

ARE TOOLS AND TRAINING ENOUGH? AN ARGUMENT FOR LEADERSHIP

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ABSTRACT

In 2006, Skanska Finland began implementation of lean production management based on Last Planner[®] and location based scheduling. This paper reports what was done to implement lean production management, what happened, and what was learned.

Implementing lean practices is notoriously challenging, not least because organizations and individuals need to change their behavior. The more extensive and fundamental the change needed, the greater the challenge. Implementing Last Planner is a fundamental change: from commanding to requesting, from planning by planners to planning by doers, from managing contracts to managing production. Location based scheduling is also challenging. The mainstream activity breakdown structures are subordinated to location breakdown structures. Managing the flow of trades through locations is quite different from managing each trade task-by-task.

Not surprisingly, implementation has not gone smoothly. Early assumptions that successful pilot projects would ‘infect’ others proved false. Habits proved hard to break, perhaps in part because reward systems pushed managers into short-term thinking. In response, staff personnel were asked to drive implementation. That also failed.

In the last three years, from 2010 through 2013, progress has been made standardizing planning and scheduling processes and tools and extensive training has been provided in their use. Some senior managers believe that will be sufficient to change behavior and to achieve better project performance and better corporate profitability. While there is some evidence of improvement, both the published literature and Skanska Finland’s own experience suggest that change in behavior and outcomes will be limited and in danger of reversal until line managers from top to bottom lead the change. This paper provides support for this claim through a review of the literature and through a case study that illustrates what line managers can do to provide the needed leadership.

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INTRODUCTION

In May of 2006, Jan Elfving invited Glenn Ballard and UC Berkeley's Project Production Systems Laboratory to help him in his role as head of Skanska Finland's supply chain management. The company, a national subsidiary of Skanska AB, had set aggressive goals for improving profitability. Elfving and Ballard developed a supporting vision for supply chain management, with an initial focus on preparing construction sites to be better customers of supply through implementation of principles and methods for production management. Substantial progress has been made in production management in Skanska Finland, but sustaining those practices and achieving further improvement in processes and outcomes, we argue in this paper, requires leadership from line management, top to bottom. In support of our position, we share the advice from the literature on organizational change and on lean leadership specifically.

This paper can be understood as a case study of a project within a case study of implementation of production management within a company. It describes how and how well the production management component of Skanska Finland's supply chain management vision has been realized in the previous eight years, and has the following sections:

- The vision for supply chain management,
- A brief history of production management implementation, covering
- Early days (2006-2007)
- From development to deployment (2008-2010)
- Institutionalization (2011-2013)
- Lean leadership in the literature
- A case study on lean leadership
- Leadership and safety
- Conclusions

THE VISION FOR SUPPLY CHAIN MANAGEMENT

The site is the customer. When fully implemented, Skanska Finland's sites will:

- Have the materials needed when needed
- Have small and controlled amounts of materials on hand before they are needed
- Remove or radically reduce the risk of accidents related to materials
- Minimize the additional costs imposed on suppliers (and ultimately on Skanska) by demand variability

- Use logistics centers to receive materials, to consolidate or disperse into units needed by sites, and to control deliveries to sites
- Pay a reasonable price for materials

Suppliers become partners:

- Shared processes are systematically improved.
- Control over supply chain structure and performance is progressively extended.
- Allocation of risks and rewards provides incentives for collaboration and continuous system-level improvement.

As a result:

- Preassembly and modularization will be facilitated
- Speed of installation will not be constrained by the speed of procurement or delivery
- Accidents will decrease
- Profit margins will increase

As is apparent from the Supply Chain Management (SCM) vision, which was published internally in 2006, production management was one of several intertwined initiatives. We consider only production management in this paper, neglecting logistics, engineered-to-order products, and supplier development, which have been treated in previous publications (Elfving, et al., 2010; Elfving, et al., 2011; Elfving, et al., 2013).

A BRIEF HISTORY OF PRODUCTION MANAGEMENT IMPLEMENTATION

This brief history is divided into phases: early days (2006-2007), from development to deployment (2008-2010), institutionalization (2011-2013).

