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“Next Step” - A new systematic approach to plan and execute AEC projects

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Abstract

Planning and control of project execution is the core of project management. One key success factor is an adequate implementation strategy. The Architecture, Engineering and Construction industry (AEC) is portrayed as an industry with serious challenges ahead. Among observed problems that often happen in AEC project are the decisions, which are made in wrong time or at the wrong level of organization, as well as solutions executed in the project without being aligned with corporate strategies. This conceptual paper presents a new systematic approach introduced in Norway to fight the many difficult challenges in the AEC industry. The systematic approach is called “Next Step” and is a framework inspired by the RIBA plan of Work. The new framework presented in this paper identifies the key steps and tasks in a project lifecycle from the definition to the termination of the building. The framework focuses on project execution as well on the critical decisions on a corporate level, involvement of the proper stakeholder perspective, and a sustainable development of the AEC industry. The main purpose is to help the actors of the AEC industry. The intention is not to define a constraining recipe, but to give the industry a common language and collective reference for AEC projects. The framework also highlights important issues in the front end of projects concerning strategic alignment and project planning. This paper also reports on the adaptability of the new framework with different procurement forms. The new framework suggests examining the different phases in this systematic approach through different perspectives: by introducing the perspective of the owner, user, supplier and public, the project is driven to achieve strategic goals and leads to a more efficient process and sustainable outcome.

Keywords: Project execution framework, Perspectives, Stage gates, Project delivery methods, Contracts

1. Introduction

Planning and control of project execution is the core of project management. One key success factor is an adequate implementation strategy. This is specifically true in the architecture, engineering and construction (AEC) industry. Implementation strategies refer to the systematic approach to planning and execution of a specific project within a corporation. Reasons for wanting systematic approaches are obviously the constant need for continuous improvement and learning from past experiences. These are difficult challenges, and given the wide array of different contexts (national-, financial-, industry etc.) and individual strategies of corporations (business models, markets, growth etc.) and technical solutions (elements, products, materials etc.) it is no surprise the approaches vary a lot. Focusing the AEC industry, the specific challenges are often identified as being increasingly fragmented and complex on one side (Pennanen et al., 2010) and reluctant to change and innovate on the other (Dale, 2007). These characteristics combined portray an industry with serious challenges ahead.

To summarize some observed problems that frequently occur in construction projects: strategic decision-making often rely on documents (Business Case, Project Plans etc.) that are incomplete, inconsistent and in some cases simply wrong by purpose or incident ([Flyvbjerg et al., 2002](#)). Decisions are not made in time, sometimes made on the wrong level of the organization (Berg, 1999) or by the wrong individuals. This may be indication of unclear roles in connection to the decision-making process, or ineffective organizations. It may also indicate errors and flaws in decision making on individual or group level as pointed out by many authors (e.g. ([Kahneman, 2011](#); [Lovallo & Kahneman, 2003](#); [Raiffa et al., 2006](#))). Another recurring problem is solutions planned and executed in projects, without being aligned with corporate strategies. Projects are often viewed as pure execution without responsibility for delivering the right product, the right result for users and owners. This is evident in the traditional definition of a project as a unique task (PMBOK, 2004). It is also well known that construction projects are tormented with errors and mistakes in planning, design and execution, costing unnecessary money and reputation ([Love et al., 2003](#)).

In sum all these challenges form a problem-complex that is too much to handle for each individual project owner, project sponsor or project manager. Allowing completely individual implementation strategies to be developed for each single project will not only be costly in terms of making the same development many times, but will also miss out the opportunity to improve and learn. This conceptual paper presents a new systematic approach introduced in Norway to fight the many difficult challenges identified above. The framework is presented in chapter 3. The main issues in this paper are addressed through three axes, each represented in a research question:

- How can the framework help to achieve the right result for owners and users?
- How can the framework help to secure that the right perspectives are considered?
- How can the framework deal with different procurement forms?

2. Theoretical Framework

2.1 Success and stakeholders

In project management literature there are many definitions of success, yet Oxford dictionary of English simply states, “Success is the accomplishment of an aim or purpose” and failure as “lack of success”. Samset (2010) states “Projects are initiated to solve problems or satisfy needs”. Thus, we can assume that a project success is actually connected to its ability to solve those problems or needs.

The identification of problems and needs and the process of solving them is an important step to be able to define the project, and to define the aim or purposes in order to achieve success. Samset (2010) also argues to look at AEC projects in a larger context than only to solve the immediate problem. He claims that monitoring of a project should be both on tactical and strategic level. The tactical level deal with what most regards as the important success indicators in a project; cost, time and quality. Tactical success in projects is associated with the term “project management success” (Cooke-Davies, 2002). The strategic level looks at indicators as effect, relevance and sustainability. Strategic success is associated with “project success” (Cooke-Davies, 2002).

