Advancing Competitive Advantage & Efficiency in Indian Construction Industry

Applying Lean Thinking to Construction Projects

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Abstract

Construction projects are required to be completed faster than ever before, and are at the same time becoming more complex and uncertain. Construction companies therefore can not run business as usual; they can advance their competitive advantage and also can become cost efficient by adopting Lean thinking—focusing on process waste elimination. This also entails engaging all employees in pursuit of continuous improvement. Creating process flow and visible project site facilitate rapid response to emerging problems leading to faster and more reliable project execution

Business Case

As a result of large investments flowing into infrastructure sector, project execution periods and budgets both are shrinking, and at the same time, risks are increasing. It is natural to throw more resources to achieve faster execution but many times sacrificing profitability.

How to switch from "Growth vs. Profitability" thinking mode to "Growth AND Profitability" mode? There is a need to deliver superior value to customer (to win contracts) and to sustain profitability also, as construction industry adopts performance based contracting.

Waste type	Cost(% of....)	Country
Quality-Non-conformance	12% of Project costs	USA
Poor Materials management	10-12 % of Labor costs	USA
Excess materials consumption at site	10% of Materials costs	Sweden
Lack of 'Constructibility'	6-10% of Project costs	USA
Lack of Safety	6% of Project costs	USA

(SOURCE: Koskela: 1992)

Table 1

[1] For any further information, please visit: www.patconsultingindia.com; Presented at the CII center of Excellence at Kolkata on November 11, 2009

Therefore, if a Rs1000 Cr project aims to increase profits by 20 %, using current practices would require increasing revenue to Rs1200 Cr, a formidable task in a fiercely competitive scenario!

Is there a better way? Yes, indeed there is!

Based on the research done abroad, waste embedded in Materials & Services for construction projects could be estimated at 20-30% of Project Value.

Therefore, just a 5% reduction in waste obtained without reducing revenue, can do the same job, better, faster and more reliably. The waste reduction strategy will not only deliver commercial benefits but also strategic benefits.

How? Enter Lean Thinking!

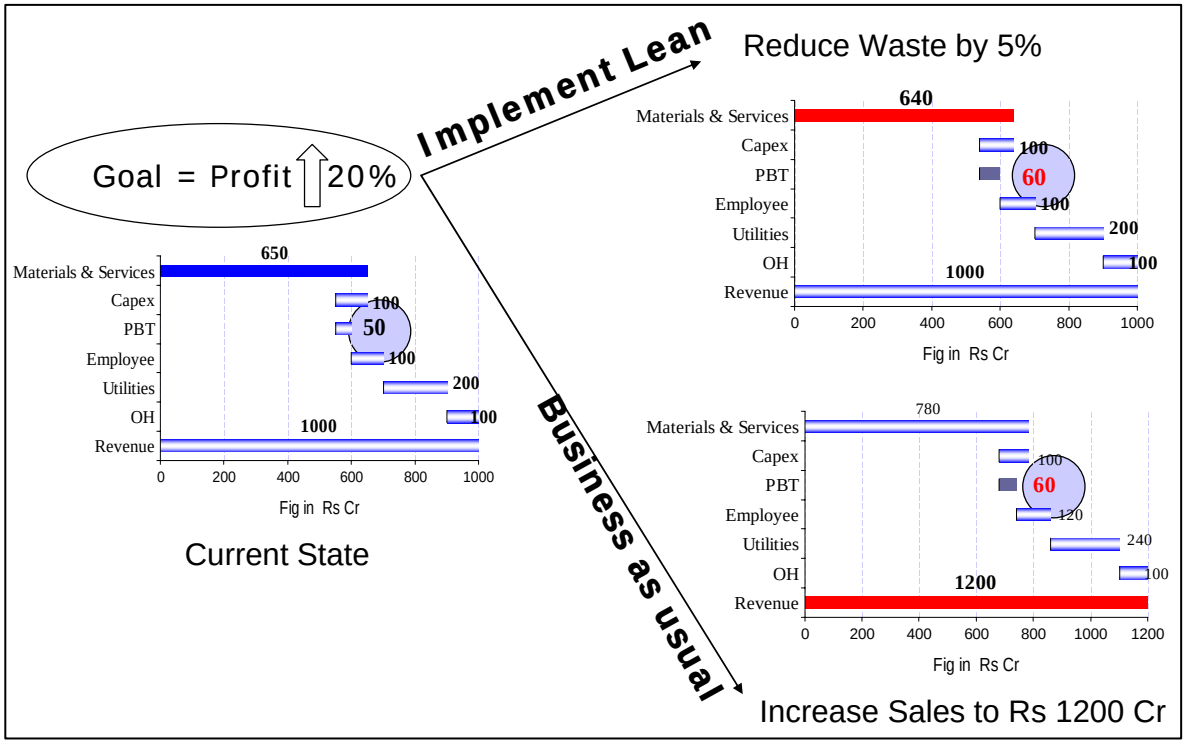


Fig. 1

Think Lean

Having observed Toyota's sustained Sales Growth & Profits year after year for decades, and also one of the highest market

