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Title	Introducing last planner - Finnish experiences
Authors	Koskenvesa, A and Koskela, LJ
Type	Conference or Workshop Item
URL	This version is available at: http://usir.salford.ac.uk/id/eprint/9380/
Published Date	2005

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Introducing Last Planner™: Finnish Experiences

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Abstract

The Last Planner method1 represents a radically different manner of controlling production in construction. Even if its benefits are widely observed, it is also a common observation that the introduction of the Last Planner method to a site, into a company or into a country is not an easy and uncomplicated task. This paper reports on the experiences and lessons gained during the introduction of the Last Planner to Finland. A simplified explanation of Last Planner is presented. The experiences and lessons gained are contrasted with those presented in prior literature.

Keywords: Last Planner System, production control, implementation

1. Introduction

During the last few years, Last Planner has been implemented systematically in a number of contracting companies in different countries. The results have been most encouraging in regard to productivity, duration and safety. The Last Planner method represents a radically different manner of controlling production in construction. Even if its benefits are widely observed, it is also a common observation that the introduction of the Last Planner method to a site, into a company or into a country is not an easy and uncomplicated task.

The authors undertook to implement and disseminate this method in Finland since 2003. The goal of this paper is to report of the experiences gained.

The paper is structured as follows. First, the salient characteristics of Last Planner are recapitulated. Then, the first Finnish pilot project is presented, and after that, the learning gained in the subsequent projects. Then, the Finnish manual on Last Planner is briefly described. Next, the simplified explanation of Last Planner is discussed. After considering the present status and prospects of Last Planner in Finland, the concluding remarks are presented.

[1] Last Planner is a trademark of Lean Construction Institute

2. The Last Planner System of Production Control

Last Planner, developed in the United States in the 1990's [1] [2] [3] is a method for production planning and control on construction sites. Last Planner addresses short term planning and control of operations. The goal is to ensure, through different procedures and tools, that all the preconditions of a task exist when it is started, that the task can be executed without disturbances, and that it is completed according to the plan. The share of tasks completed as planned is monitored on a weekly basis. The reasons for lack of completion are investigated. By influencing the reasons found, an increase of the degree of realization of weekly plans is sought. One further element of the Last Planner method is rolling look-ahead planning, in which the preconditions for tasks are made ready for the next 4-6 weeks. The goal is to maintain a sufficient backlog of ready tasks.

Last Planner production control is based on a new theoretical foundation [7]. Production is conceptualized as flow, leading to an emphasis on reduction of uncertainty and on stemming the penalties of uncertainty. The primary concern of weekly planning is not merely, which tasks should be started according to higher-level plans, but also, which tasks can be started regarding their preconditions. The execution of weekly plans is seen to be based on a conversation, where the responsible person commits himself to the completion of a task as planned. Control is positioned as a starting-point for continuous improvement.

3. The First Pilot Project

The first Finnish pilot project in introducing Last Planner took place in the year 2003. Four major construction companies, YIT Rakennus Oy, Skanska Talonrakennus Oy, NCC Rakennus Oy and Rakennusosakeyhtiö Hartela, each with one project and site took part in the training and testing project. Testing and training lasted for six months on each site.

How did the project go ahead? A detailed theoretical explanation was prepared and it was initially used in training. However, a simplified way of explaining and justifying the Last Planner method for construction professionals was also developed and it turned out to be more effective in training. The training time could be reduced, and justification of the method to managers was made easier.

Training started with a one day teaching and discussion session. About twenty persons involved in site management took part in learning the basic principles of Last Planner and discussing the practices which were to be tested. We also wanted to learn what were the major reasons for difficulties of production planning by making the participants to choose among the following reasons:

- Managing concentrates in control (monitoring) and forgets “making ready” the pre-requisites and resources required to do the work.

- Planning isn’t systematic, but instead it depends only on the ability, skills and motivation of the managers in charge.

- Planning is considered to be same as drawing a schedule.

- The capability of the planning system is not measured.

- When targets and plans are not met, the reasons are not sought and analyzed.

