Using the sociotechnical systems approach for analysing nondeterministic project progress: a conceptual exploration

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Abstract

This thesis proposes the use of a sociotechnical systems approach for analysing project management in nondeterministic project progress. The academic context of the research covers the domain of general systems theory, more specifically sociotechnical systems, and that of project management. The empirical part of the research comprises of a questionnaire spread amongst project managers in technical service firms in the built environment sector. The research shows that there are research opportunities in project management to which the sociotechnical approach to temporary project organisations can contribute.

Keywords

General systems theory, sociotechnical systems, technical service firm, built environment, project management, analysis, reverse salient.
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1. Introduction

Projects in the built environment sector often include many stakeholders with different interests, ways of working and specialisations, which can make a project complex and its goal vulnerable. Ideally, a project goal is guarded by a well-functioning temporary organizational structure, wherein project staff and managers report their activities to their superiors (Maylor, 2010). If a project is off track, correction actions are instigated to make sure that the project goal is reached. When a project is completed, a post-project review compares the achieved result with the original plan.

The above description of project control implies a solution-focussed attitude of project staff and managers. Limited by time and money, they should execute project activities with the project goal in mind. Moreover, every project has a high degree of uniqueness (Maylor, 2010) and thus needs a tailor-made combination of activities to reach its goal. The concepts of project control and uniqueness make a more theoretical and generic approach to project analysis not obvious. Nevertheless, such an approach is the subject of the present research. It will investigate the theoretical possibilities of applying a sociotechnical systems approach to project progress analysis.

1.1 Research questions

The present research revolves around an uncommon and theoretical approach to analysing project progress in technical service firms in the built environment sector. The research questions is based on several opportunities in project management research that have been distinguished, on the limited application of the sociotechnical system approach to processes and on an observation of the author: project managers solve problems more than they analyse them.

The main question that the present research will answer is:

*Do project management theory and sociotechnical systems theory allow for an application of sociotechnical concepts to the analysis of nondeterministic project progress?*

Sub questions include:

- Does the approach, as described in the main research question, fit to any recognized research opportunity in project management theory?
- As opposed to project management theory, what research opportunities do derive from project management practice?
1.2 Purpose

The main goal of the present research is to lay a theoretical foundation for an empirical research, by carrying out a conceptual exploration in the domains of project management and sociotechnical systems theory. It should be clear that the present research doesn't aim to design a new project management execution method nor does it want to operationalise the concepts from sociotechnical theory in a project management environment right away.

1.3 Delimitations and scope

The theoretical part of the present research focuses on project management research and theory and sociotechnical systems theory. Related subjects as organisational learning and knowledge management are not taken into consideration, as these subjects relate more to the processes that occur after problem solving and not to identification and analysis of problems.

The empirical part of the present research focuses on non-deterministic projects in technical service firms in the built environment. This means that the empirical research focuses on project management practice in technical service firms that initiate projects to contribute to the design and planning on the built environment. Hereafter this kind of project will be referred to as built environment design projects.

1.4 Positioning

Although the present research will introduce concepts from sociotechnical theory, the main topic is still project management. Not only does the empirical part of the present research focus on firms in which project management is one of the core business activities, also the theoretical part aims to contribute to expanding project management theory. Project management is an important topic within the field of industrial engineering and operations management (Salvendy, 2001). It is therefore that the present research is positioned within the field of industrial engineering and management.

1.5 Methodology

The present research uses different ways of generating knowledge and consists of both a theoretical and a practical part. The theoretical part of the present research focuses on existing theories and ways in which these theories can be interpreted and combined. The practical part of the present research focuses on the collection of qualitative data from people in order to get a better understanding of a situation in practice. In both theoretical and empirical context, this
research is focused on exploration and possibilities for generating new knowledge and is therefore qualitative and interpretivist.

2. Literature review: research opportunities in project management

This section will introduce the reader to the relevant opportunities in project management research that have been identified. The research opportunities have been derived mainly from two papers, in which the authors provide an extensive overview of (trends in) existing research in project management and the opportunities that derive from it.

Using elements from systems theory to analyse and better understand project progress may contribute to project management theory. Theories of projects are defined as “conceptualizations and models that explain and predict the structure and behaviour of projects” (Söderlund, 2004, p. 186). As the present research focuses on the analysis of project work that is ongoing or finished, the element of predicting the structure and behaviour of project is not included in the definition used. Thus, in the context of the present research, a theory of projects is defined as follows: conceptualizations and models that explain the structure and behaviour of projects.

2.1 Social elements of project management

Söderlund (2004) distinguishes between five questions that might further facilitate the building of project management theory. The present research aims at contributing to possible answers to two of these questions, being 1) how do project organisations behave? and 2) what determines the success or failure of project organisations? Hereafter, both questions will be discussed and together will be related to the present research.

2.1.1 Project organisation behaviour

In project organisation literature, the understanding of social themes like “learning”, “participation”, “commitment” and “action” is mentioned as crucial when investigating behaviour of project organisations (Söderlund, 2004). However, the many models found in project management that exist today do not increase our understanding the aforementioned themes. The themes all refer to something that project staff can undertake and which can have an influence on the behaviour of the project as a whole. Herewith, the study of project behaviour becomes a highly social study.

2.1.2 Success and failure of projects
A great number of researches in project management focuses on determining critical success and failure factors in projects. Although recognizing the importance of these studies, Söderlund (2004) argues that future research should be more focused on real life project management and the social embeddedness of project management. As with project organisation behaviour, again the social aspect of project management is stressed.