The AEC industry is a fragmented industry and relies on many different stakeholders to complete a project (Kerosuo, 2015). Each stakeholder have a different perception of the aim and the success of the project and these stakeholders will most certainly try to optimize their own operation (Aapaoja et al., 2012). This leads to sub-optimization of projects (Zidane et al., 2015). The right stakeholder involvement is important to create value in projects. By displaying key stakeholders and together aligning their aims, can help to conquer some of the differences (Yang et al., 2009). Keeping the most important stakeholders in mind, it is important to look at the three major groups of stakeholders and their views. Samset (2010) refers to this as perspectives and list them as the owner perspective, the user perspective and the executing perspective.

The owner is the initiating and financing party, the one who normally has a long-term interest in the investment that the project represents. The user is the party who is going to utilize the result of the project for operating their business. The executing party (-parties) is the architects, engineers and contractors who are executing the project on behalf of the owner – the project organization. The owner typically has, or at least should have, interest in the strategically performance of the project, while the executing parties typically limit their interest to the tactical performance (Slevin & Pinto, 1987). Bertelsen and Emmitt (2005) identify the owner, user and society as important groups that a “client” should represent: “These three groups of interest each value different things at different times in the life of the building.” Identifying the perspectives early might help to change and understand the focus of the stakeholders.

2.2 Project delivery methods

Project Delivery Method (PDM) - a system for organizing and financing design, construction, operations and maintenance activities that facilitates the delivery of a goods or service ([Miller et al., 2000](#)). Choosing different PDM will affect the project cost, schedule, success and influence the efficiency of running the project. This makes it a challenging issue for stakeholders and decision makers ([Al Khalil, 2002](#); [Chan et al., 2001](#); [Kumaraswamy & Dissanayaka, 2001](#)). The suitability of the selected PDM can improve the project performance to a great extent ([Al Khalil, 2002](#); [Han-Kuk et al., 2008](#); [Kumaraswamy & Dissanayaka, 2001](#); [Oyetunji & Anderson, 2006](#); [Udechukwu et al., 2008](#)).

There are large numbers of different PDMs available in AEC industry to overcome the shortcomings of traditional procurement ([Alhazmi & McCaffer, 2000](#)). Numerous authors have categorized the range of procurements forms in the literature. However, in this paper we try a new classification of procurement forms, to make it more practical for alignment with the framework. This classification is inspired by a very recent PMI book ([Walker & Lloyd-Walker, 2015](#)). The procurement forms could be fitted in three groups:

Segregated procurement forms: A key feature of procurement forms in this group is a trend to separate design and construction/delivery. Segregated forms include well-known traditional approaches. The dominant segregated form of procurement, which is operating in most countries, is Design Bid Build (DBB). In DBB the owner will receive the bid and award construction contract based on the finished designer's construction document. In this procurement approach, it is assumed that the project design is complete enough to enable a bidding process to establish the cheapest and/or the quickest tender cost. It also assumes that the price of design variations encountered throughout the delivery process will not be excessive ([Masterman, 1992](#); [T. Rizk & Fouad, 2007](#); [Sanvido & Konchar, 1998](#)).

The advantage of segregated forms, which is the key cause to select this procurement form in many organizations, theoretically lies with market contestability for the lowest cost (bid) in combination with shortest time. Other example of forms in this group is Cost reimbursement (Cost-Plus).

Integrated procurement forms: Integrated procurement forms are to some extent either physically or contractually integrated design and delivery process. A key character of this collection of procurement forms is that there is a planning and control logic driving the project and a confidence that integration is mainly accomplished through planning and control systems. Some of the procurement forms in this group are: Design and Construct (D&C), Management contracting (MC/CM), Joint venture consortia, and BOOT family procurement approaches (PFI, PPP). The most recognized procurement form in this cluster is Design and Construct (D&C) where one entity is contractually responsible to produce design and perform the construction service, typically called design-builder. It integrates the design and delivery functions either through an integrated firm mechanism, which has an in-house design team, as well as a delivery team or by the delivery organization outsourcing the design to another team that becomes its design services provider ([Molenaar & Songer, 1998](#); [Molenaar et al., 1999](#); [T. F. Rizk, Nancy, 2007](#)).

In all integrated procurement forms the main focus is on integrating design and delivery processes by emphasizing on planning and control, however, this does not eradicate the importance of collaboration aspect and the people management but it indicates the weight on systems integration through planning and control.

