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# WHAT TYPES OF PROBLEM-SOLVING ARE USED IN THE LAST PLANNER SYSTEM?

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## ABSTRACT

The paper presents the framework of Four Types of Problems, published by Art Smalley in 2018, and uses the framework to discuss how problems are solved in the Last Planner System. A problem is defined as any outcome other than the desired performance at any given time. The framework categorizes problems and problem-solving into four distinct types: Troubleshooting, Gap from Standard, Target Condition and Open-ended. The first two types are about maintaining a current standard (to reach the bar), while the two latter are about raising the standard (to raise the bar). The paper finds that Troubleshooting is in fact a dominant way of solving problems in the Last Planner System. Given that Last Planner is generally held to be a pro-active planning approach where tasks are being made ready for execution, this might seem surprising. Among other things, the reason lies in the project-based nature of construction.

## KEYWORDS

Problems, problem-solving, Last Planner.

## INTRODUCTION

The Last Planner System of Project Planning and Control (LPS) (Ballard, 2000; Ballard & Tommelein, 2021) is developed for project-based production (Ballard & Howell, 1998; Bølviken, 2012) in general and construction in particular. To plan is to identify, analyse and structure what is to be done from now and onward to increase the likelihood of a wanted output or outcome, or formulated the other way around to decrease the likelihood of an unwanted output or outcome. To control something can mean two different things. It can mean to check something (as in a quality check or inspection), or it can mean to be in or have control over something (as to have a process under control). When we say, "planning and control", control can be interpreted in both meanings: we seek to be in control by establishing status and, with this as our point of departure, we structure and commit to what should be done onward. Present

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problems are solved and future problems are eliminated or reduced. Planning and control is therefore a case of problem-solving.

In his book Four Types of Problems, Smalley (2018) presents a framework (or taxonomy) consisting of four types of problem-solving. In this paper we use the framework to discuss how problems are solved in LPS. What types of problem-solving are an integral part of LPS? And can Smalley's problem-solving framework cast new light on parts of LPS?

The paper is structured as follows: First we present what is meant by the term problem and give a short presentation of Smalley's framework. We then analyse what types of problem-solving are present in LPS. Based on this analysis, we then discuss what we find to be the most relevant findings, before we sum up and conclude.

# METHOD AND TERMINOLOGY

The paper it conceptual in nature. It presents Smalley's problem-solving concept and uses it to analyse another concept, LPS. To do so, it uses theoretical reasoning supplemented with the authors experience with the use of LPS.

LPS related terminology differs. Phase Scheduling is sometimes referred to as Making Work Ready, Weekly Work Planning sometimes as Commitment Planning. We have chosen to use the original terms according to Ballard (2000) and Ballard & Tommelein (2021).

In its original version LPS consists of four levels of planning (Master Scheduling, Phase Scheduling, Lookahead Planning and Weekly Work Planning) (Ballard, 2000). Researches and practitioners have later included further levels (Project Execution Planning, inclusion of the individual construction workers (Crew Planning) and Daily Huddles) (Ballard & Tommelein, 2021). We have in this paper chosen to limit the discussion to the four original levels.

# FOUR TYPES OF PROBLEMS

According to Smalley (2018), a problem is "any outcome other than the desired performance at any given time"[5]. A problem is an unwanted (present or future) event or situation. A problem can therefore be described as a meeting between on the one side something external and empirical (the event or situation) and on the other something internal and subjective (our attitude towards the event or situation and why it is unwanted). An event or situation is not a problem if it is not unwanted, and something unwanted is not a problem if it can or will never happen[6].

At first glimpse, there seems to be a clear distinction between the problem to be solved and the approach we take to solve the problem, the problem-solving. However, a closer look at the definition above, reveals a rather ambiguous relationship between the two. Because a problem is a meeting between an event on the one hand and our attitude towards the event on the other, two similar events can constitute two rather different types of problems, because we approach them differently through different types of problem solving. If we see something as a tactical or a strategic problem, this is not only a consequence of the event at hand, but of our strategy. Due to this, Smalley is in his book ambiguous. Sometimes he refers to his concept as a framework of types of problems, but more often as a framework of types of problem-solving. A type of problem (e.g. what he calls a Gap from Standard problem) is constituted by the fact that it is approached through a specific type of problem-solving (in this example Gap from Standard problem-solving).

