

SPECIAL REPORT ON EVALUATION OF LEAN PRINCIPLES AND APPLICATIONS IN MANUFACTURING INDUSTRY

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ABSTRACT

Lean manufacturing has become an important avenue for both academics and practitioners in recent times many organisations around the world have attempted to implement it but the lack of clear understanding of lean performance and its measurements will contribute to the failure of the lean practice. There are many papers, articles and reports that address lean principles and tools but few studies are focussed on evaluation of lean. Manufacturing companies worldwide have been replacing traditional mass-production practices by lean initiatives. This translation process is progressive and may vary depending on several factors. Hence, it could be expected that the degree of adoption of the lean practices could vary significantly among industries. The literature studies showed lean manufacturing started at Toyota car manufacturing plant, Japan, which is known as Toyota Production System (TPS). The main pillars in TPS are Just in time and automation which main objective is to identify and eliminate waste in an organization. Lean manufacturing can be applied successfully in all industries providing a full understanding on lean ingredients i.e. concept, principles and practices.

There are numerous practices being highlighted by academicians and practitioners which are compulsory to be implemented in order to gain full benefits of lean. As small and medium enterprises (SMEs) are resources constraints, facing difficulties to adopt all lean principles this module examines the principles, techniques, key tools of "Lean" and how they might apply in a variety of processes and sectors. The strategic importance of creating "lean enterprise" is explored as well as the challenges associated with achieving and sustaining this. The module also provides scope for participants to explore how they might appropriately apply Lean in their own organizations

The purpose of this paper is to explore the implementation performance of lean principles in Indian manufacturing, the paper developed a survey in the New Mumbai Metropolitan Area, which considered industries of different sizes, from different industrial segments

KEYWORDS: Lean Performance, Manufacturing System, Lean Practices, Continuous Improvement

INTRODUCTION

Lean thinking has its root in the Toyota production system, and has been developed in the manufacturing sector. Womack and Jones (1996) highlight five core principles to define lean thinking as a means for understanding values (Womack 2002).

- Specify the value desired by the customer
- Identify the value stream for each product providing that value and challenge all off the wasted steps.
- Make the product or service flow continuously

- Introduce pull between all steps where continuous flow is impossible
- Manage towards perfection so the no of steps and the amount of time and information needed to serve the customer.

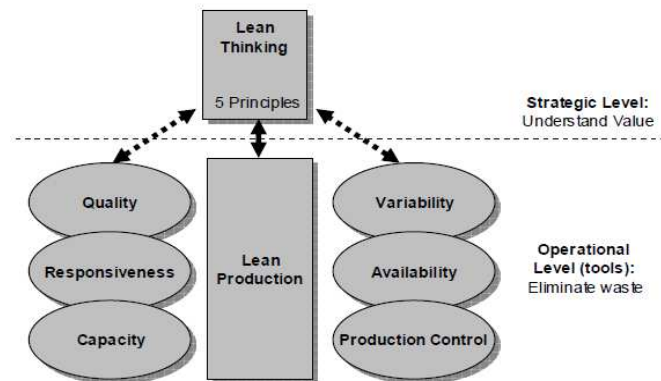


Figure 1: A framework for Lean (Hines et al, 2004)

Hines et al (2004) present Lean from two perspectives – at a strategic level focusing on the principles and at an operational level focusing on the tools and techniques often associated with Lean. Figure 1 illustrates this relationship which, as the report will indicate and refer to, became an important distinction when assessing the use of Lean.

A practical method used at the operational level has been developed to support lean thinking e.g. value stream mapping which is used to analyse the flow of resource, highlight areas where activities consume resources but do not add value from the customer perspective, this map is used to generate ideas for process redesign. Although applied successfully in the private sector specially in manufacturing the approach is applied in most of the public sector companies. The companies who are using lean has given emphasis on the research which has evaluated whether the lean approach transfers successfully and what impact this has had on productivity.

However, this finding does not necessarily imply that Lean is not appropriate for Public services. On the contrary the literature review indicates that many of the tools and techniques used at the operational level within Lean could potentially be applied within the manufacturing sector.

