M&IS 34060—Operations Management
Just-in-Time and Lean Assignment

ASSIGNMENT:

- **Read the textbook chapter on JIT and the enclosed article that relates to JIT, lean systems, and six-sigma.**
- **Do you agree or disagree that the lean and six-sigma approaches are just "fads", repackaged from total quality management (TQM)?**
    - Even if they are extensions of TQM does this mean they are "fads" that will total disappear in a short time? Or could they be more enduring in some fashion?
    - Give some examples from your own experience or from recent publications (print or online) to further develop your response.
    - NOTE: Do not make the definition of a fad or the structure of a fad the main focus of your write up. Make the focus JIT, lean, six sigma, TQM and perhaps comment on how they might be fads, extensions, the same thing etc. but do not give a long discussion on what makes a fad a fad.

- **Use at least four concepts or discussion points from the article and expand upon your position.**
    - Some of the whitepaper is technical in nature and other areas give accessible examples. Be sure to include in any technical discussion some form of explanation or example to illustrate what is meant.
    - Be sure to use formatting cues, such as bold or headings, so I can easily find the different points you are making.
    - This must be type written and double spaced and would typically be somewhere in the 3 to 5 page range. You may use paragraph form, bullet points, or a combination of formats but you must use complete sentences.
- **This will be part of your "Individual Investigation" that is to be turned in the last week of class as noted on the course calendar. Note, though, the schedule has a suggested timeframe for when you may want to complete this as it relates to other course materials.**

WHITEPAPER BEGINS ON NEXT PAGE

Lean, six sigma and lean sigma: fads or real process improvement methods?

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Abstract

Purpose – The purpose of this paper is to explore if six sigma and lean are new methods, or if they are repackaged versions of previously popular methods – total quality management (TQM) and just-in-time (JIT).

Design/methodology/approach – The study is based on a critical comparison of lean with JIT and six sigma with TQM, a study of the measure of the publication frequency – the number of academic articles published every year of the previous 30 years – for each topic, and a review of critical success factors (CSF) for change efforts.

Findings – The more recent concepts of lean and six sigma have mainly replaced – but not necessarily added to – the concepts of JIT and TQM. lean and six sigma are essentially repackaged versions of the former, and the methods seem to follow the fad (product) life cycle. The literature offers fairly similar and rather general CSF for these methods, e.g. top management support and the importance of communication and information. What seems to be missing, however, is the need for a systemic approach to organizational change and improvement.

Practical implications – A prediction is, given the fad or product life cycle phenomenon, that there will be a new method promoted soon, something perhaps already experienced with the borderline preposterous concept of lean six sigma. On the other hand, based on the gap in time between both JIT and lean, and TQM and six sigma – a gap filled by BRP/reengineering – the next method will be process oriented. This paper concludes with the discussion of the need for a process-based approach to organizational improvement efforts.

Originality/value – This paper is of value in that it analyzes what lessons can be learnt from organizational change and improvement efforts. The analysis includes a comparison of CSF for any change project before discussing the need for a process (systems) perspective for successful organizational improvement efforts.

Keywords Just in time, Lean production, Total quality management, Six sigma, Production processes

Paper type General review

Introduction

Lean has been marketed as a new organizational change and improvement method, particularly as a cost reduction mechanism (Bicheno, 2004; Achanga, 2006). Similarly, six sigma has been promoted as a new organizational change and improvement method (Hoerl *et al.*, 2004; Arnheiter and Maleyeff, 2005). As Spector (2006, p. 42) writes, "Lean and Six Sigma are two of the most effective business-improvement techniques available today." Recently, there have also been efforts to promote lean six sigma (George *et al.*, 2004; Arnheiter and Maleyeff, 2005; Brett and Queen, 2005; Caldwell *et al.*, 2005).

Interestingly enough, it seems as if American and European businesses experience a couple of management fads per decade. While individual methods to change may vary in approach and target, ultimately it is a matter of different ways to improve

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organizational performance. However, the method marketed and promoted as a "new" method, is sometimes a repackaged version of a previously popular method. As Gibson and Tesone (2001) argue, "... out of disintegrating fads come remnants which, often under new names, become new fads or blend into standard operating practice."

Organizations appear to jump from one fashionable practice to the next (DiMaggio and Powell, 1983; Abrahamson, 1996). At any given time, practitioners and researchers are likely to agree that older management techniques were deficient, and/or that their popularity was not justified by performance improvements. As with any fashion trend, discussions of contemporary techniques tend to be much more positive (Staw and Epstein, 2000). These methods, or fads, tend to follow a seven-stage life cycle:

(1) an academic article is written on a new discovery or theory;
(2) the study is discussed, summarized, and repeated;
(3) the concept is popularized in a best-selling book;
(4) throngs of management consultants carry the new technique to their client base;
(5) managers embrace the fad and champion the concept;
(6) time passes, enthusiasm dims, and doubts and cynicism arise; and
(7) new discoveries occur and consultant interest turns elsewhere.

Similarly, Ettorre discusses five stages: discovery, wild acceptance, digestion, disillusionment, and hard core. During the digestion stage, critics start suggesting that the method may not be the ultimate savior it once was believed to be. By the hard core phase, only staunch supporters still remain.

An important question is obviously why organizations fall for these fads. Abrahamson (1996) states that these fashion-like cycles may be created by organizations continually searching for improvement in their operations. New procedures may be adopted when they are widely hailed as solutions to human and organizational problems, then dropped after the promised results fail to materialize or are superceded by another, even more promising alternative. Wood and Caldas (2001) discuss institutional factors. These are external forces which pressure the adoption, such as consulting firms, authors and management gurus. Brochures and other marketing material are convincing in claiming that these methods really provide improvements and make managing easier (Cranier, 1996). Miller and Hartwick (2002) found that fads had eight primary qualities:

(1) simple;
(2) prescriptive;
(3) falsely encouraging;
(4) universally relevant;
(5) easy to apply;
(6) able to speak directly to business issues of the day;
(7) interesting because of their novelty; and
(8) given legitimacy by consultants and their successful devotees.

Furthermore, a project may not necessarily offer a solution to organizational needs, but rather an ideal road to power and influence (Wood and Caldas, 2001). As Cranier (1996) writes, "... latching onto the latest great idea may serve to advance your career...

aspiring managers cast around for recipes for success and ideas which can distinguish them from the crowd." Staw and Epstein (2000) found that organizations often copy other organizations to gain legitimacy rather than technological or economic advantage As March and Olsen (1976) noted, when technologies are poorly understood and organizations face problems with ambiguous causes and unclear solutions, copying other organizations may simply be a low-cost heuristic for finding useful solutions. Other reasons include the manager's need to feel up-to-date with the latest thinking as well as the need of security and reassurance. People who read management books often want the safety of a proven formula or need a precedent before they act (Cranier, 1996).