[5] P. 2.

[6] This statement is, we think, valid within the "rational" domain of production. It might however not be valid in other domains as e.g. psychology.

Above we described a problem as a meeting between something happening (an event or situation) and our attitude towards what is happening. This implies that there from a principal point of view are two ways of solving a problem; we can make something else happen (change the situation), or we can change our attitude towards the situation. An example: A construction project is progressing more slowly than expected and will not be able to reach an agreed due date. The problem can be solved either by speeding up the process making it possible to reach the due date (change the situation) or by agreeing on a new due date (change our attitude towards the situation).

A problem implies a gap between the actual and the wanted. This establishes a distinction between a problem on the one hand and a task or an assignment on the other. The latter is only a problem if it involves an element of unwantedness.

The four types of problems (or problem-solving) according to Smalley are: type 1: Troubleshooting, type 2: Gap from Standard, type 3: Target Condition and type 4: Open-ended. Types 1 and 2 are reactive in nature, they are about reacting to events or situations that have occurred and maintaining a current standard [7] by re-establishing an acceptable level of performance (to reach the bar). Types 3 and 4 are proactive in nature, they are about improving above the established level of performance and thereby raising the standard (raising the bar). While type 1 and 2 are typically addressing processes and events within a system (they are about improving within the system), type 3 and 4 are typically about system level improvements (they are about changing the system).

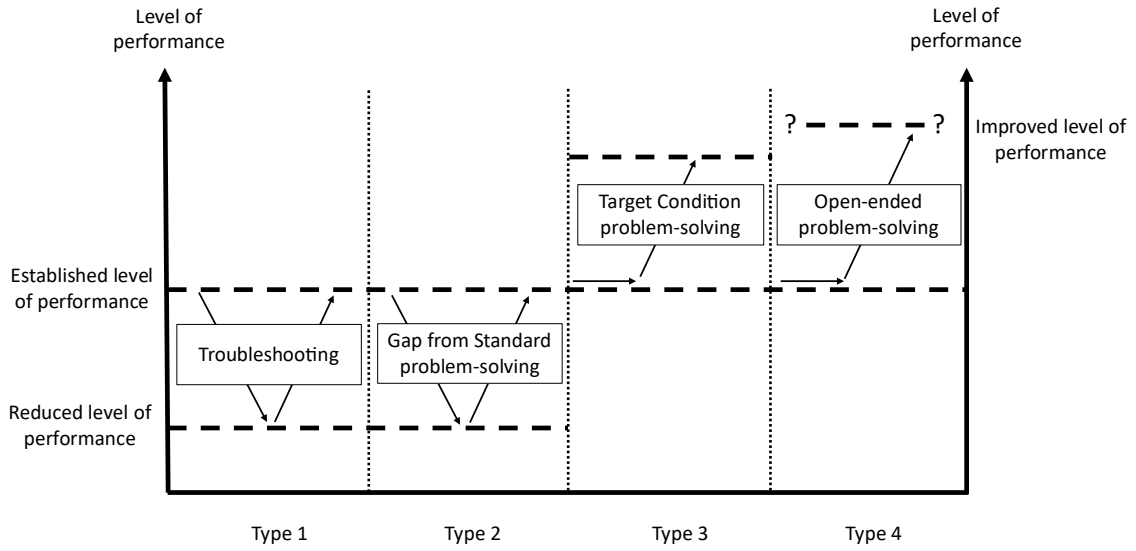


Figure 1: The four types of problem-solving

The ideal is to solve the problem at hand. Many times, this is however not possible. This can be for principle or pragmatic reasons. The problem can be unsolvable, (e.g. the resources needed are unavailable or the cost of solving the problem can be too high). In these cases, we

[7] The term "standard" can be used in (at least) two meanings; as an ideal or norm to be reached and as a de facto level or way of performance (common practice). The ISO standards can here serve as an example of the first. In Smalley's concept the meaning of "standard" is the latter: the standard is our present level of performance (institutionalized practice (Klethagen, 2017)). Ballard and Tommelein (2021) define a standard as "an accepted way of doing or assessing something" (p. 110), but do not clarify whether or not "accepted" implies accepted as an ideal or made common practice.

are left with no other choice than to mitigate, manage or simply accept the problem. To solve one problem can also give rise to new problems.