LITERATURE REVIEW

In this study, we examine three organizational context characteristics – unionization, plant age and plant size – that may influence the implementation of manufacturing practices. A limited number of empirical studies suggest that implementation or adoption of a manufacturing practice is contingent upon specific organizational characteristics (White et al., 1999; McKone et al., 1999). For example, White et al. (1999) found significant evidence that large US manufacturers adopted JIT practices more frequently than small manufacturers.

In general, the success of implementation of any particular management practice frequently depends upon organizational characteristics, and not all organizations can or should implement the same set of practices (Galbraith, 1977). Consideration of organizational contexts has been noticeably lacking in research on implementation of JIT and TQM programs or other lean manufacturing practices. Perhaps because of the failure to consider organizational context,

evidence on the impact of JIT and TQM programs on

Organizational performance has been mixed (Adam Jr., 1994; Powell, 1995; Samson and Terziovski, 1999). It is often assumed that because implementation of most manufacturing practices requires negotiating changes in work organization, unionized facilities will resist adopting lean practices and thus lag behind non-unionized facilities.

Drucker (1987) discussed the problems of existing union work rules and job classifications in the implementation of JIT systems. In a similar vein, the business press has often asserted that unionization prevents the adoption of some “Japanese” manufacturing practices in US manufacturers. Further, there are also instances in which unions have been cooperative and helpful in the implementation process (Katz, 1985; Cappelli and Sherer, (1989). Irrespective of the theoretical perspective, plant age is found to impede adoption and implementation of new, innovative work practices. However, empirical evidence from industrial and labor relation literature indicates that age of an establishment is not a significant determinant of adoption of work practices. Specifically, Osterman (1994) using data from 694 US manufacturing establishments found that age was not associated with the adoption of innovative work practices such as teams, jobrotation, quality circles, and total quality management. Osterman (1994) study was limited to innovative work practices related to human resource management.

We study a wider set of manufacturing practices related not only to human resources but also workflow in production, preventive maintenance and quality management programs. In this regard, anecdotal evidence suggests that newer plants have a natural advantage in implementing new lean practices because of a younger, arguably less cynical workforce and also because of fewer physical barriers to lean practices such as set up time reduction. This implies that plant age has a negative impact on the likelihood of implementation of lean manufacturing practices.

Many researchers argue that a lean production system is an integrated manufacturing system requiring implementation of a diverse set of manufacturing practices (e.g. Womack and Jones, 1996). Further, they also suggest that concurrent application of these various practices should result in higher operational performance because the practices, although diverse, are complementary and inter-related to each other.

M. Eswaramoorthi et al., (2011) have pronounced the core motivation of lean manufacturing is that the practices which we use can work synergistically to produce finished product at the pace of customer demand with little or no waste.

METHODS

This research aimed to evaluate the application of lean in manufacturing to consider if it is an appropriate means to embrace a culture of continuous improvement. The research consisted of a literature review and case studies of manufacturing organisations predominantly based in Mumbai-India. Survey of these organisations who believe that they were implementing lean and evaluation of its implementation and impact of lean methodology categorised in three parts.

Lean in Indian manufacturing sector----Working Definition of Lean

The research found key difference when lean used in manufacturing. The emphasis is given on a set of management tools and techniques that are used to standardise processes within the manufacturing sector. However there is an engagement with the principles of lean but less with full range of techniques in most of the organisations. e.g. in most of

the enterprises they are using just a few tools such as value stream mapping instead more tools needs to be adopted to cope with the need for greater process flexibility that are found in the public sector to meet the need of the customer.

Lean in Indian manufacturing sector---**Implementation Approach**

There are different models of lean implementation are used in manufacturing , most case study sites are using Kaizan approach often describe as a Kaizan Blitz or rapid improvement event (RIE).This approach uses rapid improvement to make small and quick changes.RIE approach has three changes , it begins with 2-3 week preparation period , followed by 5-6 days even to identify changes required ad 2-3 week as a follow up period, after each event when changes are implemented, however , the disadvantages of the RIE was that, quick wins may be difficult to sustain growth ,because they are not easily integrated into the overall strategy of the organisation which would be more likely to lead to layer term continuous improvement.