However, when making his point on the surplus of critical success and failure factor studies in project management, Söderlund illustrates a research background that only indicates a tendency towards critical success factor thinking and less so towards critical failure factor thinking. When referring to the history of research in project failures and how this has motivated scholars to start researching project success, Söderlund relies on the publications of empirical studies in project management journals and books in the 1980s.

2.2 Measuring progress in nondeterministic projects

There are several arguments to state that the possible reasons for project failure, including reasons for problems in project progression, have changed since the 1980s. Firstly, project management is now applied to a wider range of business applications with different characteristics (Hall, 2015). Simply applying findings from old studies on critical failure factors to new project management applications could lead to wrong conclusions or could prevent researchers from looking for contemporary reasons for project failure. Secondly, and related to the first argument, in the 1980s project management had just been established as a professional field and most of project management practice in those days would now be considered traditional and deterministic (Hall, 2015). In a typical deterministic project, the “eventual configuration of the project is known before the start of the execution phase” (Hall, 2015, p.947). As opposed to traditional projects, many present-day projects are nondeterministic, which means that “the eventual project configuration needs to be found as part of the execution process” (Hall, 2015, p.947).

Hall (2015) argues that projects that are raised to develop a new product or service can be classified in a midrange application; they have characteristics of both deterministic and nondeterministic projects. Typically, a product development team knows what kind of product they’re looking for and what attributes it should have (deterministic), but there are several and sometimes unknown ways in which this development can take place (nondeterministic). It is not completely by chance that projects in the development of the built environment demonstrate the same characteristics. The similarities between new product development and building design and
construction have been studied before and it seems that the two type of projects share principles (Mikulina, 1998). In this context, built environment design projects are usually characterised by a mix of the two aforementioned types of projects: a nondeterministic design process has to lead to a deterministic and engineered end product.

The application of project management in (partly) nondeterministic projects can lead to difficulties in estimating progress (Hall, 2015). If the goal of a project is more or less clear but there are different known and unknown means of reaching that goal, much of the value of the project will be delivered at completion. During the project it is hard to determine how much value is added by the different project tasks, because nobody knows if these tasks will actually contribute to the final product. Due to this haziness in added value it is hard for project managers to determine project time and cost variance during the project execution phase. This in turn makes it difficult for them to reallocate project resources. The described difficulties in estimating progress and allocating resources may rise the question if the behaviour of project sub systems can be a progress indicator instead.

2.3 On organisational learning and knowledge management

In project organisations, the following challenges often emerge during the process of problem solving; 1) problems are complex and are difficult to structure, and 2) project managers and staff are focused on solutions and not a thorough analysis of the problem itself (Maylor, 2010). Under pressure of limited resources, a solution-focused attitude of project managers and staff is needed to make a project successful. However, this attitude may underestimate the learnings that can be drawn from analysing problems more thoroughly. Also during completion and review of a project, this situation may occur. Many organisations do not give project staff the required time to review projects, but preferring them to continue to the next project. The so-called hedgehog-syndrome occurs when project staff does not learn from previous projects and makes the same mistakes in new projects.

Although the above description of a typical problem-solving process in projects has implications for organisational learning and knowledge management, these two research fields are not considered part of the scope of the present research. This is because organisational learning and knowledge management are especially important when transferring learnings from projects to other projects or institutionalising the knowledge within the organisation. On the contrary, the present research is focused on determining the failures in which these potential learnings are rooted. The literature reference that is given above stresses the importance of
problem analysis in projects.

3. Theoretical framework

This section will firstly introduce the reader to the relevant theoretical frameworks in the domains of sociotechnical systems theory and project management. Secondly, the present research will be positioned in the existing bodies of knowledge and it will become clear which gap it aims to fill.

3.1 Sociotechnical systems

To understand the concepts of the sociotechnical system approach, an introduction in general systems theory (GST) is needed. The general systems theory was first described by the Austrian biologist Ludwig von Bertalanffy and proposes a systematic approach to the world around us, where more or less everything can be regarded as a system (Blomkvist & Johansson, 2016). The core of the concept is the possibility of identification of characteristics that all systems have in common, which are: the existence of a process that transforms input into output, a feedback loop, an environment to the system, a hierarchy of sub-systems within the system and systems mutually, and a goal that can be reached in multiple ways (equifinality). As the name general systems theory implies, the systems approach is applicable to almost everything and is therefore sometimes questioned as a unique research area (Blomkvist & Johansson, 2016). To narrow down the research field and to make the connection with the research field of project management, the following paragraphs will focus on both the technological and social concepts within the general systems theory.

The technological systems approach refers to a non-unitary view of technology (Dedehayir, 2009). In this view, a technological phenomenon is seen as a hierarchically structured system that consists of connected sub-systems. The technological systems approach not only makes it possible to distinguish different technological sub-systems but, more importantly, makes it possible to analyse how these sub-systems are related and how they interact. However, this view still only considers merely technological sub-systems of a system.

Whereas a pure technological systems approach does not involve any social sub-systems, so does a sociotechnical systems approach (Bijker, Hughes & Pinch, 1987). Besides technological sub-systems, a sociotechnical system also recognizes the (influence of) end-users and the creators of the technology. These social sub-systems can be individuals, groups or organisations and, depending on how the border of the sociotechnical system is defined, they can be influenced by
external factors. This again corresponds to the idea of Von Bertalanffy that any system that interacts with the environment should not be interpreted as an isolated system (Blomkvist & Johansson, 2016).

