What are the practical tools for planning and managing time in projects? – A study in Norwegian organizations

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Abstract

Delivering projects on time is a significant challenge in the project world. The time component – as it is closely connected with other components of projects, for example, cost – has a huge impact on both the execution and success of projects. It is also widely known that several projects fail – including, in terms of delivery in time. In order to make sure the effectiveness and success of projects, better time management practices are necessary. Identifying better practices requires a study on current practices as a first step.

The main purpose of this paper is to contribute to the improvement of time management in projects by presenting a study on the current situation and practices regarding time management in projects, and suggesting possibilities for improvement. The paper will look at project-based organizations in Norway. This paper is connected to a research and development project called "SpeedUp".

This paper will first describe a summary of current practices in the organizations (AS-IS study). In this regard, it will provide an overall framework, tools and methods, roles and responsibilities, competence development initiatives and aspects that facilitate effective time planning and management. Secondly, a model for planning and managing time (including a link to a list of "best practices") will be presented. The results from the AS-IS study can be considered as a base for deriving suggestions and devising initiatives for improving time management in projects. One such initiatives is to develop this model for time management in projects. In addition, this paper will present a discussion on competence development that can support sharing and utilization of "best practices".

Implication of this paper can be described as follows: The model and the tools correspond to some of the important issues that the results of the AS-IS study point out. The model and the tools can be seen as readily applicable practical results. This paper is based on both qualitative and quantitative studies.

Keywords: Time planning and management, Project, Tools, Productivity, Competence

1. Introduction

One of the challenges that project-based organizations face is ineffective use of time. Delays and unnecessary use of time are not uncommon in projects, and they cost much. Studies on time planning and management in construction projects (e.g. Zidane et al., 2015; Eik-Andresen et al., 2016) describe the nature of non-value-adding time-usage in large projects, and suggest that there is a need to address this problem. This is the major motive for engaging in the topic of time planning and management, and finding out means to improve the situation.

The purpose of this paper to contribute to the improvement of time management in projects. This paper aims to accomplish this purpose by presenting (1) a study on the current situation and practices regarding managing time in projects and (2) a model for planning and managing time, along with a link to "best practices" (3) a discussion on competence development that can support sharing and utilization of "best practices". The paper will look at project-based organizations in Norway. This paper is connected to a research and development project called "SpeedUp". The project is classified under the category of "User-driven Research based Innovation".

This paper will first describe a summary of current practices in the organizations (AS-IS study). In this regard, it will provide an overall framework, tools and methods, roles and responsibilities, competence development initiatives and aspects that facilitate effective time planning and management. And then, a model for planning and managing time will be presented. This model can be seen as a result of the AS-IS study. This model has a list of practical tools ("best practices") that correspond to each component of the model. These tools are currently used in organizations that are involved in the study on which this paper is based.

The structure of this paper is as follows: After the introduction, this paper will provide background information regarding the project that this paper is based on. Then, relevant concepts will be presented. In this regard, productivity and competence development will be described, and will be followed by a description of research methods. This paper is based on both qualitative and quantitative studies. The results will then be presented. Some observation and general reflection followed by concluding remarks will finally complete this paper.

2. Background information: The point of departure

This paper is connected to a research project called "SpeedUp" (*http://www.prosjektnorge.no/index.php?pageId=635*). This research project is funded primarily by the Research Council of Norway.

The objective of the project "SpeedUp" is to support and enable participating organizations to reduce execution time in their projects with 30-50%. The participants of the project believe that this is possible to achieve, based on their own experiences. Furthermore, recent research studies show that productivity in the building and construction sector have had a negative development in the last 10 years (see for example, Parliament-report: St.mld. 28, 2011-2012). Speed Up will

develop and test strategic, tactical and operational concepts that can improve the total time-usage on projects together with its industrial partners.

The current budget of the SpeedUp project is approximately 48 mill. NOK (approximately 4.8 mill. EURO). The project is classified under the category of "User-driven Research based Innovation".

There are 9 industrial partners (both from the public and private sectors) and 5 academic partners who are involved in this project.

3. Relevant concepts

Here, we will present some key concepts that are related to time management in projects. These concepts can be categorized as (1) productivity and (2) competence development.

3.1 Productivity

Productivity is about the relationship between input and output of a system. It is defined in several ways. A general definition can thus be described in a ratio-form: Output/input (Andersen, 1995).

A recent McKinsey report (Barbosa et al., 2017) says that the construction industry remarkably poor productivity compare to other industries. According to this study, "global labor-productivity growth in construction has averaged only 1 percent a year over the past two decades (and was flat in most advanced economies). Contrasted with growth of 2.8 percent in the world economy and 3.6 percent in manufacturing, this clearly indicates that the construction sector is underperforming" (ibid).

