

# **Quality Management and Supply Chain Management Integration: A Conceptual Model**

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## **Abstract**

Recent trends in the business world has forced companies to expand their activities into new regions where they can find qualified manpower, lower production costs, high availability of raw materials giving rise to wider and more complex supply chains but also bringing in new opportunities to leverage their competitive advantages. These changes require the implementation of new organizational models with different suppliers and partners responsible for an important part of the final product and consequently to provide a service of excellence to satisfy customers. In order to produce value and optimize profitability, it is fundamental to establish successful partnerships with the supply chain organizations that can be achieved by new models of cooperation, improved communication and integration among all the supply chain partners. The use of advanced management practices is essential to accomplish these objectives. In this context, the use of integrated approaches to quality management, logistics and SCM becomes fundamental. Therefore, it will be important to take advantage of TQM and SCM synergies in order to improve customer satisfaction, increase employee's motivation and to promote performance of the organization. In this paper, a conceptual model is presented which reflects the integration of SCM/QM and their impact in companies' performance.

## **Keywords**

Supply Chain management, quality management, organizational performance

## **1. Introduction**

Quality has become an increasingly important issue in organizations and so it is crucial to develop sustained resource management and therefore logistics emerges as an activity that allows, in a near term, the achievement of a great efficiency and economic benefits, and, in long term, to obtain competitive advantages.

Although the concept of logistics has been progressing in recent decades, one of the definitions reported by the *Council of Supply Chain Management Professionals* is that logistics concerns to the part of the management of the supply chain which plans, implements and controls the efficient flow and storage of raw materials, finished products and semi-finished materials, as well as related information between the origin point and the point of consumption, in order to meet customer requirements. Thus, it is critical to meet customer requirements at the time and quantity needed and with the right quality and appropriated cost of product and service.

The concept of how the areas of QM and SCM are related in a particular organization and their impact on organizational performance is still very limited (Ramos et al., 2007; Agus, 2011).

Flynn and Flynn (2005) realized that the organizations that pursue both quality and supply chain goals achieve a competitive advantage. Also, other researchers found mixed results of the effect of quality management practice on supply chain performance, suggesting that more research is required in order to provide some guidance to both researchers and supply chain managers on how to distribute resources to issues that are critical for the integration of quality management to improve supply chain performance, and consequently analyze the impact of this in companies performance (Fynes et al., 2005; Flynn and Flynn, 2005; Min and Mentzer, 2000; Forker et al., 1997; Yeung, 2008).

The main aim of this paper is to analyze and discuss the main issues concerning the integration of these two crucial areas and to develop a conceptual model that brings new insights on their impact on organizational.

## 2. Quality Management

Over the past two decades, total quality management (TQM) has become the most widely used management acronym and is considered as the buzz word in the management practices. It has been well accepted by managers and quality practitioners as a change management quality approach (Arumugam *et al.*, 2009). It plays a vital role in the development of management practices (Prajogo and Sohal, 2003; Hoang *et al.*, 2006). Many researchers asserted TQM as an approach to improve effectiveness, flexibility, and competitiveness of a business to meet customers' requirements (Oakland, 1993), as the source of sustainable competitive advantage for business organizations (Terziovski, 2006), as a source of attaining excellence, creating a right first-time attitude, acquiring efficient business solutions, delighting customers and suppliers etc. (Mohanty and Behera, 1996) and above all as a source of enhancing organizational performance through continuous improvement in organization's activities (Claver-Cortés *et al.*, 2008; Teh *et al.*, 2009).

According to Juran, international competition requires higher levels of quality achievement by organizations (Blackiston, 1996).

The idea of change is attractive and it is recommended to accept quality principles and procedures. Thus, quality management is often related with a model of organizational change (Boronat and Canard, 1995), the implementation of which largely relies on the organization's ability to adapt itself to these principles.

A recent empirical study conducted by Arumugam *et al.* (2008) explored the relationship between TQM practices and quality performance on ISO 9001 certified manufacturing organizations in Malaysia. The main finding revealed that TQM practices were found to be partially correlated with quality performance. They further found that customer focus and continuous improvement were perceived as dominant TQM practices in quality performance. Additionally, the authors found evidence that customer focus and continuous improvement were perceived as dominant TQM practices in quality performance.