In literature on technical systems there is a number of concepts with which a sub-system’s progress towards a goal can be described. These concepts are mainly used to determine to what extend sub-systems are lagging behind compared to other sub-systems. Two historians of technology have published works that clearly distinguish between two or more ways of describing lagging sub-systems (Bijker, Hughes & Pinch, 1987; Rosenberg, 1976). Hughes distinguishes between the bottleneck, reverse salient, drag, limits to potential, emergent friction and systemic efficiency. Rosenberg focuses on the concept of technological imbalance, while also briefly naming the concept of the bottleneck.

There are several reasons to limit the application of the aforementioned concepts in the present research. Firstly, in his publication, Hughes does not clarify whether the concepts that he mentions correspond to different ways in which sub-systems lag behind or that they all refer to the same concept but in different environments or industries. The amount of definitions in the publication by Hughes is limited. Additional literature that too distinguishes between all the aforementioned concepts and also contextualises and defines them is absent. Secondly, Rosenberg’s technological imbalance only focuses on technological sub-systems and does not recognize the existence of social elements, which makes it not fit for an application to project management, in which people are one of the main resources. The present research therefore focuses on the two concepts that are most well defined in literature and which recognize both technical and social elements: the bottleneck and the reverse salient. Differences between these concepts can be small and nuanced. Generic definitions need to be given as a basis before applying these concepts to a practical project environment for the purpose of analysing project progress.

3.1.1. The Bottleneck

In the sociotechnical systems approach, a bottleneck can be described as a sub-system that curbs the performance or output of a complete system but does not necessarily prevent the complete system from reaching its goal to a satisfactory level (Dedehayir, 2009). The bottleneck usually occurs in a linear system with connected processes in sequence. This makes the bottleneck concept quite rigid, as it does not leave much space for processes to occur parallel or to be not connected in one linear system (Bijker, Hughes & Pinch, 1993).
3.1.2 The reverse salient

A sub-system in a larger system that doesn’t develop sufficiently may hold back the system as a whole in reaching its goal, in which case the sub-system is identified as a reverse salient (Dosi, Gianetti & Toninelli, 1992). “A salient is a pronounced projection or bulge in an advancing front; a reverse salient, an oxymoronic concept, refers to a part of a front that lags behind” (Dosi, Gianetti & Toninelli, 1992, p.97). In a sociotechnical system, the reverse salient sub-system is lagging behind in comparison with other sub-systems, which are not necessarily connected in a linear process. The reverse salient concept has proven to be useful in analysing the history of technology and is sometimes used to predict innovations within younger technological systems. Figure 1 shows an example of using the salient and reverse salient concept in the analysis of the development of an electric light and power system.

3.1.3 Comparison and relation between the concepts

When comparing the bottleneck and the reverse salient, some similarities and differences arise. The main difference between the reverse salient and the bottleneck is that a reverse salient can hold back the development of the complete system to a satisfactory level, where the bottleneck cannot. The performance of a system can be limited due to a sub-system that acts as a bottleneck, but the bottleneck doesn’t require improvement if the larger system’s performance is satisfactory (Hughes, 1983). But when a higher level of performance of the same system is
needed, the bottleneck may turn into a reverse salient, which holds back the system from reaching the required output performance.

Another difference between the bottleneck and the reverse salient relates to the degree of complexity the concepts allow systems to have. The reverse salient describes complex and uneven progression of sub-systems, which makes it more suitable for analysing parallel sub-systems than the bottleneck (Bijker, Hughes & Pinch, 1993).

Existing research in management hardly cites the sociotechnical concepts that describe lagging sub-systems in larger systems, like the reverse salient (Dedehayir, 2009). When it does, it relates to strategic management and not at all to project management. This results in a perceived gap between research in the fields of project management and the reverse salient concept. However, strategic management and project management become more and more acquainted, as both are increasingly occurring activities in a project management office (Hobbs, 2007). The aforementioned perceived gap between the sociotechnical and project management domain and the designated route between the two via the shared relation with strategic management indicates an opportunity for the construction of new project management theory.

3.2 Project management

To be able to bring together concepts from the sociotechnical systems approach and its theoretical compeers in project management knowledge, an introduction to the main characteristics of project organisations and project management is required. Some characteristics of projects have already been given in the review of opportunities in project management research. This section will elaborate more on the basic characteristics of projects.

The Project Management Institute defines a project as “a temporary endeavour undertaken to create a unique product or service” (Project Management Institute, 2004, p.5). Projects exist in all kinds of different appearances. No matter how big or small or how short or long run the project is, what is most important is that the project is a unit with set boundaries, a temporary existence and a specific goal (Meredith & Mantel Jr., 2009).

Besides uniqueness, temporality and focus, important characteristics of projects include:

- A project can be seen as a social construction (Maylor, 2010). Although a lot of projects involve technology, it is still people that find a reason to come together and carry out a linked set of tasks. This also means that a project organisation usually knows a high degree of conflict (Meredith & Mantel Jr, 2009). Besides the battle for resources (time,
money and personnel), a common conflict in many projects roots in the different definitions of project success that the various stakeholders apply.

- Projects tend to interact with other projects within the same organisation, with the functional departments of an organisation and with projects in other organisations (Meredith & Mantel Jr, 2009). Besides conflicts that are mentioned above, projects can also collaborate with each other and lead to cross-fertilisation.

3.3 Theoretical merger

After the introduction of both the sociotechnical systems theory and project management theory, it seems that there are some similarities between the two bodies of knowledge. Both theories recognize a closed entity (system or organisation) with input (needs) and output (product or service). The entity has an environment and furthermore consists of smaller entities (sub-systems or groups). Finally, both the nondeterministic project organisation and the sociotechnical system have a goal that is set but that can be reached in multiple ways. Because the reverse salient recognizes parallel and complex change, this concept from sociotechnical theory is more appropriate to use in a project environment than the bottleneck concept.

