

Lean Project Management

In Large Scale Industrial & Infrastructure Project via Standardization

Dr. Azharul Karim, Saviz Nekoufar

Faculty of Built Environment and Engineering, Queensland University of Technology

Abstract

Lean project management is the comprehensive adaption of other lean concept like lean construction, lean manufacturing and lean thinking into project management context. Execution of many similar industrial projects creates the idea of lean project management in companies and rapidly growing in industries. This paper offers the standardization method in order to achieve Lean project management in Infrastructure and other large scale industrial project. Standardization refers to all activity which makes two projects most identical and unify to each other. Although standard project may have minor efficiency decrease, compare to custom built project; but great advantage of standard project like cost saving, time reduction and quality improvement justify standardization methodology.

1 Introduction

Standardization of large scale industrial include some of the infrastructure projects is new idea which emerged in leading companies in last few years and it is under development in companies and wildly spread through industry. Execution of many similar large scale industrial plants generates the idea of lean project management through standardization of large scale project.

In this article **large scale industrial** project refers to all heavy industry projects like power plant, water treatment, mining or refinery plants, which include some type of infrastructure projects.

Standardization of project refer to all activity to make a large scale project as identical as to other similar project by means of standardization of design, reducing output variability, strategic planning, standardization of procurement and construction. Standardization idea is broadly used in computer and electronic industry since 1980 according to Cusumano (1987), and used in car manufacturing since 1960 and greatly adopted and developed by Toyota in 1980 and flow to other mass production factory like machine tool manufacturing, aircraft and agriculture equipment. Standardization of large scale industrial project is one of the methods of applying lean philosophy to industrial projects and project management aspects of these projects.

Lean design is the first step of standardization of project, which results in minimizing waste of material, time and maximization of project value.

Lean construction is based on lean production concept. 'Lean construction looks into the possibility of bringing successful lean production theories into the construction industry'.(Low Sui and Teo Hui 2005)

Lean construction started in 1990s and it is one of the bases of lean project management. 'Lean construction has attracted interest from academics since the early 1990s' (Green and May 2005).



Figure 1: Lean Concept

2 Background

2.1 *Lean Design*

According to Koskela and Howell (2002), lean construction starts from **lean design**. Lean design results in minimizing waste of material, time and maximization of project value. Also, lean design is one of the main grounds of lean project management in this article. In this article standard design is used in order to achieve lean design in large scale projects.

2.2 *Lean Manufacturing*

In general lean manufacturing has the capability to produce product using the least amount of non-value adding activities that add time and subsequently cost to the manufacturing process. (Hobbs 2003)

2.3 *Lean Construction*

'**Lean construction** is a translation and adaption of lean manufacturing principles and practices to the end-to-end design and construction process. Unlike manufacturing, construction is a project based-production process.'(Wikipedia 2009)

As mentioned by Green and May (2005), one the most practical methods of applying lean philosophy in construction are off-site manufacturing, prefabrication and modularization. This article aims to expand these techniques and especially modularization to large scale industrial project like mining and power plants.

2.4 *Lean Project Management*

'Projects are temporary production systems. When those systems are structured to deliver the product while maximizing value and minimizing waste, they are said to be 'lean' projects ' (Ballard and Howell 2003)

The Lean project management concept is taken from lean manufacturing to construction industry. Standardization is one the leanest approach in large scale projects. Lean project management is a comprehensive outcome of other lean principles and has many ideas in common. Still the main definition of lean project management is delivering more value with less waste in project context.

2.5 *Summary of Lean Concept*

The following schematic summarize the process of the lean idea and developing this idea from lean thinking to lean project management, according to above literature review.

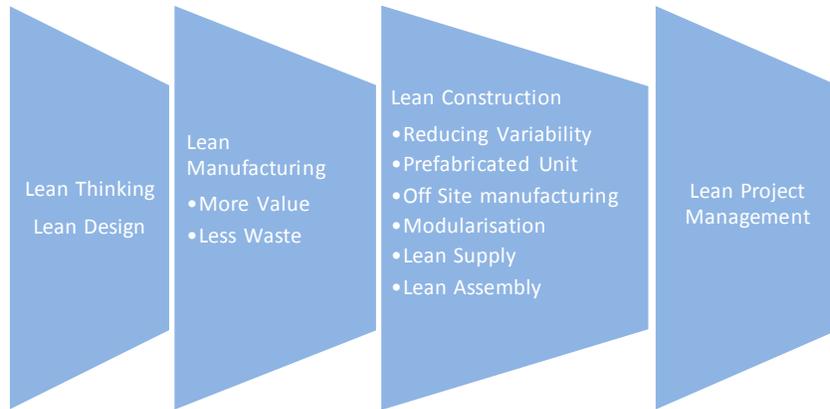


Figure 2: Development of lean concept

2.6 Standardization

By searching accurately in all scientific data bases around 10 articles in regard of standardization will be found, which could be used in engineering and large scale industry. These numbers will high light the great need in the standardization field in engineering and industrial field.

As Cusumano (1987) noted if a customer needs a product, whether it is an automobile, a machine tool, a semi conductor chip, or a software program, there are basically three options:

1. Obtain a fully customized product;
2. Obtain a standardized product;
3. Obtain a semi customized product

Above statement present three options for the purchaser or client in order to procure his goods or project. Of course as the product became more customized the price of the good/project will raise. Providing three options or two options to client in the large-scale project will give a chance to client with tight budget or time, in order to proceed with his project.

2.6.1 Design Standardization

Standardization of projects starts from **standard design**. Standard design results in minimizing waste of material, time and maximization of project value.

