

# DEFINING THE PATH: A CASE STUDY OF LARGE SCALE IMPLEMENTATION OF LAST PLANNER

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## ABSTRACT

This article explores the hypothesis that over the course of time, implementation of Last Planner<sup>3</sup> System moves through a predictable sequence of development stages. The ambition is to establish a standard framework of fundamentals to help organizations who stand on the starting block of large-scale implementation. Implementation on a wide scale is seen as different from implementation on one isolated project because resource limitations and the involvement of people who may not have fully bought in to the ideologies of LPS.

The hypothesis is tested through screenings of earlier publications in IGLC, theory of innovation and empirical interviews. Interviews provide lessons learned by implementation leaders in Skanska Nordic where today over 60 projects have used LPS with more to come. The article defines characteristics of different phases and how change agents interact to spur an effective diffusion process.

## KEY WORDS

Last Planner System, Large-scale implementation, Case study, Learning curve, Culture change, Strategy

## INTRODUCTION

### AMBITIONS AND HYPOTHESIS

The ambition is to establish a standard framework of the fundamentals required to deploy Last Planner System, LPS. The hypothesis for this paper is that over the course of time, deployment of LPS moves through a predictable sequence of development stages. The hypothesis is tested through screening of earlier publications in IGLC, theory of innovation and interviews in Skanska Nordic.

### ADAPTABILITY OF CONCLUSIONS AND FUTURE RESEARCH

This article summarizes lessons learned when working with LPS implementation in Skanska Nordic. The models outlined as conclusion, are from the authors perspective, adaptable to larger construction companies where there exists a management system describing a way of working and central support for different key functions.

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3 Last Planner<sup>TM</sup> is trademark of Lean Construction Institute. Information on commercial use of the term is obtained through [www.leanconstruction.org](http://www.leanconstruction.org)

The authors strongly invite other companies and academic researchers to use, improve or disagree with the suggested model and return with their findings in future papers. The development of ownership for LPS among non-believers is an especially interesting area for future research.

### **THE AUTHORS PERSPECTIVE**

The article written is from a change agency perspective and discusses how LPS can be implemented as part of a journey to a Lean Enterprise. The authors agree that implementation of LPS can not be separated from implementation of Lean philosophy and practices. There must be a purpose to LPS implementation, which from the writers' perspective is flow and reliable production.

The authors work as change agents with founding from different central initiatives in Skanska Nordic. They have academic backgrounds with master degrees in construction engineering, presently working with development and change management in the company.

### **LOOKING FOR IMPLEMENTATION MODELS IN THEORY**

#### **IMPLEMENTATION, DEPLOYMENT AND DIFFUSION**

Implementation, deployment and diffusion are used somewhat synonymously in this article. Implementation refers to actions to drive and spur the use of new ideas in a company. It involves planning and execution of activities as well as feedback on benefits, hindrances and perceptions. The same goes for deployment, but additionally it refers to a more standardized approach.

Diffusion on the other hand refers to a vaguer and time dependent process where new ideas are communicated through different channels in the society.

#### **INNOVATION**

This article discusses the pattern when LPS moves through the innovation process. Innovation in this article is referred to as the process where companies utilize new ideas to improve existing ways of working. This implies that innovation means change in behaviour in order to benefit from a new process, technical standard or tool. (Rogers, 1983)

#### **BODY OF KNOWLEDGE WITHIN IGLC ON LARGE SCALE IMPLEMENTATION**

The authors have gone through earlier publications in IGLC to get input in their daily work. When looking through publications it becomes obvious that IGLC connects a great network of professionals with expertise in implementation of Lean Construction and LPS.

The body of knowledge for implementation of Lean covers a wide range of project sizes and types. For example, Pavez, Alacron (2008) discuss the dynamics of implementing Lean in an organization and identify that enterprise vision, technical and social competence need to be developed simultaneously in the organization. Ballard and Kim (2007) draw similar conclusions and present a 14 step model for implementing Lean on capital projects and how it connects to the enterprise vision. Many articles focus on implementation of LPS in a specific project with detailed

analysis of lessons learned and suggestions for future deployment approaches in projects. A typical example is Kalsaas, Skaar and Thorstensen (2009) description of the approach in a medium sized residential project with suggestions on important focus areas for successful implementation. A similar article by AlSehaimi, Tzortzopoulos and Koskela (2009) presents a model for implementation of LPS in two single projects and identifies critical success factors: *Top management support, Commitment to promises, Involvement of all stakeholders, Communication between parties to achieve team work, Close relationship with suppliers and Motivate people to make change.*

Barros Neto and Alves (2007) identify that few articles discuss Lean implementation in a larger perspective and how it's linked to business strategy. However, Gehbauer (2008) presents LPS as tool for evolutionary revolution and suggests that change in a company takes time because it involves people who live for the existing organizational structures and practices. In the journey to become a Lean Enterprise, LPS can be used as a structured way to delegate responsibility for change management. From a traditional viewpoint, this can be seen as a threat by top-, middle- and project management.

