

Research Paper

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Four stages of making project management flexible: insight, importance, implementation and improvement

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Abstract: Increased project complexity, project dynamics and changes in clients' requirements are a few examples that suggest the necessity for flexibility in project management in order to deliver successful projects. Despite the fact that literature suggests adding flexibility to project management, there is no existing framework that provides a practical method for adding flexibility into the practice of project management in the construction industry. Therefore, this research is aimed at proposing a practical framework that helps practitioners in embedding project management flexibility into their project management practice. The research question is as follows: how to embed flexibility in the practice of project management in the early project phases? To answer the research question, four sub-questions have been formulated, which have been separately researched. The main question is answered by proposing a flexibility framework. This framework comprises four stages: understanding the current situation, practitioners' perspectives on flexible project management, choosing enablers to become flexible and applying selected enablers to improve project performance. The framework is validated using the examples given by practitioners from 24 cases. Considering the movements towards flexibility and adaptability concepts, this research fills the gap in literature by providing a practical framework for project management flexibility. Moreover, it provides a step-by-step guideline for practitioners to embed flexibility in practice.

Keywords: flexible project management, agile project management, early project phases, project performance

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1 Introduction: 'flexibility' as a paradigm shift in project management

Projects are influenced by their complexities in two ways: positively, in terms of defining new opportunities; and negatively, in terms of threats. Therefore, management of project complexity can focus on maximising opportunities and minimising threats (Vidal et al. 2011). Such project complexity needs to be managed well in order to add value to the project. The first approach to manage project complexity is to keep projects simple, as suggested by Giezen (2012). The uncertainty in projects can be reduced by decreasing the project's complexity. Thus, it becomes easier to better predict the project and, consequently, better manage the project. However, reducing a project's complexity has also disadvantages, such as ignorance of the project's strategic potential. Therefore, instead of focusing on the complexity itself, an alternative approach concentrates on the project management capabilities in managing project complexity.

Nowadays, a pure project management approach is no longer effective (Hertogh and Westerveld 2010, Koppenjan et al. 2011). Moreover, Smith and Irwin (2006) questioned the ability of traditional project management approaches to effectively deal with irrational, non-linear complexity. Cooke-Davies et al. (2008) argue that a paradigm shift away from conventional project management is required to enable the management of current challenges. Conventional project management is known as a rational and linear approach (Williams 2005), which makes it ineffective in the management of project complexity in the project life cycle (Harvett 2013). Furthermore, most of the current project management approaches still seem to underestimate the influence of the dynamic environment (Priemus and van Wee 2013). The capabilities of conventional project management approaches in managing the fundamental sources of uncertainty are questionable, and a complementary management approach is hence

required (Atkinson et al. 2006). In contrast to the controlled approach that conventional project management exerts over the projects, literature suggests increasing the flexibility of project management in order to cope with complexity and uncertainty (Koppenjan et al. 2011). Kreiner (1995) suggests that flexibility is required to deal with changes and uncertainties in the changing business environment. Control implies that the parameters should be fixed and stuck to, while flexibility implies that required changes should be embraced.

Having said so, the importance of bringing flexibility into project management to deal with project complexity and uncertainty requires further attention. Olsson (2006) states, *‘while flexibility was frequently needed in studied projects, it was rarely prepared for’*. Therefore, this research aims at making project management flexibility explicit by the following actions: 1) recognising the degree of flexibility in practice; 2) finding practitioners’ perspectives regarding flexibility; 3) embedding flexibility into practice; and 4) focusing on improvement of project performance and management of complexity by implementing flexibility. To fulfil these four objectives, four research questions were formulated.

- 1) What is the status of flexibility in current practice?
- 2) What are the enablers of flexibility?
- 3) What are the practitioners’ perspectives regarding project management flexibility?
- 4) What is the contribution of flexibility to project performance?

By answering these four questions, a conceptual framework is proposed in this paper. To develop the framework, four separate research experiments were performed as part of a Doctor of Philosophy (PhD) thesis (Jalali Sohi 2018).

