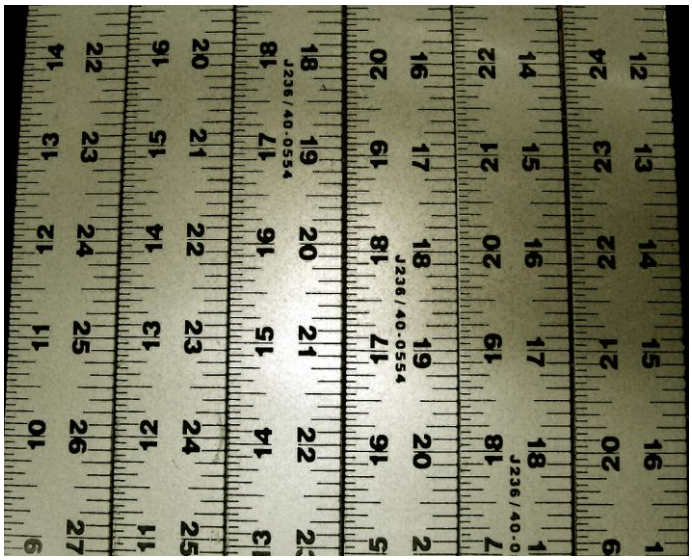
2010 ISSUE
B>Quest
BUSINESS QUEST
1996 - 2010



On the Links Between Lean Manufacturing Practices and Consistency of Organizational Benchmarking Performance Measures

by Mohammad Z. Meybodi

Peer Reviewed

Mohammad Z. Meybodi mmeybodi@iuk.edu is a Professor of Operations Management at Indiana University Kokomo.

Abstract

This article investigates the possible links between lean manufacturing (LM) practices and consistency of strategic performance measures in the deployment of organizational strategy. A set of six questions was used to examine the differences between conventional companies and lean manufacturing companies in setting

organizational goals and objectives, scanning environmental factors, building core competencies, and aligning competitive capabilities with competitive priorities. Statistical results indicate that compared with conventional companies, lean manufacturing organizations are overall better in recognizing external environmental factors, building organizational core competencies, aligning competitive priorities with the corporate goals and objectives, and aligning organizational competitive capabilities with their competitive priorities.

Introduction

For the past three decades, world-class organizations have utilized benchmarking as an effective continuous improvement tool to improve aspects of organizational competitive priorities such as cost, quality, delivery, flexibility, and customer service. Benchmarking may be defined as a process in which an organization tries to learn from the best-in-class organizations; determine how the best-in-class achieve superior performance levels; and utilize those practices as benchmarks to their own organization (Watson, 1992 and 1993; Whiting, 1991). Flexibility, outward looking, setting a high level of standard, and creating a culture of organizational learning are the primary reasons for the use of benchmarking as an effective quality improvement tool. Specifically, the main reasons for the use of benchmarking by world-class organizations may be summarized as: (1) Benchmarking is a flexible tool that can be used for gradual continuous improvement as well as for major changes of process reengineering (Bogan and English, 1994). (2) It is a valuable educational tool that provides opportunity to learn and prepare a company for change because it exposes employees to new approaches, systems, and procedures of other organizations (Welch, 1993; Kuebler, 1993; Zairi, 1994). (3) It is an efficient tool to capitalize on proven ideas and to avoid the cost of additional resources for developing new ideas from scratch. (4) It is an effective tool for improving quality and increasing customer satisfaction while minimizing both the cost of good quality as well as the cost of poor quality (Blanchard, 2008).

Although for the past three decades, there has been a considerable amount of research on the application of benchmarking in various areas of businesses, the primary focus of the research has been on the short term technical and financial aspects of functional benchmarking. Fundamental strategic factors such as recognition of external environmental factors and the building organizational core competencies were generally disregarded. As a result, the benefits of the research have generally been limited. Furey (1987), Goldwasser (1995), Kaplan and Norton (1992 and 2001),

Ahmed and Rafiq (1998) and Talluri and Vazacopoulos (1998) argued for the benchmarking process to be effective, organizations need to integrate their activities into long term organizational strategy and the process needs to employ a broad range of balanced performance measures that are consistent with organizational strategy. The objective of this article is to investigate if LM organizations are more consistent than conventional organizations in integrating benchmarking activities into long term organizational strategy.