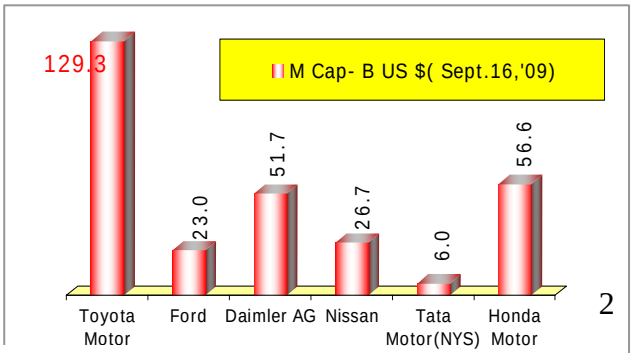


Fig. 2

[Source: PAT Consulting Research, Data as on NYSE]

cap amongst its peers, two scientists - Womack & Jones set out to study how Toyota produces cars (TPS[2]) and to develop a generalized business management system which they would call Lean System.

Lean thinking has two clearly defined objectives: the first – Create and deliver Value to your customer, and the second – Continuously find waste or *muda*[3] in your processes and remove waste. They went on categorize wastes, originally identified by Taiichi Ohno, into seven[4] typically occurring areas: Over-production, Waiting, Transportation, Unnecessary Inventory, Unnecessary Processing, Unnecessary Motion, and Defects. Relentless pursuit to improve "processes" continuously by engaging all employees throughout the enterprise enables it to create and sustain competitive advantage[5].

While many Indian manufacturing companies created their own versions of TPS and found that the system is not culture specific, and that it works for them, many Indian companies in sectors such as Software sector, Banking have also adopted the Lean concepts to gain benefits.

Typical Construction Related wastes	
Off-site manufacturing error	Spatial clash
Using wrong method	Constraint from preceding work
Rework thru design change	Waiting for materials/tools/equipment
Rework thru installation error	Late start/early finish/extended break
Waiting for instructions	
Obstructed work area	

Table 2

Waste in Construction

Many countries have initiated steps to transform their construction processes to make them lean & efficient; for example, UK- with "Rethinking Construction".

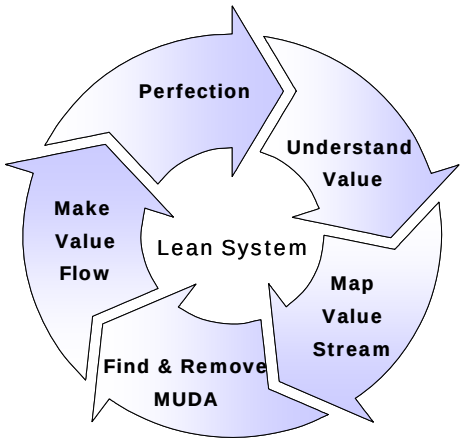
Nothing could be more important to Indian construction sector with an investment of Rs 14,50,000 Cr in infrastructure envisaged in the 11th Five year plan.

[2] TPS: Toyota Production System
[3] MUDA: A Japanese term for non-value added work or waste
[4] Subsequently, the 8th waste has been identified as "under / non utilization of talents"
[5] See: "Understanding A3 Thinking" by Sobek and Smalley

Applying to Indian Construction Industry

Womack & Jones also recommended a 5-step Lean implementation Process (See Fig. 3) which begins with identifying your customer and what s/he values, through waste elimination and establishing value flow, to improving continuously

Fig. 3



1. Stripped to essentials, whatever the customer is willing to pay for is what "value" is[6].

2. Mapping Value stream means to:

- Select your most value creating process,
- Understand it through the mapping process so well that you become acutely aware of waste and also essential wastes[7]
- Create a "Future Process" a dream, near-zero-waste process
- Develop an action plan to progress towards this ideal process in specific, time bound phases.