This paper is structured as follows. In Section 2, the literature review on project management flexibility is covered. Section 3 elaborates on the research methodology applied. Sections 4, 5, 6 and 7 provide answers to the four formulated research questions, respectively. Section 8 presents the proposed flexibility framework. In Section 9, examples of flexibility from practice are discussed to support the proposed framework. The discussion and conclusion are covered in Sections 10 and 11, respectively.

2 Literature review: what is flexibility in project management?

One of the early definitions of flexibility is provided by Bateson (1972). He defines flexibility as *‘uncommitted*

potentiality for change’. He cites the ability to harmonise with the environmental flexibility in advanced urban civilisations, which have the highest degree of flexibility in his opinion. He emphasised that the context conditions should be taken into account while talking about flexibility.

Flexibility can be defined as a competence of the project manager, as discussed by Turner (2004): *‘the project manager should be empowered with flexibility to deal with unforeseen circumstances as they see best, and with the owner giving guidance as to how they think the project should be best achieved’*. Flexibility may be described as a way of making irreversible decisions more reversible or postponing irreversible decisions until more information is available (Olsson 2006). This refers to the following definition of flexibility put forth by Husby et al.: *‘the capability to adjust the project to prospective consequences of uncertain circumstances within the context of the project’* (Olsson 2006). Flexibility can be related to the degree of modularity in projects, wherein modularity refers to the possibility to divide the project into more-or-less independent subunits (Olsson 2006).

All these definitions have two main facts in common about flexibility: taking the dynamic context into account and readiness for changes. What can be concluded from these provided definitions is the unanimity about *‘ability to adapt to project context and to the dynamics of the environment’*. This concluded commonality from the provided definitions forms the basic definition of flexibility for this research: *‘the ability and readiness to deal with dynamics in a project’*.

Apart from defining what flexibility in project management is, some scholars have looked for practices of flexibility. Sager (1990) found two main aspects of flexibility in order to prepare the management to deal with uncertainty and its effect on the project in urban planning: future choice opportunities and capacity for adjustment. He defines robustness, resilience and stability as other related qualities for flexibility. Flexibility in the planning and implementation phase of a project may be accomplished not only by flexible decisions but also through enabling the possibilities for adjustments in the entire planning system, such as departing from plans, changing them or sidestepping them altogether (Sager 1990). According to Gupta and Rosenhead (1968), robustness in sequential investment decisions is defined as follows: *‘Robustness of a decision or decisions must be measured in terms of the numbers of the good end-states for expected external conditions which remain as open options’*. Hashimoto et al. (1982) define resilience as the quality that describes *‘how*

quickly a system is likely to recover or bounce back from failure once failure has occurred. Stability of a plan or a project is defined as *‘the maximum deviation between predicted and realised value of the key variables which renders the planning product satisfactory’* (Sager 1990).

Hertogh (2014) discusses the fact that project managers should be open for opportunities, not only at the start, but also during the course of the project. This so-called opportunity framing is supposed to be a recurring, iterative process, aiming at maximum value creation. However, usually project managers stick to their scope, hence missing possible enrichment of their projects. Sager (1990) states that keeping options open is the crucial issue, and this is what flexibility is aimed at.

Aaker and Mascarenhas (1984) argue that while the intention of the control-oriented approach is reducing undesirable changes, flexibility enables incorporating required changes as necessitated by the uncertain and changing environment. The control- and flexibility-based approaches are defined by Koppenjan et al. (2011) as ‘command-and-control’ and ‘prepare-and-commit’, respectively. The difference between these two approaches lies in their attitude towards managing uncertainty and complexity. The command-and-control approach aims at eliminating the uncertainty and complexity by imposing strict planning and control over the process, while the prepare-and-commit approach aims at managing both uncertainty and complexity by close cooperation among the project actors, thus facilitating increased flexibility.

Perminova et al. (2008) state that reflective learning and sense-making are required in order to increase flexibility. Reflective learning can be accomplished by standardisation or repetitiveness of procedures. Standardisation helps to react to possible changes by providing flexibility in choosing among a number of alternative actions. However, it is not possible to reduce all the uncertainty by standardisation. While uncertainty can be decreased to some degree, some uncertainty is wished for to grab opportunities. Evolution is tied with opportunities, and the elimination of all uncertainties hinders the evolution of the project. Similarly, Collyer and Warren (2009) identify ‘environment manipulation: making dynamic static’ as one of the management approaches in dynamic environments. This can be done by fixing objective and design, refusing change requests, reducing or delaying adoption of new technologies or techniques, and extending the life of existing systems. The approach of making dynamic static has disadvantages also such as lost opportunity and productivity through delayed implementation of new approaches. Moreover, it is not always possible to

reduce complexity or making dynamic static since we do live in a dynamic environment.