Literature Review

Since the early 1980's, a large number of articles have been written about the development and application of benchmarking in diverse areas of businesses, including such areas as manufacturing, health care, marketing, supply chain, human resources, and accounting. Zairi and Whymark (2000) report the successful results of the application of benchmarking at British Royal mail. Applications of benchmarking to public procurement, world-class purchasing, and to the US service sectors have been reported respectively by Raymond (2008), Newman, Hanna, and Duffett (1995), and Roth et al. (1997). Bartley, Gomibuchi, and Mann (2007) utilized benchmarking to provide insights into how organizations can develop a more customer-focused culture. Seong-Jong et. al. (2009) used benchmarking to measure the performance of a number of specialty coffee stores. Singh, Narain, and Yadav (2006) utilized benchmarking and performance measurement to investigate supply chain management practices at a number Indian manufacturing organizations. They found that Indian organizations were using benchmarking mainly as a continuous improvement tool. Chia et. al (2009) also employed the benchmarking approach to measure the performance of a number of entities in the supply chain. These authors concluded that despite the need to utilize a balanced performance measurement, organizations primarily focused on the use of traditional financial measures.

Gurumurthy and Kodali (2009) utilized benchmarking to assess the implementation of lean manufacturing. Practical application of lead benchmarking and performance measurement to achieve organizational change has been investigated by Moffett, Anderson-Gillespie, and McAdam (2008). Goncharuk (2008) investigated the capability of using performance benchmarking tools for estimation of efficiency in gas distribution companies. The use of benchmarking to measure operational performance of organizations utilizing internet based services has been reported by Hadaya (2009).

The use of benchmarking as an effective organizational learning tool has been presented by Garvin (1993), Ford and Evans (2001), Smith (1997), Hambly (1997),

Gleich et. al. (2008), Watson (2001), Chen and Paetsch (1995), O'Dell and Grayson (2000), and Evans and Dean (2003). A comprehensive list of legal and ethical issues of benchmarking is presented by Brue (2002) and Vaziri (1992). A comprehensive review of the evolution of different aspects of benchmarking activities has been presented by Harrison (1999).

However, as was stated previously, although the content of the above articles is diverse, the primary focus has been on narrow short term aspects of departmental benchmarking. In a benchmarking study, Meybodi (2005a) demonstrated the inconsistency of traditional organizations in choosing benchmarking performance measures at various levels of organization. That is, performance measures chosen by managers at operational levels were inconsistent with overall organizational strategy. The lack of a consistent strategy is a major impediment in building core competencies to ensure long term organizational competitiveness.

Lean manufacturing has been a great force in the world of manufacturing since the early 1980's. Some of the chief benefits of lean manufacturing such as inventory reduction, quick delivery, quality improvement, and cost reduction have been well documented. In the simplest form, LM requires production of the right parts in the right quantities and at the right times. Elimination of waste and respectful treatment of people are the two fundamental principles of a LM system (Payne, 1993). To understand application of LM in other areas, Cook and Rogowski (1996) advocated careful examination of the two principles of waste elimination and respect for people. Looking at LM as a process for eliminating waste and respectful treatment of people, its principles can be applied to other areas of manufacturing as well as services. Hong, Dobrzykowski, and Vonderembse (2010) utilized integration of LM practices and supply chain IT for benchmarking activities in the area of mass customization. Liang (2010) utilized LM practices to develop an integrated product development process in the automotive industry. In a number of other studies, researchers showed that world class lean manufacturing organizations are successful not only in areas such as inventory reduction and quick delivery, but also in other service areas such as quality improvement and new product development (Handfield, 1993; Meybodi, 2005b; Pettersen, 2009). The objective of this article is to take advantage of the established benefits of LM principles and examine if there are links between LM practices and consistency of performance measures at various levels of organizational strategy. Specifically, the objective of the article is to answer the following questions:

1. *Are lean manufacturing companies more consistent than conventional companies in setting their long term goals and objectives?*

2. *Are lean manufacturing companies more consistent than conventional companies in recognizing external environmental factors to set their goals and objectives?*

3. *Are lean manufacturing companies more consistent than conventional companies in developing their core competencies to deploy their strategy?*