Collective procurement forms: In this cluster the focus is on integrating the project design and delivery teams rather than the process by highlighting collaboration and coordination. Some might claim that this group of procurement forms could be the most mature forms for best outcome and value for money. Collaborative procurement forms like *Partnering*, *Integrated Project Delivery (IPD)*, *Delivery Consortia/Partner (DC/P)*, *Competitive Dialogue (CD)* and *Alliancing* are fitted in this collection. However, the authors believe that some of the forms in this cluster (partnering, competitive dialog, etc.) are naturally represented as a cultural state or formal/informal contract arrangements rather than procurement choice. They have characteristics, features, and cultural elements that can be applied to other forms.

Collective procurement forms provide a framework for establishing mutual objectives among all parties involved. This normally also lead to developing an agreed dispute resolution system. Collective forms need strong team building skills among participant. Compared to other traditional forms it also needs a different paradigm from highly commercial winner-gets-all and adversarial relation between parties involved. In collective forms, the project owner does not only engage/collaborate with the designers but also collaborate from the very initiate stage of the project with contractors and possibly with significant subcontractors. Collective forms mainly characterized by covering collaboration, transparency, innovation and accountability.

2.3 Phases and decision gates

The governing of projects is a major challenge for project management. With the increased focus on governance over the last decade, phases and decision gates became more in focus and hence have received increasing attention (O.J. [Klakegg et al., 2009](#); Müller, 2009). A fundamental logic in this perspective is that for each step of the development, one should stop and check the status before moving on, that is; one should proceed only if everything is in order. This approach is maybe best summarized in the concept of gateways: a formal control of documents and assumptions before making a decision to accept a project, or to close one phase and enter into the next. The source of this thinking seems to stem back to the term “stage gate” introduced by Cooper (1993). We choose to use the term “decision gate” as a reminder that in a governance perspective, we hold the decision to be the main issue connected with these gates.

The gateway is a key element in an adequate implementation strategy: Seen from an owner’s perspective a decision point (a point for looking forward), whereas seen from the constructor’s perspective it may be a milestone (a point for celebration, following accumulated results), as pointed out by Lereim (2009). The purpose of a decision gate, as seen from a project owner’s perspective, is to make sure the formal decision-making is successful in supporting the success of the organization, business-corporation or public entity. Broadly speaking, this depends on making the right decisions. The logical way of making sure the right decisions may be achieved

is to choose the right people to make the decisions, and make sure they have the best possible basis for making the decisions.

Having the best possible basis for making key decisions is a question of extracting the right information. The right information is a question of what is available (known at the time of decision) balanced against the cost of obtaining more/better information and the risk associated with making the decision on less than perfect basis. Decision gates are often characterized by having defined procedures for assessments/control and decision making, defined roles and responsibilities, criteria for acceptance, and a gatekeeper (owner of the gateway process) who decides whether the project is allowed to enter the gateway or not.

The cost of attaining perfect information means it is rational to divide the development in steps and not produce more than needed at each step. Making sure the relevant information is available at the right time and in adequate detail is paramount. Consequently, phases and decision gates are key elements of an information flow framework. Examples from phases given below are meant to illustrate some selected decisive moments in this development:

The first phase is the initial process where the problem or need is acknowledged. This could be due to an owner having a site he wants to realize, or a company looking for other facilities to do their business. This indicates a reason to invest and is often referred to as the business case. Acknowledging that a reason to invest exists is a decisive moment because it drives the decision-making and planning process forward and raises expectations among users.

The next logic step is to view the feasibility of the business case; can it be developed, what are the best alternative concepts, what should the project include. This should now end up in a brief, specifying the contents of a project. Particularly the brief is viewed as a crucial document to achieve a successful project (El. Reifi et al., 2013). The brief is the foundation for a good design and production process. Approving the brief is another decisive moment because this is the point in time where you decide what the users are going to get in the end.

Another key milestone is the handover from the contractors to the owner. This decisive moment represents responsibility shifting from executing party to owner. At this point it is crucial to compare the actual delivery against what was decided in the final brief. For some projects this is when the owners and users for the first time are able to consider to what degree the project fits his or her needs. Traditionally this was where the focus of the project organization ended, but today there is strong focus in the use of the project, looking at how the users of the project succeed in their business and in the management of the facility.

Having a long-term perspective that includes sustainability of the investment is today required, even expected for all parties, despite traditional short-sighted execution perspective. Sustainability has to be considered in terms of the investment's economical-, social- and environmental consequences. Only when the truth is known about the investment's long-term consequences can its true value be assessed. This makes the decision to terminate,

decommission or sell the facility into another decisive moment. This is where the initial intention meets the hard reality of the end and the circle is completed.