Similar to flexibility, adaptability in project management is a term emphasising the adaptation of project management to the (changing) context of projects. Giezen (2012) defines adaptability as the ability of adaptation to changes. Priemus and van Wee (2013) argue that adaptability is needed. They argue that complex projects require adaptations in their management in order to deal with threats and opportunities to overcome internal deadlocks and external changes.

This brief literature scan suggests that in order to manage a project’s complexity and dynamics, an ideal project management approach should take the following into account:

- Redundancy, in terms of keeping alternatives open, and making a decision at the last-possible moment (Priemus and van Wee 2013);
- Achieving reflective learning by standardisation of process and design to the degree that fits the project’s context (Perminova et al. 2008; Giezen 2012);
- Being open to change by understanding that change is unavoidable, coping with threats and seizing opportunities (resilience) (Priemus and van Wee 2013);
- Defining the project’s scope into required functions (Koppenjan et al. 2011);
- Establishing stakeholders’ close collaboration (Koppenjan et al. 2011);
- Self-steering of the complete project team (Koppenjan et al. 2011);
- Building trust among the parties involved in the project (Atkinson et al. 2006).

The aforementioned characteristics point out some features of flexibility in project management. However, flexibility is not only limited to these items.

3 Research methodology

The main objective of this research is to propose a flexibility framework to help practitioners in construction industry to embed flexibility into their normal routines more explicitly. As explained in the Introduction section, before proposing the framework, four research questions have to be answered, providing the basic ingredients of the proposed flexibility framework.

This research fits well with the pragmatist philosophical world view (Creswell 2009). Research on pragmatism is problem-centred and oriented towards real-world

practice. In this research, the problem is *how* to make project management flexible in practice. Therefore, it has the nature of being both problem-centred and oriented towards real-world practice. From the research strategy point of view (Blaikie 2009), this research is partly inductive and partly deductive. The switch between inductive and deductive research is what Wallace (1971) has already introduced as ‘The Wheel of Science’ (see Figure 1).

Since each of the four questions requires a different research approach, a mixed-method research approach (Creswell 2009) is applied. This approach is split into four phases (Figure 2). Phase 1 answers the first research question regarding flexibility in current practice of project management. An in-depth literature review with complementary case study research is performed in this phase. The second phase explores what the enablers of flexibility are by means of a literature study and validates the extracted enablers from literature via interviews with practitioners. Practitioners’ perspectives with respect to flexibility in project management have been researched using the Q-methodology in Phase 3. In Phase 4, the effect of project management flexibility on project performance is investigated by statistical analysis of data gathered from 111 surveys.

Overall, the research has a deductive character as the starting point is theory, followed by development and testing of hypotheses. Based on the outcomes of these four phases, a framework is proposed, which has a more inductive character as it aims at generalising the results and contributing to theory.

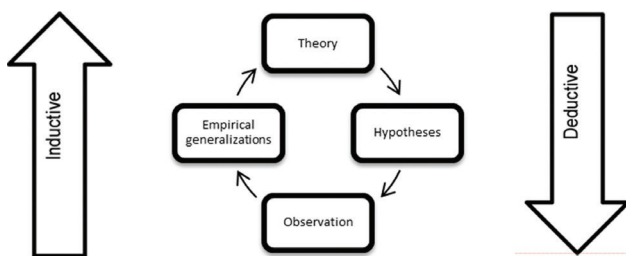


Fig. 1: Wheel of science (Wallace 1971).