4. *Are lean manufacturing companies more consistent than conventional companies in aligning their competitive priorities with their corporate goals and objectives?*

5. *Are lean manufacturing companies more consistent than conventional companies on emphasizing more on flexibility, customization, and new product development speed as their competitive priorities?*

6. *Are lean manufacturing companies more consistent than conventional companies in aligning their competitive capabilities with their competitive priorities?*

Research Methodology

A questionnaire-based, mailed survey was used to test the hypotheses. The survey contained a series of questions on the use of strategic and operational benchmarking performance measures for conventional and LM organizations. Strategic questions were concerned about organizational mission and goals, as well as attitude toward customers, competition, technology, globalization, development of core competencies, and organizational competitive priorities. Operational items are related to specific technical performance measures such cost, quality, and delivery.

The target population for this study consisted of manufacturing firms in Midwestern United States. A sample of 500 manufacturing firms was chosen from the manufacturers' directories of the states of Illinois, Indiana, Ohio, Michigan, and Wisconsin. The sample covers organizations in a variety of industries ranging from fabricated metal, communication, electronics, automotive, toots, chemicals, rubber, and paper products. In addition to general organization and managerial profile items, the survey contained series of questions regarding organizational goals and

objectives, competitive priorities, manufacturing performance objectives, manufacturing action plans, and the LM system. Out of 91 completed surveys received, 84 surveys were usable, resulting in a response rate of 17 percent. Based on a number of questionnaire items on the principles of LM practices, 33 organizations were grouped as LM organizations and 51 organizations were categorized as conventional organizations.

The survey data indicates that the majority of respondents had various levels of managerial positions of organization with less than 500 employees. Presidents and vice presidents accounted for 29 percent and plant managers accounted for 30 percent of the sample. About 35 percent of the sample had other managerial positions such as operations/production managers and quality managers, and the remaining 6 percent were production line supervisors. In terms of manufacturing experience, about 28 percent of the respondents had between 10 to 20 years, and 60 percent had more than 20 years of manufacturing experience.

Results

Tables 1 and 2 (shown below) reveal, respectively, the mean importance ratings for corporate goals and objectives and strategic environmental and core competencies factors. The respondents were asked to rate each element included in these tables based on the degree of importance (1=low importance, 5=high importance) to the company for the next five years. Table 1 indicates that, for conventional companies, the ranking for the corporate goals and objectives are building market share, maximizing profits, and focusing on customer satisfaction. Customer satisfaction, building market share, and maximizing profits are the corresponding rankings for LM companies. Being in a better competitive position with respect to quality and customer satisfaction is a possible explanation for market expansion and profit making posture. The statistical results shown in Table 1 reveal that, although the ranking of corporate goals and objectives for conventional and LM companies are not quite the same, the last column indicates that overall there are no significant differences between them. Hence, the answer to the first question is no.

Table 1. Importance Ratings for Corporate Goals and Objectives
(1=low importance, 5=high importance)

	Conventional		LM		
Factor	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Build market share	4.67	1.27	4.66	1.23	0.145
Maximize profit	4.59	1.32	4.53	1.27	0.136
Focus on customer satisfaction	4.56	1.15	4.78	1.31	0.073

SD= Standard Deviation, * = Statistically significant at α = 0.05

Table 2. Importance Ratings for Strategic Environmental and Core Competencies Factors
(1=low importance, 5=high importance)

	Conventional		LM		
Factor	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Understand competitors' strategy	4.32	1.28	4.73	1.44	0.015*
Build innovative & agile organization	4.12	1.21	4.80	1.25	0.018*
Develop knowledge workforce	3.85	1.39	4.75	1.35	0.005*
Understand global strategies	3.83	1.37	4.62	1.26	0.005*
Understand the state of technology	3.78	1.32	4.70	1.41	0.005*