EARLY DAYS: 2006-2007

The SCM Initiative work plan called for a single demonstration project in each of the major business lines: residential building, commercial building, and civil. The purpose of demonstration projects was to develop and test production management processes, largely by adapting Last Planner. At this time, Skanska Finland was aggressively pushing its projects to use location-based scheduling (often referred to as 'Flowline'), so the integration of Last Planner with location-based scheduling was also an objective.

Projects were invited to serve as demonstration projects and were selected based on the reputations of the project manager, construction manager, and regional manager for openness to new ideas¹.

¹ Business lines that constructed buildings were divided into regions and Civil projects into product types; e.g., highways, tunnels. Each regional manager had several construction managers reporting

- First demonstration project in Residential: Mäntylä
- First demonstration project in Commercial: Hacklift
- First demonstration project in Civil: VT2

Mäntylä was a 4 story, 16 apartment residential building located in the outskirts of Helsinki. Training of site staff in Last Planner began early in the project in Fall 2006. The project completed in Fall 2007. Skanska's project manager, foremen and engineer listed as benefits increased ability to rely on scheduled tasks being performed and consequent reduction in Skanska's own labor. The project manager reported that this was the first project on which he had under run the project budget for Skanska labor. He and the project engineer also agreed that the analysis of plan failures had not been effective. Assessment by the development team was a bit more critical, noting that reverse phase scheduling had not been implemented, the relatively low percent plan complete (68% over the entire project), poor root cause analysis of plan failures, inadequate constraint analysis, and lack of first run studies. This initial development project incompletely implemented the standard Last Planner system.

A more complete implementation occurred on Hacklift, the commercial development project, which was a warehouse building with office space on two levels, located in western Finland, near Turku. Following an information sharing session in March 2007, reverse phase scheduling was introduced and applied to the finishing trades through the office spaces. As was the case in Mäntylä, the project schedule was constructed in location-based scheduling software. Once the reverse phase schedule was constructed using the traditional stickies-on-a-wall approach, the project engineer entered the data into the software to reveal visually where the schedule was too tight and too loose. The team made the appropriate adjustments and was delighted with the process and outcomes. The construction project was completed early, despite a very aggressive 8 month schedule, came in under its 15 million Euro budget, and achieved better-than-estimated profitability.

VT2, a section of a highway construction project, was selected as the demonstration project in the Civil business line. As opposed to the building projects, subcontractors did essentially all the direct work, and little explicit direction was given them beyond 'keep to the schedule'. Rough evaluations of equipment utilization were made through activity sampling, with findings of 33% utilization, but this was said by the subcontractors to be normal and unavoidable. There was one instructive attempt to implement an aspect of Last Planner; namely, 5 Whys analysis of plan failures. Although imperfectly implemented (many failures were dismissed as inconsequential to project performance, and no countermeasures were taken to prevent reoccurrences), the exercise revealed high levels of recurrent failures, some of which were beyond the power of the project to prevent or mitigate.

to them, and each construction manager had several project managers as direct reports. The project manager was based at the construction site and had one or more Skanska foremen, depending on project size, plus a project engineer and support staff. Most of the direct construction work was performed by subcontractors, less in buildings and more in civil.

An example of a recurrent failure cause within the project's power: unexpected soil conditions. The first such instance occasioned the comment: 'The solution is more costly than doing nothing', which seemed at least plausible given a single instance. However, the same 'solution' was applied every time unexpected soil conditions were encountered, occasioning the question 'How much is it costing us not to predetermine soil conditions?'. The development team subsequently found similar problems across all business line projects.

An example of a recurrent failure cause outside the project's power: getting a reliable promise from the local utility for their installations. In one of the development team's reports to Skanska Finland's management team, it was discovered that no one on the team had responsibility for handling recurrent problems of this nature.

FROM DEVELOPMENT TO DEPLOYMENT (2008-2010)

The development team's strategy for deployment was based on an infection model. The intent was to place each of the key members of demonstration projects, after completion of the pilots, on other projects where they could serve as coaches. The success of the initial projects was expected to inspire imitation by others—if not by all, at least by those most willing to experiment and to learn. The strategy simply did not work. One of the foremen most dedicated to Last Planner had to return to his hometown in the middle of Finland, where he had little support from local management. Several of the project managers and foremen stayed together, with the advantage of familiarity but the disadvantage of limited enrollment of others. The primary problem, however, seems to have been that more top-down line management engagement was needed to change long-established habits.