3. Result

In January 2015 Bygg21 and The Norwegian Property Federation took an initiative to make a common phase model for the Norwegian AEC industry. The project was undertaken by a research group from the Norwegian University of Technology and Science (Ole Jonny Klakegg et al., 2015). Figure 1 presents an outline of the resulting framework, which was released in December 2015 (www.bygg21.no).

Step	1 Strategic definition	2 Brief development	3 Concept development	4 Detailed designing	5 Production	6 Handover	7 In use	8 Termination
Core process	Owner perspective							
	User perspective							
	Supplier perspective							
	Public perspective							
Management process	Planning							
	Procurement							
	Communication							
	Sustainability - economics							
	Sustainability - environment							
	Sustainability - scocial							

Figure 1: Outline of the framework called "Neste Steg" (Next Step)

The framework "Next Step" is generic and based on a similar set-up as the RIBA Plan of Work (RIBA, 2013). The AEC industry can use the framework with any form of contracts and is open for future development of new PDMs as well. The main purpose is to help the actors of the AEC industry with defining key tasks that need to be fulfilled in the different stages of a project, and to help coordinate their involvement. The intention with this framework is not to define a recipe that needs to be followed to the letter, but to give the industry a common language and collective reference to execute projects.

The different steps of the project are indicated on the top of Figure 1. Each step has a clear purpose and together they all the different phases of a project. In this framework there are 8 steps, including the last important step of termination. Termination can refer to the termination of ownership; i.e. the owner sells the property or the demolition of the building in order to utilize the site in a different way. The logic of the steps is based on a systems thinking approach with input, process, and output logic, creating decisions gates after each step. The output can be input to the next step or leading to a termination of the project. The process is the actual tasks that need to be completed in order advance the project (Ole Jonny Klakegg et al., 2010).

Inspired by Eikeland (2001) the framework divides the processes into two major categories: Core processes and Management processes. Core processes are main tasks and supporting tasks that develop the professional contents of the project. Management processes are planning, coordination and control tasks that need to be performed professionally to make the core processes work well.

In the core processes, the activities are separated into four different perspectives, allowing the stakeholders to easier identify their major activities and tasks and understand the purpose of the tasks at hand. The fundamental perspectives are described by Samset (2010), consisting of owner- user- and executing perspectives. In addition, the new framework includes a public perspective to put focus on how projects need to work actively with their context. The core processes are described with recommended activities that needs to be addressed, in what perspective they need to be performed, and summarizes necessary start-up conditions (input) and deliveries (output) from each step. The idea is that all parties in the project need to know that these are the main activities and issues to be addressed. The framework does not prescribe who should address each task – it is up to the project management to organize the project. The framework prescribes what perspective, or mindset, each task should be performed in.

The management processes includes several categories of tasks that are of the utmost importance for the project process. Planning, procurement and communication are three vital examples. These processes run continuously over time across all steps, but also include separate tasks for each step. Another category of management processes deals with the sustainability of the projects. To secure a wide perspective all three dimensions of the triple bottom line is explicitly addressed. To secure a long time perspective the 8th step focus termination of the project result (the infrastructure, building etc.). There shall be no excuse for not making sustainability considerations in construction projects.

The planning tasks are linked to making plans for the execution of the tasks, adding details to the plan through each step. Examples of important planning tasks include planning the handover strategies from the contractor to the owner and for the user. The procurement tasks will vary along the steps and have to be adjusted to the execution strategies of the project. A typical question is at what step you procure consultants and contractors: This can vary from step three to step five depending on how early involvement is optimal for the development of the project. Some execution strategies require involvement of all parties on an early stage; other strategies develop a detailed design before procuring the construction companies and suppliers. The framework holds that it is important not only to plan but also to control that the plans are followed. The framework is a powerful tool for project management.

Communication in a project is important and challenging; given that the construction industry tends to be fragmented with many different parties specialized in different areas. The framework explicitly addresses the digitalization of the project process, especially the use of integrated communication tools, such as building information models (BIM) as a communication platform. Developing digital project execution strategies early in the project is important to make sure the parties are all “on the same page”.

Sustainability is necessary for future projects – both in execution and with regards to the result. The AEC industry will not be allowed to continue using energy and producing waste like they used to. The framework differentiates the sustainability in three dimensions: economic, environmental and social. The economic sustainability includes securing the right choices in investment and for the full lifecycle cost of the project result. The environmental sustainability is regarding the use of materials, emission, heating, cooling etc. – both the climate effect and the energy use. The social sustainability is how the project affects the life of the team members, users of the result and people around the project, including ethical dimensions and fairness in distribution of effects.