An example of a visualisation of the application of the reverse salient in a typical nondeterministic project in the built environment sector, is given in Figure 2. Note that some sub-systems are not necessarily part of the own company, but are external. They are however crucial for the project to reach its goal and are therefore considered part of the model of the sociotechnical system.
4. Empirical research

The literature review has shown what relevant research opportunities are present in project management theory and how the present research wants to contribute to it. It has also shown that there is a gap between project management theory and the sociotechnical systems theory. However, the fact that this gap exists does not necessarily mean that closing it will lead to new knowledge that will contribute to the existing project management body of knowledge, be it in theory or practice. The empirical part of the present research has been designed to determine whether project progress is a relevant topic in project management practice and if there is too a motive for a more elaborate research in measuring project progress.

4.1 Method

In this section the method of the empirical part of the qualitative research, which comprises of a questionnaire, will be discussed. It clarifies the goal of the questionnaire, what it aims to contribute to the complete present research and what means are used to execute it. After this section the results of the empirical research will be discussed in the results section.

The questionnaire is designed to determine how project managers and project staff in technical service firms in the built environment sector identify and experience problems in project progress. The questionnaire consists of mainly open and a few closed questions. All of the
questions are qualitative; none of the questions are aimed at obtaining quantitative data. The varied set of questions addresses different aspect of (problems in) project progress. One the one hand, the answers to these questions provides insights in the specific project management practices of the respondents. On the other hand, the answers to the questions reveal to what extend the different project managers think differently or the same about a certain topic. Respondents will be project staff and managers in technical service firms in the built environment sector

The questionnaire has been made with Google Forms and has been presented to project managers and staff by including a hyperlink in an email. The questionnaire can be reached through the following hyperlink: http://goo.gl/forms/MeY40MU2Rw. A copy of the questionnaire is included in Appendix I.

4.2 Results

The results of the questionnaire can be reached through the following hyperlink: https://docs.google.com/spreadsheets/d/1RwJYpTindZ3oTCprAGvUG27DxtWTMQcIN7bCFEfZwk/edit?usp=sharing. A copy of the results of the questionnaire is included in Appendix II.

4.3 Analysis

The results show that there are aspects of problems in project progress that are experienced very different by the respondents and that other aspects are experienced more or less the same.

Different experiences with (problems in) project progress include:

- Monitoring project progress
- The kind of problems in project progress that are identified
- The degree to which these problems lead to a potential standstill of the project as a whole
- The way problems in project progress are identified
- The way problems in project progress are analysed
- The difficulties in analysing the problem and solving the problem after identification
- Reasons for poor project performance
- The root of a problem in project progress

Similar experiences with (problems in) project progress include:

- The degree of recurrence of problems in project progress
5. Conclusion

After the theoretical and empirical research, this section aims at answering the main research question and the sub-questions. The main research question is:

_Do project management theory and sociotechnical systems theory allow for an application of sociotechnical concepts to the analysis of nondeterministic project progress?_

The answer to this question is: yes, partly. Project management theory and socio technical systems theory share some characteristics, which makes it possible to view a project organisation as a temporary sociotechnical system. It seems that the reverse-salient concept from the sociotechnical approach is most applicable to the project organisation, because it recognizes parallel development of organisational sub-systems that work independently but towards the same project goal.

Concerning the sub questions, these can be answered as follows:

_Does the approach, as described in the main research question, fit to any recognized research opportunity in project management theory?_

The answer to this question is: yes, a sociotechnical approach to the analysis of project work might contribute to research opportunities in project behaviour. Project behaviour is one of the fields which is recognized in literature as a field with research opportunity (Söderlund, 2004). The sociotechnical approach takes the social and technical entities that exists in project organisations as a basis for behavioural study. By decomposing the project organisation into these entities, the sociotechnical approach might make it easier to study project behaviour.

_As opposed to project management theory, what research opportunities do derive from project management practice?_

The answer to this question is: the empirical part of the present research shows that there are a lot of topics in project progress on which project managers differ in their experiences and there are less topics in project progress on which project managers agree. However, the things they agree on all relate to the fact that there is a lot room for improvement when it comes to learning from problems in project progress.
6. Discussion and Limitation

This thesis aimed to expose research opportunities in project management and how the socio technical systems approach can contribute to building new theories in project management. After analysing literature and the theoretical framework it can be concluded that a systematic and sociotechnical approach to project management is absent. This might be the result of project work being primarily practical and focussed on reaching the project goal. Moreover, transforming insights from post-project reviews into usable knowledge for organisational learning can be unattractive, as by then the project is already finished and probably a next one is about to begin.

7. Discussion on sustainability and ethics

Since the present research is not about a physical product but merely about the processes that can lead to a product, it is suitable to focus on the implications of the present research for social sustainability and not physical sustainability. In comparison to economical and environmental sustainability, social sustainability is a not very well defined approach to sustainable development.

8. Future research

The present research provides a basis for a possible empirical research in applying concepts from the sociotechnical systems approach to a project management environment. In that case, many variables have to be considered and this leads to the same number of questions. Which sociotechnical concepts will be operationalised? Will the research focus on the operationalisation of sociotechnical concepts for analysing an upcoming project, a running project or a finished project? How can the application of sociotechnical concepts contribute to knowledge management or organisational learning?

