

A Review of Lean Principles As Applied to the Education Environment

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Abstract

In the 1980's, a new manufacturing management model gained popularity throughout US and Europe manufacturing facilities. The widely adopted Japanese manufacturing concepts came to be known as 'lean production'. In time, the concepts associated with lean production spread to other activities such as health care, construction, distribution, the service industry and transformed into applications loosely called lean thinking. Lean thinking looks at the value chain and posits: How can things be structured so that the function under consideration does nothing but add value, and does that as rapidly as possible? This paper proposes that the methods of lean thinking can be adapted for design and delivery of education. This is a relatively new concept that requires attention. We provide a review of lean thinking literature, the history and evolution of lean thinking principles followed applications lean thinking principals to the education environment.

Introduction

The emergence of the knowledge economy has implications for more emphasis on capabilities that add value through knowledge development, improvement and innovation and less with the traditional economic factors such as capital, physical labor, raw materials etc (Drucker¹⁰, 1993). Knowledge development, improvement and innovation require a high degree of personal involvement from the individuals. For employers, the knowledge economy will probably demand knowledge workers to be more capable, autonomous and responsible for their

learning and development. The scholarly literature has well established that learning is a significant source of creating competitive advantage for organizations and is conducive for individual and organizational learning and performance (Ellinger¹¹, Ellinger¹¹, Yang & Howton¹¹, 2002; Marsick & Watkins²⁴, 1999; Pfeffer & Veiga²⁹, 1999). An organization's human resources are now recognized as a significant competitive advantage behind growth, and profits.

The increased global competition, escalating pace of technology require that organizations become more responsive to meeting learner's needs and adopt more flexible approaches (Guglielmino & Guglielmino¹⁴, 2001; Guglielmino & Murdick¹⁵, 1997; Zemke⁴⁴, 1998). According to Smith³³ (2001) and Stansfield³⁵ (1997) flexible training and self-directed learning approaches have emerged as organizational responses to meet the complex demands of the world.

In the 1980's, a new performance management model hit factories throughout the US and Europe. Mass production and scientific management techniques from the early 1900's were re-evaluated as Japanese manufacturing companies demonstrated that 'Just-in-Time' was a better paradigm. The widely adopted Japanese manufacturing concepts came to be known as 'lean production'. In time, the concepts associated with lean production spread to other activities such as health care, construction, distribution, the service industry and transformed into applications loosely called lean thinking. Lean thinking looks at the value chain and posits: How can things be structured so that the function under consideration does nothing but add value, and does that as rapidly as possible? All the intermediate steps, all the intermediate time and all the assets are eliminated from the process.

It appears that the application of lean thinking principles as originally developed to optimize manufacturing processes by identification and elimination of waste can be adapted for design and delivery of employee education. This is a relatively new concept that requires attention. Given that lean thinking is a relatively new concept in education, the review of literature proceeds first by briefly reviewing lean thinking literature: history and evolution of lean thinking principles followed with specific mapping of Lean Principles to the education environment.

It appears that application of Lean Thinking principles for design and delivery of employee education is a relatively new topic that requires attention. Given that lean thinking is a relatively new concept in education, the review of literature proceeds first by briefly examining lean thinking literature: history and evolution of lean thinking principles. Employee perspectives of lean adoption, the latest developments in lean and some major criticisms of lean practices are reviewed. In a final section, the application of lean thinking principles in employee education is discussed. Since this still a new area, some of the suggestions offered can best be described as testable hypotheses for future research.

Evolution of Lean Thinking

Globalization and technology have propelled the application of theories and principles across disciplines and different geographical settings. The Toyota Production System is a case in point. Much has been written about Toyota's impact in the automotive industry. From the 50's the quality movement practices implemented at Toyota's factory locations in Japan have been translated, copied and applied across industries and around the world. As a result, "TQM" or Total Quality Management became a buzz word in the 80's and 90's and its impact in U.S. business and industry has been well recorded. However in the late 90's the influence of the TQM movement began to see a decline. Lean thinking principles became the next stop for cost and waste elimination activities replacing TQM as the hottest trend in the automotive industry. Lean thinking which evolved from the TQM movement is one of the current buzz words in business. Extensive research efforts have been invested in the application of lean thinking principles thus extending its influence beyond the manufacturing industry.

Lean production actually is based on many of the earlier innovations, especially on just-in-time manufacture (JIT), total quality control (TQC) or later total quality management (TQM), group or team-based work and flexible programmable technology, the aim of which was to enhance the flow of production (Appelbaum & Batt², 1994; Landsbergis, Cahill, & Schnall²⁰, 1999; Taira³⁷, 1996). The lean thinking principles of value, value stream mapping, flow, pull and perfection are essentially about creating customer value through a process of identifying and eliminating wasteful activities (Womack & Jones⁴¹, 1996). This often has led to a mean and flat organization (Kinnie, Hutchinson, & Purcell¹⁹, 1988).

