, complaint resolution, design for the environment, ERP, supplier development, focus groups, and supply chain management. Benchmarking appears to be important to supply chain managers as they seek to compare their processes and performance with other firms to improve competitiveness. Complaint resolution is central to supply chain management because more focus is placed on downstream customer relationships in an unbuffered environment. Design for the environment is important as life-cycle and systemic approaches to environmental management have been implemented by supply chain managers. ERP is necessary in coordinating supply chain activities. As we look upstream, we find supply chain managers involved in developing suppliers. (It is interesting that operations managers placed higher relative importance on evaluating suppliers.) We found that supply chain managers emphasised focus groups more than operations managers did. However, the relative importance of focus groups was not particularly high for either group. Finally, it was not a surprise that supply chain managers place more emphasis on supply chain

management. However, this does provide some face validity to the design of our survey and results.

The quality values results even more starkly illustrate the higher-level emphasis on quality by supply chain managers: for every value except future orientation and social responsibility, supply chain managers expressed a significantly higher emphasis. The values with the greatest differences were visionary leadership, customer-driven quality, organisational learning, personal development and growth, and focus on innovation. In sum, these five values illustrate that supply chain management is forward looking with an emphasis on improving performance. It is interesting that this approach is different from the process orientation of operations managers.

The primary theoretical implication of this study is that there exists an emerging field that we can term 'supply chain quality'. This study provides a preliminary outline of the domain of this field. We have demonstrated differences in practice and philosophy between supply chain and operations managers that should be studied further. It appears that by emphasising supply chain management, we indeed are un-buffering the operations of a company and focusing more on developing suppliers and communicating with customers.

This study also has implications for managers. Managers must rethink their approaches to quality management to take advantage of the opportunities provided by supply chain management. While considering the practical implications of this study, we should consider the pedagogical implications of supply chain management. As organisations, including universities, place more emphasis on supply chain management, they can use these results to tailor their curricula to meet the needs of the supply chain and to emphasise the tools and values identified in this study. When considering the design of supply chain management programs, faculty must understand that our findings show that quality management training for their students is more important than it was when emphasising operations management (or probably management science) to adequately prepare their students for the workplace. However, the design of the courses in quality management that have traditionally focused on process improvement may need to emphasise topics such as supplier development and customer relationship management. The emphasis on ERP may have serious implications for practice and education as these are costly systems for both businesses and universities. This study also tentatively shows where training is currently deficient for both supply chain and operations managers. It could be that supply chain managers could be more process focused.

This study has several limitations that should be addressed in future studies. Of course, the standard caveats for survey research apply. Also, studies with a larger sample size could provide more insights into this topic. Such studies would allow researchers to control for firm size and industry effects. As more researchers create surveys for practitioners, it is getting more difficult to obtain high response rates. The approach we took in achieving these response rates is time consuming and costly, albeit fruitful, and requires close interaction with these professional organisations. While fruitful, our methods involved convenience samples. The typical cautions apply to non-random samples. Also, the reader should be careful to not generalise beyond the organisations included in this study. Future studies should include the American Society for Quality (ASQ), which was not included in this study.