3. Reduce/remove wastes as per your plan

4. Connect your processes to establish flow. This will require that your processes are *available, reliable* and also *capable*. This will never be 100% perfect but it will provide direction to your efforts and priorities. Standardize them as this will be the base to improve upon.

[6] "Value is what Customer says it is".. Deming

[7] See "Lean thinking" by Womack & Jones, to learn about MUDA I and MUDA II

5. Institutionalize continuous improvement systems enterprise wide.

How does this really work in our construction industry?

The author's experience of applying lean concepts in Indian construction companies has made confronting the following typical questions quite common:

"We are different.

Our processes are unlike those predictable manufacturing processes.

We are in a highly unorganized sector.

Our customer values only "lowest cost" and nothing else. Mind set of all needs to change before Lean concepts can be applied in India.

Most of our workers are illiterate; they can not understand your management theory".

Well, a one-sentence response to all of them is "It is precisely your current conditions which make Lean an ideal application for you".

In construction projects, there are processes which are repetitive in nature, such as Rebar(Bar bending), Casting yard fabrication, Piling, Shuttering& de-shuttering, Concreting etc. Let us remember, that resistance barrier to change can be removed / reduced by creating awareness, being transparent, and giving continuous feedback to people.

Yes, L1 bid or the lowest cost offer will always be valued and demanded by the customer. Let us realize that the concept of L1 is rapidly changing—it is no more lowest quoted price but the "lowest effective price". *You need Lean Systems to become effective* L1! (See Fig. 4)

> "... the contract criteria of awarding the works to the lowest cost bidder also hinders the process of adoption of better technology, best practices, and quality. This only results in cost cutting practices by the contractor, preventing passing on the benefits to the workmen.
>
> In order to have a better system of award, focus now must shift to " Effective Lowest Price " from the "Lowest Price" syndrome. Grading of construction entities may be adopted as an effective tool to determine the "Effective Lowest Price". This practice is in vogue in Singapore...."
>
> [[Source: Report of the working Group on Construction for the 11th Five Year Plan(2007-2012)]]

Fig. 4

There is abundant evidence that Lean concepts are not culture specific and work all the normal human beings. Therefore, there is no reason why it can not be applied in India. In fact, in author's experience, Lean Concepts are more readily accepted by the top management and also by workmen at sites; the greatest resistance comes

from the Jr /middle management, who perhaps feel(unnecessarily though) insecure. Lean systems are by no stroke of imagination a rocket science, but require common sense to understand.

Understanding Process Flow

The concept of Process Flow is found to be a little difficult to understand and hence goes under-appreciated. However, it is very benefit-critical and hence very important to implementation of lean system.

Simply stated, two dependent processes get "connected" and thus flow of value (material / information/services) is established rendering the entire process more efficient, when there is "no inventory (WIP[8])" between the processes.

Inventory is seen by Lean thinkers as Process de-coupler, a flow-interrupter, and hence value