4. Discussion

Planning and control of project activities is still a challenge in the AEC-industry. As seen in the introduction, this is a serious threat to tactical or project management success (doing it right). However, as argued in the introduction, there is a bigger issue – the strategic or project success (doing the right thing). More systematic planning and execution in every step of the development, from problem to solution to effect to termination, can improve both. Doing this one by one (each company by themselves) will necessarily create non-conformance and miscommunication. It will also require a lot of unnecessary effort in repeatedly inventing the wheel. It will waste time and resources and at the same time create limited results.

Trying to change this situation require major steps. Designing a new framework like described above is only a first step. Whether it is good or bad, suggesting it as a general standard will inevitably spark resistance in a traditional industry. To have effect many actors will have to adapt their systems and management practice to the new framework.

First of all, the time is right. There is a growing attention to the importance of good governance in solving major challenges in the industry, companies and projects. All leading actors in the industry accept sustainability as the standard – at least on paper and in speeches. There is a highly developed understanding that projects are about value creation and that everything that represents wasting time and money or “gold plating” is improper. This is helped by the current slow-down in the economy due to reduced activity in the oil and gas sector. Finally there is a wide range of different new standards being developed for PDMs and information exchange that paves the way for integrated delivery strategies. These strategies obviously need some sort of common framework.

The new framework itself is made as flexible and future oriented as possible. The generic framework is valid for different projects delivery methods (PDM) including future innovations. The framework is scalable in the sense that roles and activities can be adapted to small and big, simple and complex projects. Finally the framework is not a strait jacket that requires everyone to become the same or use the same words. On the contrary, it is designed acknowledging the need for companies to be able to develop their profile and competitive edge. The framework is supposed to be a common reference and “language” that all parties refer to in order to clarify concepts and better coordination. In order to achieve this, the framework should highlight the

most important issues in each step, and help to create a platform for timing the right decisions and securing relevant basis for these decisions.

The framework is constructed from well-known principles and international best practice. It has a solid basis. For most actors the changes needed to implement it will be small to moderate. A comparison between the project-models of major companies in the industry reveals that most of the major decision making points are identified in most models(Ole Jonny Klakegg et al., 2015). The level of detail in models varies and the choice of words and graphic presentation is different, but the fundamental structures are remarkably compatible.

Leading organizations in the Norwegian AEC-industry are behind the new framework, including major public clients. The response from the industry has been positive. Other major actors are ready to start using it, and this is the main force that will be able to influence the industry. By January 2016 it is already clear that three different committees in Standards Norway are using Next step as a part of their working basis in developing new standards for the AEC industry. When major clients require it used as a reference, and major executing parties also say they will comply, this has the potential to grow into a strong wave with the force to change a conservative industry. In the long run, the observed improvements will be the best selling points for the model. This of course still remains to be seen.

5. Conclusions

This paper presents a new Norwegian framework for the AEC industry. The framework is not a detailed recipe for project execution, but tries to define the key tasks and steps in a project from the definition to the termination of a building. To sum up we conclude the proposed research questions:

How can the framework help to achieve the right result for owners and users? By defining the decisive moments and the necessary steps on the way from problem to solution until the investment is terminated. By forcing the parties to consider the long-term issues, and assess holistically the relevance and sustainability of alternative concepts, the right choice comes forward and becomes the natural decision.

How can the framework help to secure that the right perspectives are considered? A key feature of this framework is the focus on the key stakeholders and their perspectives. To help the owner make good business decisions, the actors need to think like an owner when they perform their tasks in planning and execution. To create the right solution for the users, the actors need to think like a user and consider how the project can best support the user's business and facility management. To perform an efficient execution process the actors need to think about project delivery models early and make conscious choices about constructability. To secure that society's perspective is considered, the model puts emphasis on requirements, approvals and other aspects of context that the project has to work with.

How can the framework deal with different procurement forms? One challenge in delivering a project is at what stage you procure consultants and contractors. The framework helps to deal with this challenge by explicitly state on what stages different procurement strategies has to be considered to be valid alternatives. Collective and integrated procurement forms needs to be considered early – from step three to five – depending on how early involvement of parties is optimal for the development of the project. Segregated procurement forms could be fitted in step five. A typical problem today is that some strategies are constantly considered too late in the process and thus remain unexploited. Other actors choose strategy from tradition and lack of awareness more than a conscious choice. If they are confronted with the new framework there will be no room for such neglect anymore.

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