In this review of LPS articles in IGLC, the authors gained an understanding about LPS in a specific project when it is used by believers. From the authors perspective and in their roles as change agents, earlier articles give few clues on the dynamics of large scale implementations of LPS other than for a few isolated projects and when leaving the safe zone of Lean construction believers.

### THE LIFE CYCLE CONCEPT AND ADOPTER GROUPS

The diffusion of a new process, technical solution or tool can be explained through steps in a life cycle concept, where every step has its own characteristics.

Figure 1, Olhager (2000), illustrates how sales vary over the product life cycle. When a product is introduced, sales are low and only people actively looking for the new product become aware of it and its benefits. In this early stage, advertising costs are typically high in order to increase customer awareness and target early adopters. In the introduction phase, the product is under revision and adjustment in order to increase competitiveness. The growth phase is a period of rapid revenue growth. In the maturity phase, brand awareness is very strong and advertising costs are low. Eventually sales begin to decline as the market becomes saturated and the product becomes technologically obsolete or customer taste changes.

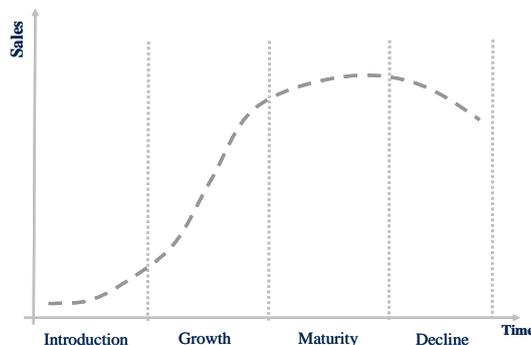


Figure 1: Product Life Cycle (Olhager, 2000)

### Adopter Groups in a Life Cycle Perspective

Through social studies, Rogers (1983) defined a model to explain the collective diffusion process in larger communities. The model explains how an innovative idea diffuses from innovators, early adopters, early majority, late majority to laggards. In this research, most opinion leaders are found in the early adopter group. For industries like construction, which is less driven by innovation than others, it can be argued that values among the early majority is more accepted and therefore more opinion leaders are found in this group. (Josephson, Saukkorpiipi, 2005) (Josephson, Knauseder, Styhre, 2003) Figure 2 shows the statistical distribution of adopters in different groups combined with independent variables of adopter characteristics.

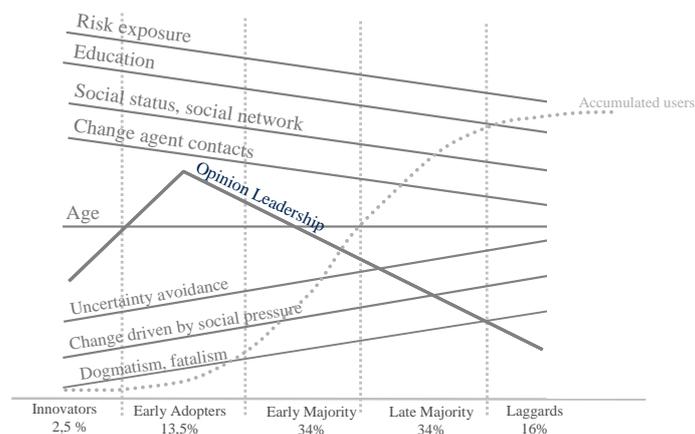


Figure 2: Adopter categories as part of population combined with characteristics (Freely outlined by authors from Rogers 1983)

### IDENTIFIED MECHANISMS IN IMPLEMENTATION

#### Change Agency

A commonly stated group in change management is a change agency. In a construction company it can be a product center owning a specific design or other staff functions with the purpose to improve existing practices.