Types 2 to 4 problem-solving are much more comprehensive than Troubleshooting (type 1). All organizations have limited resources. Always to use types 2, 3 or 4 is therefore simply not an option. Any organization will have to do Troubleshooting on a daily basis (just fix the problem) and prioritize which problems are to be dealt with through more ambitious types of problem-solving.

There is a connection between problem-solving and learning. When we solve a problem, we learn something. Broadly speaking, the potential for learning grows as we move from type 1 to type 4 problem-solving. When Troubleshooting, we basically learn whether or not the problem was fixed. When moving on to the other types we introduce root causes and the system (context) around the problem. This implies a huge increase in the potential for learning. Learning theory distinguishes between single-loop and double-loop learning. Single-loop learning can be conceptualised as "doing better", double-loop learning as "doing differently" (Ashby, 1960; Argyris & Schön, 1998; Kalsaas, 2012). Types 1 and 2 are mainly related to single-loop while types 3 and 4 require some degree of double-loop learning.

## TYPE 1: TROUBLESHOOTING

"Troubleshooting is a reactive process of fixing problems by rapid response and short-term corrective actions."[8] Type 1 problems "are abnormalities that require some type of immediate response"[9]. Examples of type 1 problems are a house on fire[10] or a customer who hasn't received what he or she has paid for. The modus operandi of Troubleshooting is action, to take care of the situation here and now. Smalley underscores that because nothing ever goes 100% according to plan, some degree of daily Troubleshooting is necessary in any organization – and in everyday life. There is no rational choice. Also, when we intend to treat the problem as a type 2, 3 or 4 type, we will often have to start by resolving the immediate issue at hand. Troubleshooting can therefore also be a precondition for moving on to other types of problem-solving.

## TYPE 2: GAP FROM STANDARD

"Gap from Standard problem-solving moves us from symptoms to root causes"[11]. The typical problems to be dealt with through this type of problem-solving are reoccurring cases of performance below the level we usually have (the standard[12]). The modus operandi of Gap from Standard problem-solving is to analyse, and based on this, to find ways to prevent the problem from recurring. Root cause analyses using 5 Whys and the Plan-Do-Check-Act cycle (PDCA) are well known methods used in Gap from Standard problem-solving.

## TYPE 3: TARGET CONDITION

With type 3 problem-solving we move from reaching the bar to raising it. We take a proactive approach in order to move beyond the current state.[13] In this sense, a type 3 problem is a problem created by ourselves. It can however also be forced upon us, (e.g. if our company is in danger of being outperformed by competitors). Continuous Improvement, Waste Reduction and

[8] Smalley (2018), p. 35.
[9] Smalley (2018), p. 35.
[10] A related term to Troubleshooting is firefighting, see the conclusion.
[11] Smalley (2018), p. 47.
[12] See footnote 7.
[13] Target Condition problem-solving is also described by Rother (2009) as a part of Toyota Kata, an approach to generate adaptiveness, improvement and innovation.

Value-Stream Mapping are concepts often used in type 3 problem-solving. There is however a substantial overlap in the tools used in type 2 and 3.

At first glimpse, the difference between type 2 and 3 might seem straight forward. Type 2 is about regaining an earlier established level of performance (avoid sliding backwards), while type 3 is about reaching a new level of performance. However, what we see as our level of performance need not be unambiguous. If for example a construction company experiences one serious work-related injury per one million working hours, they might say that their normal level of performance is not to have injuries, and therefore treat the injuries that occur as a Gap from Standard, that is a type 2 problem. They could however also say that their normal level of performance is to have on average one injury per one million working hours and therefor see the problem as a type 3 problem where the goal is to raise the level of performance. This explains the substantial overlap in the tools used in types 2 and 3 problem-solving. In our example, one of the main differences between seeing the problem as a type 2 or 3 problem is probably that by seeing it as a type 2, we take a reactive approach, while we by seeing it as a type 3 take a more proactive approach.