Quality management is a set of approaches for supporting all the components of a business to the quality requirements of the client or customer, in order to maximize quality and reduce waste. Process improvement methodologies such as Six Sigma are used to reengineer business processes and business communications in order to identify and reduce opportunities for defects, which cause reductions in the quality of process outcomes.

## 3. Supply Chain Management

Interest in the concept of supply chain management has gradually increased since the 1980s when companies saw the benefits of collaborative relationships within and beyond their own organization (Lumms and Vokurka, 1999). Since then, different definitions have been proposed concerning the concept of "the supply chain" and its management. One of the definitions is that Supply Chain Management (SCM) is an integrated philosophy to manage the total flow from the supply of raw materials to the end customer (Tyndall *et al.*, 1998; Ellram and Cooper 1990; Houlihan 1988). Robinson and Kalatoka (2000) view the supply chain as a process "umbrella" under which products are developed and delivered to customers. In other words, the supply chain management extends the concept of integrated management of an organization for all organizations involved in the process.

Cooper and Ellram (1993) suggested that the implementation of SCM has three major objectives that are: reduce inventory investment in the chain; increase customer service through increased stock availability and reduced order cycle time; and help build competitive advantage for the channel to create customer value.

Hence, with SCM, companies can become more specialized and search for suppliers who can provide a better service with lower price. So, it becomes critical for companies to manage the entire network of supply in order to optimize the overall performance. These organizations have realized that each time a company deals with another one that executes the next phase of the supply chain, both stand to benefit from the other's success (Robinson and Malhotra, 2005).

Some research considered that SCM provides a vision that focuses everyone in an organization on product, production and quality improvements, and these improvements are not only required by the market, but are also driven by the need for companies to survive (Agus, 2011).

#### **4. Quality Management and Supply Chain Management Integration**

Some studies define the integration between quality management and supply chain management as the concept of Supply Chain Quality Management – SCQM (Lin and Gibson, 2011). From the point of view of quality management, design supply chain could be recognized as providing quality products and services across every organizations in the supply chain, to clients expectations. Robinson and Malhotra (2005) stated that *SCQM is the formal coordination and integration of business processes involving all partner organization in the supply channel to measure, analyze and continually improve products, services, and processes in order to create value and achieve satisfaction of intermediate and final customers in the marketplace.*

SCM assumes a methodical and integrative approach to managing the operations and relationships among different parties in supply chains, in other words, integrates all parties along the value chain into one whole organism and manages them as the assets of a wide company (Simchi-Levi et al., 2000, Mentzer et al., 2001; Kannan and Tan, 2005; Wang et al., 2004).

Improving the quality of all supply chain processes leads to cost reductions, improved resource utilization, and improved process efficiency (Wang et al., 2004). There are some studies that investigate how the quality management can be used to improve the performance of the entire supply chain and inclusive solve some problems within the supply network (Lin and Gibson, 2011; Dowlatshahi, 2011; Flynn and Flynn, 2005; Fynes et al. 2005) and other studies that identify various theoretical and methodological characteristics of the way in which knowledge management applications are proposed in the supply chain context (Robinson and Malhotra, 2005). However, there still some issues that remains unexplored (Yeung, 2008 Forker et al., 1997). Some authors suggests that further research is needed to provide more understanding about quality practices along the supply chain and the association between quality practices and a system's overall performance, and so, some suggest some directions for future research that could be very helpful for the companies (Marra et al., 2012; Kim, 2007; Cao and Zhang, 2011; Craighead et al., 2009; Bozarth et al., 2009). For example, Terziovski and Hermel, 2011, that had presented an exploratory study about the role of quality management practice in the performance of integrated supply chain, conclude, similarly to Robinson and Malhotra, 2005, that traditional quality management programs should be transformed in a supply chain perspective, so that quality initiatives interact and synchronize across the entire network of firms in the supply chain. In this study, Terziovsky and Hermel proposed that future research should focus in why quality practices are strong predictors of an integrated supply chain, and that future models of integrated quality and supply chain management need to empirically examine the aforementioned research questions using different methods as survey and case study approaches with multinational samples.