SD= Standard Deviation, * = Statistically significant at α = 0.05

Table 2 shows for conventional companies that the ranking of the strategic environmental and core competencies factors are focusing on competition, building innovative and agile organization, developing knowledge workforce, understanding global issues, and understanding the state of technology. However, the ratings for these factors are not as strong as the ratings of the corporate goals and objectives in Table 1. This is perhaps an indication of a typical reactive strategy by conventional companies in which the primary focus of managers is on customer satisfaction to increase market share and profits. Understanding external environmental factors such as competition, global issues and building innovative and agile organization through development of knowledge workforce, and the state of the art technology to effectively deal with environmental factors are not under prime consideration. For conventional companies, understanding the causes for such strategic misalignment between

corporate goals and objectives and detection of external environmental factors as well as proactive development of organizational strategic core competencies is crucial. Table 2 shows that for LM companies, building an innovative and agile organization and developing strategic workforce to be the top two strategic environmental factors. These are closely followed by understanding of competition, global issues, and technology. The last column of Table 2 clearly shows that for LM organizations, the mean rating for these five elements is significantly higher than the mean ratings of the corresponding items for conventional organizations. This is an indication that, unlike conventional companies, LM organizations focus more on understanding external environmental factors and especially building organizational core competencies through development of knowledge workforce and state of the art technology. In fact, LM organizations often develop their core competencies first and then utilize a proactive strategy to find opportunities for exploiting their core competencies to achieve competitive advantage in the market. The statistical results of Table 2 clearly indicates that the answer to the second and third questions is yes.

The rating of the elements of competitive priorities for conventional and LM organizations is shown below in Table 3. The respondents were asked to rate each element of competitive priorities based on the degree of importance (1=low importance, 5=high importance) to the company for the next five years. From Table 3, the respondents from conventional companies ranked product reliability, conformance quality, delivery reliability, price, and fast delivery as the top five important competitive priorities. The ranking of product reliability and conformance quality as the top two competitive priorities is consistent with corporate strategy. It indicates the responding managers believe that quality factors are still important elements of competition. However, the ranking of delivery reliability, price, and fast delivery as the next three competitive priorities indicate that managers also believe on the importance of delivery and price. Relative low ranking of factors such as customization, new product development speed and ability to make design changes is inconsistent with the corporate strategy of customer satisfaction through building innovative and agile organization.

Table 3. Importance Ratings for Competitive Priorities
(1=low importance, 5=high importance)

	Conventional		LM		
Factor	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Product reliability	4.61	1.22	4.85	1.16	0.135
Conformance quality	4.50	1.31	4.34	1.34	0.242
Delivery reliability	4.42	1.26	4.73	1.28	0.040*
Price	4.39	1.33	4.33	1.32	0.270
Fast delivery	4.18	1.48	4.69	1.34	0.036*
Product customization	4.03	1.41	4.55	1.23	0.045*
NPD speed	3.95	1.39	4.63	1.36	0.010*
Performance	3.90	1.29	4.30	1.21	0.048*
Design change	3.82	1.32	4.65	1.31	0.009*
Service after sales	3.71	1.47	4.29	1.44	0.042*
Volume flexibility	3.52	1.36	4.05	1.31	0.040*

* = Statistically significant at $\alpha = 0.05$

The right side of Table 3 shows that the respondents from LM companies ranked product reliability, delivery reliability, fast delivery, design change, new product development (NPD) speed, and product customization as their top six important competitive priorities. The ranking of product reliability as the top competitive priority indicates that managers of LM companies also believe in the importance of quality as an essential element of competitive advantage. However, the ranking of delivery reliability, fast delivery, design change, NPD speed, and product customization as the next five competitive priorities indicate that the respondents also believe in the importance of time based competition, agility, and product customization. Table 3 also shows that conformance quality and price as elements of competitive priorities ranked relatively low by LM companies. This rather interesting result indicates that, unlike conventional companies, the responding managers from LM companies believe that conformance quality and low price are no longer the primary elements of competitive advantage. The relative low ranking of these two competitive priorities is, perhaps, an indication that these elements represent order qualifiers, and that the top six factors are order winners. In other words, competitive market considers these competitive priorities as given. To attract customers, organizations must perform on the basis of the top six competitive priorities. From the results of Table 3, one can conclude that overall LM organizations are more consistent than conventional organizations in

aligning their competitive priorities with their corporate goals and objectives. Also from table 3 it is clear that LM companies place more emphasis on the elements of flexibility, NPD speed, and customization. Overall, from statistical results of table 3 we may conclude that the answer to the fourth and fifth questions is yes.