## TYPE 4: OPEN-ENDED

This last type of problem-solving is about radical innovation and change. In type 4 situations we cannot paint as clear a picture of the future state as in the other types of problem-solving. "It is unclear how to get there and what it will look like when we do."[14] The openness needs not be limited, however, to the process of problem-solving and its results, but can also include the problem definition itself. "The exact problem definition and associated solution space are not necessarily known at the outset."[15] Type 4 problem-solving may even "entail a problem that no one even knows exists."[16]

In type 4 problem-solving we therefore typically diverge before we converge. Both in the analytical and in the solution phase we first open up in search for new ideas and perspectives before we narrow down towards a solution. While type 2 problem-solving is about drilling down (e.g. through root cause analyses), type 4 is about what could be called drilling up. We must see the whole picture and be able to think out of the box. The Design-Thinking framework (Brown, 2009) can here serve as an example of a type 4 problem-solving tools.

## IS SMALLEY'S CONCEPT GENERIC?

Smalley claims that his concept is "providing a framework for approaching any problem"[17], but presents no argument for this claim. The context within which Smalley is writing is however manufacturing (industrial production processes). This makes it relevant to ask to what degree his concept is actually generic (relevant also beyond its original context), and to what degree it contextual (only relevant within this specific context). To address the question, we will go into some of the main distinctions within Smalley's concept.

The first is the distinction between Troubleshooting (type 1) and the more ambitious approaches (types 2, 3 and 4). As also stated by Smalley, "some degree of daily Troubleshooting is necessary in any organization – and in everyday life"[18]. To distinguish between solving a problem here and now and going into underlying causes is obviously relevant in all situations.

The second is the distinction between what we could call open minded approaches (types 1 and 4) and approaches that are more structured and method based (types 2 and 3). How to troubleshoot a here and now situation is obviously totally dependent on the situation and the

[14] Smalley (2018), p. 110.
[15] Smalley (2018), p. 110.
[16] Smalley (2018), p. 109.
[17] Smalley (2018), p. 33.
[18] Smalley (2018), p. 35.

means at hand, and not much can be said about methods. Also a type 4 problem is per definition open. Although there exist methodological approaches to Open-ended problem-solving, it would not be Open-ended if not also the approach was (at least to some degree) open.

The third is the distinction between reactive approaches (types 1 and 2) and proactive approaches (types 3 and 4). This is also obviously relevant in all situations.

The fourth is the distinction between reaching the bar (types 1 and 2) and raising the bar (types 3 and 4). The bar is an established level of performance. The underlying assumption here is that such a level of performance exists, that is that the process is repetitive. We therefore argue that Smalley's concept is mainly addressing repetitive processes.

Our brief analyses shows that Smalley's concept mainly addressing repetitive processes. At the same time, some of its main characteristics are in fact generic. The concept should therefore, at least to some degree, be applicable to all types of problems in repetitive processes.[19] Although having generic traits, it can still have more or less to offer in different contexts. Our agenda in this paper is to find out if it has something to offer to our understanding of LPS.

# PROBLEM SOLVING IN THE LAST PLANNER SYSTEM

We will in this section describe what types of problem-solving are normally seen at each of the planning levels[20] of LPS.

## PROBLEM-SOLVING IN MASTER SCHEDULING

Master Planning is done once at the start of the project. It establishes the overall duration of the project and the main phases with milestones and main interconnection. It can also include a rough breakdown of the phases. There is in LPS no specific planning method prescribed for Master Planning. In practice, the Critical Path Method (CPM), simplified Gantt planning and methods known from Phase Scheduling in LPS are often used.