Another important question is if it matters that organizations switch from idea to idea. In searching for increased performance, organizations sometimes do not seem to know what they are really trying to accomplish, thus the distraction of another change effort is actually a relief, and pursued with a passion. Cranier (1996) quotes Richard Pascale, author of *Managing on the Edge*:

> It's like the practice of medicine in the Middle Ages. A leech under the armpit, and one to the groin, with no understanding of bacteria, viruses or how the body worked, there were lots of prescriptions [...] But cures were largely the product of random chance. A parallel holds today. Lots of remedies but few examples of authentic transformation. Organisations chum through one technique after another and at best get incremental improvement on top of business as usual. At worst, these efforts waste resources and evoke cynicism and resignation.

Unfortunately, practitioners and researchers are relearning old lessons by repeating past mistakes (Sarker and Lee, 2002). Problems occur because organizations forget what they have learned from previous development projects. Thus, it does matter and organizations should be aware of fads.

This study

The purpose of this paper is twofold. First, the paper explores if six sigma and lean are new methods, or if they basically are a repackaged versions of previously popular methods – total quality management (TQM) and just-in-time (JIT). The study is based on a comparative literature review and a measure of the frequency at which each of these approaches has appeared in the literature to investigate if the methods seem to follow the fad (product) life cycle. The second purpose is to analyze what lessons we can learn from organizational change and improvement efforts. The analysis includes a comparison of critical success factors (CSF) for any change project before discussing the need for a process (systems) perspective for successful organizational improvement efforts.

Six sigma

The purpose of six sigma is to reduce cost by reducing the variability in the processes which leads to decreased defects. Six sigma is a method to improve process capability and enhance process throughput (Nave, 2002). Six sigma is also hailed as a method to reduce waste, increase customer satisfaction, and improve financial results (Revere *et al.*, 2003). By using statistical methods, organizations are able to understand fluctuations in a process, which will allow them to pinpoint the cause of the problem. Improving the process by eliminating root causes, and controlling the process to make sure defects do not reappear (Pojasek, 2003) should ideally provide long-term benefits to the firm

(Bisgaard and Freiesleben, 2004). Over time, six sigma evolved (Arnheiter and Maleyeff, 2005). Six sigma includes designing, improving, and monitoring business processes (Revere *et al.*, 2003). It has become multifaceted, encompassing everything from simple process improvement to broad initiatives, such as project management, change management, leadership, culture change, rewards and compensation, defect definition, teaming, and problem solving (Goodman and Theuerkauf, 2005).

The six sigma methodology is based on the DMAIC cycle (define, measure, analyze, improve, and control). Motorola, the company usually recognized as one of the original developers of six sigma, decided in the 1980s that the traditional quality levels, measuring defects in thousands of opportunities, were not satisfactory (Arnheiter and Maleyeff, 2005). Based on the ideas of statistical process control, Motorola defined "six sigma" as 3.4 defects per million opportunities. Six sigma was further developed in the 1990s, among other places at General Electric. The development included the needed cultural change associated with the method (Hoerl *et al.*, 2004; Revere *et al.*, 2003).

Some argue that six sigma is mainly a fad (Caudron, 2002) and that projects are simply narrowly defined continuous improvement efforts (Hammer, 2002). Proponents claim that it is more than just a quality system (Arnheiter and Maleyeff, 2005; Spector, 2006). Six sigma is argued as a vision, a philosophy, a symbol, a metric, a goal, and/or a methodology. Proponents also mean that one should look at eight characteristics that account for six sigma's increasing bottom-line success. They claim that other quality initiatives typically fulfill only one or two of these characteristics:

(1) bottom-line results expected and delivered;

(2) senior management leadership;

(3) a disciplined approach (i.e. DMAIC);

(4) rapid (3-6 month) project completion;

(5) clearly defined measures of success;

(6) infrastructure roles for six sigma practitioners and leadership;

(7) focus on customers and processes; and

(8) a sound statistical approach to improvement.

Comparing discussion: history and development

However, these points appear very much like a description of TQM. TQM started in Japan, although many of the original ideas came from Americans (especially, Deming, 1986; Juran, 1989) who helped rebuild Japanese industry after World War II (Talha, 2004; Tarí, 2005). The purpose of TQM, as with any change method, is to improve organizational performance. TQM emphasizes the importance of satisfying customer requirements in terms of availability, delivery, reliability, maintenance, and cost effectiveness (Al-Mashari and Zairi, 2000a, b). TQM is also striving towards zero-defects via continuous improvements, achieved via two not mutually exclusive approaches. First, TQM consists of gradual, unending improvement activities that involve every person in the organization (Koehler and Pankowski, 1996; Love *et al.*, 1998; Bhuiyan and Baghel, 2005). As Gunasekaran *et al.* (1998, p. 948) write "... total quality will create a positive spiral in the company. Happy employees will do a better job, i.e. better products and services which will satisfy more customers."

Customer satisfaction includes both internal and external customers. Second, improvements were achieved via efforts to reduce variation in production processes.

Deming's basic quality philosophy was that efficiency improves as variability decreases. Statistical methods are needed to reduce variation in the production processes since over 90 percent of manufacturing errors typically belong to the system and very few problems are special problems (Motwani, 2003). Statistical control does not imply absence of defective items. It is a state of random variation, in which the limits of variation are predictable. There are two types of variation: chance and assignable. Deming's position was that the difference between these is one of the most difficult things to comprehend. It is a waste of time and money to look for the cause of chance variation; yet, he claimed, this is exactly what many companies do when they attempt to solve quality problems without using statistical methods. He advocated the use of statistics to measure performance in all areas, not just conformance to product specifications. Furthermore, he also believed that it is not enough to meet specifications; one has to keep working to reduce the variation as well. Thus, the processes need to be monitored for variation with statistical tools.

Lessons learned

If statistical process control was included in TQM – something both Crosby (1979), Deming (1986) and Juran (1989) emphasized – then it is difficult to identify differences between TQM and six sigma. The Deming wheel of TQM is basically the same as the DMAIC cycle. Both methods also evolved over time. Hellsten and Klefsjo (2000), for example, described TQM as a management system. Both methods require more than statistical tools to change and improve processes. Both emphasize the importance of top management commitment and employee involvement (Zhang, 2000). Deming was critical of the US approach to business management and he was an advocate of worker participation in decision making. He claimed that management was responsible for most quality problems, and thus it is management's task to help people work smarter, not harder. Thus, Deming was not only focused on statistics, but also the more managerial aspects, as exemplified in his well-known "fourteen points" (Crosby, 1979; Anderson *et al.*, 1994).

Both TQM and six sigma also rely on a plethora of tools. Many, many quality tools exist. In her book, Tauge (2005) discusses 148 different tools divided into six categories (project planning and implementing tools, idea creation, process analysis, data collection and analysis, cause analysis and finally evaluation and decision-making tools) with many tools belonging to more than one category. Similarly, Tarí (2005) presents a wide range of tool and techniques. Some of the more commonly mentioned quality tools are often described as QC7 tools or the seven basic quality tools (McConnell, 1989; Bamford and Greatbanks, 2005; Tauge, 2005). These are cause-and-effect diagrams (fishbone and ishikawa) control charts, check sheets, pareto charts and histogram, scatter diagrams and graphs or flow charts (McConnell, 1989; Koehler and Pankowski, 1996; Dale and McQuater, 1998).