## References

- Alukal, G., Create a lean, mean machine. *Qual. Prog.*, 2003, **36**(4), 29–35.
- Anderson, J.C., Rungtusanatham, M. and Schroeder, R.G., A theory of quality management underlying the Deming management method. *Acad. Manage. Rev.*, 1994, **19**(3), 472–509.
- Anderson, J.C., *et al.*, Path analytic mode of a theory of quality management underlying the Deming management method: preliminary empirical findings. *Decision Sci.*, 1995, **26**(5), 637–658.
- Argote, L., Beckman, S.L. and Epple, D., The persistence and transfer of learning in industrial settings. *Manage. Sci.*, 1990, **36**(2), 140–154.
- Bechtel, C. and Jayaram, J., Supply chain management: a strategic perspective. *Int. J. Logistics Manage.*, 1997, **8**(1), 15–34.
- Benson, G., Saraph, J. and Schroeder, R., The effects of organisational context on quality management: an empirical investigation. *Manage. Sci.*, 1991, **37**(4), 1107–1124.
- Bessant, J., *Managing Advanced Manufacturing Technology – the Challenge of the Fifth Wave*, 1990 (Basil Blackwell: Oxford).
- Bessant, J., Kaplinsky, R. and Lamming, R., Putting supply chain learning into practice. *Int. J. Oper. Prod. Manage.*, 2003, **23**(2), 167–184.
- Bevan, J., What is co-makership? *Int. J. Quality Reliability Manage.*, 1987, **4**(3), 47–57.
- Billington, C., Strategic supply chain management. *OR/MS Today*, 1994, **21**(2), 22–27.
- Brewer, P.C. and Speh, T.W., Using the balanced scorecard to measure supply chain performance. *J. Business Log.*, 2000, **21**(1), 75–93.
- Carr, A.S. and Smeltzer, L.R., An empirically based operational definition of strategic purchasing. *Euro. J. Purchasing and Supply Management*, 1997, **3**(4), 199–207.
- Carter, C.R. and Dresner, M., Environmental purchasing and supply management: cross-functional development of grounded theory. *Journal of Supply Chain Management*, 2001, **37**(3), 12–27.
- Carter, C.R., Auskalnis, R. and Ketchum, C., Purchasing from minority business enterprises: a cross-industry comparison of best practices. *Journal of Supply Chain Management*, 1999, **35**(1), 28–32.
- Carter, C.R., Purchasing and social responsibility: a replication and extension. *Journal of Supply Chain Management*, 2004, **40**(4), 4–17.
- Carter, J. and Narasimhan, R., The role of purchasing and materials management in total quality management and customer satisfaction. *International Journal of Purchasing and Materials Management*, 1994, **30**(3), 3–15.
- Carter, J. and Narasimhan, R., Is purchasing really strategic? *International Journal of Purchasing and Materials Management*, 1996, **32**(1), 20–28.
- Carter, J., Smeltzer, L. and Narasimhan, R., Human resource management within purchasing management: its relationship to total quality management success. *Journal of Supply Chain Management*, 2000, **36**(2), 52–63.
- Choi, T. and Eboch, K., The TQM paradox: relations among TQM practices, plant performance, and customer satisfaction. *J. Oper. Manag.*, 1998, **17**, 59–75.
- Choi, T. and Hartley, J., An exploration of supplier selection practices across the supply chain. *J. Oper. Manag.*, 1996, **14**, 333–343.
- Cooper, M. and Ellram, L., Characteristics of supply chain management and the implications for purchasing and logistics strategy. *International Journal of Logistics Management*, 1993, **4**(2), 13–24.
- Cooper, M.C., Ellram, L.M., Gardner, J.T. and Hanks, A.M., Meshing multiple alliances. *J. Bus. Logistics*, 1997, **18**(1), 67–89.
- Cooper, M.C., Lambert, D.M. and Pagh, J.D., Supply chain management: more than a new name for logistics. *International Journal of Logistics Management*, 1997, **8**(1), 1–13.
- Cox, J. and Blackstone, J., *APICS Dictionary*, 1998 (Alexandria: VA).
- Davis, T., Effective supply chain management. *Sloan Management Review*, 1993, **34**(4), 35–46.
- Dickson, G., An analysis of supplier selection systems and decisions. *Journal of Purchasing*, 1966, **2**, 5–17.
- Dillman, D., *Mail and Internet Survey: The Tailored Method*, 1999 (Wiley: New York).