Time management contributes to determine the degree of productivity – that is for instance, planning and managing time (including resources associated with the time) in order to produce a desired output. How smart the time (and associated resources) can be used to produce an output productively is hence the central focus. There are several tools and approaches of time management that are applied in project settings to obtain productivity. Since this paper is about practical tools for time management, it is relevant to look at few traditional tools and methods:

- Productivity in terms of time planning can be seen historically from Gantt chart. Gantt Chart was developed by Henry Gantt. This is one of the most used, common project management tools (White & Fortune, 2002). Several authors (Field & Keller (1998), Meredith & Mantel (1995) and Nicholas (1990)) point out that Gantt chart was developed by Henry Gantt in the First World War (Wilson, 2003). Gantt's work can be seen in the context of Frederick Taylor's Scientific Management movement. Before Gantt, Karol Adamiecki (1866-1933) developed a method for work harmonizing that was based on a graphical analysis. The graphic diagrams used in this method has been known as "Harmonograms" (Urwick, 1963; Marsh, 1975).

- Program Evaluation and Review Technique (PERT) and Critical path method (CPM) are other methods that were developed later and have been applied in managing time in projects. The main difference between PERT and CPM is that PERT operates with stochastic durations, while CPM operates with deterministic durations (Rolstadås et al., 2014).
- Goldratt (1997) developed a method called "Critical chain project management (CCPM) in 1997. This method was based on the management paradigm "Theory of constraints (TOC)". TOC assumes that a few constraints would restrict any manageable system (a unit of organization; for example, a project) to accomplish its goals. Eliminating constrains will contribute to reduce the time usage in projects.

These tools and methods are integrated into the modern practical time planning tools at least to a certain extent.

3.2 Competence development

Acquiring or updating knowledge of time management and time management tools requires focus on competence development. In this paper, we take into consideration a systemic lessons learned knowledge (Syllk) model that was refined by Duffield & Whitty (2015). See Figure 1.
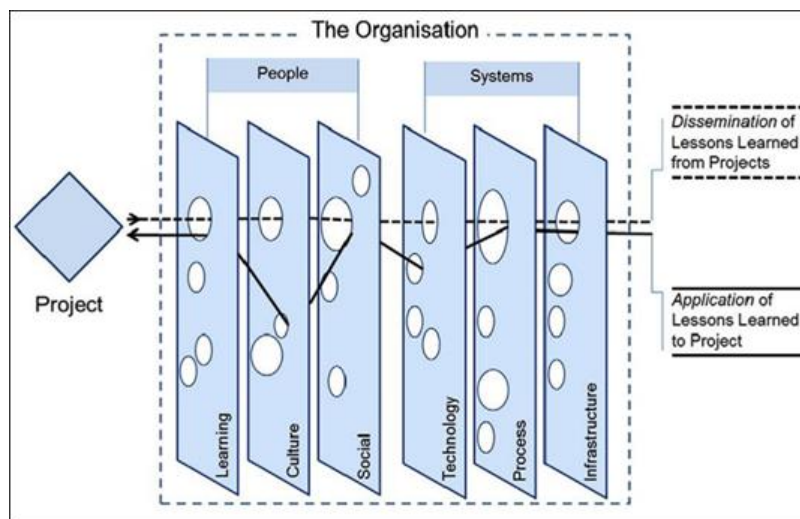

Figure 1: Refined Syllk model (Duffield & Whitty, 2015, page 318)

This model presents a set of organizational elements that affect both application and dissemination of knowledge (lessons learned practices). The elements are: Learning, culture, social, technology, process, and infrastructure. The authors categorize the first three elements as people and the last three elements as systems.

One can distinguish between a systems (or hard) and a people (or soft) approach to knowledge sharing and competence development. The systems approach typically focuses on knowledge-as-data. A common approach is to create knowledge repositories of knowledge items.

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Knowledge repositories are electronic databases that are created for access by users. The databases can be filled through collecting and registering knowledge and valuable experiences.

The people approach focuses on human interaction, communication, reflection, sense-making (knowledge-as-meaning), and practice based issues (knowledge-as-practice). This approach includes, among other things, communities of practice (CoP), storytelling and ad-hoc experience transfer (around the watercooler or coffee machine, etc.).

It is to be noted that describing knowledge as data, meaning and practice is a categorization that is made by Spender (2008). This categorization can guide to develop and structure initiatives for competence development.