Lin et al. (2005) concluded that key QM practices could be integrated in the supplier participation programs to provide needed collaboration, which in turn would result in improved organizational performance and also that organizational performance can be optimized when the organization considers its suppliers as important trading partners and members of the value chain. Although, they consider that more research is needed to extend these conclusions to other countries or regions.

Kannan and Tan (2005) have empirically examined the extent to which just in time (JIT), SCM and QM are correlated, and consequently their impact on business performance. Their study demonstrate that at both strategic and operational levels, linkages exist between how these areas are viewed by organizations as a part of their operations strategy, as well as the results indicate a commitment to quality and an understanding of supply chain dynamics have the greatest effect on performance. Their empirical study although interesting is like others studies, limited in scope for all the supply chain and quality practices.

With all the research background we can say that the integration between SCM and QM is a natural procedure, since traditionally the emphasis of supply chain was on specific features such as purchasing, manufacturing and shipping in order to support logistics operations, but due to the competitive environment, there is a need to improve the performance by controlling cost, increasing efficiency and high service levels, rapid response and high quality of products and services (Lin et al., 2005).

#### **5. Conceptual model proposal**

There are some studies concerning the relationship between SCM and QM, although, as far as we were able to find out based on the literature review carried out, there is none that covers the entire supply chain. For that reason we present a conceptual model proposal where it is possible to see the major areas that affect both quality management and supply chain management. Are also present some principles that affects QM and other that affects SCM, that the authors consider being of great importance for the integration of these two fields.

Figure 1 presents the SCM and QM integration conceptual model that has been developed at this stage of the project. The model proposes that most of SCM and QM practices have some aspects in common, and that they will have an impact on organizational performance. This conceptual model also suggest that there are some practices that are important for SCM, and others for QM, but also some that are transversal for both fields, namely integration, process optimization and sustainability.

Integration of QM and SCM has already been described as a natural procedure that will improve the customer satisfaction and the performance of supply chain parties.



Figure 1. Conceptual model developed

Process approach is important for both QM and SCM because the results could be achieved more efficiently when activities and related resources are managed in an organization as processes. Process optimization is related with all the areas of the supply chain and includes four integration areas: planning; coordination; collaboration and execution (Stadtler and Kilger, 2000). Regarding the optimization by planning a global and cross company logistics network the idea is to have connections with all the stakeholders and to optimize procedures as process flows, logistics plan among others, in order to reduce costs, lead times and so on. Process coordination of the existing logistics chain helps to adjust, manage and analyse all the interaction among the entire supply chain from raw materials suppliers to the end customers. Process collaboration is important because it benefits customers since when there's collaboration between customers and business partners in the control of cross-company processes the customer needs will be best served. Finally, in process optimization, the execution is important to ensure that the logistics chain integrates well the production, warehouse management, transportation and materials management.

Regarding the sustainability in the supply chain, it is increasingly seen as essential to delivering long-term profitability and has been replacing monetary cost, value, and speed as the dominant topic of discussion among purchasing and supply professionals. Regarding to quality, sustainability can help firms to develop their success in the long term.

For QM two major principles were identified: product/service quality, and quality culture. We believe that these two principles are well correlated with organizational performance. Product/service quality is what a customer expects in the product/service that he is acquiring. If a customer expects 'excellence' in everything he purchases, then his expectations are very high (Murthy, 2007). Just as it is important that company financial policies, marketing strategies, and its products are well designed and established. it is also imperative for the company to establish quality assurance steps and follow them. Quality culture is the shared beliefs, values, attitudes, institutions, and behaviour patterns that characterize the members of a community or organization. In a healthy business culture,

what is good for the company and for the customers comes together and becomes the driving force behind what everyone does (Woods, 1998).

Regarding SCM, three main practices were designated: procurement, internal logistics and distribution. Procurement is the main function that describes the activities and processes to acquire goods and services, all inbound supply processes are executed by procurement (Stadtler and Kilger, 2000). Thus, procurement includes the activities involved in establishing fundamental requirements, sourcing activities such as market research and seller evaluation and negotiation of contracts. It can also include the purchasing activities required to order and receive goods. The internal logistics should be beheld as a value-adding supply chain process (Stank et al., 2001), since is a process about movement and storage of product inventories throughout the chain. So, logistics has a critical importance for the operations function, since it is responsible for transforming sourced material into finished products.