- Dollinger, M.J., Enz, C.A. and Daily, C.M., Purchasing from minority small businesses. *International Journal of Purchasing and Materials Management*, 1991, **27**(2), 9–14.
- Donelan, J.G. and Kaplan, E.A., Value chain analysis: a strategic approach to cost management. *Journal of Cost Management*, 1998, March/April, 7–15.
- Doshi, M., Supply chain: How effective supplier performance management drives strong quality and productivity improvements. *Business Wire*, 2004, New York, 1 October, 1.
- Ellram, L.M., The supplier selection decision in strategic partnerships. *Journal of Purchasing and Materials Management*, 1990, Fall, 8–14.
- Ellram, L.M., A structured method for applying purchasing cost management tools. *International Journal of Purchasing and Materials Management*, 1996, **32**(1), 20–28.
- Ellram, L.M. and Carr, A., Strategic purchasing: a history and review of the literature. *International Journal of Purchasing and Materials Management*, 1994, **30**(2), 10–18.
- Emmelhainz, M.A. and Adams, R.J., The apparel industry response to ‘sweatshop’ concerns: a review and analysis of codes of conduct. *Journal of Supply Chain Management*, 1999, **35**(3), 51–57.
- Evans, J. and Lindsay, W., *The Management and Control of Quality*, 2004 (Thomson: Florence, KY).
- Fawcett, S. and Cooper, M., Logistics performance measurement and customer success. *Industrial Marketing Management*, 1998, **27**(3), 341–357.
- Fisher, M., What is the right supply chain for your product? *Harvard Bus. Rev.*, 1997, March/April, 105–116.
- Flynn, B.B., Schroeder, R.G. and Sakaibara, S., A framework for quality research and an associated measurement instrument. *J. Oper. Manage.*, 1994, **11**(4), 339–366.
- Flynn, B. and Flynn, E., Synergies between supply chain management and quality management: emerging implications. *Inter. J. Prod. Res.*, 2005, **43**(16), 3421–3436.
- Foster, S.T., *Managing Quality: Integrating the Supply Chain*. 2007 (Prentice Hall: NJ).
- Foster, S.T., One size does not fit all. *Qual. Prog.*, 2006, **39**(7), 54–61.
- Gomes-Casseres, B., Group versus group: how alliance networks compete. *Harvard Bus. Rev.*, 1994, July/August, 4–11.
- Granovetter, M.S., The strength of weak ties. *Am. J. Sociol.*, 1978, **8**(8), 1360–1380.
- Grant, E. and Leavenworth, W., *Statistical Quality Control*, 1984 (McGraw Hill: Boston, MA).
- Gulati, R., Alliances and networks. *Strategic Manage. J.*, 1998, **19**, 293–317.
- Gustin, C.M., Supply chain integration: reality or myth? *Distribution Business Management Journal*, 2001, **1**(1), 71–74.
- Hackman, J.R. and Wageman, R., Total quality management: empirical, conceptual, and practical issues. *Admin. Sci. Quart.*, 1995, **40**, 309–342.
- Hahn, C.K., Kim, K.H. and Kim, J.S., Costs of competition: implications for purchasing strategy. *Journal of Purchasing and Materials Management*, 1986, Fall, 2–7.
- Handfield, R.B., *et al.*, ‘Green’ value chain practices in the furniture industry. *J. Oper. Manag.*, 1997, **15**(3), 293–315.
- Hayes, R., Wheelwright, S. and Clark, K., *Dynamic Manufacturing*, 1988 (Free Press: New York, NY).
- Hult, G., Ketchen, D. and Nichols, E., Organisational learning as a strategic resource in supply chain management. *J. Operat. Manag.*, 2003, **21**(5), 541–562.
- Hyland, P., Soosay, C. and Sloan, T., Continuous improvement and learning in the supply chain. *International Journal of Physical Distribution and Logistics Management*, 2003, **33**(4), 316–326.
- Kaynak, H., The relationship between total quality management practices and their effects on firm performance. *J. Oper. Manage.*, 2003, **21**(4), 405–435.
- Kidd, J., Richter, F. and Li, X., Learning and trust in supply chain management. *Manage. Decis.*, 2003, **41**(7), 603–613.
- Krajewski, L., Wei, J.C. and Tang, L., Responding to schedule changes in build-to-order supply chains. *J. Operat. Manag.*, 2005, **23**(5), 452–480.
- Kuei, C., Madu, C. and Lin, C., The relationship between supply chain quality management practices and organisational performance. *International Journal of Quality and Reliability*, 2001, **18**(8/9), 864–873.