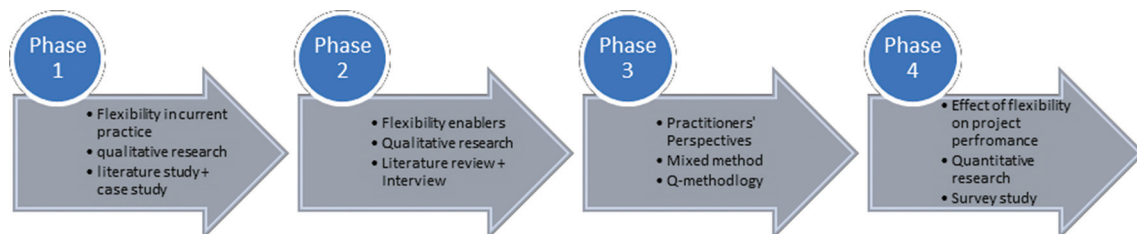


Fig. 2: Research phases.

4 Flexibility in current practice of project management: Agile project management

The first step in adding flexibility to project management is the recognition of current flexible approaches. This section elaborates on such flexible project management approaches by means of a literature review and an empirical study on the application in practice.

‘Agile Project Management’ is the most-known flexible project management methodology. It is defined as ‘*a style of project management that focuses on early delivery of business value, continuous improvement of the project’s product and processes, scope flexibility, team input, and delivering well-tested products that reflect customer need*’ (Owen et al. 2006). The Agile approach has been developed in the software industry, but many other industries, including the construction industry, have also adopted the Agile approach (Owen et al. 2006). Agile project management lets software project managers and employees adapt to changing circumstances, rather than trying to impose rigid formal controls, as in traditional linear development methods (Augustine et al. 2005). Agile core values are as follows: ‘*high-quality deliverables are a result of providing customer value, team interactions and adapting to current business circumstances*’ (Layton 2010). In contrast to Agile, traditional software development methodologies can be characterised as reflecting linear, sequential processes, which can be effective in developing projects with stable, known, consistent requirements (Augustine et al. 2005), which does not match the characteristics of dynamic systems. Highsmith (2002) has stated that agility is the ability to balance flexibility and stability. Agile methodologies have sought to focus on rapid iterative delivery, flexibility and better-working software projects (Abrahamsson et al. 2003), with mutual interactions among a project’s various parts, and steering them in the direction of continuous learning and adaptation (Augustine et al. 2005). Conventional project management approaches promise

predictability, stability and high assurance, in contrast to the Agile approach, which promises higher customer satisfaction, lower defect rates, faster development times and a solution to rapidly changing requirements (Boehm and Turner 2003).

Since Agile is an umbrella name, it cannot be seen as a tool in itself. Therefore, it is more recognised and visible by its tools such as Scrum (Agile Methodology 2014).

In an empirical exploratory case study research (Yin 2002), the application of Agile project management and its tool Scrum in the context of infrastructure projects in the construction industry was studied (Jalali Sohi et al. 2016). In total, nine interviews were performed, including respondents from three projects that were managed using Scrum. All interviewees were active at the project level and assigned to the project in different roles, including project manager, project engineer, Scrum master and Scrum coach. During the interviews, several themes regarding the characteristics of Agile project management were covered, which were extracted from the literature. The themes were as follows: performance of the project, value delivery, client satisfaction, project team, role of the Scrum master, interaction among the parties involved in the project, reporting, project planning and management of scope changes.

The practice of Scrum in relation to the theory of Scrum is presented in Table 1.

This exploratory research revealed a number of positive outcomes by using Scrum in the management of infrastructure construction projects. The impression obtained during the interviews was that most of the practitioners who work with Scrum were generally very positive about it. On frequent occasions, they expressed their positive opinions about Scrum:

- Scrum presents a very structured way of working (product backlog, daily stand-ups are some examples).
- Working together in the same room provides the team members an environment of continuous motivation and team satisfaction.
- The mix of different specialities in the Scrum teams is crucial to achieving maximisation of the value of the project.
- There is a high level of intensity while working with Scrum, which makes it efficient.
- Scrum reduces the amount of rework (i.e. early detection of problems).
- Working in an Agile environment does require high client participation in the project, which focuses on client satisfaction.

Furthermore, a number of challenges were faced while using Scrum in practice:

- Multitasking of team members affects the efficiency, and an excess of documentation/communication is required for those who cannot attend such events.
- Team members would be uncertain about the benefits of Scrum if they are asked to use it without educating them.
- There should be a balance between the amount of time spent in Scrum meetings and the intensity of the project (days per week).
- High level of commitment of the client is required while it is not in place.
- There is still no quantitative analysis on how Scrum affects the end results of the project (cost).
- There should be a match with the contract type if the project would be managed by Scrum (contract flexibility).