Lean

Lean is defined by Womack and Jones (1994) as the systematic removal of waste by all members of the organization from all areas of the values stream. Lean is often referred to as a cost-reduction mechanism (Achanga, 2006; Bicheno, 2004). Lean strives to make

organizations more competitive in the market by increasing efficiency, decreasing costs incurred due to elimination of non value-adding (VA) steps and inefficiencies in the processes (Motwani, 2003) as well as reducing cycle times (Sohal and Egglestone, 1994) – and increasing profit for the organization (Claycomb *et al.*, 1999). An organization can achieve these results while not sacrificing effectiveness (Monden, 1981) if it produces exactly what is needed in the right amount when it is needed (Kannan and Tan, 2005; Monden, 1981). "Lean manufacturing is aimed at the elimination of waste in every area of production including customer relations, product design, supplier networks, and factory management" (Phillips, 2000, p. 23).

The approach to lean is based on mapping and analyzing the activities in the processes. In lean terminology, this is value stream mapping (Womack and Jones, 1994; Worley and Doolen, 2006). The value stream includes all activities needed to produce the product. The value stream represents the "flow of value" to these organizations. The analysis is primarily based on identifying activities that add value to the product or activities that can be classified as *muda* – the Japanese word for waste (Worley and Doolen, 2006). Waste can be found in all activities in the value stream, especially where the product moves from one department to another (Womack and Jones, 1994). Taj and Berro (2005) claim that many manufacturing companies waste over 70 percent of their resources. Jones *et al.* (1997) claim that for many organizations less than 10 percent of activities often are value adding and as much as 60 percent do not add any value at all. Similarly, Bhasin and Burcher (2006) claim that implementing lean can reduce waste by 40 percent. Seven typical examples of waste are: overproduction, waiting, transportation, inappropriate processing, excess inventory, unnecessary motion, and defects (Endsley *et al.*, 2006; Bhasin and Burcher, 2006).

Lean is also described as a pull system. The system promotes conditions necessary to manufacture high-quality products to meet market demand with relatively small levels of inventory. Holding costs are diminished because materials do not arrive until needed and items are only produced to meet the forecasted demand. As a result, "companies have substantially cut lead times, drastically reduced raw material, work-in-process and finished goods inventories, and effectively increased asset turnover" (Claycomb *et al.*, 1999). Thus, there are five basic steps in the lean process (Nave, 2002; Snee, 2004; Womack, 2006):

(1) define value and all of the VA features in a given process;

(2) identify the "value stream," the chronological flow of activities that add value – people are visual by nature, and they place value on seeing a process flow visually;

(3) force the activities to flow without interruption. Any non-value adding activities should be removed or minimized (in the case that non-value adding activities are required, their impact to the process is minimized);

(4) allow the customer to "pull" the product or service through the process, akin to JIT manufacturing; and

(5) continuously pursue perfection of the process by revisiting the steps again in a continuous loop. Go through the aforementioned steps repeatedly to ensure that the process is as improved as it can be.

Comparing discussion: history and development

JIT can be described as an approach to redesign production systems – from the receipt of raw materials to the shipment of the finished product. JIT strives to eliminate waste within this system (Chong *et al.*, 2001). Aghazadeh (2004) claims that JIT is a philosophy of problem solving with the purpose of cutting cost and eliminating waste. JIT is focused on pull production. Sometimes the term Kanban is used to describe the philosophy to shift from push to pull production. Kanban is also described as the actual signaling device (card and bin) to trigger production of correct quantities in a correct manner (Chausse *et al.*, 2000). In most production systems, the use of in-process buffers can hide potential organizational problems, thus creating waste. A JIT flow system can expose these problems at the source, facilitating their elimination and driving the continuous improvement of the production system. This, in turn, will lead benefits such as reduced inventory levels, reduced throughput time, improved external and internal quality, increased efficiency in general and on-time delivery (Davy *et al.*, 1996; White *et al.*, 1999).

In many ways, lean is an updated version of JIT. For all practical purposes they share the same approach to change. Both are focused on the process – adding value and eliminating waste in the process. Ironically, when JIT was in focus, lean was one important aspect of the JIT movement (Suzuki, 2004). Similarly, JIT is one of the more important components in the lean philosophy (Liker and Yu, 2000). Both methods also origin in the Toyota production system – TPS (Womack and Jones, 1994; Petersen, 2002; Vokurka and Davis, 1996). In developing TPS, the objectives were to shorten production and set up time, integrate suppliers, eliminate waste, synergize the entire business process, and to gain support at all levels for this system – from all managers and all workers (Bowen and Spear, 1999).

Lessons learned

The tools for achieving lean (Liker, 2004; Motwani, 2003; Worley and Doolen, 2006) are basically the same as the tools promoted under JIT. Some of the more prominent tools are: process/value stream mapping, Kaizen, Five S, and Kanban. Both methods strive to eliminate waste and to make the production flow as VA as possible. VA activities are activities in the production process that actually add value to the product – from the customer's perspective (Hammer, 2001; Hines and Taylor, 2000). VA activities thus refer to the actual production process (whether manufacturing or service) and could simply be explained as activities that the customer is willing to pay for. Another way to interpret VA activities is to contrast them to waste or non-value adding activities or *muda* (Hammer, 2001).

Kaizen is a theory of continuous improvements (Shirouzu and Moffett, 2004). With Kaizen, organizations strive to incrementally improve performance and to sustain a culture of continuous improvements (Faulk, 2006). Incorporating the concepts of standardized procedures and workplace improvement via the 5S's (Sort – *seiri*, Set – *seiton*, Shine – *seiso*, Standardize – *seiketsu*, and Sustain – *shitsuke*) can improve efficiency and responsiveness and thus reduce costs for the organization (Liker and Yu, 2000). The 5S's technique has benefits for both the employee and the organization. Organizational benefits include higher quality, reduced costs, improved safety, more reliable deliveries, and improved availability of plant and equipment.

Frequency of academic publications on each method

Fad behavior is not only marked by the repackaging of similar ideas under new titles, but also the abandonment of approaches in favor of new ones that may actually be similar. One measurement of whether JIT vs lean, and TQM vs six sigma, have followed the latter aspect of fad behavior, is the number of academic publications, as identified through the ABI/Inform data base, in these areas during each of the last 30 years (1975-2004). For each of the four approaches, this study presents the number of articles published with the method in the title, the number of articles published with the method in the abstract, and number of articles published with the method in the keyword (subject). The results are shown in Figures 1-4.

The number of articles featuring JIT as a primary subject reached their peak during the late 1980s and early 1990s and have tailed off ever since. The popularity of lean started to grow rapidly in the late 1990s and lean has continued to grow in popularity since. A very similar – but even more sharply defined – phenomenon has occurred in the TQM vs six sigma comparison. TQM's popularity was enormous in the late 1980s and early 1990s. The Baldrige Award became the symbol of TQM excellence in the USA with similar awards in Europe. However, without widespread understanding of the culture that made TQM successful in Japan, American, and European efforts did not always show the same results. By the late 1980s, reports started coming in about lack of results, implementation problems, and failed TQM efforts (de Cock and Rickards, 1996; Holland and Dey, 1996; Wiersema, 1998). The number of published TQM articles also dropped significantly.