4. Research methods

The study on which this paper is build incorporates both qualitative methods (interviews, and document analysis) as well as quantitative methods (questionnaire survey).

For instance, when it comes to mapping the current practice (AS-IS study), both interviews and questionnaires were applied. Interviews were conducted with representatives from 9 collaborating companies with a help of a semi-structured interview guide. Each interview lasted 1-2 hours. In total, 13 project managers participated in the interviews. Most of the interviews were conducted on an individual basis. However 2 interviews were group interviews. The questionnaire contained 19 closed questions. These questions were first tested out before sending online to the potential respondents. This testing process can be viewed as a way of making sure the validity of the study. Total number of persons from the collaborating companies who got the questionnaire is 142, and 86 of them answered. Hence, the response rate is 61%.

Using multiple methods to study a single problem or program, such as interviews, observations, questionnaires and documents is called as methodological triangulation (Denzin, 1978; Patton, 1987). Since this paper is based on a study that utilizes different methods – both qualitative and quantitative methods – to look at the research problem, it deals with methodological triangulation.

5. Results, analysis and discussion

5.1 A short summary and reflection of the interview-results (AS-IS)

The results touch upon overall framework, tools, roles and competence development (course, training, etc.) regarding time management in project based organizations.

When it comes to overall framework, the qualitative study shows that most of the organizations mainly use their own project model or quality systems as their framework to manage time in projects. These models focus on issues such as efficiency and decision making. Tools that the

organizations use in time management also varies; some organizations apply standard project management tools such as Microsoft Project, and others develop their own tools for their usage. In some organizations (OPAK), the tools were used comprehensively not by project managers, but by project planners or those who assist project managers in the planning process; project managers tend to have only an overall view of time usage in projects. In Statsbygg, specially-assigned time planners work in large projects, whereas, project managers manage time in smaller projects. In Jernbaneverket, there is a person who is designated to have the responsibility of the toolset – a kind of an advisory position – and gives guidance to the line organization. Organizational roles that are connected to managing time in projects are defined or influenced by contracts and cooperative modes between the involved actors in a project. Statens vegvesen and BundeBygg are examples in this regard.

In addition to using tools, some of the collaborating organizations apply processes, for instance uncertainty analysis processes, experience transfer processes and work processes (regular meetings, etc.) to manage time. This indicates that time management in projects is of both formal and informal nature. Furthermore, this also suggests the importance of considering both the people-factor (culture, learning and social aspects) and systems-factor (tools and techniques) in managing time in projects (see Figure 1).

Both internal and external training programs / courses are mentioned by the collaborating organizations as their main approach to develop competence in project management in general, and time management in projects in particular. In addition, informal experience transfer as well as utilizing formal systems such as documents and project evaluation reports are considered as sources of gaining knowledge in time management. If we consider Spender's (2008) categorization of knowledge that was mentioned earlier, then this knowledge can primarily be considered as knowledge-as-data. The informal nature of experience transfer suggests that there is a positive organizational culture that promotes openness and willingness to share knowledge and thus contribute to develop competence (of, for example a novice project manager). This informal nature tends to facilitate sharing knowledge in the form of knowledge-as-meaning and knowledge-as-practice.

This paper will first describe a summary of current practices in the organizations. In this regard, it will provide an overall framework, tools and methods, roles and responsibilities, and competence development initiatives.

5.2 A short summary and reflection of the survey-results (AS-IS)

This section of the paper is based on a master thesis (Hoseini, 2015) connected to the "SpeedUp" project, in which two of the authors of this paper were heavily involved. Respondents' work experience connected to their current position varies. A notable portion of them (49%) have 1-5 years of experience. The study shows that time planning takes place internally (48%), and as an internal and external combination (46%), it is of less extent when it comes to conducting time planning externally (6%).

When it comes to acquiring knowledge and competence in time planning, the following aspects were mentioned as most commonly used (in descending order):

- Talking to colleagues
- Read documents, reports, etc.

This result suggest that people-factors and system-factors (see Figure 1) have a considerable influence on knowledge sharing and competence development. Furthermore, external courses (42%) and internal courses (51%) are considered by the respondents as sources of knowledge.

When it comes to tools that the collaborating organizations use in time planning, the following tools were mentioned as being frequently used:

- Microsoft Project (81 %),
- Microsoft Excel (38 %),
- Primevera (25 %)
- Safran (2%).