Open-ended problem-solving (type 4) can be highly relevant before production is launched (in the pre project planning period). However, when the decision is taken to start production, remaining problems have to be solved within the framework of the execution project and are per definition not Open-ended any longer. In some cases, the project, or parts of the project, might however have a character of never been done before and might therefore to some degree be characterized as an Open-ended problem (type 4) (e.g. if the project is aiming at a substantially shorter construction period than what is traditionally achieved in similar projects). This is however not the case in most projects.

To secure that it is realistic to reach the milestones, it can be necessary to test the Master Schedule at some level of detail. This can be done in several ways; for example, by making overall judgements based on experience, by identifying practical solution that confirm that things are doable within known methods and procedures, or by scheduling critical phases or parts of phases in detail (see Phase Scheduling). This way, the issues are sometimes solved, other times just categorized as solvable and therefore acceptable. If issues are overlooked or underestimated, they are likely to reoccur later in a more challenging way. In Smalley's terminology, the process of confirming milestone realism can be both a question of just fixing things based on experiences (Troubleshooting – type 1) and more thorough analyzes (Gap from Standard – type 2).

When the Master Schedule is settled, the milestones are set. This way the Master Schedule becomes the project baseline. If problems arise that make it difficult to meet a milestone, the set milestone creates pressure to find a solution that is not in conflict with the baseline. If one instead were to move the milestone, this could not only have negative effect on subsequent

[19] This conclusion is related to the concept as such, not necessarily to the tools described by Smalley.
[20] See the section on Method and Terminology.

phases, but also damage the overall credibility of the baseline. In both cases, the risk of major negative ripple effects for the rest of the project are substantial. The baseline with set milestones establishes a framework for the more detailed levels of scheduling by forcing people to search for new solutions to meet those milestones. Translated into Smalley's terminology, this constitutes a Target Condition problem (type 3). However, if it is not feasible to keep the milestone, it is crucial to accept this fact and adjust the milestone accordingly.

## PROBLEM-SOLVING IN PHASE SCHEDULING

The goal of Phase Scheduling is to identify the tasks in the phase in question, estimate their duration and determine the sequence in which they should be done. Ballard and Tommelein (2021) recommend to use Pull Planning. In Pull Planning the milestones from the Master Schedule are set as a demand that needs to be met, and the plan is built backwards in time to solve the demand set by the milestone. One important advantage of Pull Planning is that problems end up closer to the current time than in Push Planning, where there is a tendency to push problems into the future and close to the milestone. Thereby it becomes more likely that they are seen as less important, that their significance is underrated and their solution postponed. In total this makes it more challenging to solve the problem.

Let's use an example of a team that after the first run-through of a Phase Schedule end up having too little time available to execute the plan. What typically happens is that the team starts identifying and discussing potential solutions. Depending on the nature of the problem and their choice, they might make use of all four types of problem-solving. They might try easy and intuitive ways to fix the problem (Troubleshooting - type 1), they might start a thorough root-cause analysis or drill down into more levels than what is usually done in Phase Scheduling (Gap from Standard - type 2 or Target Condition - type 3), or they could go for an open brainstorming (Open-ended - type 4). If they are not able to solve the problem this way, they are left with no other option than to challenge the milestone.

During execution, problems might occur that challenge the Phase Schedule. The solution to this should be either to take measures that can bring production "back on track" or to revise the Phase Schedule. In both cases, the approach of the team will usually be to try to solve the situation quickly and with the use of known solutions, that is mainly through Troubleshooting (type 1).

## PROBLEM-SOLVING IN LOOKAHEAD PLANNING

The goal of Lookahead Planning is to make upcoming tasks ready for execution. This is done by going through all tasks to be executed in the coming 6 to 10 weeks, checking if they are sound or unsound. Sound tasks are tasks where all preconditions for unhindered execution will be present at the time of execution. Unsound tasks are tasks where one or more preconditions will or is likely to be missing.[21] If the tasks are sound, they are passed on to the Weekly Work Planning. If not, action is taken to make them sound in time for execution.