- Lambert, D.M. and Cooper, M.C., Issues in supply chain management. *Industrial Marketing Management*, 2000, **29**, 65–83.
- Lambert, D.M., Emmelhainz, M.A. and Gardner, J.T., Developing and implementing supply chain partnerships. *International Journal of Logistics Management*, 1996, **7**(2), 1–17.
- Levy, P., et al., Developing integration through total quality supply chain management. *Integrated Manufacturing Systems*, 1995, **6**(3), 4–13.
- Lummus, R.R., Vokurka, R.J. and Duclos, L.K., Delphi study on supply chain flexibility. *Int. J. Prod. Res.*, 2005, **43**(13), 2687–2703.
- Mehta, J., Supply chain management in a global economy. *Total Quality Management*, 2004, **15**(6), 841–848.
- Min, H. and Galle, W.P., Green purchasing strategies: trends and implications. *International Journal of Purchasing and Materials Management*, 1997, **33**(3), 10–18.
- Monczka, R.M., et al., Success factors in strategic supplier alliances: the buying company perspective. *Decision Sci.*, 1998, **29**(3), 553–576.
- Narasimhan, R. and Carter, J.R., *Environmental Supply Chain Management*, 1998 (Center for Advanced Purchasing Studies: Tempe, AZ).
- Narasimhan, R. and Das, A., The impact of purchasing integration and practices on manufacturing performance. *J. Operat. Manag.*, 2001, **19**(5), 593–609.
- Newman, R.G., Single sourcing: short-term savings versus long-term problems. *Journal of Purchasing and Materials Management*, 1989, Summer, 20–25.
- NIST, 2007. Malcolm Baldrige National Quality Award Criteria for Performance Excellence. Gaithersburg, NJ.
- Pagell, M., Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics. *J. Operat. Manag.*, 2004, **22**, 459–487.
- Pearson, J.N., Ellram, L.M. and Carter, C., Status and recognition of the purchasing function in the electronics industry. *International Journal of Purchasing and Materials Management*, 1996, **32**(2), 30–36.
- Plsek, P.E., Incorporating the tools of creativity into quality management. *Qual. Prog.*, 1998, **31**(3), 21–29.
- Powell, W.W., Neither market nor hierarchy: network forms of organisations. *Research in Organisational Behavior*, 1990, **12**, 295–336.
- Presley, A., Sarkis, J. and Liles, D., A soft-systems methodology approach for product and process innovation. *IEEE T. Eng. Manage.*, 2000, **47**(3), 379–392.
- Raedels, A., *CPM study Guide*, 2001 (Institute for Supply Management: Tempe, AZ).
- Robinson, C. and Malhotra, M., Defining the concept of supply chain quality management and its relevance to academic and industrial practice. *Int. J. Prod. Econ.*, 2005, **96**(3), 315–325.
- Sanchez-Rodriguez, C. and Hemsforth, D., A structural analysis of the impact of quality management practices in purchasing on purchasing and business performance. *Total Quality Management and Business Excellence*, 2005, **16**(2), 215–230.
- Scannell, T.V., Vickery, S.K. and Droge, C.L., Upstream supply chain management and competitive performance in the automotive supply industry. *Journal of Business Logistics*, 2000, **21**(1), 23–48.
- Scott, C. and Westbrook, R., New strategic tools for supply chain management. *International Journal of Physical Distribution & Logistics Management*, 1991, **21**(1), 23–33.
- Shank, J.K., Strategic cost management: new wine, or just new bottles? *Journal of Management Accounting Research*, 1989, Fall, 47–65.
- Shin, H., Collier, D. and Wilson, D., Supply management orientation and supplier/buyer performance. *J. Operat. Manag.*, 2000, **18**, 317–333.
- Slack, N., The flexibility of manufacturing systems. *Int. J. Oper. Prod. Manag.*, 1987, **7**(4), 35–46.
- Sower, V.E. and Fair, F.K., There is more to quality than continuous improvement: listening to Plato. *Qual. Manage. J.*, 2005, **12**(1), 8–21.
- Spekman, R.E., Spear, J. and Kamauff, J., Supply chain competency: learning as a key component. *Supply Chain Manag.*, 2002, **7**(1), 41–55.
- Talha, M., Total quality management (TQM): an overview. *The Bottom Line*, 2004, **17**(1), 15–19.



- Theodorakioglou, Y., Gotzamani, K. and Tsiolvas, G., Supplier management and its relationship to buyers' quality management. *Supply Chain Manag.*, 2006, **11**(2), 148–159.
- Thomas, K. and Schmidt, W., A survey of managerial interest with respect to conflict. *Acad. Manage. J.*, 1976, **10**(3), 315–318.
- Tidd, J., Bessant, J. and Pavitt, K., *Managing Innovation: Integrating Technological, Market, and Organisational Change*, 2001 (Wiley: New York, NY).
- Trent, R. and Monczka, R., Achieving world-class supplier quality. *Total Qual. Manag.*, 1999, **10**(6), 927–939.
- Vokurka, R. and Lummus, R., Better supply chains with Baldrige. *Qual. Prog.*, 2003, **36**(4), 51–58.
- Wasti, A.N. and Liker, J.K., Collaborating with suppliers in product development: a U.S. and Japan comparative study. *IEEE T. Eng. Manage.*, 1999, **46**(4), 444–461.
- Watts, C.A. and Hahn, C.K., Supplier development programs: an empirical analysis. *International Journal of Purchasing and Materials Management*, 1993, **29**(2), 10–17.
- Watts, C.A., Kim, K.Y. and Hahn, C.K., Linking purchasing to corporate competitive strategy. *International Journal of Purchasing and Materials Management*, 1992, Fall, 2–8.
- Wong, A., Leadership for effective supply chain partnership. *Total Qual. Manage.*, 2001, **12**(7/8), 913–927.
- Zhang, Q., Vonderembse, M.A. and Lim, J., Logistics flexibility and its impact on customer satisfaction. *International Journal of Logistics Management*, 2005, **16**(1), 71–92.

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