When it comes to the frequency of using time planning tools, 32% of the respondents use the tools at least once per month, while 27% of the respondents use the tools minimum once in a week. There can be several reasons for using the tools. According to Figure 2 the most important reasons are user-friendliness (25%), company policy (20%) and request from customer / client organization.
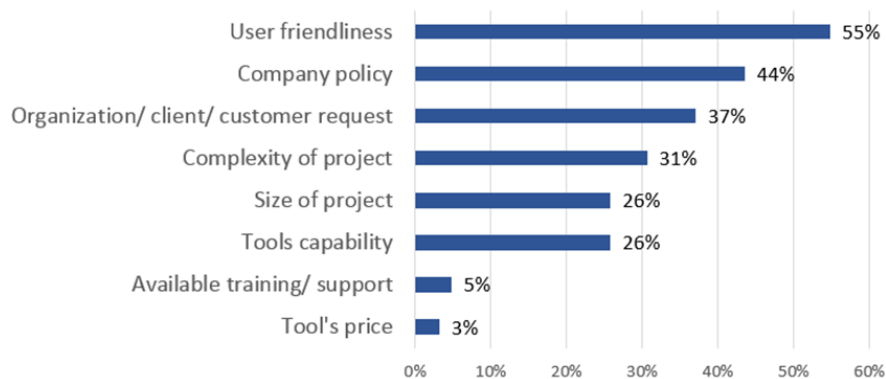

Figure 2: Reasons for using time planning tools

The tools are aimed at carrying out various tasks in time planning. The most common tasks mentioned by the respondents in this regard are: Project control (29%), Updating time plan (28%) and detailed planning (27%).

The study also looks at the connection between time planning and delays in projects. Most of the respondents (82%) are agree or partly agree that poor planning lead to delays. When it comes to the extent of delays, 50% of the respondents say that poor planning leads to 1-6 months delay, 26% of the respondents estimate 2 weeks to 1 month delay, and 19% of the respondents mention more than 6 month delay.

Delays in projects can be avoided or reduced by the help of time planning tools in different ways. The respondents mention the following 3 major roles of the tools in avoiding or reducing delays: (It warns when project has a delay (2) By better managing activities and resources (3) It helps better communication.

The study looks at what the enablers of better time planning are. Figure 3 shows the results.
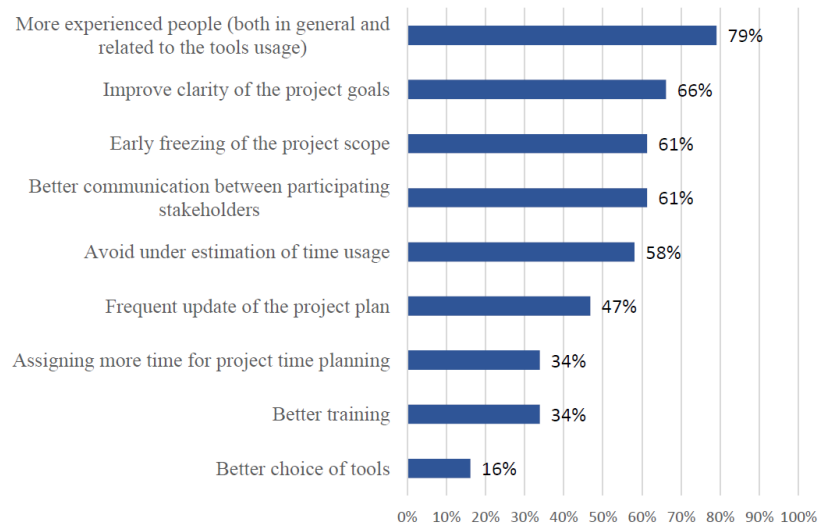

Figure 3: The enablers

In Figure 3, we see that more experienced people is considered as the most influential enablers of better time management. This shows that there is a need to focus on competence development. This does not mean that the already experienced person should do the task all the time. This experienced person can be accompanied by a novice and share knowledge and experience with the novice. In terms of Spender's (2008) knowledge categorization, this situation suggests sharing / acquiring knowledge-as-practice.

5.3 Tools that are currently used in Norwegian project-based organizations

We have seen the AS-IS situation of the collaborating organizations when it comes to their time management practices. In this regard, among other things, the following aspects are described:

- Variety of tools and framework that are used
- Motivation for using the tools
- The importance of having competence and experience in time management, specifically the usage of tools that support time management

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These results from the AS-IS study can be considered as a base for deriving suggestions and devising initiatives for improving time management in projects. One such initiatives that was carried out by the "SpeedUp" project is to develop a model / framework for time management in projects (Figure 4), and use this model as a means to gather time management tools that the collaborating organizations use (based on positive experiences of the usage), and present them at the webpage of "SpeedUp" project. This collection of tools, presented in a structured manner, can help others to make use of the tools and improve their time management competence. In this regard, this model can be viewed as both an integral part as well as a concrete result/ contribution of the study that this paper is based on.