Product life cycle

It appears from these comparisons that "abandonment in favor of the new (albeit not necessarily different)" aspect of fad behavior has occurred in academia for both pairs.

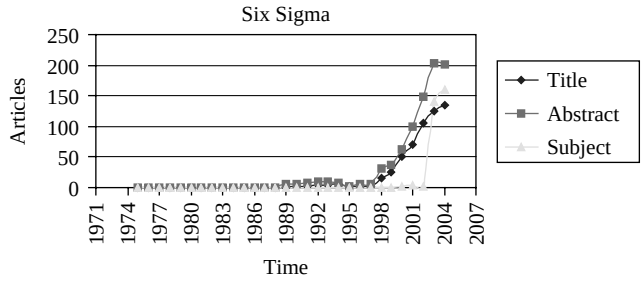

Figure 1.
Frequency of six sigma publications

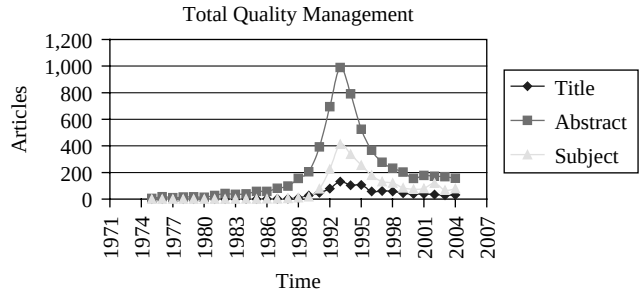

Figure 2.
Frequency of TQM publications

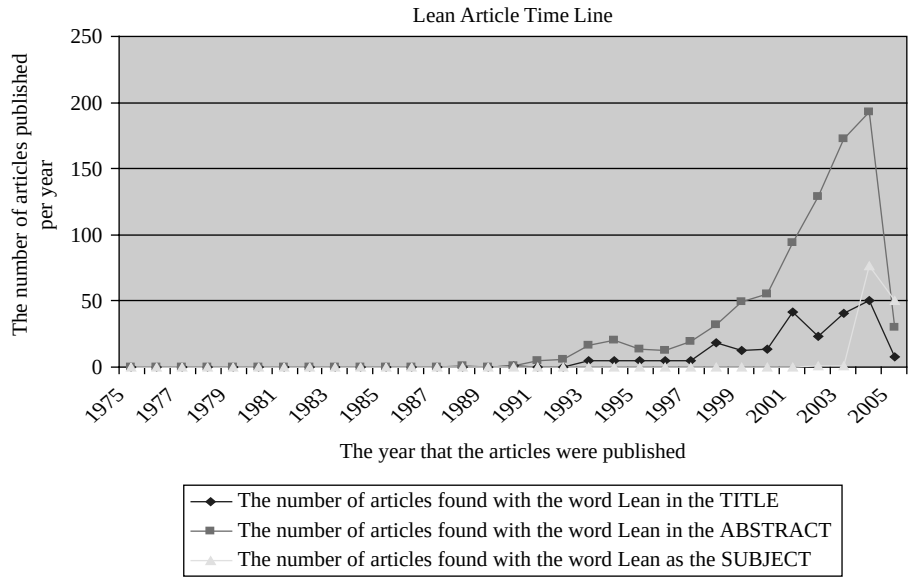

Figure 3.
Frequency of lean publications

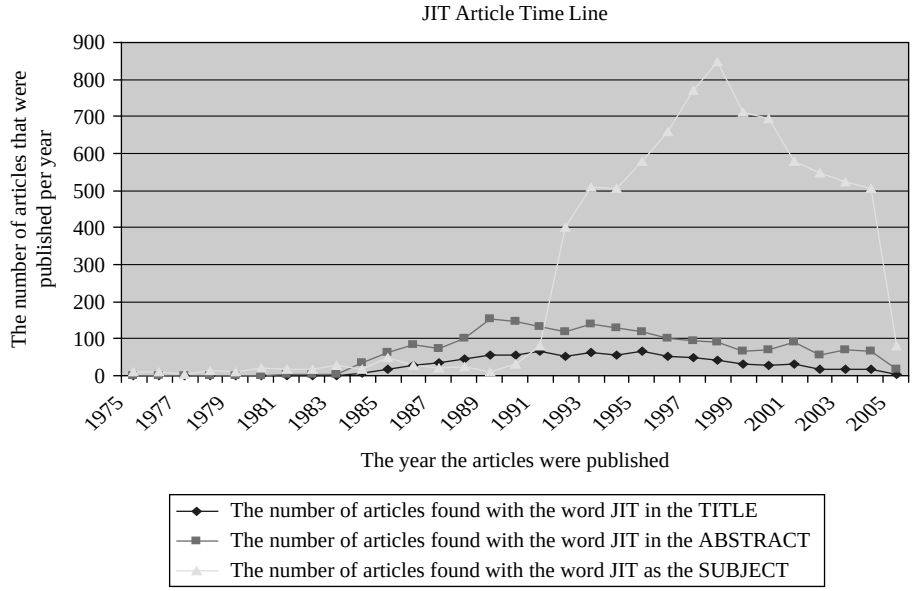

Figure 4.
Frequency of JIT publications

Another interpretation of these timelines is that management change methods indeed seem to follow the product life cycle. When a method begins to fade in popularity it will be difficult to market useful approaches, tools and techniques under that brand name. On the other hand, it may be an advantage that a new method can be marketed as

something that is indeed new. That way, organizational members can get emotionally connected to "their" method.

One may also wonder what occurred in the era between TQM and six sigma, as well as between JIT and lean. This era can perhaps be described as the business process reengineering (BPR) era. The rapid growth and popularity of BPR in the early 1990s can be explained by the relative lack of success of many TQM and JIT initiatives. Then, in the mid-1990s, the term BPR became intimately connected with downsizing and lay-offs. Organization argued that reduction in force would result in enhanced financial performance and competitiveness, and that the short-term costs associated with layoffs would be justified by long-term benefits to the organization, its stockholders, and its customers. When the data on downsizing did not support these contentions BPR went from being the dramatic solution for improvement to being just another among many "change management" philosophies (Dervitsiotis, 1998).

Critical success factors

Another comparison between these methods is to analyze CSF. As Table I indicates, a review of the literature offers fairly similar and rather general CSF for these methods. For further comparison, CSF for BPR/reengineering and enterprise resource planning (ERP) systems implementations are also included.

Frequently mentioned success factors include the importance of a vision and strategy, top management support and commitment and the importance of communication and information, and so forth. While not surprising that similar change methods have issues in common, one can argue about the practical application of such general success factors. For example, what does top management support really mean?

The purpose of any change method is to improve performance of the processes by increasing efficiency (e.g. reduced cost or time) and/or increasing effectiveness. Yet, efforts to change and improve operational performance do not seem to be very successful when they are compartmentalized. Most organizations, approach these change methods in a functional, operational and/or *ad hoc* manner rather than in a holistic or systemic way (Harber *et al.*, 1990; Goyal and Deshmukh, 1992; White *et al.*, 1999; Chong *et al.*, 2001). The functional approach to change can also lead to sub-optimization. In trying to achieve improvements in one function, the result may actually decrease performance for the organization overall. Functional approach to change can also lead to fragmentation. To conduct number of different projects within one not only requires resources, it also requires that organizations manage the dynamic big-picture, not the fragmented pieces. In addition, it makes prioritization even more difficult (Spector, 2006).