The make ready process in Phase Scheduling distinguishes LPS from other planning concepts. It is a proactive process where the tasks actively are made ready. The modus operandi of the team will however usually be reactive. Action is triggered by missing preconditions and the team does whatever they find appropriate to establish the missing preconditions. They try to solve the problem by direct action (Troubleshooting - type 1) and only if this doesn't work will they move to looking at root causes etc. (Gap from Standard - type 2).

[21] The checking of task soundness can be done using the seven preconditions for task soundness, a project specific checklist or an open approach. The seven preconditions are: design/information, components and materials, workers, equipment, space, connecting works and external conditions (Koskela, 1999).

## PROBLEM-SOLVING IN WEEKLY WORK PLANNING

In the Weekly Work Planning sound tasks are pulled into the Weekly Work Plan in a quantity that corresponds to the available capacity. Each team confirms (promises) that it can and will do the job as planned. At the end of the week a check is done of which of the tasks on the plan are completed and not. The ratio of completed tasks (Percent Plan Complete (PPC)) is calculated and compared to the results this far in the project. Reasons for the development in PPC are discussed[22]. Noncompleted tasks are re-planed and often put on the Weekly Work Plan for next week (or a week following).

Such re-planning can include elements of Gap from Standard problem-solving (type 2). When putting noncompleted tasks back into the Weekly Work Plan without any further analyzes or adjustment of the task or plan, this is a direct handling of the problem that must be characterized as Troubleshooting (type 1). By measuring PPC and discussing reasons of noncompletion[23], a potential learning loop is built into LPS. In theory the team should find the root causes for noncompletion and take action based on this. If the agenda is to stop a falling PPC, this is a Gap from Standard problem (type 2), while if the agenda is to improve PPC above the current level, this is a Target Condition type of problem (type 3). However, our experience is that in many projects, what is done in practice is only a very brief identification of the direct cause of noncompletion, often by categorizing which preconditions were missing. Such categorization makes sense only if it is used to track trends and that these trends in turn are used to trigger type 2 or 3 problem-solving (or conceivably even type 4).

## LPS METRICS

Metrics are a way of visualizing problems. We will therefore here give a short description of the LPS related metrics recommended by Ballard and Tommelein (2021). In total they recommend five metrics to be used: Commitment Level (CL), Percent Plan Completed (PPC), Tasks Anticipated (TA), Tasks Made Ready (TMR) and Frequency of Plan Failures.

***Percent Plan Completed (PPC)*** is the by far best established LPS metric and has been a part of LPS from the very start (Ballard 2000). We discussed PPC as a part of Weekly Work Planning above and will not go further into it here.

***Commitment Level (CL)*** is recommended as a response to the observation that capacity is not always allocated first to critical/required tasks. In order to calculate CL, all tasks must, when released from the Lookahead Planning, be assessed as critical or non-critical and tagged accordingly. CL is calculated as the percentage of these critical (and therefore required) tasks that are committed to be performed on the Weekly Work Plan.

***Tasks Anticipated (TA)*** measures the percentage of tasks on the Weekly Work Plan that were anticipated for the week in question during Lookahead Planning.

***Tasks Made Ready (TMR)*** gauges the percentage of tasks allocated to a specific week in the Lookahead Planning that end up being put on the Weekly Work Plan for the week.

***Frequency of Plan Failures*** is a metric showing the frequency of different reasons for noncompletion of tasks (plan failure), see the description of Weekly Work Planning above.

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[22] In principle there are two possible reasons for noncompletion of a task. The task might not have been sound when it was put on the Weekly Work Plan, or it can have become unsound after it was put on the plan. One example of the first can be underestimated task duration. Another example can be that the task was pushed into the plan even though it was known to be unsound. One reason this might be done is that management hopes to put pressure on the team to complete the task.

[23] Ballard and Tommelein (2021) use the term *plan failure* for what we here refer to as *noncompletion*.

# DISCUSSION

Metrics are indicators of performance and can thereby visualize problems. They can also describe first order causes (e.g. reasons for noncompletion of tasks). This way they can increase the likelihood of problems being addressed and facilitate problem-solving, but offer no guarantee of this. It is not always true that "what gets measured gets done". Metrics can be a part of a problem-solving method, for example by assessing if a problem-solving approach is having the desired outcome, but they are not problem-solving methods themselves.