By reviewing all observed positive aspects and the challenges faced with the use of Scrum and also looking back at the comparisons made between theory and practice, it is concluded that the application of Scrum in practice is not fully aligned with theory, but still, it showed positive results in some areas, especially in terms of scheduling, interactions and communications. In all case studies, it was observed that the applied project management approach, in fact, was a hybrid version. The Scrum projects follow Scrum on the basis of a waterfall approach.

5 What are the enablers of flexibility?

Apart from emphasising the importance of flexibility in project management (Section 1) and the definition of flexibility (Section 2), it is important to know what makes project management flexible. Therefore, this section elaborates on enablers of flexibility in project management.

By doing a literature review on flexibility in project management, a list of literature references that directly define or identify sources of flexibility was extracted. It was concluded that some works only sheds light on the importance of flexibility in project management without explaining further what flexibility is (Olsson 2006; Kreiner 1995; Koppenjan et al. 2011). Some others define areas of flexibility (Geraldini 2008; Osipova and Eriksson 2013). A number of studies look into flexibility as one aspect, such as human resource management or scheduling, among others (Kellenbrink and Helber 2015; Gupta and Rosenhead 1968; Gil and Tether 2011; Chan and Chan 2010).

Tab. 1: The practice of Scrum versus the theory

Explored items	Scrum based on theory	What is happening in practice at the company (3 projects)	Aligned	Misaligned	Neutral
Overall success of the project		Successful from the client point of view, successful from project teams' point of view, not successful from the company point of view	N/A		
Time	Time is fixed	Mostly projects delivered within time; for those delivered with delay, it was acceptable by the client because the client was the source of delay	x		
Cost	Maximum budget is fixed	One of the negative aspects of Scrum within the company; mainly because of learning costs	N/A		
Quality		Accepted by the client, delivery of products with high quality (company strategy)	N/A		
Client satisfaction	Main value driver of Scrum.	Clients were satisfied	x		
Conditions of client satisfaction	Conditions of client satisfaction should be known and addressed explicitly	There was a set of quality criteria as client satisfaction conditions, but overall, there was no common idea regarding what the client satisfaction conditions were		x	
Team building	Scrum team should be constant /fixed and the project should be assigned to the team	Few problems; first of all, lack of capacity at the company, teams vary in size during the project, teams are not constant, in contrast with the principal team which is being assigned to the project		x	
Multidisciplinary team	Team should be multidisciplinary	To some extent, teams are multidisciplinary	x		
Multitasking in team	It should be avoided	It happens always		x	
Integration	Working in one room, rather than individually in separate offices	Scrum teams were integrated. In the case of multitasked people in the team, the level of integration decreases considerably	x		
Exchange of information/knowledge	Working in one room, rather than individually in separate offices	Easy/doable in face-to-face communication	x		
Documentation	Proper/enough documentation, excessive or too much paperwork	Enough for the project itself but not enough for use as lessons learned for another project; in the case of multitasked people in the team, the amount of documentation increases			x
Overall picture of the project	Visualising the overall project	Scrum creates the big picture of the project; the inconsistency of the Scrum team is a problem here		x	
Within team	Daily stand-ups/sprint meetings	Different opinions; examples are as follows: it is difficult when a team member is a multitasker; generally, a waste of time but saves time according to team alignment			x
With stakeholders/clients	Client involvement/participation in weekly/every sprint meeting	Not enough client involvement/ no interest from client side to participate in all meetings		x	
Definition	Value should be defined at the beginning	No definition of value		x	
Tracking	Value should be tracked during the project	Since there is no value definition, there won't be any tracking of value		x	
Product backlog	Work is done in small batches, which are listed in the product backlog	Product owner defines the product backlog	x		

(Continued)