All of the possible answers above were chosen. This shows clearly that the problems of production planning are wide. Solving them requires understanding of the theories, too. In this regard, our one day of training was just a start.

In our site testing we concentrated in

- Making weekly plans, where tasks don’t have any constraints and the pre-requisites are taken care of.

- Getting participants to make commitments in the weekly plans.

- Checking the PPC (percent plan complete).

- Arising interest and starting systematic look-ahead planning, where the pre-requisites for the tasks to be done in the next couple of weeks are realised.

- Finding the reasons and explanations why the weekly goals were not met and also trying to learn from the past to prevent similar difficulties recurring in the future.

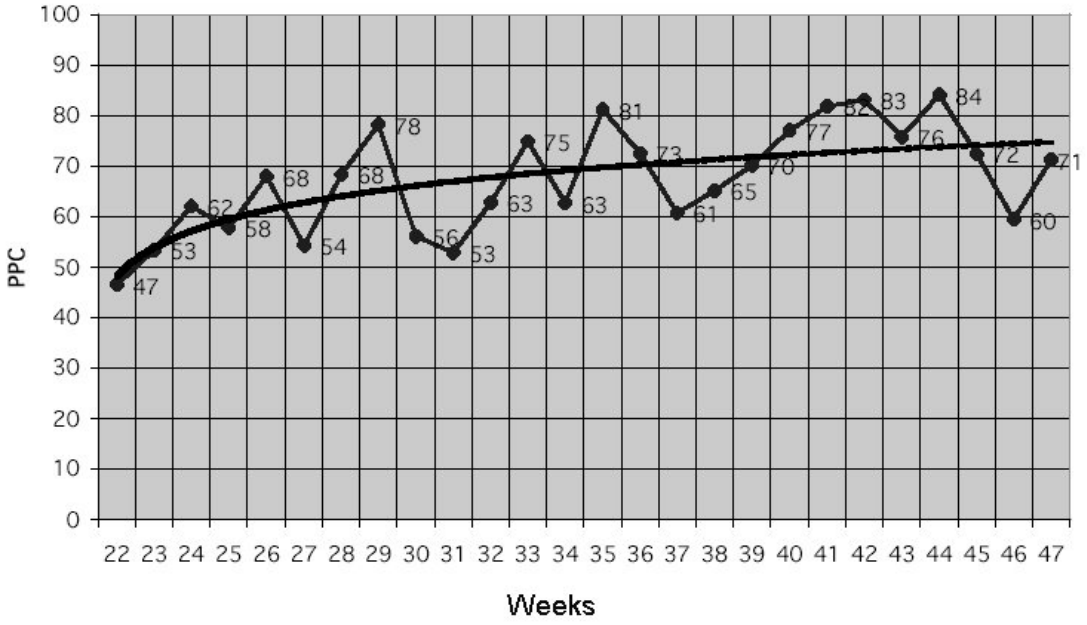

Figure 1. The development of the PPC as an average on all four test construction sites in Finland [8].

The results of the introduction of Last Planner on four domestic construction sites are parallel to those abroad. The PPC got better rising from the average of 47 % to over 80 % before our second day of teaching (Figure 1). After having a day of feedback and benchmarking the intensity of planning and following the Last Planner method probably somewhat dropped.