Japanese Influence

A common belief prevailing earlier in the West was that the success of Japanese firms was connected to the unique features of Japanese culture. Experience has shown that the transfer of organizational innovations as such over cultural, national, and industrial borders often fails (Lillrank²², 1995). The transfer of key components of lean production such as Quality Control Circles (QCC) and Total Quality Management (TQM) did not succeed fully in the West in the 1980s because their original meaning and cultural background were not understood, and they were implemented under a different management paradigm. On the other hand, findings from the transplants in U.S. demonstrated that at least the important elements in Japanese management systems can be transferred to other cultural environments. However, North American and European experiences with lean production show that national and local features in social conditions, labor markets, the status of labor unions, and especially management and leadership traditions are critical for the success of transferring Japanese management systems and lean production to other cultural environments (Smith & Elger³¹, 1998; Taira³⁷, 1996). Consequently, the lean production applied in manufacturing in various countries differs from the original lean concept developed by Toyota in the automobile industry. For example, teams in Japanese car factories are not semi-autonomous work groups in the sense that they are in western manufacturing companies and the number and role of supervisors are different (Appelbaum & Batt² 1994; Landsbergis²⁰ et al., 1999).

Lean Production: Employee Perspective

The principles of lean production can be viewed as controversial from the point of view of human well being (Jackson & Mullarkey¹⁶ 2000). On the one hand, teamwork, multi-skills, enlarged responsibilities, innovation, collaboration, etc., characteristics of so called good work are emphasized in lean production. On the other hand, researchers of socio-technical systems orientation (Berggren⁴, 1992; Niepce & Molleman²⁸, 1998) have criticized the type of lean production developed in the Japanese car industry.

The opinions on change management and innovation activity were related to the perception of improvements in the production flow in recent years. In addition, age, information exchange, opportunities for decision making, social climate, and the quality of group work were

significant predictors for the white-collar employees. The improvements in the collaboration within one's own work group, social climate and the quality of group work were important factors for both groups. For the blue-collar employees, poor social climate also was a significant predictor of stress.

Previous experiences, mainly from the automobile industry, revealed a controversial picture regarding the consequences of lean production for job contents and employee well being (Jackson & Mullarkey¹⁶, 2000). Jackson & Mullarkey have suggested that there are various mediating factors that affect the outcome when the principles of lean production are implemented.

Lean Consumption

Womack and Jones⁴² (2005) further extend the concept of lean to include the processes of consumption. They suggest that by 'minimizing customers' time and effort and delivering exactly what they want when and where they want it, organizations can reap huge benefits' (p.59). For producers and providers (whether organizations or universities), developing lean consumption processes requires determining how to configure linked business activities, to meet customer needs without squandering their own -or the consumer's-time, effort, and resources. Womack and Jones suggest solving the customer's problem completely by insuring that all the goods and services (courses, content, learning activities, certification, competencies etc) work, and work together. The age of mass consumption is coming to an end and traditional educational methods that have long adopted the stance of mass production of teaching and learning need to embrace the opportunity to solve learners' problems completely. Learners must be able to get just what they want, when they want it at an attractive price with no waste of time.

Lean thinking and employee education

Theoretical frameworks that support lean thinking in Employers

Dirkx⁹ (1996) suggested the workplace as a 'primary site for adult learning and the practice of adult education (p.44). Confessore⁷ and Knops⁷ (1998) identified several organizational characteristics that support self-directed learning. These include:

1. tolerance for errors, support for experimentation and risk taking, emphasis on creativity and innovation
2. use of participative leadership style and delegation of responsibility to organizational members
3. support for learning initiatives that are linked to organizational goals and values
4. encouragement of open communication and of information systems that provide collaboration and teamwork and use of both internal and external learning resources
5. Provision of opportunities and situations for individual learning. (p.371)

These studies and several others (Knowles¹⁹, 1975; Merriam & Caffarella²⁵, 1999) suggest that there is a strong grounding of adult and self-directed learning approaches in lean thinking principles as it relates to the central role of the customer's needs (here role of the adult learner's needs), design of learning events drawing from learner's previous experiences and knowledge, immediacy in application and internal motivation. The concept of adult learning also acknowledges individual and situational differences. The concept of lean consumption brings us closest to recognizing learning as interaction of between an individual and a situation and the inherent variability of learning experiences from one adult learner to another.

Recent studies have focused on faculty perceptions of learner-centered principles as enumerated by the American Psychological Association (1997) but fail to examine student perceptions (Barden³, 2000; Kanuka¹⁷, 2001, Winegar³⁹, 2000). Instructor perceptions of learner-centeredness will be compared to student perceptions on the degree by which online classes are learner-centered. Learner-centered psychological principles will provide the framework for assessing learner-centeredness of online classes. Lean thinking principles on the other hand will help in infusing the voice of the customer in key processes for delivery and continuous improvement of online degree programs in order to attain expected learning outcomes for the learners. There is usefulness in adopting this approach to characterize online learning with potential applications for industry and the university settings.