Figure 4: A model for time management in projects

This model was developed through discussion between researchers and representatives from the collaborating organizations, and through collective reflection. This process itself is a learning process where people-elements and system-elements (see Figure 1) were involved.

The model starts with focusing on the frame conditions that guide the time planning / management process. This is followed by planning time management and then time planning. The former can be seen as, in a way, planning of the planning of time. The latter is the actual time planning with respect to the project. When a time plan is developed, then it is anchored and presented to relevant actors. As activities according to the plan are unfold, progression is checked and evaluated, and reported. Evaluation and reporting go on continuously. As a part of the output from the progress reporting, revision can be done in order to change time planning. If there is a need to carry out uncertainty on time plan, then it will be done between time planning and evaluating progression. Finally, experience gained from the whole process are captured and shared.

This model functions as a guiding framework for planning managing time in projects. Furthermore, the SpeedUp-team of researchers and representatives from the collaborating organizations gathered relevant tools related to each part of the model from the collaborating organizations and published them on the SpeedUp project's webpage:

. The tools are presented with their particular purpose, tips and experience of using them and the source of the tools (that is, the organization that developed / use the tool). These tools can be used by anyone who are interested in.

5.4 Some observation and general reflection

The model and the tools were presented and illustrated at a forum arranged by the "SpeedUp" project in August 2016 in Oslo, Norway. Representatives from all the collaborating organizations and researchers participated in the forum. The presentation and the illustration of the tools can be seen as a way of sharing existing knowledge ("best practices") with others. In this regard, Figure 1 presented earlier in this paper can be considered. The forum acted as an arena for knowledge sharing and social interactions. It provided a conducive setting to discuss issues openly, share knowledge and enhance the collaborative spirit between the participants. This setting can play a pivotal role in developing or strengthening a positive culture for learning and knowledge sharing. As the people-factors depicted in Figure 1 are at place, the systems-factors such as technology, process and infrastructure are also covered; availability of the model and the tools with relevant information for applying the tools at an open access website contributes to address the systems-factors.

Results from both the interview and questionnaire studies also point out that taking to colleagues and reed reports and documents are main means to learn more about time management techniques and tools. Information provided with the model and the set of tools published at the website would help potential users to contact the respective organizations (that have positive experience in developing/ using the tools and hence gained productivity gains) to get more detailed information, if needed. The collaborative atmosphere developed in the "SpeedUp" project would make the communication between collaborating partners smoother and more effective.

Furthermore, sharing of tools does not necessarily jeopardize competitiveness of an organization that shares its tools with others. A major determining element of competitiveness here is how the tools are actually used. In addition, sharing of tools that enhance time management in projects can also contribute to establish a common pool of known tools. Since many of the industrial partners of "SpeedUp" cooperate among themselves in their (inter-organizational) projects, establishing a common pool of known tools would contribute to improve their common understanding and cooperation in their inter-organizational projects.

6. Concluding remarks

In this paper, we presented firstly an AS-IS study of time management in projects (with a special focus on tools for managing time in projects), and secondly a model for planning and managing time in projects. The results from the AS-IS study can be considered as a base for deriving suggestions and devising initiatives for improving time management in projects, and hence the development of the model. The model includes a list of practical tools (including

"best practices") that correspond to each component of the model. We also presented a discussion on competence development that can support sharing and utilization of "best practices".

The model and the tools correspond to some of the important issues that the results of the AS-IS study point out. The model and the tools can be seen as readily applicable practical results that revolve around two main theoretical focus-areas, namely, productivity and competence development.

Further study can include, among other things, measuring the effect of the usage of the tools (both in organizations that already using the tools and in organizations that choose to use the tools). In addition, it can also include evaluation of the process of knowledge sharing and learning regarding the new tools.

Furthermore, the gathered knowledge on the current situation of time management in projects can be assessed in order to identify the maturity of the organizations in time management. This identification at an early stage will be necessary when organizations plan to implement initiatives for improvement in time management. Maturity in time management after the implementation can then be determined and compared to the initial maturity level. This paper is based on both qualitative and quantitative studies.

There are other research initiatives that are directly connected to time management in projects (for example, a Dutch initiative called "Halftime") and that are indirectly connected to time management (for example, Norwegian initiatives called "OSCAR" and "Involverende planlegging"). A comparison of some common areas / research topics also a possibility for a future study.

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