Knowing that project management practice evolves at a high rate, it is recommended that new research initiatives endeavour to extend project management theory that connects to project management practice. Existing literature already has some recommendations: the research field of project management lacks “in-depth case studies, studies of processes, and studies in real time” (Söderlund, 2004, p.189).
9. List of references


10. Appendices

Appendix I: Questionnaire (blank)

Problems in project progress

Welcome!

This questionnaire intends to determine how project managers and project staff in technical service firms in the built environment sector identify and experience problems in project progress. The results of this questionnaire will be used for a MSc thesis research in project management at the School of Industrial Engineering and Management of the Royal Institute of Technology, Stockholm, Sweden.

Instructions & Information

- Please only take part in this questionnaire if you are a project owner, project manager/leader or a member of project staff in a technical service firm in the built environment sector.
- If you are not able to answer the questions in accordance with the general project management practice in your firm, please base your answers on a typical project in your firm that has recently been finished and in which you were highly involved.
- Questions that ask for a description in text can be answered in your native language.
- Filling out the questionnaire will take approximately 10 minutes.
- Personal details of respondents will NOT be mentioned in the final thesis paper.
- For inquiries mail to: maih@kth.se

Thank you very much for your cooperation!

Kind regards,

Maarten Ingen Housz
maihs@kth.se

1. Your name (optional)
   Short-answer text

2. Your firm (optional)
   Short-answer text
3. If you want to be updated on the result of the present research, please leave your e-mail address here (optional)

Short-answer text

4. Shortly describe what your firm does*

Long-answer text

5. I am*
   o a project owner (the internal client)
   o a project manager or leader
   o a member of project staff
   o Other...

6. How do you monitor project progress? *

Long-answer text

7. What kind of problems in project progress do you experience during your work? *
   Name anything that you experience as a problem. Examples: delay of the whole project (standstill), delay of a specific task/activity, malfunctioning of supporting technology, an individual or group not doing their work, having to remind people of their tasks, tasks are not properly completed, etc...

Long-answer text

8. How often do you experience problems in project progress? *

   1  2  3  4  5
   Almost never  o  o  o  o  o  Very often

9. When a problem in project progress occurs, how often do you feel that it holds back the project as a whole and might lead to a complete standstill? *

   1  2  3  4  5
   Almost never  o  o  o  o  o  Very often

10. How do you identify problems in project progress? *
   Select 1 or 2 answers
   □ A member of project staff reports it to me
   □ Another project manager or leader within the same project and same firm reports it to me
□ Another project manager or leader within the same project but different firm reports it to me
□ During my or my direct colleagues' project tasks, I experience the problem in project progress myself
□ The project owner (internal client) reports it to me
□ The customer (external client) reports it to me
□ A digital monitoring tool gives me a notice
□ Other...

11. After identification, how do you usually analyse problems in project progress? *
   Long-answer text

12. After identifying a problem in project progress, what is most urgent for you? *
   1  2  3  4  5
   Analysing the problem o o o o o  Solving the problem

13. After identifying a problem in project progress, what is most difficult for you? *
   1  2  3  4  5
   Analysing the problem o o o o o  Solving the problem

14. From the 5 reasons for poor project performance given below, pick the one that - according to you - influences project progress the most*
   o Problems with organising a project team
   o Weak project leadership
   o Communication problems
   o Conflict and confusion
   o Insufficient upper management involvement

15. How often lies the root of a problem in project progress outside your span of control? *
   1  2  3  4  5
   Almost never o o o o o  Very often

16. How often lies the root of a problem in project progress outside your firm? *
   1  2  3  4  5
   Almost never o o o o o  Very often
17. Do you or does your firm learn from problems in project progress? *
   If so, how do you make sure that new insights and knowledge from a project is taken into consideration during the next project?
   Long-answer text

18. Do you think there is room for improvement when it comes to learning from problems in project progress? *
   
   1 2 3 4 5
   No, not at all o o o o o Yes, very much

19. Is there anything you want to say about problems in and monitoring project progress? (optional)
   Long-answer text

Appendix II: Questionnaire (results)

From the next page and on, the results of the questionnaire are shown. Personal details of respondents, like name, e-mail address and firm, are not included.
Shortly describe what your firm does *
raw materials supplier for building industry

I am: *
☐ a project owner (the internal client)
☐ a project manager or leader
☐ a member of project staff
☐ Other ____________________________

How do you monitor project progress? *
by financial reports, and talking to project members

What kind of problems in project progress do you experience during your work? *
Name anything that you experience as a problem. Examples: delay of the whole project (standstill), delay of a specific task/activity, malfunctioning of supporting technology, an individual or group not doing their work having to remind people of their tasks, tasks are not properly completed, etc..

could be any of the given examples, due to technical, regulatory or human reasons.
There's no specific, general cause, divers a lot

How often do you experience problems in project progress? *

1 2 3 4 5

Almost never ☐ ☐ ☐ ☐ ☐ Very often

When a problem in project progress occurs, how often do you feel that it holds back the project as a whole and might lead to a complete standstill? *
How do you identify problems in project progress? *
Select 1 or 2 answers

- [ ] A member of project staff reports it to me
- [x] Another project manager or leader within the same project and same firm reports it to me
- [ ] Another project manager or leader within the same project but different firm reports it to me
- [ ] During my or my direct colleagues' project tasks, I experience the problem in project progress myself
- [x] The project owner (internal client) reports it to me
- [ ] The customer (external client) reports it to me
- [ ] A digital monitoring tool gives me a notice
- [ ] Other: __________________________

After identification, how do you usually analyse problems in project progress? *

By talking to project members, financials etc. And discussing a solution.