Lean in Indian manufacturing sector---**Outcome from Lean implementation**

The test for any new management concept is whether or not the outcome of the approach are sufficient to justify the cost efforts of implementation , In most of the cases as well as survey respondent reported some cases where improvement is seen, but they have not achieved all the objectives they have hoped from lean project . The research found two types of outcome from lean, tangible and intangible, the former referring to measurable outcome and the latter referring to more quantitative outcome.

There are wide range of **tangible** outcome reported including

- Improvement in customer waiting time
- Improvement in processing time
- Improvement in service performance in failure
- Achievement of more work in less staff time
- Bringing service up to the standard
- Reduction in staffing and costing
- Improvement of customer flow time

There was also a range of **intangible** outcomes delivering benefits to the customer which includes:

- Speed up the process
- Culture change to focus on customer requirement and encourage joined up working
- Greater focus on prevention rather than correction of errors
- Support for the development of a culture of continuous improvement
- Greater understanding of the system
- Improved performance measurement

- Greater staff satisfaction

It is observed that lean can drive efficiency improvement but cannot necessarily be used for the primary purpose of making cash savings in particular. Irrespective of the lean principles used, these findings suggest that organisational and cultural factors shape the degree of success rate of lean.

As per the research findings, the organisations that are more engaged with lean and considered and planned for it are ready to embrace lean improvement. The result suggest that the organisation with a history of managing change , that had previously tackled change and are able to build effective , multi-disciplinary teams to work across traditional organisational barriers are those with the greatest capacity for lean improvement. Research suggests that a critical mass of people who are comfortable working with lean practice is required. In the short term this requires behaviour change and those using the tools and techniques needs to be trained in lean. In the longer term, skills transfer specially those involved in the RIE to those needed to implement change. It is a key factor in sustaining the growth.

RESULTS

When we apply, the lean principles in manufacturing firm in in India, we found reasonably improve growth in their business, remarkable improvement shown after evaluation of their performance.

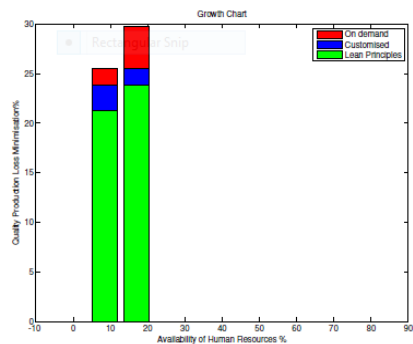


Figure 2: Growth Chart

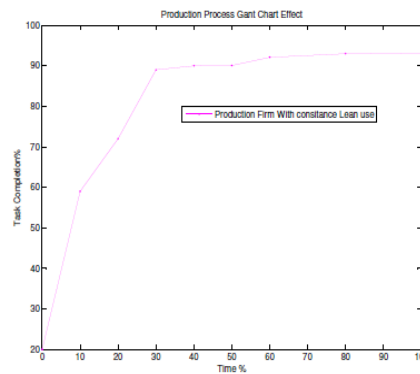


Figure 3: Production Process Gant Chart Effect (with Consistence Lean Used)

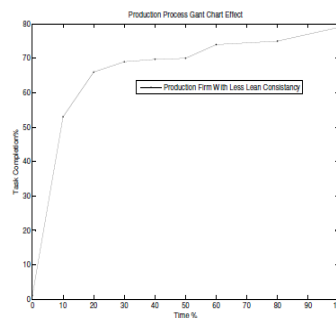


Figure 4: Production Process Gant Chart Effect (with Less Lean Consistency)

CONCLUSIONS

Analysis from the research with manufacturing firm in Indian manufacturing sector together with evidence from the literature indicates that lean is transferable to the manufacturing and can be used to develop more seamless processes, improve flow, reduce waste and develop an understanding of customer value. However to ensure greater success, organisation require an awareness or realisation of the need for improvement. For longer term impact and sustainability, implementation of lean should be tied to more strategic objective .By tackling the barriers and ensuring the provision of the factors contributing to success, this research finds that lean is suitable methodology for improving performance and embedding a continuous improvement culture in the manufacturing sector.

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