To help understand relative strength of organizational competitive capabilities, the respondents were asked to rate relative competitive strength of their organization with respect to the competitors who are doing best for each element of competitive priorities. A five-point scale, where 1 corresponds to weak and 5 to strong, was used to indicate managers' perceptions of the company's current competitive capability relative to the best competitors. The mean strength scores for each element of competitive priorities for conventional and LM organizations are shown below, respectively, in Tables 4 and 5. As the last column of Table 4 indicates, for conventional companies, the mean strength of the top five competitive priorities is significantly lower than the mean importance. This indicates that for these companies, although managers ranked product reliability, conformance quality, delivery reliability, price, and quick delivery as the top five competitive priorities, organizational capabilities of those elements is not that strong. This imbalance between organizational competitive priorities and their competitive capabilities is a serious area that needs to be investigated.

Table 4. Importance and Strength Ratings for Competitive Priorities (Conventional Companies)

(1=low importance, 5=high importance) (1=weak strength, 5=strong strength)

	Importance		**Strength**		
Factor	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Product reliability	4.61	1.22	3.51	1.24	0.000*
Conformance quality	4.50	1.31	3.81	1.14	0.040*
Delivery reliability	4.42	1.26	3.75	1.32	0.030*
Price	4.39	1.33	3.31	1.13	0.005*
Fast delivery	4.18	1.48	3.26	1.32	0.005*
Product customization	4.11	1.41	3.91	1.29	0.230
NPD speed	3.95	1.39	3.73	1.14	0.210
Performance	3.90	1.29	4.14	1.21	0.190
Design change	3.82	1.32	3.76	1.35	0.240
Service after sales	3.71	1.47	4.10	1.27	0.100
Volume flexibility	3.52	1.36	4.47	1.31	0.005*

* = Statistically significant at α = 0.05

The statistical results shown in Table 5 below indicate that the mean strength of the elements of competitive priorities for LM companies is significantly higher than it is for conventional companies. In fact, statistical tests indicate that, unlike conventional companies, the mean strength for the majority of the elements of competitive priorities is close or higher than the mean importance ratings. This indicates for LM companies there is a better balance between competitive priorities and organizational competitive capabilities and, hence, the answer to the sixth question is yes.

Table 5. Importance and Strength Ratings for Competitive Priorities (LM Companies)
(1=low importance, 5=high importance) (1=weak strength, 5=strong strength)

	Importance		Strength		
Factor	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Product reliability	4.85	1.16	4.78	1.24	0.217
Delivery reliability	4.73	1.28	4.77	1.14	0.315
Fast Delivery	4.69	1.24	4.80	1.32	0.226
Design change	4.65	1.30	4.73	1.18	0.193
NPD speed	4.63	1.36	4.70	1.09	0.167
Product customization	4.55	1.23	4.67	1.36	0.154
Conformance quality	4.34	1.34	4.61	1.25	0.153
Price	4.33	1.32	4.75	1.19	0.120
Performance	4.30	1.22	4.47	1.28	0.162
Service after sales	4.29	1.44	4.80	1.23	0.008*
Volume flexibility	4.05	1.31	3.95	1.37	0.163

* = Statistically significant at α = 0.05

Conclusion

The objective of this article was to determine if there are links between lean manufacturing practices and consistency of benchmarking performance measures. A set of six questions was utilized to examine if there are differences between conventional and LM companies in setting their goals and objectives, scanning environmental factors, building core competencies, and aligning their competitive capabilities with their competitive priorities. Statistical results indicate that, while there is no significant difference between goals and objectives for the two types of companies, significant differences are present in the following areas:

- LM organizations are better in recognizing external environmental factors such as competition and global issues to set their strategy.

- LM organizations are better in building their core competencies through development of knowledge workforce and state of the art technology to effectively deal with those external environmental factors.

- LM organizations are overall more consistent than conventional organizations in aligning their competitive priorities with the corporate goals and objectives.

- LM companies are more consistent than conventional companies in placing a higher emphasis on flexibility, customization, and new product development speed as their competitive priorities.

- LM companies are more consistent than conventional companies in aligning their competitive capabilities with their competitive priorities.

The managerial implication of this research is that lessons learned from a LM system go beyond elimination of wastes in manufacturing. Since successful implementation of LM principles requires a thorough understanding of organizational strategy, LM companies have a better understanding of aligning their competitive priorities and competitive capabilities with organizational goals and objectives.