After identifying a problem in project progress, what is most urgent for you? *


After identifying a problem in project progress, what is most difficult for you? *
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From the 5 reasons for poor project performance given below, pick the one that - according to you - influences project progress the most *

- [ ] Problems with organising a project team
- [ ] Weak project leadership
- [ ] Communication problems
- [ ] Conflict and confusion
- [ ] Insufficient upper management involvement

How often lies the root of a problem in project progress outside your span of control? *

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How often lies the root of a problem in project progress outside your firm? *

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Do you or does your firm learn from problems in project progress? *

If so, how do you make sure that new insights and knowledge from a project is taken into consideration during the next project?

There is some learning, but its hardly ever documented. So its the projectmembers or -leader that learns.
Do you think there is room for improvement when it comes to learning from problems in project progress? *

1    2    3    4    5

No, not at all    ○    ○    ○    ○    ○    Yes, very much

Is there anything you want to say about problems in and monitoring project progress? (optional)

If there is no obligation in a firm to report on progress is projects on a specific template then the progress report will not be sufficient to manage a project. There has to be some obligation to it.
Shortly describe what your firm does *

involved in building materials like clay and sand

I am: *

☐ a project owner (the internal client)
☐ a project manager or leader
☐ a member of project staff
☐ Other __________________________

How do you monitor project progress? *

by keeping focus on the goal which is set before the project has started. getting the required information from own personal as well as being informed by the client

What kind of problems in project progress do you experience during your work? *

Name anything that you experience as a problem. Examples: delay of the whole project (standstill), delay of a specific task/activity, malfunctioning of supporting technology, an individual or group not doing their work, having to remind people of their tasks, tasks are not properly completed, etc..

technical troubles with equipment, difficulties with establishing the quantities, internal troubles with regard to locations where the materials have to go to

How often do you experience problems in project progress? *

1 2 3 4 5

Almost never ☐ ☐ ☐ ☒ ☐ ☐ Very often

When a problem in project progress occurs, how often do you feel that it holds back the project as a whole and might lead to a complete standstill? *
How do you identify problems in project progress? *
Select 1 or 2 answers

- A member of project staff reports it to me
- Another project manager or leader within the same project and same firm reports it to me
- Another project manager or leader within the same project but different firm reports it to me
- During my or my direct colleagues' project tasks, I experience the problem in project progress myself
- The project owner (internal client) reports it to me
- The customer (external client) reports it to me
- A digital monitoring tool gives me a notice
- Other: __________________________

After identification, how do you usually analyse problems in project progress? *
set up an internal meeting, this is more to find solutions, to analyse the problem(s) is not the difficult part

After identifying a problem in project progress, what is most urgent for you? *

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After identifying a problem in project progress, what is most difficult for you? *
From the 5 reasons for poor project performance given below, pick the one that - according to you - influences project progress the most *

- Problems with organising a project team
- Weak project leadership
- Communication problems
- Conflict and confusion
- Insufficient upper management involvement

How often lies the root of a problem in project progress outside your span of control? *

1 2 3 4 5

Almost never  |

How often lies the root of a problem in project progress outside your firm? *

1 2 3 4 5

Almost never  |

Do you or does your firm learn from problems in project progress? *
If so, how do you make sure that new insights and knowledge from a project is taken into consideration during the next project?

Yes, it is considered to be a learning curve. In the way new projects will be managed lessons learned from past experience will be implemented.
Do you think there is room for improvement when it comes to learning from problems in project progress? *

1 2 3 4 5

No, not at all  ○ ○ ○ ○ ○ Yes, very much

Is there anything you want to say about problems in and monitoring project progress? (optional)

This content is neither created nor endorsed by Google.

Google Forms
Shortly describe what your firm does *

My previous company is mainly manufacturing and supplying precast construction parts as well as complete solutions

I am: *

☐ a project owner (the internal client)

☐ a project manager or leader

☐ a member of project staff

☐ Other Supervisory Board Member (Chair)

How do you monitor project progress? *

through project planning in the integrated process logistics software or by hand in Excel sheets.

What kind of problems in project progress do you experience during your work? *

Name anything that you experience as a problem. Examples: delay of the whole project (standstill), delay of a specific task/activity, malfunctioning of supporting technology, an individual or group not doing their work, having to remind people of their tasks, tasks are not properly completed, etc..

Multiple. Lack of clarity from customer side, unclear specifications, delays in information from other disciplines (structural engineer, HVAC companies).
Our engineering process can take more time, lack of designers, the job being more complicated than expected.
Production takes more time or is more complex than expected.
Erection on site takes more time or is delayed by third parties being late, weather or other external influences.
How often do you experience problems in project progress? *

1  2  3  4  5

Almost never  ○  ○  ○  ○  ○  Very often

When a problem in project progress occurs, how often do you feel that it holds back the project as a whole and might lead to a complete standstill? *

1  2  3  4  5

Almost never  ○  ○  ○  ○  ○  Very often

How do you identify problems in project progress? *
Select 1 or 2 answers

☐ A member of project staff reports it to me
☐ Another project manager or leader within the same project and same firm reports it to me
☐ Another project manager or leader within the same project but different firm reports it to me
☑ During my or my direct colleagues' project tasks, I experience the problem in project progress myself
☐ The project owner (internal client) reports it to me
☐ The customer (external client) reports it to me
☐ A digital monitoring tool gives me a notice
☐ Other: ____________________________

After identification, how do you usually analyse problems in project progress? *

Trying to find the root cause of the problem by asking 5 times why
After identifying a problem in project progress, what is most urgent for you? *

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After identifying a problem in project progress, what is most difficult for you? *

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From the 5 reasons for poor project performance given below, pick the one that - according to you - influences project progress the most *

- ○ Problems with organising a project team
- ○ Weak project leadership
- ○ Communication problems
- ○ Conflict and confusion
- ○ Insufficient upper management involvement

How often lies the root of a problem in project progress outside your span of control? *

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<td>Very often</td>
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How often lies the root of a problem in project progress outside your firm? *

1 2 3 4 5

Almost never ☐ ☐ ☐ ☐ ☐ Very often ☐

Do you or does your firm learn from problems in project progress? *
If so, how do you make sure that new insights and knowledge from a project is taken into consideration during the next project?