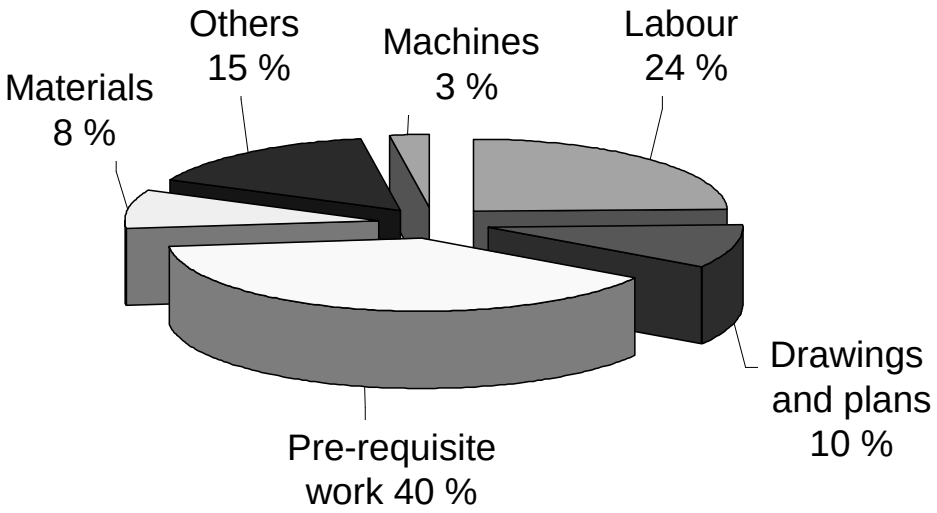

Figure 2 The reasons for non-completion of tasks in weekly plans in the Finnish experiment [8].

The reasons for non-completion of weekly tasks were not those expected. The two biggest groups of reason were pre-requisite work and the labour (See Figure 2). Our test showed that maybe too

easily we are looking someone from the outside to blame. Drawings and plans are often said to be the reason for delays and changes. In our test only ten percent of weekly plan failures were due to drawings and plans.

The quality and degree of realization of weekly plans clearly increased. The site personnel considered the method useful especially regarding that the quality level of task ready-making increased and that getting tasks completed in one pass became easier. The quality and quantity of tasks could be controlled, when tasks were clearly defined. This made it easy to measure the productivity of a particular task and its variation. The amount of ad hoc work decreased. The weekly planning sessions made coordination between tasks, workgroups and contractors easier. Also, having reasons for lack of task completion was experienced useful, and it was seen to contribute to the elimination of problems.

Taking the positive results of the experimentation and the foreign cases into account, the implementation of the Last Planner method was recommended in short term production control on construction sites in Finland.

4. Subsequent Pilot Projects

After the first experiment and the report [8] written about it, interest to Last Planner arose among the construction firms. Similar experiments as in the pilot project were conducted in a couple of firms. Some firms made experiments on their own. In the following, related observations and findings are presented.

Phase planning was tested in a middle-sized reconstruction firm. They wanted to get the HVAC-contractors to make commitment to a tight schedule. This was established by making the participants and performers to know each other and collaborate in dividing the building in to parts which can be the basis for phase planning. After that schedules were made in co-operation and committing to one another. A tight four month plan was made to be the basis. Even a great number of changes, as in reconstruction so often, didn't mess up the phase plan because the promises and commitments were so clear and the tasks due to changes were fitted in with the motivation of keeping the due dates.

The problem with planning ahead seems often to be caused by a failure to plan ahead. Very often the tasks just seem to come from nowhere and we have to start them without all necessary prerequisites. This produces problems in quality, safety and productivity. Although for some managers in Finland it seems to be hard to believe that it is more efficient to wait and make things ready than to just go ahead, lookahead – planning became reality in several projects when a simple worksheet was taken into use (see Figure 3).

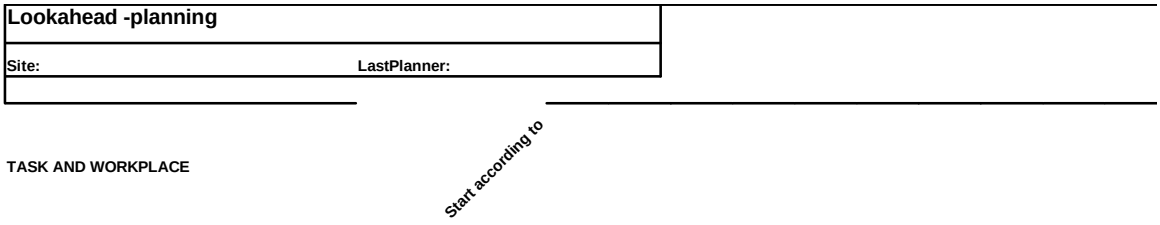

Figure 3. Lookahead –planning spreadsheet on one Finnish construction site.