The distribution includes the wide range of activities concerned with effective and efficient movement of material from the source of supply to the point of use or consumption (Sanders, 2012). Those activities included freight transportation, warehousing, materiel handling, packaging, inventory management, and associated management information systems. The distribution end of supply chain management must deal with such decisions as to whether to sell the product directly, or through a retailer; if the product should be distributed on a wholesale basis; either if the members of the network should share advertising costs, etc.

Six dimensions have been considered to conceptualize SCM and QM practices that are: Management and strategic planning; stakeholders/employees involvement and commitment; information, integration and mutually beneficial supplier relationships; leadership and continuous improvement and innovation.

The principles for both SCM and QM where chosen considering the bibliography that is available concerning these areas. As an example, Krause et al., 1998, identified five factors for supplier selection: quality, delivery, cost, flexibility, and innovation. These factors are included in the principles present in the research framework. Similarly, QM practice can be represented by several ways, although some authors (Lin et al., 2005), considered nine constructs as the most important: top management leadership, training, product/service design, supplier quality management, process management, quality data reporting, employee relations, customer relations and benchmarking learning. All of the existing ideas were taken into account, although in this paper some will be just briefly described, and other aspects are integrated in the major activities.

Management and strategic planning in SCM concerns inventory, supplier, production, information, technology and quality. On the other hand, regarding quality management, this principle respects: human resources; quality policy; planning; responsibility; authority and communication; and commitment.

The involvement and commitment of people at all levels of an organization is the very important, so their complete involvement allows their capacities to be used for the benefit of the organization. Also for the whole supply chain the involvement and commitment shall be very positive in organizational performance.

Information is another aspect that has considerable importance. In fact, it has been stated by some researchers that the performance of supply chain is influenced by managing and integrating key element of information into the supply chain (Gunasekaran and Ngai, 2004). For that is imperative that the firms have information technology system implemented, in order to be possible the firm's to managing everything as quality, cost, delivery, profit, among others aspects that should be fundamental for a better firm performance. Additionally, information and communication technologies are the key element for a fully integrated relationship between stakeholders and the drivers for the implementation of coordinated relationships.

Since an organization and its suppliers are interdependent, a mutually beneficial relationship between them increases the ability of both to add value.

Leadership is important in order to focus on the creation and maintenance of such an internal environment, that people become completely involved in reaching the organization's quality objective. Also, a greater attention has been given to appropriate leadership styles that are responsible for sustaining supply chains and managing their performance and improvement (Sharif and Irani, 2012).

As written before, the main objective of both QM and SCM is the continuous improvement and innovation of its overall performance. Innovation capacity both in organizations and in supply chain is increasingly important in terms of both competitiveness and developing dynamic capability to respond to dynamic markets and customer needs. So, the companies must be prepared to rapid changes in the market.

Therefore, we consider that this conceptual model is an adequate representation of the supply chain and quality management areas.

## 6- Final considerations

Much attention has been focused on supply chain management concepts in recent years. However, the link between supply chain management and quality management perspective is often limited and tangential in nature (Robinson and Malhotra, 2005).

In order to go deeper in this topic, this paper presents the first result for a research project that we are conducting to analyze the influence of different aspects in both quality and supply chain management and the relationship between these areas, and consequently their impact on companies' performance.

There are a high number of studies that suggests more research in the area of both quality management and supply chain management integration is needed, and due to the lack of information/results, we think that this conceptual model may help to fill some of the gaps related in other works, and in the future help the companies to successfully implement TQM and SCM practices.

Therefore, this conceptual model will be validated using a structural equation model after a survey questionnaire be prepared and answered by specialists in these areas from Portuguese companies. Subsequently a model of integrated performance evaluation will be developed and validated through case studies of some companies. This process of evaluating individual performance of organizations is very important so that they can optimize results and subsequently the performance of the entire chain.