Tab. 1: Continued

Explored items	Scrum based on theory	What is happening in practice at the company (3 projects)	Aligned	Misaligned	Neutral
Sprint meetings	Value orientation over process orientation; delivering something that has value for the client in 2–4 weeks' time	It worked well in doing the tasks, but there is doubt if something that has value for the client is delivered in each sprint meeting		x	
Duration of tasks	Realistic time planning by means of poker game	Estimation of the duration of tasks (products) by poker game	x		
Within team	More face to face, less paperwork	Informal face-to-face discussion, rather than official reporting; digital Scrum board, which is updated regularly			x
With client	Client involvement/ close cooperation with client	Monthly report to client/ no client involvement in the Scrum process		x	
Time buffers	Time buffer is needed	Because of tight deadlines, there are no planned buffers	x		
Response to scope change	Responding to change (scope change)	In contrast with contract conditions, it results in requests for extra budget and time		x	
Problem-solving	Problem-solving should be planned/clear; impediment should be resolved	Not really planned; product owner/project manager is the source of problem-solving		x	

In total, 30 enablers of flexibility were extracted from all studied literature. In order to validate the flexibility enablers, 14 interviews with practitioners were conducted. In total, 13 out of the 14 interviewees had an engineering background, mostly in civil engineering. Half of the interviewees were project managers. The others were involved in projects as senior manager, process manager, project director or other project roles. The majority of interviewees (71%) work in the construction industry. About 62% of them had >20 years of working experience.

The refined list of flexibility enablers after analysing the gathered data from the interviews is presented in Table 2.

6 Practitioners' perspectives on flexible project management

After the identification of the flexibility enablers in Section 5, the next step is to identify the practitioners' perspectives regarding flexible project management using the Q-methodology (Jalali Sohi et al. 2018). This methodology allows for studying topics with a subjective character. Two types of organisations were targeted in this research, viz. clients and consultancies. In total, 43 practitioners (21 from clients and 22 from consultancies) from six different organisations participated in the research. The input for this step of the research was the list of 26 flexibility enablers concluded from Section 5 (see Table 2).

The data analysis revealed three parallel perspectives per organisation type (client and consultancy). The first perspective that appears in both organisation types – named as 'Trust', which means trust and its related enablers – is ranked high as the distinguishing statement for this group of practitioners, regardless of the fact that they work for client or consultant organisations. However, some differences were also found. High-ranked and low-ranked flexibility enablers from each participant's point of view are presented in Table 3. All team-related enablers are ranked relatively low from the clients' point of view, but from the consultants' point of view, some of these enablers are ranked high. It can be said that the way the project team is organised seems much more important for respondents from consultancy organisations than for the client organisations who share opinions in the 'trust' perspective.

The second shared perspective was 'Scope flexibility by contractual flexibility'. Looking at the overall ranking of flexibility enablers of this perspective, not many differences were found between the client respondents and the consultant respondents in the corresponding perspectives.

The third perspective for both organisation types was 'Proactive management'. The enablers that contribute to a proactive approach, such as 'seizing opportunities and coping with threats', 'possible alternatives' and 'contingency planning', were ranked high in this third perspective for both respondent groups. Moreover, some differences were also found. In the case of consultant respondents, the 'when' category of enablers was ranked higher, compared

Tab. 2: Flexibility enablers of project management

Category	Flexibility enablers	Main source
What	1 Broad task definition	(Koppenjan et al. 2011)
	2 Embrace change as much as needed	(Olsson 2006; Priemus and van Wee 2013)
	3 Functional-realisation-based contract	(Koppenjan et al. 2011)
How	4 Self-steering of the complete project team	(Koppenjan et al. 2011)
	5 Open information exchange among different groups	(Koppenjan et al. 2011)
	6 Shared interface management	(Koppenjan et al. 2011)
	7 Contingency planning	(Olsson 2006)
	8 Seizing opportunities and coping with threats	(Blom 2014)
	9 Trust among involved parties	(Atkinson et al. 2006)
	10 Standardised process and design	(Giezen 2012; Perminova et al. 2008)
	11 Visualised project planning and progress	(Beck et al. 2001)
	12 Possible alternatives	(Priemus and van Wee 2013)
	13 Network structure rather than hierarchical structure	(Beck et al. 2001)
	14 Continuous learning	(Giezen 2012; Perminova et al. 2008)
Who	15 Consensus among team members	(Cobb 2011)
	16 Stable teams	(Beck et al. 2001)
	17 Self-assigning of individuals to tasks	(Cobb 2011)
	18 Team priority over individual priority	(Beck et al. 2001)
	19 Team members as stakeholders	(Beck et al. 2001)
When	20 Late locking	(Olsson 2006; Huchzermeier and Loch 2001)
	21 Short feedback loops	(Cobb 2011)
	22 Continuous locking (iterative)	(Olsson 2006)
	23 Iterative planning	(Cobb 2011)
	24 Iterative delivery	(Beck et al. 2001)
Where	25 Joint project office	(Osipova and Eriksson 2013)
	26 Have flexible desks	(Osipova and Eriksson 2013)