References

Ahmed, P.K. and M. Rafiq, (1998) “Integrated Benchmarking: A Holistic Examination of Select Techniques for Benchmarking Analysis”, Benchmarking for Quality Management and Technology, Vol. 5, No. 3, pp. 225-242.

Bartley, B. Gomibuchi, S. and Mann, R. (2007) “Best practices in achieving a customer-focused”, *Benchmarking: An International Journal*, Vol. 14, No. 4, pp. 482-496.

Blanchard, D. (2008) “Portrait of Best-In-Class Quality Management”, *Industryweek*, December issue.

Bogan, C. E. and English, M. J. (1994), Benchmarking for Best Practices, McGraw Hill, New York.

Brue, G. (2002), Six Sigma for Managers, McGraw Hill, New York.

Chia, A. Goh, M. and Sin-Hoon, H. (2009) "Performance measurement in supply chain entities: balanced scorecard perspective", *Benchmarking: An International Journal*, Vol. 16, No. 5, pp. 605-620.

Chen, I. J. and Paetsch, K. (1995) "Benchmarking: Quality Managers' Perspective", Proceedings of the Decision Sciences Institute, pp. 1623-1625.

Cook, R. L. and Rogowski, R. A., (1996) "Applying JIT principles to Process Manufacturing Supply Chains", Production and Inventory Management, 1st Quarter, 12-17.

Evans, J. R. and Dean, J.W. (2003), Total Quality Management, Organization and Strategy, 3rd edition, Thomson/Southwestern.

Ford, M. W. and Evans, J. R. (2001) "Baldrige Assessment and Organizational Learning: The Need for Change Management", Quality Management Journal, Vol. 8 No. 3, pp. 9-25.

Furey, T. R. (1987) "Benchmarking: The Key to Developing Competitive Advantage in Mature Markets", Planning Review, Vol. 15, pp. 30-32.

Garvin, D. (1993) "Building a Learning Organization", Harvard Business Review, pp. 41-48.

Gleich, R. Motwani, J. and Wald, A. (2008) "Process benchmarking: a new tool to improve the performance of overhead areas", *Benchmarking: An International Journal*, Vol. 15, No. 3, pp. 242-256.

Goldwasser, C. (1995) "Benchmarking: People Make the Process", Management Review, Vol. 84, pp. 39-45.

Goncharuk, A. G. (2008) "Performance Benchmarking in Gas Distribution Industry", *Benchmarking: An International Journal*, Vol. 15, No. 5, pp. 548-559.

Gurumurthy, A. and Kodali, R. (2009) “Application of benchmarking for assessing the lean manufacturing implementation”, *Benchmarking: An International Journal*, Vol. 16, No. 2, pp. 274-308.

Hadaya, P. (2009) “Benchmarking firms' operational performance according to their use of internet-based interorganizational systems”, *Benchmarking: An International Journal*, Vol. 16, No. 5, pp. 621-639.

Handfield, R. (1993), “Distinguishing Features of Just-in-Time Systems in the Make-to-Order/Assemble to Order Environment”, Decision Sciences, Vol. 24 No. 3, pp. 581-602.

Hambly, L. (1997) “Sun Microsystems Embeds Quality into Its DNA”, The Quality Observer, Vol. 45, pp. 16-20.

Harrison, N. J. (1999) “A Research Agenda For Benchmarking”, Proceedings of the Decision Sciences Institute, p. 1394

Hong, P.C., Dobrzykowski, D.D., and Vonderembse, M. A. (2010), “Integration of Supply Chain IT and Lean Practices for Mass Customization: Benchmarking of Product and Service Focused Manufacturers”, *Benchmarking: An International Journal*, Vol. 17, No. 4, pp. 561-592.

Kaplan, R. S. and Norton, D. P. (2001) “The Strategy Focused Organization”, Harvard Business School Press, Cambridge, MA.

Kaplan, R. S. and Norton, D. P. (1992) “The Balance Scorecard-Measures that Drive Performance”, Harvard Business Review, pp. 71-79.

Kuebler, A. (1993) “The Quest for Excellence 5”, Annual Conference of Baldrige Award Winners”, AT&T Universal Card Services Presentation, Feb. 15-17.