A belief in the almighty power of the master schedule sits very tightly in the Finnish construction. Master schedules are mainly produced by special scheduling programs on computers. Maybe the colourful, nice looking schedules seem to be something to trust in. In one reconstruction project there were more than 1400 master schedule tasks. So many tasks but very little actual information on task contents, people who are to do the work, with what equipment and even less on commitments. The reality in this project was that the master schedule was of no use.

One key instrument on Finnish construction sites is task planning. It is a systematic way to plan one task from all the production aspects. For example time, cost, quality, safety and pre-requisites are taken into account. Tasks are prepared as whole from beginning to end. Still there is the continuous need for look-ahead planning.

The success in planning and controlling production comes from reliable commitments to the client, phase planning done together, task planning by each subcontractor, rolling lookahead planning and weekly plans into which participants have committed (Figure 4).

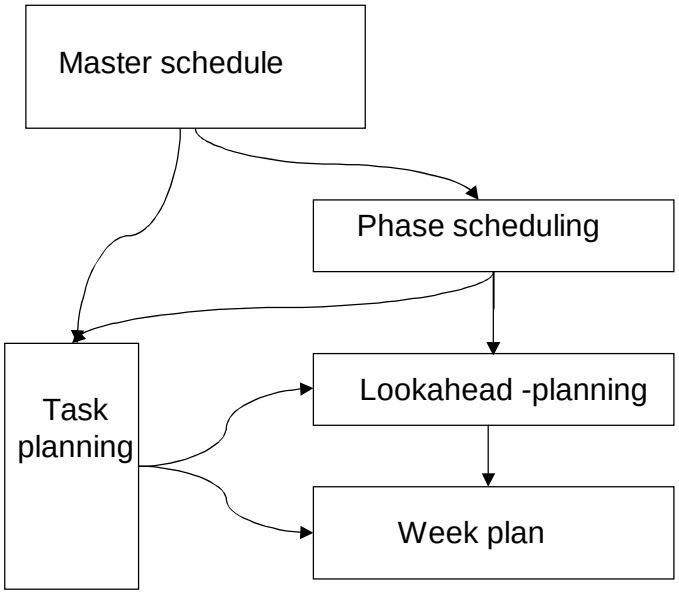

Figure 4. Overall picture of the Last Planner stimulated production planning and control, which is being implemented at the moment in Finland [8].

In view of the first, successful pilot project, the Confederation of Finnish Construction Industries organized a project for creating a manual of Last Planner, to be used both in company training and college and university education. The outline of the resulting manual [9] is presented in Table 1.

Table 1.The outline of the Finnish Last Planner manual.

Koskela, Koskenvesa, Sipi: Työmaan toimiva tuotannonohjaus: Opas Last Planner™ menetelmään. Rakennusteollisuuden Kustannus, Helsinki. 42 p. 2004.
Introduction Guideline for using and reading this manual Last Planner production control: why and what? What is the goal of LP? The totality of the LP production control **Methods and practices of LP production control** Phase planning Why? Basic procedure Advanced practice Examples and observations Look ahead planning (this heading and all below in this section have the same subtitles as above) Weekly planning: making ready Weekly planning: conversation and commitment Weekly planning: checking task completion Weekly planning: finding reasons for non-completions Continuous improvement **Introduction of the Last Planner production control** Implementation on site when LP is new for all parties Implementation in a company Training effort needed Information technology as a support to LP Interfacing Last Planner to existing production control system of the company Higher level plans Task planning **Further information** References, links etc.

In the manual, the method is structured into seven parts, and the rationale, basic procedure, advanced practice as well as related examples and observations for each part, connected to the overall explanation of the method, are presented. Also the implementation issues are discussed.

5. Explaining Last Planner

In the introduction of Last Planner, there are two challenging moments of explanation and persuasion. First, the method must be sold to the management of the contracting company, so that pilot test can be launched. Second, the method must be explained to the site personnel participating in the pilot test. To some extent, the method can be sold referring to good results abroad. However, inevitably the question emerges: Why is Last Planner more effective than the conventional method? Thus the problem is as follows: How can Last Planner be shortly explained

in a plausible way to an experienced professional of site construction? The authors came to think that the explanation must be anchored in the everyday experiences of these professionals.