to the ranking of client respondents. This suggests that these consultants favoured a more iterative approach in their scheduling. Another difference was found in the ‘where’ category of enablers: client respondents showed less willingness in having a joint project office.

For the complete dataset, the top-ranked enablers and the derived perspectives for both clients and consultants are the same. Hence, the general mind-set of these practitioners working for client or consultant organisations regarding flexibility in project management seems similar.

7 The contribution of flexibility to project performance

It was evident from the literature that conventional project management needs to gain flexibility to deal with the

dynamics of current projects. These dynamics are known as sources of uncertainty and complexity. The effect of such management flexibility on project performance in the domain of infrastructure construction projects has not been studied empirically. Therefore, this section elaborates on the effect of project management flexibility on project performance. Adding flexibility to the practice of project management is assumed to improve project performance by better dealing with project complexity. To study the effect of flexibility on project performance, a survey study was performed. By doing statistical analysis using partial least squares structural equation modelling on data gathered from 111 surveys, five hypotheses regarding the direct effect of five areas of flexibility on project performance are tested. In the online survey, the respondents were asked to rank their last-finished project regarding its complexity, managerial flexibility and project performance by giving a score to the factors of complexity,

Tab. 3: High-ranked and low-ranked flexibility enablers from different participants' (N=43) points of view

		Perspectives	
Trust		Scope flexibility by contractual flexibility	Proactive management
Client organisations	High-ranked flexibility enablers	<ul style="list-style-type: none"> • Trust • Short feedback loops • Continuous locking • Seizing opportunities and coping with threats • Continuous learning 	<ul style="list-style-type: none"> • Broad task definition • Functional-realisation-based contract • Shared interface management • Visualised planning and progress • Seizing opportunities and coping with threats • Iterative delivery
	Low-ranked flexibility enablers	<ul style="list-style-type: none"> • Standardised process and design • Self-steering team • Consensus among team members • Late locking • Self-assigning individuals to tasks • Broad task definition • Flexible desks • Iterative delivery • Consider team members as important stakeholders 	<ul style="list-style-type: none"> • Flexible desks • Standardisation of process and design • Functional-realisation-based contract • Joint project office • Open information exchange • Continuous locking
Consultant organisations	High-ranked flexibility enablers	<ul style="list-style-type: none"> • Trust • Short feedback loops • Self-steering team • Consider team members as important stakeholders • Seizing opportunities and coping with threats • Visualised planning and progress • Self-assigning of individuals to tasks 	<ul style="list-style-type: none"> • Possible alternatives • Continuous locking • Contingency planning • Joint project office • Iterative planning
	Low-ranked flexibility enablers	<ul style="list-style-type: none"> • Broad task definition • Late locking • Contingency planning • Possible alternatives • Network structure • Functional-realisation based contract 	<ul style="list-style-type: none"> • Flexible desks • Consider team members as important stakeholders • Self-steering team • Functional-realisation-based contract • Visualised planning and progress • Late locking • Broad task definition

Tab. 4: Hypotheses regarding the effect of project management flexibility on project performance

Hypothesis	Result of testing
Project management flexibility in terms of project scoping and contracting (what) has a positive effect on project performance.	Rejected
Project management flexibility in terms of process (how) has a positive effect on project performance.	Supported
Project management flexibility in terms of project team organisation (who) has a positive effect on project performance.	Rejected
Project management flexibility in terms of scheduling the project and task delivery (when) has a positive effect on project performance.	Rejected
Project management flexibility in terms of location of team (where) has a positive effect on project performance.	Rejected

flexibility and project performance. An overview of the hypotheses is provided in Table 4.