The attempt to incorporate first run studies into lookahead planning illustrates the problem. In January 2007, a Site Operations Improvement workshop was held with a very experienced construction manager in the Residential Housing business line. A video-based study of a concrete element installation on the Mäntylä project was presented to illustrate the process and benefits of first run studies. Tero Nikkanen, the construction manager, immediately grasped the potential and set about promoting competition among projects to develop and share their work methods over the corporate intranet. Although Nikkanen continued to demand first run studies on the projects for which he was responsible, the company-wide initiative fizzled out when it became clear that work was required to maintain such standard operation designs and that few construction managers or other higher level managers were asking about them.

INSTITUTIONALIZATION (2011-2013)

In 2011, Skanska changed the focus to the overall picture. In trainings and internal conferences Last Planner and Production Management were presented as part of Skanska's *Our Way Of Working* as illustrated in Figure 1.

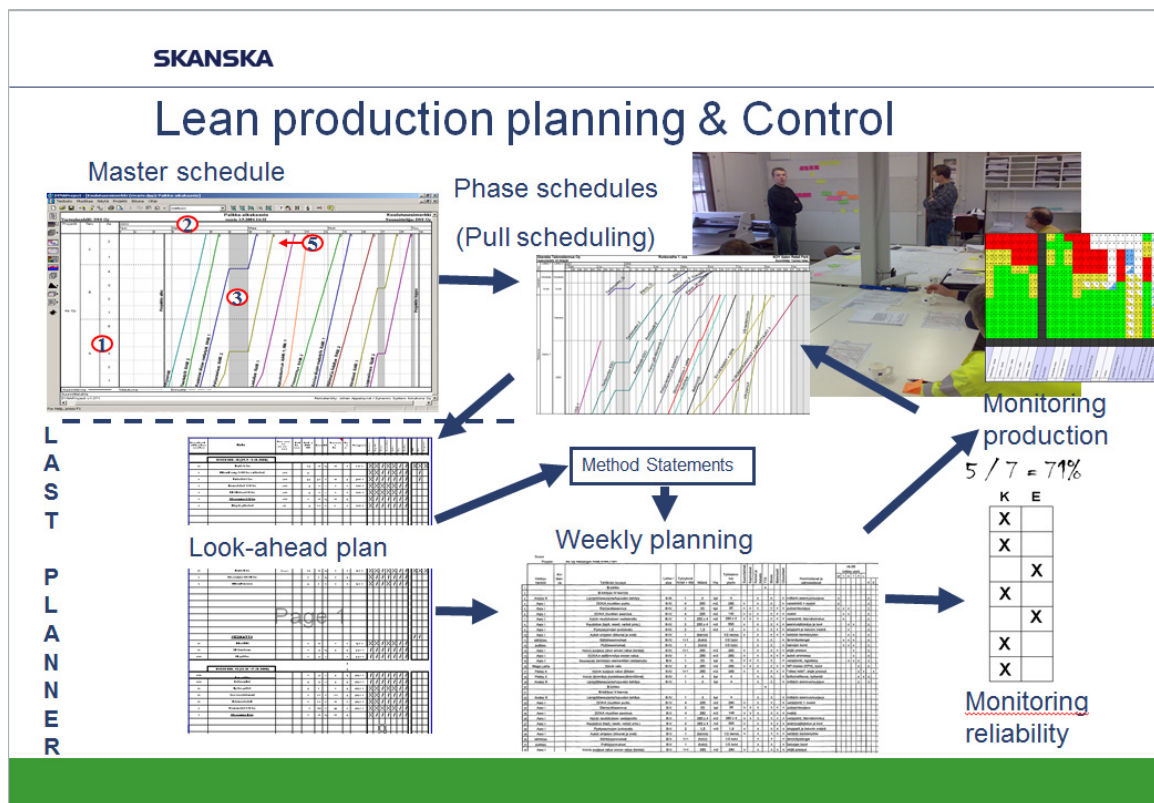


Figure 1: Skanska Finland's Lean production planning

Year 2011 was unprofitable; creating the crisis many authors have said is needed for organizational change (Kotter, 1996). Skanska decided to focus on the basics. Location based scheduling, utilization of BIM in all production planning, method statements, and Last Planner were stressed as the key methods for every project. No excuses were allowed and no excuses were offered. Mandatory trainings on these subjects were held in every region during the year 2012.