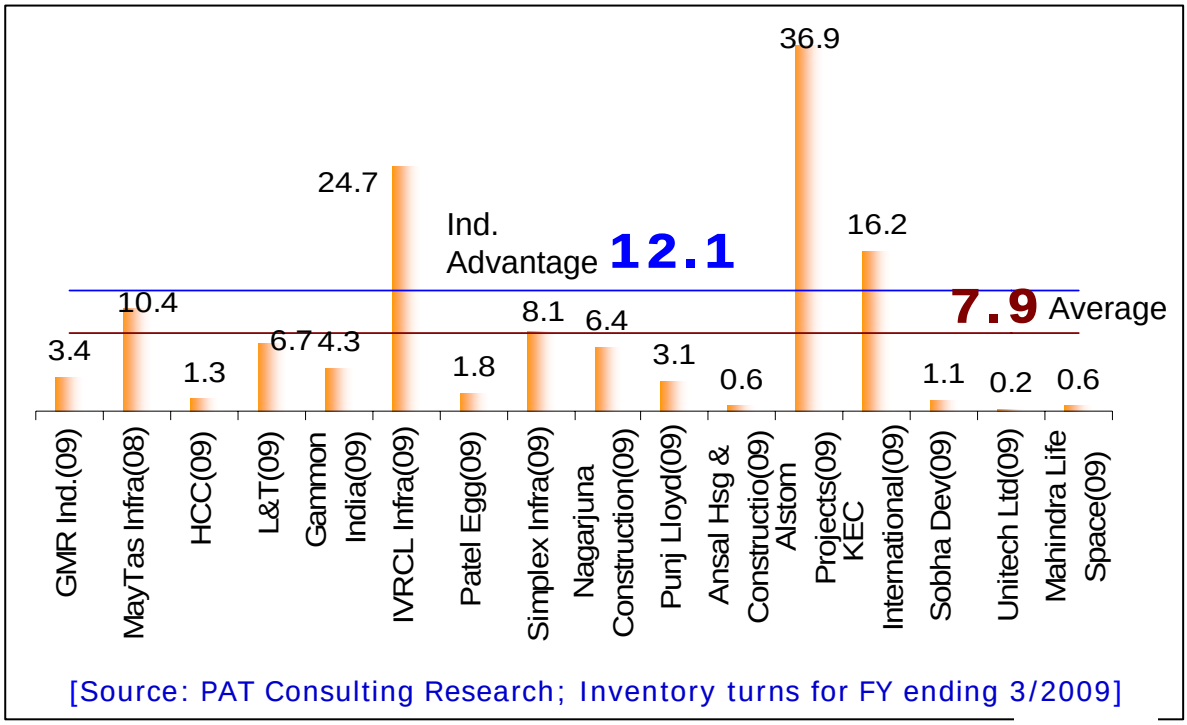


Fig. 5

destroyer, and not just something that reduces interest costs on working capital. A Relentless pursuit to keep reducing inventory (without compromising on customer service) and

[8] WIP: Work-in-Process

realization that rotating inventory faster than the competition can be a source a great competitive advantage is necessary at all the levels in an organization. A simple metric such as Inventory Turns is not even known to many at the junior/middle, and at times even senior levels in the construction management hierarchy. Impact of this is reflected in the generally lower and widely varying levels of inventory turns in Indian construction industry (See Fig. 5). Data shows that in all sectors of industry, the industry leaders rotate their inventory several times greater than the industry laggards. It must be understood throughout the construction enterprise that using inventory turns as a key performance metric of construction supply chain and improving it, helps advance competitive advantage.

Reducing inventory also ensures that problems / issues which impede "value flow" are detected immediately as they emerge (See Fig. 6), and sometimes these can be used as early warning signals of bigger problems. This leads to detection of chronic interdepartmental problems which typically lie in "no man's land".

The Leadership's role assumes a great importance; once the problems are detected, the leader must resolve them using multifunction teams where necessary, and promptly. The idea is to compress the time between detection of a problem and its resolution.

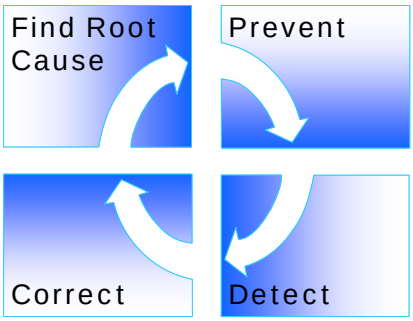


Fig. 6

Creating Visible Project Site

A Lean tool that helps this compression and thus facilitates continuous improvement is use of "Process control boards". These boards achieve the following:

- They decompose work into small manageable chunks
- They highlight the "plan-performance gap" and also record "reasons" for the gap
- Backed by "daily review", these reasons point towards the actions to close the gaps
- Involve the people "close" to the problem in solution finding & implementation
- Bring a sense of discipline and pushes accountability to lower levels leaving senior management to apply their mind to greater value creating jobs.

The same technique when extended to the entire project helps monitor the project performance without complex software. Detecting problems before they emerge and involving key people in the decision making process leads to project execution with far greater reliability. Plan-Promise-Performance gap narrows down with resultant cost benefits and increase in customer satisfaction. Lean Construction uses a tool called "Last Planner[9] which provides the required methodology.

Integrating Construction Supply Chain

Far greater benefits are realizable when the entire supply chain is integrated, providing for sharing of processes, information, knowledge, and materials across the buyer-supplier, or client-contractor interface. By consolidating supply base, developing partnerships & alliances with key / strategic suppliers, minimizing inventory at the interfaces to boost the flow, a shift from confrontational approach to cooperative approach, extends Lean thinking across the entire supply chain. Such integrated systems based on sustainable, win-win relationships have been found to lower the entire supply chain costs substantially.

Leadership Challenge

Keys to Lean Success

- Senior Management "Hands-on" approach
- Remember: Simplicity is sophistication
- Be relentless with Change—No more business as usual
- Take people along with you—involve them by challenging
- Do everything to destroy physical and virtual compartments

The Way forward

What is Your Choice?

Think LEAN!

[9] Ref: Ballard G & Howell G –Lean Construction Institute-USA