The LPS related metrics are primarily indicators of how well the planning system is working (Ballard & Tommelein, 2021). When used, they can attract attention to problems, give food for thought and contribute to continuous problem-solving and learning circles based on root cause analyses (types 2 and 3). However, as described earlier, the process can also end up with just Troubleshooting (type 1) and a short categorizing of the problem.

Such learning loops could be within or between projects. There are however reasons why this is not as straightforward as it might seem. Regarding learning between projects, one reason for this is the project-based nature of construction. The primary objective of the team is to complete the specific project at hand, rather than emphasizing the transfer of experiences to potential future projects. Within the scope of the project itself, it is not necessarily evident that situations and challenges will reoccur in ways that justify the effort of conducting more comprehensive analyses (Bølviken & Koskela, 2016). The more unique the context, preconditions and tasks are, the less relevant it becomes to adopt approaches beyond direct Troubleshooting (type 1).

LPS is project oriented, the focus being on getting the tasks and the project done. The focus is for every level of planning to do its job before the task is moved on to the next and more detailed level. In this hierarchy, a task can in theory be moved back to the previous level, but in practice this seldom happens and only to resolve the problem related to the task, not to avoid the problem from reoccurring or to improve the system as such[24].

More ambitious problem-solving approaches are to some degree encouraged and in use in LPS, revolving around metrics. However, all in all, our argument leads us to conclude that the primary problem-solving approach of LPS is to resolve issues related to task soundness directly, that is through Troubleshooting (type 1). At the heart of LPS is getting the project done by securing the *should – can – will – did* "procession" of the tasks. Acknowledging that LPS is in nature a proactive scheduling system (making things happen instead of the thermostat approach of placing commands and after the fact register what has been done), this might at first sight seem like a surprising or paradoxical conclusion. However, the main reason lies in the project-based nature of construction and need not necessarily be a weakness in LPS. It does however make us wonder if there could be something to gain from integrating types 2 or 3 problem solving into LPS? Could this be done by introducing some kinds of stop mechanisms all through the system, that could trigger more advanced types of problem-solving (types 2 and 3)? This could be seen as the Andon system of LPS.

# CONCLUSIONS

We have in this paper looked at LPS through the lens of Smalley's concept of Four Types of Problems. Our conclusion is that Troubleshooting is in fact a dominant way of solving problems in LPS. Given that LPS is generally held to be a pro-active planning approach where tasks are

[24] In this respect production planning and control in construction is different from for example car manufacturing. Due to the high repetitiveness in car manufacturing, the focus there is to stop errors from reoccurring by addressing root causes and systematically lifting problems to higher organizational levels.

being made ready for execution, this might seem surprising. Among other things, the reason lies in the project-based nature of construction.

We propose the following as possible next research steps:

1. As discussed above, could types 2 and 3 problem-solving be integrated into LPS? On the other hand: To what degree would such an expansion of LPS also imply the risk of diluting the system? And would such a more thorough handling justify the time and focus used on it?
2. We have in this paper only discussed Smalley's problem-solving concept and have not touched upon other problem-solving concepts. Another next research step could therefore be to look into such concepts in relation to LPS.
3. We have in this paper only discussed the four original planning levels of LPS. A next step could also be inclusion of Project Execution Planning, the individual construction workers (Crew Planning) and Daily Huddles in the discussion.

A term related to Troubleshooting is firefighting. Firefighting is a term that is often used with a negative connotation in Project Management in general and in Lean in particular. If we are to make a distinction between the two terms, firefighting is about taking immediate action in acute situations, while Troubleshooting is also about handling situations that are not necessarily acute. Smalley's framework calls for a rehabilitation of Troubleshooting and firefighting. If there is a fire, there is nothing wrong in fighting it. On the contrary. First after we have handled the acute problem at hand, does it make sense to start looking for root-causes and future preventive action. Doing firefighting is not a problem, doing only firefighting can be.

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