A change agent influences clients and spurs innovation, keeping in line with the change agency's ambitions. On the contrary, change agents also attempts to slow down undesired innovations. Change agents are usually professionals with university degrees in a technical field. (Greenhalgh, Robert, Bate, 2004)

#### Gatekeepers

Gatekeeper is a term used in news media communication and implies the mechanism that controls the news flow and other information streams. In the news business this selection is influenced by political view and the individuals' social context. (Nationalencyklopedin, 2010)

Gatekeepers in a diffusion stream can encourage the flow of new ideas into a social system. Gatekeepers are also in power to hinder the diffusion. This is more likely when the innovation contradict with the paradigm of the gatekeeper.

### **Centralized and Decentralized Diffusion Systems**

In centralized diffusion, decisions like when to start diffusing an innovation, who should evaluate and through what channels it should be diffused are made by a small number of officials. In a decentralized diffusion system, clients and potential adopters drive such decisions and in the extreme decentralized systems, potential adopters are solely responsible for self-management. (Rogers, 1983)

### **Training of Trainers**

A 'train the trainer' concept is widely adopted as a training principle and leadership policy in many societies. The United Nations Population Fund (2005) suggests a train the trainer model to educate in HIV prevention. Liker (2006) advocates the same model in Lean leadership and change management. It also connects to the Job Instruction Training within TWI program where the leader will tell, show and demonstrate the desired skill several times. (Dinero, 2005)

Training of peer educators is the foundation. Peer trainers are empowered by education and insight in strategy by superior managers or change agents. Training is local and often involves introduction of new information or skills. This education goes on both in formally planned and informal education and is not a one-time event.

The next level is training of future trainers. This refers to the training of middle managers who are the trainers of project managers. This level of training provides more in-depth information about peer education training and techniques.

Specialist trainers are master trainers who support training of trainers and peer educators. Specialist Trainer can be seen as a synonym to Change Agent.

## **EMPIRICAL FINDINGS**

### **INTERVIEWING EXPERTS IN IMPLEMENTATION**

The study is qualitative with a focus on categorizing data from interviewed experts in human behavior and implementation in a construction company. Interviews took place between 2008 and 2010 with focus on finding patterns and sequences in implementation.

Experts, with experience implementing LPS on over 60 projects in Finland were interviewed in the study. The Finnish initiative started in 2002 and a wider implementation was launched in 2006. Finnish findings were benchmarked with ideas from implementation leaders in Skanska Norway and Skanska Sweden. In Sweden and Norway, there have been LPS tryouts.

### **HISTORY IN DIFFUSION**

The diffusion system is historically very de-centralized with strong local opinion leaders who are important gatekeepers in the diffusion process. Today more resources are used to spur a more centralized diffusion process with assigned experts and change agents.

### **HOMOGENEITY IN CONSTRUCTION**

More heterogeneity, in gender and background, is collectively seen as the way forward in the company since it provides more influences for innovation, good work

environment, better decisions and more diverse product offerings to the market. From an implementation perspective, homogeneity can be seen as potentially advantageous since people tend to understand and believe similar people more. This means that less interpretation is needed between different kinds of users. This connects well to the possibilities with peer-to-peer education.

### **MOVING TO FULL SCALE IMPLEMENTATION**

The implementation leaders speak about the importance of linkage between strategy, philosophy, processes, tools, leadership and user driven identification of improvement potential to achieve full line improvement. Implementation in one project is seen as unproblematic by most of the interviewed people since it often involves people who strongly believe in the tested methods. These people are in many cases innovators with a broad knowledge in industrialization and planning. When going for full implementation, different agendas, management types, and budgets become obvious. A new initiative can and will most likely collide with some other initiative.

### **GATE KEEPERS IN THE ORGANIZATION**

When discussing LPS in successfully implemented projects it stands out that LPS provides answers to earlier identified needs: reliability, collaboration and learning. These people openly promote LPS. Interestingly one of the most common statements in the company is “planning is really, really important”, but this is not to the same as advocating a specific method or system. Many people are autodidact in planning with tacit knowledge and cannot express their way of controlling the project. From a change agent perspective, it can be identified that a lack of language for planning contributes to resistance.

### **IDENTIFIED DRIVERS FOR ADAPTION OF LPS**

The learning from training camps with project and middle managers spells “business profitability”. This especially goes for middle managers who are highly motivated by the potential of making money. This group also described that a good day at work is when the project is running as expected and everyone pulls for the same goal. This connects well to the purpose of LPS; reliable construction. However, it is also identified that there is wide range from Lean ambassadors to Lean novices.