Skanska was again profitable in 2012. Even though the margin was barely positive, the improvement showed that we were on the right track. For year 2013 the focus stayed on the same subjects. Quarterly trainings and consultation on big projects started to change the course. In the end of year 2013, management put even more focus on production planning. Skanska published the Productivity tools, raising master schedule, phase schedules, method statements, weekly plans and daily task plans onto a higher level. The message was sent that these were the mandatory tools for every project, no exceptions. Financial results for year 2013 improved again. Skanska had improved performance in a down market, while competitors lost money.

LEAN LEADERSHIP IN THE LITERATURE

Skanska Finland's upward trend in operational performance is encouraging, but what is needed in order to maintain and improve that trend? Are stretch goals, management pressure, and training sufficient? If we look at what others have said about implementing lean in organizations, we must conclude that something more and different is needed.

Brady, et al (2011) provides an overview of the publications on Last Planner implementation and cite leadership among the opportunities for improvement¹. This focus on leadership is found also in their references on lean implementation in general (Ahrens, 2006; Tempel & Holländer, 2001). The literature consistently and strongly calls for leadership to create and maintain a lean culture of continuous improvement and development of people. Beyond those just cited, two publications stand out in this regard: David Mann's *Creating a Lean Culture* (2005; 2nd edition in 2010) and Mike Rother's *Toyota Kata* (2009). Both authors stress the fact that all management systems are prone to entropy; i.e., all require inputs of energy in order to endure. Leadership provides that energy.

Mann introduces leader standard work, a structure for managers at various organizational levels to develop people's problem-solving capabilities, to direct those capabilities to the improvement of standardized processes, and to see that standardized processes are being followed. He stresses the role of visual controls in the workplace and 'going to gemba' as the place to see what's actually going on and in which to provide coaching.

Rother provides insight into two management kata (routines) Toyota is said to rely on to create and maintain its lean culture: an improvement kata and a coaching kata. People are developed through coaching them in the improvement kata, and coaching is done by mentors questioning those mentored in a way that helps them learn to see for themselves how to understand a current condition, how to set new target process conditions, and how to apply PDCA to reveal and overcome obstacles.

This lean leadership drives continuous improvement. From Mann and Rother's work, it becomes apparent that continuously improving people's capabilities and continuously improving performance outcomes (provide customers more value with less waste) are two sides of one coin.

Some readers may be concerned that this conception of leadership is indistinguishable from command and control, which has been criticized in the lean construction literature; to cite one of many instances, by Howell & Ballard, 1996. In that paper, the authors report the discovery that the ability to say "no" is prerequisite to making a promise. If we expect people to make true commitments to executing tasks, they must be able to question a command. Obviously, reliable promising and commanding with the expectation of unquestioning obedience are mutually exclusive. However, top-down deployment of the lean leadership advocated by Mann and Rother is consistent with reliable promising. Those who receive a request to perform a task are not only allowed, but encouraged to question if the request meets the criteria agreed in all truly lean organizations; i.e., the tasks must be well defined, sound, sequenced, and sized to the capability of those to perform them. If the person(s) receiving the request reveal that a request does not meet these criteria, that is desired and applauded by the 'leader'. The concept of servant leadership (Greenleaf, 2002) does not mean that the leader does what he/she is told by those they are serving, but rather that he/she does what's needed in order to make those they are serving

¹ The challenges of initial implementation are arguably different from the challenges of sustaining and developing lean initiatives. Leadership may play an enabling role in the former, but play the role of driver in the latter. Most, if not all, IGLC studies on implementation have been on initial implementations.

effective in performing their work and to create and maintain the conditions for them developing their capabilities and improving their work processes.

To illustrate what lean leadership can be in the context of the construction industry, a case study is presented in the next section.

CASE STUDY

Porin Puuvilla is a large shopping center project in the Finnish city Pori (see Figure 2). These are the key features of the project:

- Owners/Investors: Renor Oy ja Ilmarinen
- Developer: Porin Puuvilla Oy
- Main contractor: Skanska Talonrakennus Oy
- Value of project: EUR 110 M
- Duration of project: 11/2012-10/2014
- Size of project: 100 000 m², 400 000 m³, 2000 parking places



Figure 2: an illustration of the Porin Puuvilla shopping center

The project includes renovating a cotton factory that was founded in 1898. The old spinning mill, textile factory, head office, dye works and residential buildings are on the National Board of Antiquities' list of Important Cultural Environments.