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## References

- Agus, A., Supply Chain Management, production quality and business performance, *2001 International Conference on Sociality and Economics Development IPEDR*, vol. 10, IACSIT Press, Singapore, 2011.
- Arumugam, V., Chang, H.W., Ooi, K.-B. and Teh, P.-L., Self-assessment of TQM practices: a case analysis, *The TQM Journal*, vol. 21, no.1, pp. 46-58. 2009.
- Blackiston, G. H., A barometer of trends in quality management, *National Productivity Review*, vol. 16, no. 1, pp. 15-23, 1996.
- Boronat, P. and Canard, F., Management par la qualite: A totale et changement organisationnel, *Les Nouvelles Forms Organisationnelles*, Paris, Economica, 1995.
- Bozarth, C. C., Warsing, D. P., Flynn, B. B. and Flynn, E. J., The impact of supply chain complexity on manufacturing plant performance, *Journal of Operations Management*, vol. 27, no., pp. 78-93, 2009.
- Cao, M. and Zhang, Q., Supply Chain collaboration: Impact on collaborative advantage and firm performance, *Journal of Operations Management*, vol. 29, no. 3, pp. 163-180, 2011.
- Claver-Cortés, E., Pereira-Moliner, J., Tarí, J. J. and Molina-Azorín, J. F., TQM, managerial factors and performance in the Spanish hotel industry, *Industrial Management and Data Systems*, vol. 108, no. 2, pp. 228-244, 2008.
- Council of Supply Chain Management Professionals*: <http://cscmp.org/about-us/supply-chain-management-definitions>
- Cooper, M.C., Ellram, L.M., Characteristics of Supply Chain Management and the implications for Purchasing and Logistics Strategy, *International Journal of Logistics Management*, vol. 4, no. 2, pp. 13-24, 1993.
- Craighead, C. W., Hult, G.T.M., and Ketchen, D. J., The effects of innovation-cost strategy, knowledge, and action in the supply chain on firm performance, *Journal of Operations Management*, vol. 27, no. 5, pp. 405-421, 2009.
- Dowlatsahi, S., An empirical study of the ISO 9000 certification in global supply chain of maquiladoras, *International Journal of Production Research*, vol. 49, no. 1, pp. 215-234, 2011.
- Ellram, L. M. and Cooper, M. C., Supply Chain Management, Partnerships, and the Shipper – Third Party Relationship, *The International Journal of Logistics Management*, Vol. 1, no. 2, pp. 1-10, 1990.
- Flynn, B. and Flynn, E., Synergies between supply chain management and quality management: emerging implications, *International Journal of Production Research*, vol. 43, no. 16, pp. 3421-3436, 2005.