The observations of Jaafari [5] on productivity in a construction task were taken as a starting point:

> While the size of samples is not large enough to yield conclusive results, the general pattern remained similar. Productivity showed a gradual build-up at the start (often associated with unavailability of specific tools or materials at the time required, or lack of foreman instruction, or absence of key craftsmen). Steady progress in productivity continued unless interrupted externally, then followed by unexplained drag at the end, or often unfinished 10-15 % for a variety of reasons such as urgent start elsewhere, technical problems, or breakdown of tools.

Indeed, for every person experienced in site construction, it is evident that there are problems related to *starting a task*. After they have been solved, new problems *during the task* emerge. And finally, there are problems related to *completing the task*. However, these problems are assumed away in task planning, where a constant productivity is usually assumed (Fig. 5). This is reinforced by the habit of representing tasks as neat, well-defined rectangular boxes. However, if we consider productivity (or output), tasks cannot be considered as rectangular boxes – rather, the productivity increases slowly to its maximum, decreases through interruptions and typically there is a tail end to be completed later, often just before handover (Fig. 6).

In view of this, the simplified explanation[2] of Last Planner is as follows: *The Last Planner System endeavors to recreate the neat rectangular form of a task output, starting sharply,, reaching the sustainable and stable output level immediately, maintaining it to the end, and thus finishing the task as planned, without any tail end.* For so doing, Last Planner utilizes its seven features, the contributions of which can be allocated to the solution of these three problems (Fig. 7).

[2] Note that this explanation is parallel to the argument that Last Planner is primarily addressing the waste of *making-do* [7] but avoids the use of difficult operations management terminology.

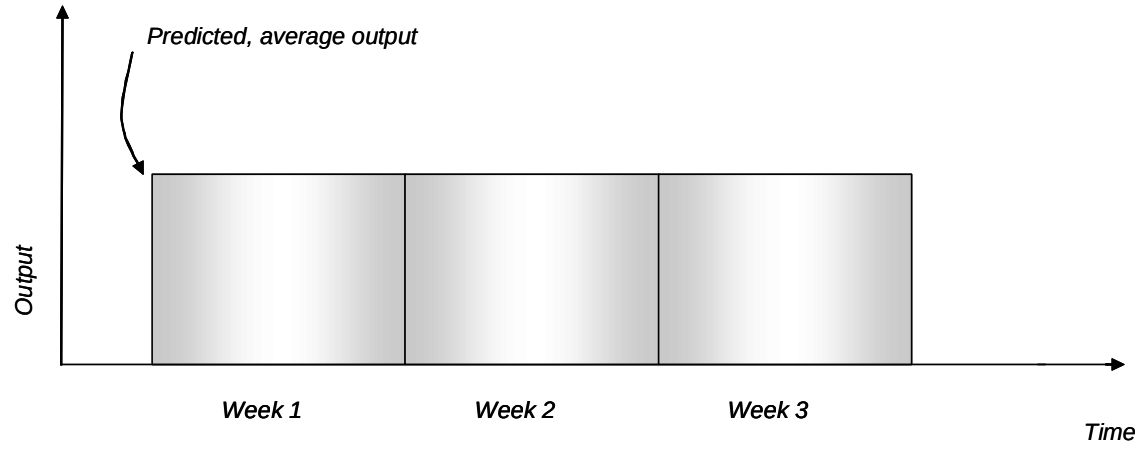

Figure 5.Task output as assumed.