As noted by Thomas, H.R., et al. (2002) variability is common in project and must be managed effectively. By reducing variability we earned better labor and cost performance. **Reducing Variability** of project's output is one of the bases of the standardization theory.

For example assume one client decides to construct 4.5, 3.5, 2.4 and 1.8 Mpta Iron ore production plant in different locations. If the designer, design plant with 2 and 4 Mtpa throughput instead of above mentioned capacity, that would be standard plants. In this case the client should be convinced to purchase a plant with 4 Mtpa instead of 4.5 Mtpa and 3.5 Mtpa. In other word, by standardizing throughput of plant to 4 Mtpa and reducing output variability, we achieve standard plant.

Accepting standard project instead of custom build project requires an agreement between all parties involved. Mainly end user or client of project must agree on standard project instead of custom build project and accept the standard project technical specification in order to benefit from standard project advantages.

Also in future, the possible client could select his project among standard size of 2, 4, 6 and 8 Mtpa existing design and save his time and budget for design and construction as the documents and experience are already exist for this sizes of plants. Of course these standard sizes of plant will be more common in future and as these projects will happen regularly.

One of the techniques which is used by many companies by using **Standard Detail** for engineering design, which improve standardization in project design.

Standard detail like the standard specification, standard section and etc are also act as an important communication device between client and general contractors.

2.6.2 Construction Standardization

As mentioned by Green and May (2005), one the most practical methods of applying standardization in construction are **off-site manufacturing, prefabrication and modularization**.

2.6.3 Project Management Standardization

As defined by Inman and Milosevic Standard Project Management as a process of managing projects composed of standardized practices. The less varied the practices, the more standardized they are.

As mentioned by Aritua and Smith (2008) the most widely used sources of project management guidance, Bodies of Knowledge and the tools/techniques used in projects generally focused on achieving single project objectives. More detail review of project activities shows that many projects are increasingly undertaken in a multi-project context now a day. Against this background, the need for new approaches, processes and techniques suitable for multi-project management is obvious. Applying above idea into our standardization theory we understand in order to achieve standard project we need to employ new methods of project management in multi project context.

2.6.4 Strategic Management

'Multi-project management provides a vehicle for considering both internal and external environments and thus integrates projects and **strategic planning**. An empirical study has shown the important role of multi-projects in aligning strategy and projects'. (Aritua, Smith et al. 2008)

Standardization is not short term goal for companies and requires enough time for substituting current project with standard project. Thus, companies should consider the standardization as strategic plan and strategically manage to approach standard projects instead of similar project.

2.6.5 Value Analysis

The approach of functional value evaluation focuses not just on the value of the function but also correlates this value with function's significance. This helps to identify functions that have value un -proportionally high compared to their significance

2.7 Summary of Project Standardization

Standardization of project is a technique which has many related techniques. The following schematic present the different basis of standardization.

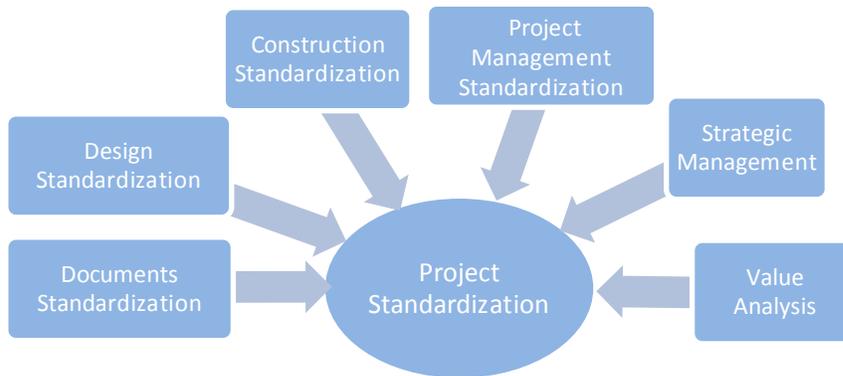


Figure 3: Schematic to show different elements of standardization

3 Lean Project Management Procedure

By summarizing literature review, we outline the lean project management to below mentioned points.

- **Strategic Planning**
- **Lean Design**
 - ✓ Reducing variability
 - ✓ Value analysis
 - ✓ Design and detail design standardization
- **Lean Construction**
 - ✓ Construction document unification
 - ✓ Modularization
 - ✓ Off site manufacturing
 - ✓ Prefabricated units
 - ✓ Lean assembly
- **Lean Project Management**
 - ✓ Project definition
 - ✓ Uniform contract
 - ✓ Identical scope and technical specification

4 Conclusion

Based on previous case study, **Time and Cost** in standard projects are very high identical. Also, standard project provide easier project management compare to similar project. This is a great advantage for companies and clients. Very high unification in standard project assist client to know the cost and time of a project at start of project. This information will be very useful for any potential client.

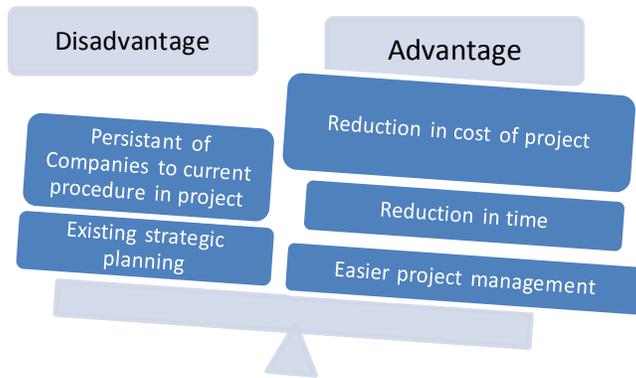


Figure 4: Advantage and disadvantage of lean project management through standardization

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