Yes, improving own organisation is a process not a project. The outside world is a bit more difficult to steer. Each project has a unique set of cooperating companies and people and therefore is by definition a unique experience, with all its consequences.

Do you think there is room for improvement when it comes to learning from problems in project progress? *

1 2 3 4 5

No, not at all ☐ ☐ ☐ ☐ ☐ Yes, very much ☐

Is there anything you want to say about problems in and monitoring project progress? (optional)

It is a very broad pallet of problems, too big to comment in a few words.

This content is neither created nor endorsed by Google.
Shortly describe what your firm does *
Winning van delfstoffen t.b.v. de keramische industrie

I am: *
☐ a project owner (the internal client)
☐ a project manager or leader
☐ a member of project staff
☐ Other __________________________

How do you monitor project progress? *
Door dagelijks de werkzaamheden te volgen, door planning en realisatie te vergelijken is het mogelijk tijdig bij te sturen. Hierdoor worden faalkosten voorkomen

What kind of problems in project progress do you experience during your work? *
Name anything that you experience as a problem. Examples: delay of the whole project (standstill), delay of a specific task/activity, malfunctioning of supporting technology, an individual or group not doing their work, having to remind people of their tasks, tasks are not properly completed, etc..

Dat gemaakte afspraken niet worden nagekomen en dat hierdoor onnodige kosten gemaakt moeten worden.

How often do you experience problems in project progress? *

1  2  3  4  5
☐  ☐  ☑  ☐  ☐  ☐  Very often

When a problem in project progress occurs, how often do you feel that it holds back the project as a whole and might lead to a complete standstill? *
How do you identify problems in project progress? *
Select 1 or 2 answers

- A member of project staff reports it to me
- Another project manager or leader within the same project and same firm reports it to me
- Another project manager or leader within the same project but different firm reports it to me
- During my or my direct colleagues’ project tasks, I experience the problem in project progress myself
- The project owner (internal client) reports it to me
- The customer (external client) reports it to me
- A digital monitoring tool gives me a notice
- Other: ____________________________

After identification, how do you usually analyse problems in project progress? *

Door evaluatie van de uitgevoerde werkzaamheden en proberen te achterhalen waarom het fout is gegaan.

After identifying a problem in project progress, what is most urgent for you? *

- Analysing the problem
- Solving the problem

After identifying a problem in project progress, what is most difficult for you? *
From the 5 reasons for poor project performance given below, pick the one that - according to you - influences project progress the most *

- Problems with organising a project team
- Weak project leadership
- Communication problems
- Conflict and confusion
- Insufficient upper management involvement

How often lies the root of a problem in project progress outside your span of control? *

1 2 3 4 5

- Almost never
- Very often

How often lies the root of a problem in project progress outside your firm? *

1 2 3 4 5

- Almost never
- Very often

Do you or does your firm learn from problems in project progress? *

If so, how do you make sure that new insights and knowledge from a project is taken into consideration during the next project?

Jazeker, er wordt gekeken of vergelijkbare problemen zich vaker voor hebben gedaan, dus of er sprake is van een trend of dat het gaat om een incidenteel geval. Bij trend verbetervoorstel maken om proces bij te sturen
Do you think there is room for improvement when it comes to learning from problems in project progress? *

1  2  3  4  5

No, not at all  ○  ○  ○  ○  ○  Yes, very much

Is there anything you want to say about problems in and monitoring project progress? (optional)

Nee

This content is neither created nor endorsed by Google.
Shortly describe what your firm does *

Engineering, Consultancy and Project Management

I am: *

☐ a project owner (the internal client)
☐ a project manager or leader
☐ a member of project staff
☐ Other ____________________

How do you monitor project progress? *

Depends on the complexity of the project. When working with several disciplines using a LEAN planning and dashboards (incl percentages)

What kind of problems in project progress do you experience during your work? *

Name anything that you experience as a problem. Examples: delay of the whole project (standstill), delay of a specific task/activity, malfunctioning of supporting technology, an individual or group not doing their work, having to remind people of their tasks, tasks are not properly completed, etc..

Miscommunication between team members, making wrong assumptions what the level of detail should be of deliverables, absence of essential team members on critical moments without notifications (lack of commitment)

How often do you experience problems in project progress? *

1 2 3 4 5

Almost never ☐ ☐ ☐ ☐ ☐ Very often

When a problem in project progress occurs, how often do you feel that it holds back the project as a whole and might lead to a complete standstill? *
How do you identify problems in project progress? *
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- A digital monitoring tool gives me a notice
- Other: ____________________________

After identification, how do you usually analyse problems in project progress? *
Identifying possibilities to start with parallel processes, and in the mean time speed up the delayed subjects

After identifying a problem in project progress, what is most urgent for you? *

1 2 3 4 5
Analysing the problem  O O O  O O Solving the problem

After identifying a problem in project progress, what is most difficult for you? *
From the 5 reasons for poor project performance given below, pick the one that - according to you - influences project progress the most *

- Problems with organising a project team
- Weak project leadership
- Communication problems
- Conflict and confusion
- Insufficient upper management involvement

How often lies the root of a problem in project progress outside your span of control? *

- Almost never
- Very often

How often lies the root of a problem in project progress outside your firm? *

- Almost never
- Very often

Do you or does your firm learn from problems in project progress? *

If so, how do you make sure that new insights and knowledge from a project is taken into consideration during the next project?