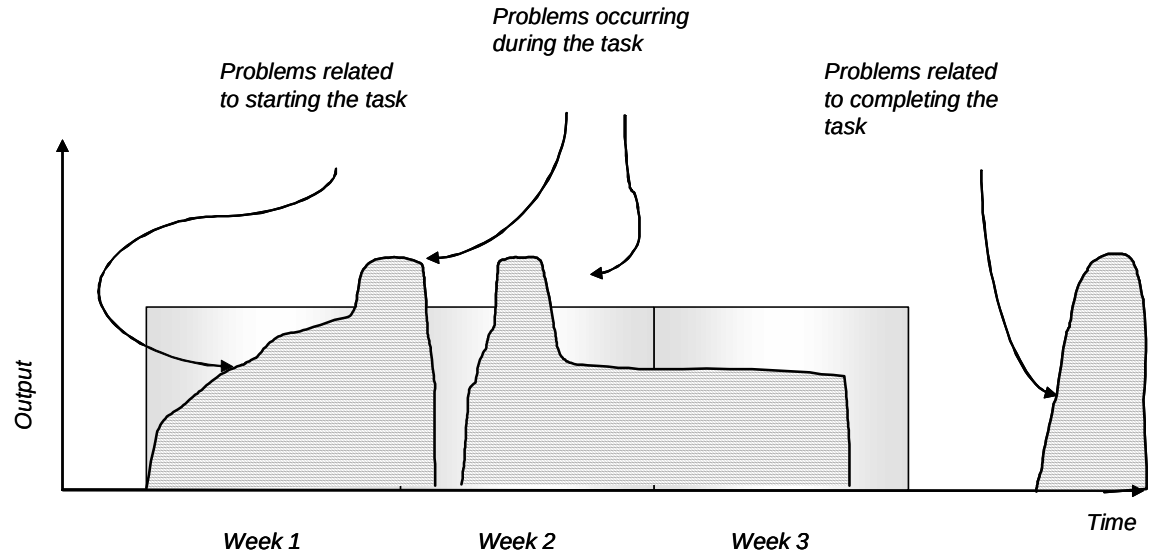

Figure 6. Task output in reality (illustrative example).

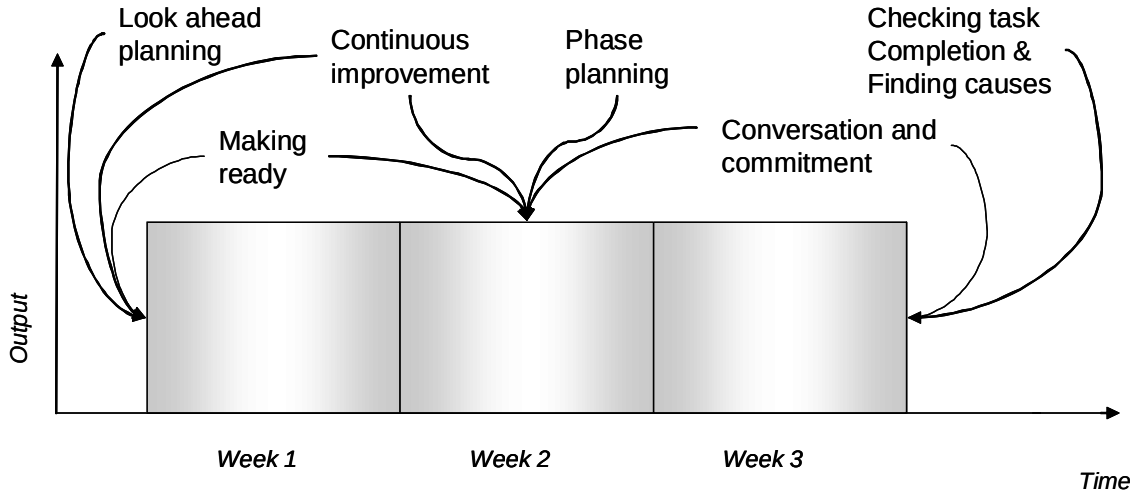

Figure. 7. Using the features of Last Planner for ensuring a sharp start, constant uninterrupted progress and planned completion of the task (only the primary mechanisms indicated).

The problems related to starting a task are addressed in three ways. In *lookahead planning*, there is a focused effort towards eliminating constraints for starting tasks: prerequisites are pulled (rather than pushed). Secondly, the *ready making* function ensures that only tasks with all prerequisites available are actually started. Thirdly, *continuous improvement* will for its part contribute to the reduction of starting problems on longer term.