Porin Puuvilla is a very big project in the Finnish construction market and especially for the district of Satakunta in which Pori is located. A large-scale project in a culturally valuable area with both new construction and renovation of existing buildings gives the project even more complexity. The contract model in Puuvilla is CM@Risk with Design responsibility.

As the old factory did 100 years ago, the new shopping center will provide income for hundreds of citizens in the region. The shopping center will have 43000 m² of commercial area to rent with 75-85 stores and it will employ 700-800 workers.

In Skanska Finland, construction managers usually have responsibility for multiple projects, but in this case, district manager Kari Lindroos and construction manager Kari Sundelin agreed that Sundelin should take the role of site manager on Porin Puuvilla. Kari Sundelin supports Lean thinking and methods and has always had the principle that everything starts from the schedule. Every task on site can be

and should be scheduled. Another principle is that schedule control must be continuous and consistent.

When building the site organization Sundelin required that the white-collar crew be open to new ideas, collaborative and solution seekers. As a result, the superintendents for each section weren't the most experienced Skanska had in the region, but Sundelin knew he could trust them and that they would adopt new ideas and ways of working.

"Leadership and coaching", said Kari Sundelin when asked how he confirms commitment. With Last Planner and other lean practices, leaders train subordinates. Schedule was the project's number one priority and in Puuvilla the way to ensure completion according to the plan is to remove the constraints from each task. To be able to handle all this and work systematically towards the target, Puuvilla has a weekly routine, which has to hold.

Puuvilla follows Skanska's Finland's way of working. Production planning starts from the Master Schedule which is scheduled with Vico Control, a software for location based scheduling. The key is to utilize the flowline view for schedule optimization. Scheduling is location based, which means that the activities have locations, not vice versa. The duration of a task comes from the equation: quantities x consumption (man-hours / units) divided by the number of resources. The technique is widely used in Finland due to the popularity of the RATU database (see Ratu website, accessed March 1, 2014), which provides consumption information and standard work methods for construction activities.

Schedule information gets more detailed with phase schedules, which are usually produced for earthworks & foundations, frame & roof, interior and finishing phases. Phase schedules are also planned in Vico Control in the same file as the master schedule. From the phase schedules the superintendents of each section drop activities into their 6 week lookahead plans.

Skanska foremen over each section start preparing the activities for which they are responsible by creating the method statements together with the site engineers. Method statements are the end result of accurate resource-loaded task planning. The main things in a Method statement are:

- Methods needed for the task
- Resources: Manhours, Work crew, materials, machinery and equipment
→**Target Cost**
- Schedule
- Safety
- Dependencies to other tasks
- Prerequisites
- Quality requirements
- Potential problems
- Quality assurance procedures

With method statements Skanska foremen get the information (method, resource, work location and target production rate) for weekly planning.

Kari Sundelin states that the work done before the task starts is the most important. The way to make sure that the schedule holds is to get rid of all constraints on a task. The last step assuring that the right things are being done is weekly planning. In Puuvilla the plan for next week has to be ready on Thursday and the actuals from the previous week are sent out to everyone on Monday. Leadership plays a key role here. The routine must hold is the key thing in Sundelin's playbook, but how to assure it? Sundelin stresses the power of being an example of the desired behavior. Leading is not shouting, it is coaching and treating people as individuals. It all starts with an open environment in which making a mistake is more than ok, as long as we learn from the mistakes. Sundelin participates in weekly meetings and challenges people if he sees a chance for an improvement. At the same time one has to be strict, the rules are the same for everyone with no exceptions. A good example of this was when Skanska foremen struggled with preparation of weekly plans in the beginning of the project. When the weekly plan was not ready on time, instead of yelling and screaming, Sundelin produced the plan together with the foremen after work. This sent a message that he was serious about keeping the weekly routines, but at the same time was willing to help and to teach in case of a problem.