What seems to be missing is a systemic approach to organizational change and improvement (Brache and Rummler, 1997; Hammer, 2002) including a readiness for change (Jones *et al.*, 2005). A common theme for all these improvement efforts, albeit not always explicitly stated, is process orientation. Successful implementation of any change effort most likely requires that they are implemented with a systemic, holistic understanding of organizations (Harber *et al.*, 1990; Goyal and Deshmukh, 1992; Chong *et al.*, 2001). Thus, the theories behind systems thinking, applied via process management, can provide the framework needed to facilitate and maintain successful organizational improvements. With a systems view of organizations, the most important processes bridge the gap between strategy and operations (Näslund, 1999).

Table I.
Critical success factors

Issues	TQM/six sigma	JIT/lean	BPR	ERP
Business plan and vision	Coronado and Antony (2002), Dalton *et al.* (1996), Deming (1986), Henderson and Evans (2000), Juran (1989) and Tarí (2005)	Achanga (2006), Chong *et al.* (2001) and Yasin and Wafa (1996)	Arora and Kumar (2000), Rummler and Brache (1995) and Hammer and Stanton (1995)	Blessing *et al.* (2001), Buckhout *et al.* (1999), Davenport (2000), Dong (2000), Falkowski *et al.* (1998), Holland *et al.* (1999), Roberts and Barrar (1992), Rosario (2000) and Wee (2000)
Top-management support (including funding)	Coronado and Antony (2002), Dalton *et al.* (1996), Deming (1986), Juran (1989) and Tarí (2005)	Achanga (2006), Chong *et al.* (2001), Worley and Doolen (2006) and Yasin and Wafa (1996)	Arora and Kumar (2000), Dervitsiotis (1998) and Hammer and Stanton (1995)	Bingi *et al.* (1999), Buckhout *et al.* (1999), Dong (2000), Holland *et al.* (1999), Roberts and Barrar (1992), Sumner (1999), Wee (2000), McNurlin (2001) and Weston (2001)
Project management (including project champion and teamwork and composition)	Coronado and Antony (2002), Tarí (2005) and Spector (2006)	Needy (2002), Spector (2006), Taj and Berro (2005) and Yasin and Wafa (1996)	Arora and Kumar (2000)	Bingi *et al.* (1999), Buckhout *et al.* (1999), Falkowski *et al.* (1998), Holland *et al.* (1999), Rosario (2000), Sumner (1999), Wee (2000) and Weston (2001)
Change management, organizational culture	Coronado and Antony (2002), Deming (1986), Dalton *et al.* (1996), Juran (1989), Spector (2006), Tarí (2005) and Winter (1994)	Achanga (2006), Parks (2003), Spector (2006), Taj and Berro (2005) and Worley and Doolen (2006)	Arora and Kumar (2000), Bancroft *et al.* (1998), Coulson-Thomas (1994), Holtham (1994), Sarker and Lee (2002) and Talwar (1994)	Bingi *et al.* (1999), Capron and Kuiper (1998), Davenport (2000), Falkowski *et al.* (1998), Holland *et al.* (1999), Kampmeier (1998), Mahapatra and Lai (1998), Roberts and Barrar (1992), Ronca (1999), Rosario (2000), Schneider (1999), Sumner (1999) and Wee (2000)

(*continued*)

Table I.

Issues	TQM/six sigma	JIT/lean	BPR	ERP
Effective communication, education and training knowledge transfer, knowledge management, (including skills and expertise)	Coronado and Antony (2002), Deming (1986), Dalton *et al.* (1996), Juran (1989), Tarí (2005) and Winter (1994)	Achanga (2006), Parks (2003), Shirouzu and Moffett (2004) and Worley and Doolen (2006)	Hammer and Stanton (1995) and Sarker and Lee (2002)	Al-Mashari and Zairi (2000a, b), Bancroft *et al.* (1998), Blessing *et al.* (2001), Falkowski *et al.* (1998), Holland *et al.* (1999), Rosario (2000), Sumner (1999) and Wee (2000)
Organizational structure	Coronado and Antony (2002), Garvin (1995), Keen and Knapp (1996) and Tarí (2005)	Chong *et al.* (2001), Goyal and Deshmukh (1992), Taj and Berro (2005), Womack (2006) and Yasin and Wafa (1996)	Arora and Kumar (2000), Garvin (1995) and Keen and Knapp (1996)	Bingi *et al.* (1999), Buckhout *et al.* (1999), Davenport (2000), Holland *et al.* (1999), Roberts and Barrar (1992), Sumner (1999) and Wee (2000)
Monitoring and evaluation of performance: performance measurements	Deming (1986), Juran (1989) and Näslund (1996)	Groebner and Merz (1994), Womack (2006) and Worley and Doolen (2006)	Arora and Kumar (2000), Kaplan and Norton (1996) and Näslund (1999)	Al-Mashari and Zairi (2000a, b), Cook and Peterson (1998), Falkowski *et al.* (1998), Holland *et al.* (1999), Rosario (2000), Roberts and Barrar (1992) and Sumner (1999)

With this approach to change, the concepts of efficiency and effectiveness should not be regarded as mutually exclusive. An organization can increase customer satisfaction while at the same time lowering its costs (Näslund *et al.*, 2006).

Acquiring a systems view of organizations, needed for successful implementation of change effort, most likely requires different education and training than what is currently offered. Education in a systems and process view of organizations answers the questions why the change of the system is needed, how it is supposed to change, and what the benefits will be to the system. This education can also prepare the organization for change – create the readiness for change (Jones *et al.*, 2005; Wanberg and Banas, 2000). Organizations can view new change efforts from a rational and historical perspective. They can avoid the tendency to "forget" previous mistakes and thus repeating them again in the next change effort. They can apply parts of the new ideas that make sense to improve their system – their processes. New tools and thoughts can be added to the existing tool box. With this approach to change, we may minimize the fad phenomenon.

Conclusion

One could argue that the nature of the transitions from TQM to six sigma and from JIT to the lean follow fad phenomena. Comparing the goals, approach, tools, history and CSF of these methods, as well as reviewing the publication frequency in academia, the conclusion is that lean and six sigma essentially share the same fundamental approach to change with JIT and TQM. Furthermore, the ideas behind JIT and lean are not that different from the ideas in the quality movement either. One difference could be the historical focus on the manufacturing industry of JIT and lean. An obvious prediction is, given the fad or product life cycle phenomenon, that there will be a new method promoted soon, something we perhaps are already experiencing with the borderline preposterous concept of lean six sigma. On the other hand, based on the gap in time between both JIT and lean, and TQM and six sigma – a gap filled by BRP/reengineering, the next method will be more process oriented.