Liang, J. C. H. (2009) “An Integrated Product Development Process in the Automotive Industry”, *International Journal of Product Development*, Vol. 8, No. 1, pp. 80-105.

Meybodi, M. Z. (2005a), “Strategic Manufacturing Benchmarking”, *The TQM Magazine*, Vol. 17, No. 3, pp.249-258.

Meybodi, M. Z. (2005b), "The Impact of Just-in-Time Practices on New Product Development: A Managerial Perspective", *International Journal of Product Development*, Vol. 2, Issue 3, pp. 254-265.

Moffett, S. Anderson-Gillespie, K. and McAdam, R. (2008) "Benchmarking and Performance Measurement: A Statistical Analysis," *Benchmarking: An International Journal*, Vol. 15, No. 4, pp. 368-381

Newman, R.W., Hanna, M., and Duffett, W. (1995) "World Class Purchasing: A Benchmarking of the Best", Proceedings of the Decision Sciences Institute, pp. 1617-1619.

O'Dell, C. and Grayson, C. J. (2000) "Identifying and Transferring Internal Best Practices", APQC White Paper.

Payne, T. E., (1993), Acme Manufacturing: A Case Study in JIT Implementation, Production and Inventory Management, 2nd Quarter, 82-86.

Pettersen, J. (2009) "Defining Lean Production: Some Conceptual and Practical Issues", TQM Journal: Vol 21, No. 2, pp. 127-142.

Raymond, J. (2008) "Benchmarking in public procurement", *Benchmarking: An International Journal*, Vol. 15, No. 6, pp. 782-793.

Roth, A. V., Chase, R. B., Voss, C., Rose, E., and Menor, L. (1997) "Benchmarking US Services: Results and Implications", Proceedings of the Decision Sciences Institute, pp. 1510-1512.

Seong-Jong, J, Stoeberl, P. A. and Fitzer, K. (2009) "Measuring and benchmarking the performance of coffee stores for retail operations". *Benchmarking: An International Journal*, Vol. 16, No. 6, pp. 741-753.

Singh, A., Narain, R. and Yadav, R.C. (2006),"Benchmarking and performance measurement of supply chain management practices: a survey of Indian organizations", *International Journal of Services and Operations Management*, Vol. 2, No. 4, pp. 313-334.

Smith, G. P. (1997) "A Change in Culture Brings Dramatic Quality Improvement", Quality Observer, January 1997, pp. 14-15, 37.

Talluri, S. and Vazacopoulos, A. (1998) “Efficiency Evaluation and Benchmarking in Small and Medium Enterprises”, Proceedings of the Decision Sciences Institute, pp. 1421-1423.

Vaziri, H. K. (1992) “Using Competitive Benchmarking to Set Goals”, Quality Progress, November, pp. 81-85.

Venetucci, R. (1992) “Benchmarking: A Reality Check for Strategy and Performance Objectives”, Production and Inventory Management Journal, Vol. 33, No. 4, pp. 32-36.

Watson, G. H. (2001) “Cycles of Learning: Observations of Jack Welch”, Six Sigma Forum Magazine, Vol. 1, No. 1, pp. 13-17.

Watson, G. H., (1992), The Benchmarking Workbook: Adopting Best Practices for Performance Improvements, Productivity Press, Portland, Oregon.

Watson, G. H. (1993) “How Process Benchmarking Supports Corporate Strategy”, Planning Review, Vol. 21 pp.12-15.

Welch, J. (1993) “Jack Welch’s Lessons for Success”, Fortune, January 25th, pp. 86-93.

Whiting, R. (1991) “Benchmarking: Lessons From Best-in-Class”, Electronic Business, Vol. 17, pp. 128-134.

Zairi, M. (1994) “Benchmarking: the Best Tool for Measuring Competitiveness”, Benchmarking for Quality Management and Technology Vol.1, No. 1, pp. 11-24.

Zairi, M. and Whymark, J. (2000) “The Transfer of Best Practices: How to Build Culture of Benchmarking and Continuous Learning- Part 1”, Benchmarking: An International Journal, Vol. 7, No. 1, pp. 62-78.

Note: Graphic by Carole E. Scott