Sundelin sees that best way for a leader to implement something is to teach and coach personally. Very often the subordinate has an idea for a solution, which just needs verification from the leader. On job walks and in meetings, Sundelin teaches the staff to look at things from different angles but he does not solve problems for people, instead he asks them to present the solution and gives it his blessing when the solution is acceptable, even if not optimum, because that's what people need, support for their ideas. After this the chance for successful execution is substantially better.

Leadership is the key in implementing new behavior. Kari Sundelin says that the style the people work in the district reflects the leader Kari Lindroos. Lindroos is a Lean believer and instead of problems and costs sees potential and income. Lindroos states that the key for a successful operation starts from leaders believing in what they are doing. Under a good leader the leading style is consistent and the crew is disciplined. Leaders must demand and lead people into fulfilling expectations, which is hard work. It can hardly be an accident that Kari Lindroos' district, Satakunta, has achieved profits (EBIT-earnings before interest and taxes) for the last six years, 2008-2013, beyond Skanska Finland's annual targets.

But to return to Puuvilla—on this project, the weekly routine has become a standard way of working, Skanska's team prepares the upcoming work, weekly plans are monitored and the root causes for failures are studied. Instead of standard Lean 5-Whys, Puuvilla has a deviation table. When they find a deviation, they find out the root cause using the 5-Why technique, assess the effect on schedule, what actions must be taken, what is the risk level and who is the responsible person.

Continuous improvement can be seen all over the project. The client has praised Skanska for constantly looking for ways to improve production.

LEADERSHIP AND SAFETY

Skanska Finland's experience with safety also supports the claim that leadership is necessary for a sustained change in organizational behavior. 15 years ago, Skanska

AB, the mother ship, committed to a zero accident target and the goal was clear for everyone in EVERY business unit. Skanska Finland's Lost Time accident rate was roughly 60 in 2004 and in early 2014 it is around 4. The goal is still 0 and it is possible, but it would not have been possible without top down commitment and leadership. Each construction manager has a monthly follow-up meeting with site and the safety is the issue number 1 on the agenda.

The message to everyone has been clear. Constant improvement is the way to better safety. The important tool for constant improvement is 5-Why analysis (Leino & Helfenstein, 2012). The root cause of an accident or a 'near miss' has to be found through 5-Why and the countermeasure to prevent it from happening again. This has had a huge impact on safety and it has taught people to look for safer ways to operate on site. The same applies to productivity.

CONCLUSIONS

Skanska Finland's profitability has increased in tandem with the consistent application of the production management that was a key part of the supply chain management vision articulated in 2006. It is also relevant to note that the Preferred Supplier Program, that part of the vision now being developed and implemented, has found a correlation between subcontractor costs to Skanska and the use of production management methods. The trend to better performance is clear, but the rate of improvement can be much faster with consistent leadership from line management. We have argued that this same leadership is essential to avoid backsliding and reversion to old habits and behaviors that are not part of Skanska's 'way of working', and have provided in support evidence from the literature on lean leadership, a case study, and Skanska Finland's experience with safety.

Much has been written about lean leadership. We cite two publications that provide vital information (Mann, 2005 and 2010; Rother, 2009). Both Mann and Rother emphasize the necessity of leadership to avoid backsliding, and provide clear and practical descriptions of leadership practices; specifically, for improving processes and for coaching those being mentored how to improve processes. Following their advice, we suggest that lean leadership be implemented in Skanska Finland by having senior managers educated in the principles and practices of lean leadership, having those senior managers educate their direct reports in the same way, all the way down to direct workers in the organization, then keep doing it forever.

The case study demonstrates lean leadership practices and their impact on performance. Kari Lindroos and Kari Sundelin exemplify the respect for people and the drive for continuous improvement at the heart of the lean philosophy, and their consistent achievement of profits beyond target is almost certainly a consequence of their leadership behavior.

The need for active leadership from line management is also supported by Skanska Finland's experience with safety. A 10-year safety improvement initiative has thus far reduced the accident rate from 60 to 4. This result was achieved by exactly the leadership practices recommended by Mann and Rother, and exemplified by Lindroos and Sundelin.

We hope to have shown that leadership is essential for continuous improvement. Further improvement in both profitability and safety will come from acting on the

processes from which they result and from teaching and developing the capabilities of the people in the organization.

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