In addition, since history does not repeat itself but it often rhymes, organizations should view any new promoted change method critically – is it a fad or does it offer something substantially new? There are tools, techniques and useful experiences from any change method. A major contribution of the BPR movement, for example, is the importance of cross-functional processes, not just processes, but cross-functional processes. Properly used, these tools can help an organization improve performance. Finally, the importance of placing organizational change and improvement methods in general under a systemic (process management) umbrella cannot be overstated. This will increase organizational readiness for change and thus, hopefully, increase probability of implementation success.

References

Abrahamson, E. (1996), "Management fashion", *Academy of Management Review*, Vol. 21, pp. 254-86.

Achanga, P. (2006), "Critical success factors for lean implementation within SMEs", *Journal of Manufacturing Technology Management*, Vol. 17 No. 4, pp. 460-71.

Aghazadeh, S-M. (2004), "Does manufacturing need to make JIT delivery work?", *Management Research News*, Vol. 27 No. 1, pp. 27-42.

Al-Mashari, M. and Zairi, M. (2000a), "Revisiting BPR: a holistic review of practice and development", *Business Process Management Journal*, Vol. 6 No. 1, p. 10.

Al-Mashari, M. and Zairi, M. (2000b), "Supply-chain re-engineering using enterprise resource planning (ERP) systems: an analysis of a SAP R/3 implementation case", *International Journal of Physical Distribution & Logistics Management*, Vol. 30 Nos 3/4, pp. 296-313.

Anderson, J., Rungtusanatham, M. and Schroeder, R. (1994), "A theory of quality management underlying the Deming management method", *Academy of Management Review*, Vol. 19 No. 3, pp. 472-509.

Arnheiter, E. and Maleyeff, J. (2005), "The integration of lean management and six sigma", *The TQM Magazine*, Vol. 17 No. 1, pp. 5-18.

Arora, S. and Kumar, S. (2000), "Reengineering: a focus on enterprise integration", *Interfaces*, Vol. 30 No. 5, pp. 54-71.

Bamford, D. and Greatbanks, R. (2005), "The use of quality management tools and techniques: a study of application in everyday situations", *International Journal of Quality & Reliability Management*, Vol. 22 No. 4, pp. 376-92.

Bancroft, N., Seip, H. and Sprengel, A. (1998), *Implementing SAP R/3: How to Introduce a Large System into a Large Organization*, Manning Publications, Greenwich, CT.

Bhasin, S. and Burcher, P. (2006), "Lean viewed as a philosophy", *Journal of Manufacturing Technology Management*, Vol. 17 No. 1, pp. 56-72.

Bhuiyan, N. and Baghel, A. (2005), "An overview of continuous improvement: from the past to the present", *Management Decisions*, Vol. 43 No. 5, pp. 761-71.

Bicheno, J. (2004), *The New Lean Toolbox towards Fast and Flexible Flow*, PICSIE Books, Buckingham.

Bingi, P., Sharma, M.K. and Godla, J. (1999), "Critical issues affecting an ERP implementation", *Information Systems Management*, Vol. 16 No. 3, pp. 7-14.

Bisgaard, S. and Freiesleben, J. (2004), "Six sigma and the bottom line", *Quality Progress*, Vol. 3 No. 9, p. 57.

Blessing, D., Goerk, M. and Bach, V. (2001), "Management of customer and project knowledge: solutions and experience at SAP", *Knowledge and Process Management*, Vol. 8 No. 2, pp. 75-90.

Bowen, K. and Spear, S. (1999), "Decoding the DNA of the Toyota production system", *Harvard Business Review*, Vol. 77 No. 5, pp. 96-107.

Brache, A. and Rummler, G. (1997), "Managing an organization as a system", *Training*, Vol. 34 No. 2, pp. 68-74.

Brett, C. and Queen, P. (2005), "Streamlining enterprise records management with lean six sigma", *Information Management Journal*, Vol. 39 No. 6, pp. 58-62.

Buckhout, S., Frey, E. and Nemec, J. Jr (1999), "Making ERP succeed: turning fear into promise", *IEEE Engineering Management Review*, Vol. 27 No. 3, pp. 116-23.

Caldwell, C., Brexler, J. and Tom Gillem, T. (2005), "Engaging physicians in lean six sigma", *Quality Progress*, Vol. 38 No. 11, pp. 42-6.

Capron, B. and Kuiper, D. (1998), "Management and implementation", *Manufacturing Systems, (Supplement): A Managers Guide to Application Systems*, April 1.

Caudron, S. (2002), "Just say NO to training fads", *Training & Development*, Vol. 56 No. 6, pp. 39-43.

Chausse, S., Landry, S., Pasin, F. and Fortier, S. (2000), "Anatomy of Kanban: a case study", *Production & Inventory Management Journal*, Vol. 41 No. 4, pp. 11-16.

Chong, H., White, R. and Prybutok, V. (2001), "Relationship among organizational support, JIT implementation, and performance", *Industrial Management + Data Systems*, Vol. 101 No. 6, pp. 273-80.

Claycomb, C., Germain, R. and Droge, C. (1999), "Total systems JIT outcomes: inventory, organization and financial effects", *International Journal of Physical Distribution & Logistics Management*, Vol. 29 No. 10, p. 612.

Coronado, R. and Antony, J. (2002), "Critical success factors for the successful implementation of six sigma projects in organizations", *The TQM Magazine*, Vol. 14 No. 2, pp. 92-9.

Coulson-Thomas, C. (Ed.) (1994), *Business Process Re-engineering: Myth & Reality*, Kogan Page, London.

Cranier, S. (1996), "The rise of guru skepticism", *Management Today*, March, pp. 48-52.

Crosby, P. (1979), *Quality is Free; the Art of Making Quality Certain*, Hodder & Stoughton, New York, NY.

Dale, B. and McQuater, R. (1998), *Managing Business Improvement and Quality: Implementing Key Tools and Techniques*, Blackwell Business, Oxford.

Dalton, G., Perry, L., Younger, J. and Smallwood, N. (1996), "Strategic restructuring", *Human Resources Management*, Vol. 35 No. 4, pp. 433-52.

Davenport, T. (2000), *Mission Critical: Realizing the Promise of Enterprise Systems*, Harvard Business School Press, Boston, MA, available at: www.amazon.com/exec/obidos/tg/detail/-/0875849067/qid = 1127414965/tomdavenportc-20

Davy, J., White, R., Merritt, N. and Gritzamacher, K. (1996), "A derivation of the underlying constructs of JIT management", *Academy of Management Journal*, Vol. 35, pp. 653-67.

de Cock, C. and Rickards, T. (1996), "Thinking about organizational change: towards two kinds of process intervention", *The International Journal of Organizational Analysis*, Vol. 4 No. 3.

Deming, W. (1986), *Out of the Crisis*, MIT Press, Cambridge, MA.

Dervitsiotis, K. (1998), "The challenge of managing organizational change: exploring the relationships of re-engineering, developing learning organizations and total quality management", *Total Quality Management*, Vol. 9 No. 1, pp. 109-22.

DiMaggio, P. and Powell, W. (1983), "The iron cage revisited: institutional isomorphism and collective rationality in organizational fields", *American Sociological Review*, Vol. 35, pp. 147-60.