From a change agents perspective this means that Lean capabilities needs to be built in order to reach LPS adoption; the eyes of reliability, collaboration and learning need to be discovered by non-believers.

### **THE INITIAL LPS IMPLEMENTATION PLAN**

In 2006, Skanska Finland decided on large scale implementation of LPS tools and Lean principles. Implementation plans were made intuitively and sequencing was chosen to support an easy implementation and fast results. In short, the plan was to:

**Phase 1. Start piloting LPS on a first few projects with approval from top management.** Goal was to try LPS in a real environment and achieve good experiences. Innovators supported personnel in pilot projects.

**Phase 2. If results from phase one are positive (as expected), proceed to the full scale implementation.** Innovators support new LPS projects in phase two and the

early adopters will spread LPS as peer-to-peer coaches. This was called “the infection model”.

## **MISBELIEVES AND LESSONS LEARNED**

### **LPS implementation will grow organically like other R&D implementations**

Usually an individual or a small group of innovators initiates LPS implementation. Top management approval is sought and pilot projects are chosen carefully. Only the most development affirmative site managers are accepted to participate. Educated change agents offer LPS tools and a lot of practical support to the site manager. Implementation in these first projects feels great. After good results from the first pilot projects, wide implementation is announced. Of course, all of the rest of the company is anxious to use this great new tool. Who wouldn't want to be a part of something as awesome as this!?

LPS will unfortunately not grow organically from here. We have learned that LPS is not some kind of gizmo which changes life quickly and easily; genuine change involves frustration and tough work. The core idea of LPS is to get people in the project collaborate at a new level of intensity and develop a genuine eagerness to solve root causes of re-occurring problems in production. This is not achieved unless implementation is capable of changing people's deepest ways of working and thinking. Because of this reason, use of LPS will not grow organically unless a great amount of mental coaching and motivating is given in advance to the company's employees at all levels of the hierarchy.

### **Once someone has started using LPS, they will continue forever**

We have learned that this is not true. Shock and disillusionment is huge when change agents realize that site managers who once were enthusiastic about LPS are returning to their old ways of working and thinking. Expanding innovators work doesn't help because every new project using LPS is followed by one returning back to the old habits.

We have learned that use of LPS tools will fade away little by little if the site personnel doesn't receive systematic and repetitive motivation and feedback. Initially, LPS users have to overcome two barriers. First, the system has to appeal enough to even consider testing the system. Second, the system needs to give users some true satisfaction. The same satisfaction can be given to the user by his/hers boss in the form of praise and encouragement if the system doesn't give it in the very beginning. In the first adoption phase, the first four months are crucial. Consistent, committed and positive leadership is needed. After the ramp-up phase, the potential and satisfaction needs to be rediscovered over and over again.

### **If a method is in the management system, it is in use**

This is hopefully the case, but not guaranteed. Other variables need to be in place as well. In early phases of implementation, the management system cannot be used due to the uncertain benefits and inexactness of templates and methods. Uploading early and not testing material will add more confusion than comfort. In later phases, when uncertainties are removed, the management system is a great tool for communication and self-education.

**ACTIONS FOR IMPROVED IMPLEMENTATION**

In the parts of Skanska that have come the furthest, implementation has gone through some drastic changes. It became evident that innovators and change agents do not have resources and mandates to teach, motivate, give feedback and spar systematically to a large amount of project personnel. The only truly lasting option is to teach middle managers to become teachers and believers of LPS. To make this happen, the middle management needs to be taught by top management.

To perform implementation in this way is much harder, but necessary, if the goal is to change the company’s way of working and thinking for good. Another important finding was to divide LPS teaching into smaller batches. It is not necessary to implement the entire LPS at once. By focusing on smaller sections of LPS, teaching becomes easier and less confusing. Implementation should not proceed until the first implemented tool has taken a strong position in company’s culture and is in every day use on all projects.

**CONCLUDING AN IMPLEMENTATION LIFE CYCLE FOR LPS**

The suggested model in figure 3, *Last Planner Life Cycle*, describes the journey phase by phase to reach a new way of working regarding reliable planning.