- Forker, L.B., Mendez, D. and Hershauer, J.C., Total quality management in the supply chain: what is its impact on performance?, *International Journal of Production Research*, vol. 36, no. 6, pp. 1681-1701, 1997.
- Fynes, B., Voss, C. and Búrca, S., The impact of supply chain relationship quality on quality performance, *International Journal of Production Economics*, Vol. 96, no. 18, pp. 339-354, 2005.
- Gunasekaran, A. and Ngai, E. W. T., Information systems in supply chain integration & management, *European Journal of Operational Research*, vol. 159, no. 2, pp. 269- 295, 2004.
- Hoang, D.T, Igel, B. and Laosirihongthong, T., The impact of total quality management on innovation: findings from a developing country, *International Journal Quality and Reliability Management*, vol. 23, no.9, pp. 1092-1117, 2006.
- Houlihan, J. B., International Supply Chains: A New Approach, *Management Decision*, vol. 26, no. 3, pp. 13-19, 1988.
- Kannan, V.R., Tan, K.C., Just in Time, Total quality management, and supply chain management: understanding their linkages and impact on business performance, *Omega*, vol. 33, no. 2, pp. 153-162, 2005.
- Kim, S. W., Organizational structures and the performance of supply chain management, *International Journal Production Economics*, vol. 106, no. 5, pp. 323-345, 2007.
- Krause, D.R., Pagell, M. and Curkovic, S., Purchasing strategy: An empirical analysis, *Proceedings of the Decision Science Institute*, pp. 1227–1229, 1998.
- Kuei, C. and Lu, M., Integrating quality management principles into sustainability management, *Total quality management*, vol. 24, no. 1, pp. 62-78, 2013.
- Lin, C., Chow, W., Madu, C.N., Kuei, C.H. and Yu, P.P., A structural equation model of supply chain quality management and organizational performance, *International Journal Production Economics*, vol. 96, no. 3, pp. 355-365, 2005.
- Lin, L. and Gibson, P., Implementing Supply Chain Quality Management in Subcontracting System for Construction, *Quality Journal of System and Management Sciences*, vol. 1, no. 1, pp. 46-58, 2011.
- Lummus, R.R. and Vokurka, R.J., Defining supply chain management: a historical perspective and practical guidelines, *Industrial Management & Data Systems*, vol. 99, no. 1, pp. 11-17, 1999.
- Marra M., Ho, W. and Edwards, J.S., Supply chain knowledge management: A literature review, *Expert Systems with Applications*, vol. 39, no. 5, pp. 6103-6110, 2012.
- Mentzer, J.T., DeWitt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D. and Zacharia, Z.G., Defining Supply Chain Management, *Journal of Business Logistics*, vol. 22, no. 2, pp. 1-25, 2001.
- Min, S. and Mentzer, J., Developing and measuring supply chain management concepts, *Journal of Business Logistics*, vol. 25, no. 1, pp. 63-99, 2004.
- Mohanty, R.P. and Behera, A.K., TQM in the service sector, *Work Study*, vol. 45, no. 3, pp. 13-17, 1996.
- Murthy, D.B.N., *Consumer and Quality*, 2<sup>nd</sup> Edition, New Age International Pvt Ltd Publishers, 2007.
- Oakland, J. S., *Total Quality Management*, 2<sup>nd</sup> Edition, Oxford: Butterworth-Heinemann, 1993.
- Prajogo, D. I. and Sohal, S. A., The relationship between TQM practices, quality performance, and innovation performance: an empirical examination, *International Journal of Quality & Reliability Management*, vol. 20, no. 8, pp. 901-918, 2003.
- Ramos, J.C., Asan, S.S. and Majetic, J., Benefits of applying management techniques to support supply chain management, *International Logistic and Supply Chain Congress*, Turquia, 2007.
- Robinson, M. and Kalakota, R., *E-Business Road map for Success*, Wokingham: Addison-Wesley, 2000.
- Robinson, J.R. 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*, vol. 96, no. 18, pp. 315-337, 2005.
- Sanders, N.R., *Supply Chain Management: A global perspective*, John Wiley & Sons, Inc., 2012.
- Sharif, A.M., Irani, Z., Supply Chain Leadership, *International Journal Production Economics*, vol 140, no. 1, pp. 57-68, 2012.
- Simchi-Levi, D., Kaminsky, P. and Simchi-Levi, E., *Designing and Managing the Supply Chain—Concepts, Strategies and Case Studies*, McGraw Hill, Singapore, 2000.
- Stadtler, H. and Kilger, C., Supply chain management and advanced planning. Concepts, models, Software and case studies, Springer-VERlag Berlin Heidelberg New York, 2000.
- Stank, T.P., Keller, S.B. and Daugherty, P.J., Supply Chain collaboration and logistical service performance, *Journal of Business Logistics*, vol. 22, no. 1, pp. 29-48, 2001
- Teh, P.-L., Yong, C.-C., Arumugam, V. and Ooi, K.-B., Does total quality management reduce employees' role conflict?, *Industrial Management and Data Systems*, vol.109, no. 8, pp. 1118-1136, 2009.
- Terziovski, M. and Hermel, P., The Role of Quality Management Practice in the Performance of Integrated Supply Chains: A Multiple Cross-Case Analysis, *Quality Management Journal*, vol. 18, no. 2, pp. 10-25, 2011.
- Terziovski, M., Quality management practices and their relationship with customer satisfaction and productivity improvement, *Management Research News*, vol. 29, no. 7, pp. 414-24, 2006.
- Tyndall, G., Christopher, G., Wolfgang P. and John, K., *Supercharging Supply Chains: New Ways to Increase Value through Global Operational Excellence*, John Wiley & Sons, NY, 1998.

- Wang, F., Du, T.C. and Li, E.Y, Applying Six-Sigma to supplier development, *Total quality Management*, vol. 15, no. 9-10, pp. 1217-1229, 2004.
- Woods, J.A., The six values of a quality culture, *The quality Yearbook*, 1998 Edition, CWL Publishing Enterprises, 1996.
- Yeung, A.C.L., Strategic supply management, quality initiatives, and organizational performance, *Journal of Operations Management*, vol. 26, no. 4, pp. 490-502, 2008.

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