Dong, L. (2000), "A model for enterprise systems implementation: top management influences on implementation effectiveness", in Chung, H.M. (Ed.), *Proceedings, 2000 Americas Conference on Information Systems,* Omnipress, Long Beach, CA, pp. 1045-9.

Endlsey, S., Magill, G. and Marjorie, M. (2006), "Creating a lean practice", *Family Practice Management*, Vol. 13 No. 4, p. 34.

Falkowski, G., Pedigo, P., Smith, B. and Swanson, D. (1998), "A recipe for ERP success", *Beyond Computing*, September, pp. 44-5.

Faulk, C. (2006), "Reducing waste by design", *Machine Design*, Vol. 78 No. 1, p. 31.

Garvin, D. (1995), "Leveraging processes for strategic advantage", *Harvard Business Review*, September/October, pp. 77-90.

George, M., Rowlands, D. and Kastle, B. (2004), *What is Six Sigma?*, McGraw-Hill, New York, NY.

Gibson, J. and Tesone, D. (2001), "Management fads: emergence, evolution, and implications for managers", *The Academy of Management Executive*, Vol. 15 No. 4, pp. 122-33.

Goodman, J. and Theuerkauf, J. (2005), "What's wrong with six sigma?", *Quality Progress*, Vol. 38 No. 1, pp. 37-42.

Goyal, S. and Deshmukh, S. (1992), "A critique of the literature on just-in-time manufacturing", *International Journal of Operations & Production Management*, Vol. 12 No. 1, pp. 18-28.

Groebner, D. and Merz, C. (1994), "The impact of implementing JIT on employees' job attitudes", *International Journal of Operations Management*, Vol. 14 No. 1, pp. 26-37.

Gunasekaran, A., Goyal, S.K., Martikainen, T. and Yli-Olli, P. (1998), "Total quality management: a new perspective for improving quality and productivity", *The International Journal of Quality & Reliability Management*, Vol. 15 Nos 8/9, pp. 947-69.

Hammer, M. (2001), *The Agenda: What Every Business Must Do to Dominate the Decade*, Three Rivers Press, New York, NY.

Hammer, M. (2002), "Process management and the future of six sigma", *Sloan Management Review*, Vol. 43 No. 2, pp. 26-32.

Hammer, M. and Stanton, A. (1995), *The Reengineering Revolution Handbook*, Harper Collins, London.

Harber, D., Samson, D., Sohal, A. and Wirth, A. (1990), "Just-in-time: the issue of implementation", *International Journal of Operations & Production Management*, Vol. 10 No. 1, pp. 21-30.

Hellsten, U. and Klefsjo, B. (2000), "TQM as a management system consisting of values, techniques and tools", *The TQM Magazine*, Vol. 12 No. 4, pp. 238-44.

Henderson, K. and Evans, J. (2000), "Successful implementation of six sigma: benchmarking general electric company", *Benchmarking: An International Journal*, Vol. 7 No. 4, pp. 260-81.

Hines, P. and Taylor, D. (2000), *Going Lean: A Guide to Implementation*, Cardiff University, Cardiff.

Hoerl, R., Snee, R., Czarniak, S. and Parr, W. (2004), "The future of six sigma", *ASQ Six Sigma Forum Magazine.*, Vol. 3 No. 4, pp. 38-43.

Holland, C. and Dey, K. (1996), "Making quality pay", *Telephony*, January 8, pp. 34-6.

Holland, C., Light, B. and Gibson, N. (1999), "A critical success factors model for enterprise resource planning implementation", *Proceedings 7th European Conference on Information Systems ECIS, Copenhagen, Denmark*.

Holtham, C. (1994), "Business process re-engineering – contrasting what it is with what it is not", in Coulson-Thomas, C. (Ed.), *Business Process Re-engineering: Myth & Reality*, Kogan Page, London.

Jones, D.T., Hines, P. and Rich, N. (1997), "Lean logistics", *International Journal of Physical Distribution & Logistics Management*, Vol. 17 Nos 3/4.

Jones, R., Jimmieson, N. and Griffiths, A. (2005), "The impact of organizational culture and reshaping capabilities on change implementation success: the mediating role of readiness for change", *Journal of Management Studies*, Vol. 42 No. 2, pp. 361-80.

Juran, J. (1989), *Juran on Leadership for Quality: An Executive Handbook*, The Free Press, New York, NY.

Kampmeier, C. (1998), "Intellectual capital: the new wealth of organizations", *Journal of Management Consulting*, Vol. 10 No. 1, pp. 61-4.

Kannan, V. and Tan, K. (2005), "Just in time, total quality management, and supply chain management: understanding their linkages and impact on business performance", *The International Journal of Management Science*, Vol. 33 No. 2, pp. 153-62.

Kaplan, R. and Norton, D. (1996), "Using the balanced scorecard as a strategic management system", *Harvard Business Review*, January/February, pp. 75-85.

Keen, G. and Knapp, M. (1996), *Every Manager's Guide to Business Processes: A Glossary of Key Terms & Concepts for Today's Business Leader*, Harvard Business School Press, Boston, MA.

Koehler, J. and Pankowski, J. (1996), *Teams in Government*, St Lucie Press, Delray Beach, FL.

Liker, J.K. (2004), *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill, New York, NY.

Liker, J.K. and Yu, Y-C. (2000), "Japanese automakers, US suppliers and supply-chain superiority", *MIT Sloan Management Review*, Vol. 42 No. 1, pp. 81-93.

Love, P., Gunasekaran, A. and Li, H. (1998), "Putting an engine into re-engineering: toward a process-oriented organization", *International Journal of Operations & Production Management*, Vol. 18 Nos 9/10, pp. 937-49.

McConnell, J. (1989), *The Seven Tools of TQC*, 3rd ed., The Delaware Group, Manly Vale.

McNurlin, B. (2001), "Will users of ERP stay satisfied", *MIT Sloan Management Review*, Winter.

March, J. and Olsen, J. (1976), *Ambiguity and Choice in Organizations*, Universitetsforlaget, Bergen.

Miller, D. and Hartwick, J. (2002), "Spotting a management fad", *Harvard Business Review*, Vol. 8 No. 10, p. 26.

Monden, Y. (1981), "What makes the Toyota production system really tick", *Industrial Engineer*, Vol. 13 No. 1, p. 36.

Motwani, J. (2003), "A business process change framework for examining lean manufacturing: a case study", *Industrial Management + Data Systems*, Vol. 103 Nos 5/6, pp. 339-47.

Näslund, D. (1996), *On Performance Measurement Systems: Design and Development*, Lund University, Lund.

Näslund, D. (1999), "Towards bridging the gap between strategy and operations: a process based framework", Dissertation, Lund University, Lund.

Näslund, D., Olsson, A. and Karlsson, S. (2006), "Operationalizing the concept of value – an action research based model", *The Learning Organization*, Vol. 13 Nos 2/3, pp. 300-32.

Nave, D. (2002), "How to compare six sigma, lean and the theory of constraints", *Quality Progress*, Vol. 35 No. 3, p. 73.