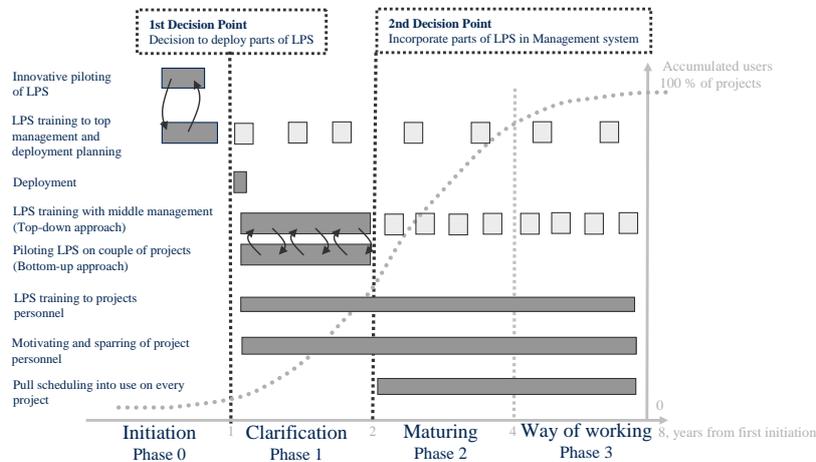


Figure 3: The Last Planner Life Cycle

**Initiation -phase 0**

Somewhere in the company LPS is identified as a mean for improved industrialization. Action is taken by project, management or change agent to start discussion about implementation of tools for improved reliability, collaboration and learning. Top management, innovators and change agent dedicates their full attention to developing a joint understanding. Confidence is built and a ground for decision-making is tested together in the first pilot project. This testing is not confused with implementation. After initial testing and removal of uncertainties, the implementation plan is decided. Visionary and determined leadership is needed to take this step. *Trap: top management does not engage in the deployment plan genuinely.*

### Clarification -phase 1

Training and involvement among middle managers is initiated. Top managers are the key trainers and change agents serve as specialists in education and methods. Middle managers start first pilots and initiate case studies. These pilots are used as a basis for education. Based on Lean principles, middle managers are encouraged to challenge existing practices and look for improvement potential. The tool box is reinvented jointly and LPS tools are portioned and prioritized. Change agents work together with top managers and assist middle managers in developing education material. In the end of this phase there is a common understanding among middle managers that some of the LPS tools should be maintained in the company. *Trap: Change agent takes middle managers role as a teacher in pilot projects. Road to hell is paved with good intentions.*

### Maturing -phase 2

In some parts of the company, LPS tools start to be well embedded in culture and behavior. Some subcontractors are well trained in the system. Middle managers initiate project personnel education based on existing case studies to spur networking and exchange of ideas. It is in this phase that endurance and determination is tested. *Trap: Top management doesn't engage in the implementation.*

### Way of Working -phase 3

*Anticipated findings:* Most parts of LPS are embedded in a significant portion of the company. Preferred sub contractors are continuously trained in LPS. Top managers are involved in improving the system. Middle managers and project personnel are encouraged to challenge existing practices and look for improvement potential. Small fragments of the company are still on a beginner level and will most likely never adopt LPS and other company values. *Expected trap: Self-satisfaction intercepts continuous improvement*

### CHANGE AGENCY INTERACTION

Change agents can spur the diffusion process and support managers when deploying LPS. Figure 4 suggest how a change agency interactions in different phases. Focus is a 'train the trainer' approach where change agents work through existing management layers.

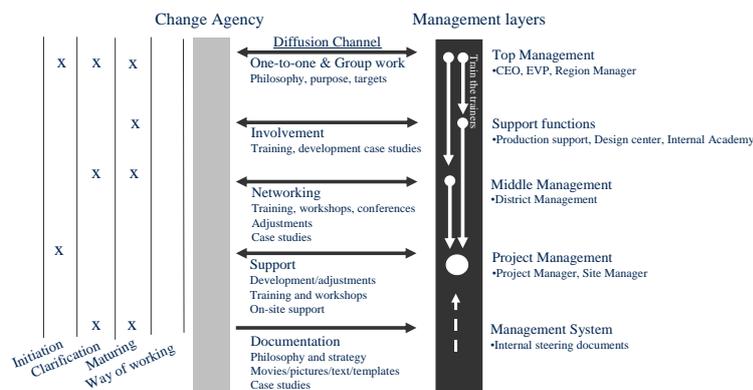


Figure 4: Change Agency Interactions Over Time

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