Regarding problems during the task, there are three mechanisms. First, *phase planning*, carried out in collaboration between different teams and subcontractors, ensures that the best order of tasks is determined, and thus the risk of unforeseen interference between tasks is diminished. Second, *ready making* is focused on weekly tasks, and thus the prerequisites of longer tasks are checked weekly, rather than only at the start of the task. Third, all the weekly tasks are covered in the weekly planning (*conversation and commitment*), and thus in principle there should not be unplanned tasks emerging during the week, causing interruption or interference to planned tasks. However, in practice, there often is unplanned work to be carried out, but as plan reliability progressively increases along with use of the Last Planner, its amount will decrease.

When it comes to problems related to completing the task, first, all features mentioned above in relation to the two first problems help to avoid these completion problems. For example, a problem related to starting (say, shortage of materials) or a problem emerging during the task (say, necessity to move the gang temporarily to another work) may halt the task for the rest of the week. Second, task completion is specifically addressed by the planning conversation resulting in *commitment* to realize tasks as planned. Thirdly, *checking of task completion* as well as *finding reasons for non-completions* emphasize the need to realize and complete tasks as planned.

Next, the benefits of Last Planner can be explained. The elimination or at least alleviation of these three problems leads to direct benefits in terms of productivity, safety, quality and duration:

- Productivity. Each task can be sharply started, when all prerequisites are at hand. Interruptions and interferences are minimized. There are fewer tail ends, requiring a revisit by the gang.

- Safety. In comparison to the prior situation, a bigger share of tasks can be carried out as planned (including safety issues) and within regular conditions.

- Quality. A bigger share of tasks can be carried out as planned, in regular conditions, in one pass.

- Duration. Plan predictability increases along with the elimination and alleviation of the mentioned three problems. Thus, the time buffer between consecutive tasks can be shortened, with leads to a shorter total duration.

6. The Present Status and Prospects of Last Planner in Finland

At the moment, Last Planner seems to have firmly settled down in Finland. It is used by several individual construction managers, and there are pilot projects underway in two major contracting companies. There is training and facilitation available to companies through a Last Planner trainer certified by the Lean Construction Institute. There is a manual for Last Planner, published by the Confederation of Finnish Construction Industries.

However, it would be wrong to assume that the production planning paradigm has already changed in the country. The diffusion has been more bottom-up than in other countries – there has not yet been a locomotive company implementing Last Planner systematically and widely in its activities. Likewise, the curricula in universities and technical colleges tend to stress the conventional production planning mode, even if Last Planner has been point wise introduced.

One explanation to the inertia observed is that many key professionals seem to passionately subscribe to the conventional production control methodology. For them, the rejection of the master schedule as the primary tool for controlling a project is not something that could be accepted easily. Also, the temptation of automating the preparation and monitoring of the master schedule through IT tools has been irresistible to many.

7. Conclusions

The Finnish experiences on the introduction of Last Planner are to a great part similar to those gained in other countries, but to a certain degree there are novel emphases. There is similarity especially in the observation that Last Planner is a powerful method, which has already been demonstrated in pilot implementations and provides clear benefits (compare [4]). Other

significant observations, some novel, others adding to prior evidence, emerging in the framework of Finnish experiences include the following:

- *Theory-based approach*. A simplified way of explaining and justifying the Last Planner method for construction professionals was developed. The training time could be reduced, and justification of the method to managers was made easier. Also, the introduction of the Last Planner into the national educational and training system seems to require that a detailed theoretical justification, especially in comparison to the traditional way of production control, can be presented.

- *Incremental introduction*. The method was structured into seven parts, and a logical order for their progressive introduction on site was developed. A rationale for each part, connected to the overall explanation of the method, was developed.

- *Need-based facilitation*. A method of facilitation emerged where the intensity of facilitation progressively decreases according to the advances and learning made on site.

- *User acceptability*. The user acceptability of the method emerged as a critical feature. The users of the method must themselves realize the superiority of the new method, if a successful implementation is targeted.

- *Contextual tailoring*. The method has been tailored in operational details to match the existing production control methodology of the company.

Acknowledgements

The authors want to thank the Confederation of Finnish Construction Industries, the Technology Development Agency (TEKES), the Finnish Work Environment Fund and VTT Technical Research Centre of Finland as well as the involved contracting companies for their funding to the Last Planner projects.

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