Petersen, P. (2002), "The misplaced origin of just-in-time production methods", *Management Decision*, Vol. 40 No. 1, pp. 82-8.

Phillips, T. (2000), "Building the lean machine", *Advanced Manufacturing*, January, pp. 21-6.

Pojasek, R. (2003), "Lean, six sigma, and the systems approach: management initiatives for process improvement", *Environmental Quality Management*, Vol. 13 No. 2, p. 85.

Revere, L., Black, K. and Huq, A. (2004), "Integrating six sigma and CQI for improving patient care", *The TQM Magazine*, Vol. 16 No. 2, p. 105.

Roberts, H. and Barrar, P. (1992), "MRPII implementation: key factors for success", *Computer Integrated Manufacturing Systems*, Vol. 5 No. 1, pp. 31-8.

Ronca, C. (1999), "Beyond the ERP experience change management as a key factor a winning enterprise", *Proceedings, 1st International Workshop on Enterprise Management Resource and Planning Systems (EMRPS), Venice, Italy*, p. 373.

Rosario, J.G. (2000), "On the leading edge: critical success factors in ERP implementation projects", *BusinessWorld*, Vol. 27, (Philippines).

Rummler, G. and Brache, A. (1995), *Improving Performance: How to Manage the White Space on the Organization Chart*, Jossey-Bass, San Francisco, CA.

Sarker, S. and Lee, A.S. (2002), "Using a positivist case research methodology to test three competing theories-in-use of business process redesign", *Journal of the Association for Information Systems*, Vol. 2 No. 7, available at: http://jais.isworld.org/articles/

Schneider, P. (1999), "Wanted: ERPeople skills", *CIO*, Vol. 12 No. 10, pp. 30-6.

Shirouzu, N. and Moffett, S. (2004), "Bumpy road: as Toyota closes in on GM, quality concern also grow", *The Wall Street Journal*, August 4.

Snee, R.D. (2004), "Weave six sigma into the fabric of an organization", *Quality Progress*, Vol. 37 No. 9, pp. 69-72.

Sohal, S. and Egglestone, A. (1994), "Lean production: experience among Australian organizations", *International Journal of Operations & Production Management*, Vol. 14 No. 11, pp. 35-51.

Spector, R. (2006), "How constraints management enhances lean and six sigma", *Supply Chain Management Review*, Vol. 10 No. 1, pp. 42-7.

Staw, B. and Epstein, L. (2000), "What bandwagons bring: effects of popular management techniques on corporate performance, reputation and CEO pay", *Administrative Science Quarterly*, Vol. 45 No. 3, pp. 523-56.

Suzuki, Y. (2004), "Structure of Japanese production system: elusiveness and reality", *Asian Business and Management*, Vol. 3 No. 2, pp. 201-19.

Taj, S. and Berro, L. (2005), "Application of constrained management and lean manufacturing in developing best practices for productivity improvement in auto-assembly plant", *International Journal of Productivity and Performance Management*, Vol. 55 Nos 3/4, pp. 332-45.

Talha, M. (2004), "Total quality management (TQM): an overview", *The Bottom Line*, Vol. 17 No. 1, pp. 15-19.

Talwar, R. (1994), "Re-engineering – a wonder drug for the 90's", in Coulson-Thomas, C. (Ed.), *Business Process Re-engineering: Myth & Reality*, Kogan Page, London.

Tarí, J. (2005), "Components of successful total quality management", *The TQM Magazine*, Vol. 17 No. 2, p. 182.

Tauge, N. (2005), *The Quality Toolbox, American Society for Quality*, Quality Press, Milwaukee.

Vokurka, R. and Davis, R. (1996), "Just-in-time: the evolution of a philosophy", *Production & Inventory Management Journal*, Vol. 37 No. 2, pp. 56-9.

Wanberg, C. and Banas, T. (2000), "Predictors and outcomes of openness to change in a reorganizing workplace", *Journal of Applied Psychology*, Vol. 85 No. 1, pp. 132-42.

Wee, S. (2000), "Juggling toward ERP success: keep key success factors high", *ERP News*, February, available at: www.erpnews.com/erpnews/erp904/02get.html

Weston, F. (2001), "ERP implementation and project management", *Production & Inventory Management Journal*, Vol. 42 Nos 3/4, pp. 75-80.

White, R., Pearson, J. and Wilson, J. (1999), "JIT manufacturing: a survey of implementations in small and large US manufacturers", *Management Science*, Vol. 45 No. 1, pp. 1-15.

Wiersema, W. (1998), "Producing better quality at lower cost", *Electrical Apparatus*, Vol. 51 No. 9, pp. 51-2.

Winter, S. (1994), "Organization for continuous improvement, evolutionary theory meets the quality revolution", in Baum, J. and Singh, J. (Eds), *The Evolutionary Dynamics of Organizations*, Oxford University Press, Oxford.

Womack, J. (2006), "Value stream mapping", *Manufacturing Engineering*, May, pp. 145-56.

Womack, J. and Jones, D. (1994), "From lean production to the lean enterprise", *Harvard Business Review*, Vol. 72 No. 2, pp. 93-103.

Wood, T. and Caldas, M.P. (2001), "Reductionism and complex thinking during ERP implementations", *Business Process Management Journal*, Vol. 7 No. 5, pp. 387-93.

Worley, J. and Doolen, T. (2006), "The role of communication and management support in a lean manufacturing implementation", *Management Decision*, Vol. 44 No. 2, pp. 228-45.

Yasin, M. and Wafa, M. (1996), "An empirical examination of factors influencing JIT success", *International Journal of Operations & Production Management*, Vol. 16 No. 1, p. 19.

Zhang, Z. (2000), "Developing a model of quality management methods and evidence their effects on business performance", *Total Quality Management*, Vol. 11 No. 1, pp. 129-37.

Further reading

Benavent, F. (2006), "TQM application through self-assessment and learning: some experiences from two EQA applicants", *The Total Quality Management Journal*, Vol. 13 No. 1, pp. 7-25.

DeToro, I. and McCabe, T. (1997), "How to stay flexible and elude fads", *Quality Progress*, Vol. 30 No. 3, pp. 55-60.

Jabnoun, N. and Sedrani, K. (2005), "TQM, culture, and performance in UAE manufacturing firms", *The Quality Management Journal*, Vol. 12 No. 4, pp. 8-20.

Kaplan, R. and Murdock, L. (1991), "Core process redesign", *The McKinsey Quarterly*, Vol. 2, pp. 15-31.

Kueng, P. (2000), "Process performance measurement system: a tool to support process-based organizations", *Total Quality Management*, Vol. 11 No. 1, pp. 67-85.

McCarthy, M. (2006), "Can car manufacturing techniques reform health care", *The Lancet*, Vol. 367 No. 9507, p. 290.

Nah, F., Lau, J. and Kuang, J. (2001), "Critical factors for successful implementation of enterprise systems", *Business Process Management Journal*, Vol. 7 No. 3, pp. 285-96.

Turner, D. and Crawford, M. (1998), *Change Power: Capabilities that Drive Corporate Renewal*, Business and Professional Publishing, Warriewood, NSW.

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