Yes, for example during monthly project monitoring and 'project management interventions'
Do you think there is room for improvement when it comes to learning from problems in project progress? *

1 2 3 4 5

No, not at all  O  O  O  O  O  Yes, very much

Is there anything you want to say about problems in and monitoring project progress? (optional)

One of the most important aspects is having a culture where project managers are feeling safe to share and discuss problems and lessons learnt. Sharing successes is much easier...
Shortly describe what your firm does *
Consultancy & Engineering

I am: *
☐ a project owner (the internal client)
☐ a project manager or leader
☐ a member of project staff
☐ Other: Director Advisory Group

How do you monitor project progress? *
Monthly reports/reviews

What kind of problems in project progress do you experience during your work? *
Name anything that you experience as a problem. Examples: delay of the whole project (standstill), delay of a specific task/activity, malfunctioning of supporting technology, an individual or group not doing their work, having to remind people of their tasks, tasks are not properly completed, etc..
risk, resources, scope, schedule

How often do you experience problems in project progress? *

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Almost never | Very often

When a problem in project progress occurs, how often do you feel that it holds back the project as a whole and might lead to a complete standstill? *


How do you identify problems in project progress? *
Select 1 or 2 answers

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☑ The project owner (internal client) reports it to me

☐ The customer (external client) reports it to me

☐ A digital monitoring tool gives me a notice

☐ Other: ________________________________

After identification, how do you usually analyse problems in project progress? *

meeting with responsible PM

After identifying a problem in project progress, what is most urgent for you? *

1 2 3 4 5

Analyzing the problem ☐ ☐ ☐ ☐ ☐ Solving the problem

After identifying a problem in project progress, what is most difficult for you? *
From the 5 reasons for poor project performance given below, pick the one that - according to you - influences project progress the most *

- Problems with organising a project team
- Weak project leadership
- Communication problems
- Conflict and confusion
- Insufficient upper management involvement

How often lies the root of a problem in project progress outside your span of control? *

- Almost never
- Very often

How often lies the root of a problem in project progress outside your firm? *

- Almost never
- Very often

Do you or does your firm learn from problems in project progress? *

If so, how do you make sure that new insights and knowledge from a project is taken into consideration during the next project?

YES lessons learnt

Do you think there is room for improvement when it comes to learning from problems in project progress? *
1  2  3  4  5

No, not at all  ○  ○  ○  ●  ○  Yes, very much

Is there anything you want to say about problems in and monitoring project progress? (optional)

Important issues: contract, scope, good PM & team, open culture share information, ownership.

This content is neither created nor endorsed by Google.
Shortly describe what your firm does *
Consult, design and engineer

I am: *
☐ a project owner (the internal client)
☐ a project manager or leader
☐ a member of project staff
☐ Other __________________________

How do you monitor project progress? *
Planning, checking, looking in the eyes (balance of progress, budget spent and deliverables gives a strong indication of project health)

What kind of problems in project progress do you experience during your work? *
Name anything that you experience as a problem. Examples: delay of the whole project (standstill), delay of a specific task/activity, malfunctioning of supporting technology, an individual or group not doing their work, having to remind people of their tasks, tasks are not properly completed, etc..

Main problems are: 1) unfit scope and interfaces (we all see something has to be delivered, but's not in my package) 2) undecisive principals (a yes means the deal is done)

How often do you experience problems in project progress? *

1 2 3 4 5
Almost never  ○ ○ ○ ○ ○ Very often

When a problem in project progress occurs, how often do you feel that it holds back the project as a whole and might lead to a complete standstill? *
How do you identify problems in project progress? *
Select 1 or 2 answers

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☐ The project owner (internal client) reports it to me
☐ The customer (external client) reports it to me
☑ A digital monitoring tool gives me a notice
☐ Other: ___________________________

After identification, how do you usually analyse problems in project progress? *

Collect the facts, interview the project management (team)

After identifying a problem in project progress, what is most urgent for you? *

1 2 3 4 5

Analysing the problem ☐ ☐ ☐ ☑ ☐ Solving the problem

After identifying a problem in project progress, what is most difficult for you? *
Analysing the problem

From the 5 reasons for poor project performance given below, pick the one that - according to you - influences project progress the most *

- Problems with organising a project team
- Weak project leadership
- Communication problems
- Conflict and confusion
- Insufficient upper management involvement

How often lies the root of a problem in project progress outside your span of control? *

- Almost never
- Very often

How often lies the root of a problem in project progress outside your firm? *

- Almost never
- Very often

Do you or does your firm learn from problems in project progress? *
If so, how do you make sure that new insights and knowledge from a project is taken into consideration during the next project?

We share knowledge and experiences, informal and formal. We have appointed very experienced project managers / directors to support project management teams.
Do you think there is room for improvement when it comes to learning from problems in project progress? *

1  2  3  4  5

No, not at all  ○ ○ ○ ○ ○ Yes, very much

Is there anything you want to say about problems in and monitoring project progress? (optional)

Figures and tables are a good basis for information, but when it doesn't feel good, you have unanswered question, rely on your intuition. A scent of a potential problem often proofs to be there.