Application of lean thinking principles in education

Laursen²¹ (2003) explored implementation difficulties in applying lean thinking principles in the hospital industry. The guiding question: can lean thinking be implemented directly in health care in its present form or it is necessary to adapt certain aspects of the principles, or develop new concepts elicited initial resistance from the hospital staff. The researcher concluded that while the lean thinking principles can be applied in the hospital industry, the very implementation uncovered several difficulties. Dichotomy of operations and motivation issues as well need to be addressed, if lean approach is not to suffer the same fate as TQM.

Learners are at the forefront of experiencing and learning in new online education systems. As end users of the learning system, it is their voice that can provide critical information on the strengths of the program: in terms of andragogy, technology and organizational support (Seung-won Yoon⁴³, 2003).

The application of lean thinking principles in the HEI (Higher Education Institutions) setting is beginning to gain the interest of educators and administrators (Comm & Mathaisel⁶, 2003). Comm & Mathaisel⁶ (2003) provide a paradigm of lean initiatives in the higher education setting for long-term sustainability. Nightingale (2000a, as cited in Comm & Mathaisel⁶, 2003) mentions some of the current and future benefits of e-lean. However, very few have actually conceptualized the design, market, delivery of learning programs as a service quality for enhancing customer value. By conceptually recognizing learning essentially as a customer or learner-centered process, new theory and knowledge initially developed by the automotive industry can be applied to meet the challenges of learning in higher education and the corporate sector. Although this innovative approach comes from a business paradigm of meeting mass production challenges, lean thinking uniquely reinforces the need for individualizing learning experiences for the online learner. Regardless of the setting, whether in the corporate or the higher education context, it is imperative to review some of the terms of lean thinking processes into the employee education context.

The initial objective in an employee education context would be to reduce the “overburden” on the learner – efforts that don’t add value to the learning process that impedes them and lengthens their learning episodes (Tough 1979, as cited in Merriam & Caffarella²⁵, 1999). The logic of starting with “overburden” is to get buy-in from the learner. There could be a semantic significance in phrasing lean thinking principles in education. As we have just seen, focusing on “overburden” emphasizes the impact course design or some process on the learner. By contrast, focusing on “waste” suggests the content provider, or some “person” as the problem.

Central to the successful implantation of lean production is direct observation, where it becomes clear to the group that machine problems are evident only when failures occur. How can one rely on direct observation for processes that are cognitive in nature? Burton & Boeder⁵ (2003) offer several examples of applying lean thinking principles in administrative processes. They suggest the following activities as administrative examples for waste elimination: easy access to information, eliminate unnecessary data, simplify the process, combine work tasks, cross-train employees, apply fail-safe mechanism, minimize checks and reviews, record accuracy and establish quality standards. Failures in these administrative processes are evident through direct observation of records, reports and other documentation.

Applying lean principles and practices to course design and delivery requires instructors to challenge their views regarding what they teach and how they teach it. Importantly, for adult learners emphasis must be placed on how the course consumes time and strive to reduce or eliminate overburden, unevenness and unreasonableness due to variation in interpretation, thematic inconsistencies, or lack of focus. Emiliani’s study points to additional paths for future action. In addition, quality policy deployment (i.e. “hoshin kanri” in Japanese; Akao¹, 1991; Roberts and Tennant³⁰, 2003) can be used to determine which business courses should be offered to begin with, as school focus or professor capabilities change, accreditation standards change, and the value proposition for adult learners and their employers change over time (Karapetrovic¹⁸ et al., 1999; Dahlgaard⁸ and Østergaard⁸, 2000).

Any solution is a cause for additional inquiry that could prompt a deeper investigation into how the process worked. A systems' perspective is necessary to identify and define the problem. Several TQM and lean tools provide methods that can be contextually applied, given the context of training to identify and define the problem. Through out the planning and implementation process of a program, a precise log of identified problems, proposed solutions, expected results and outcomes, and actual outcomes is essential as they encourage the precision that is necessary for true experimentation.

In addition to these characteristics, Maurer & Taurelli²⁶ (1994) suggest that supervisors and managers' play an important role in creating an environment that is conducive for self – development and learning. By creating a conducive learning environment, managers and supervisors encourage employee's personal initiatives in accomplishing tasks and problem solving. This is important to create a transfer of training climate that will support learning transfer.

A higher focus on the soft business processes and the right applications of enabling technology are indications of how businesses have moved from one lean generation to the next generation. Except for emphasizing the need for customizing education around an organizations' specific knowledge and skills, details on how to leverage lean thinking in education and training of employees is not provided.

Much of the literature content that I reviewed had studies that focused primarily at the organizational level, for example entire hospitals, or massive construction projects set the environment where researchers proceeded to define and implement lean thinking principles. I came across a few articles that focused on small scale projects involving teams of less than 10 people and in shorter time frames.

We think it is important to understand how lean thinking principles really work outside a manufacturing setting. More than the principles, one has to, regardless of previous experience; assimilate a culture of making improvements and modifications at a pace very few organizations have been successful. No one can expect to recreate such a strong and distinct culture of learning

and problem solving in just a few weeks or a few months. Nevertheless any company that develops and implements a training program based on the lean thinking principles is sure to reap enormous dividends

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