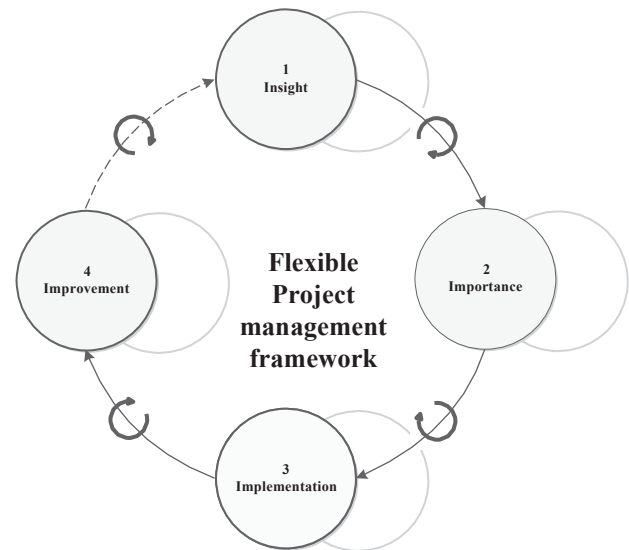
As extensively described in the research by Jalali Sohi (2018), among the five hypotheses regarding the existence of positive relationships between project management flexibility and project performance, only one was supported: flexibility of ‘how’ was shown to have a significant positive effect on project performance. The significant positive relationship here means that the higher the flexibility of ‘how’, the better is the project performance.

8 Proposed framework

Studying the notion of flexibility in project management, its definition and enablers, the practitioners’ perspectives regarding flexibility and the contribution of flexibility to project performance led us to the development of a framework to embed flexibility into practice. The so-called ‘Flexible project management framework’ (Figure 3) answers the four research questions formulated in Section 1. The framework includes four steps that logically follow each other in an iterative way: insight, importance, implementation and improvement. Here, the four steps of the framework are explained by linking each to the section in this paper.

- **Step 1: Insight**

As the name suggests, the goal of this step is to create insight about the project complexity and the project management approaches applied in current practice. Project complexity is important to be understood and investigated for the project to be managed well. Section 4 describes that current practice has applied Agile Project Management as the existing flexible project management approach. The application of such a methodology and its tools such as Scrum, however, is not fully aligned with

**Fig. 3:** Flexible project management framework (main steps).

theoretical insights from literature. Whether it should be fully aligned with theory or not depends on the added value of such methodology to practice. Therefore, it is suggested to customise the application of Agile to fit to the requirements of practice.

Two main extremes are recognised in project management approaches: a pure waterfall approach versus a pure Agile approach. Practitioners can apply either the pure approaches or any hybrid version. Whatever approach is applied, it is important to be aware of where the current approach fits in the spectrum from pure waterfall to pure Agile.

- **Step 2: Importance**

This step is about investigating the practitioners’ perspectives regarding flexible project management, as discussed in Section 5. Based on what is found to be important by practitioners to make project management more flexible, three distinct perspectives were derived: flexibility by

‘Trust’, ‘scope flexibility by contractual flexibility’ and flexibility by ‘proactive management’. Each perspective gives higher priority to certain flexibility enablers. One of the most outstanding results of this study is that the perspectives of practitioners who work as clients are similar to the perspectives of practitioners who work at engineering consultancy organisations. In this step of the framework, it is suggested to understand which of these perspectives exist in the project team in order to facilitate collaboration.

Different perspectives might co-exist in any project team, and perspectives might change over time. The goal is to understand which perspectives exist (make it explicit) and what is felt important for the project. While the first step in the framework is about creating insight into and awareness regarding the applied project management approach, the second step is about creating awareness of the practitioners’ mind-sets.

- **Step 3: Implementation**

By getting insight into and awareness regarding what is in place for the project’s management and what the mind-sets of people are, the foundation for making project management flexible is ready, but this needs to be implemented. Section 5 presented 26 enablers of flexibility, which contribute to five areas of flexibility (what, how, who, when and where). The third step of the framework is about applying these flexibility enablers in practice.

The implementation of enablers belonging to the flexibility of ‘what’: these enablers are about the scoping of the project, i.e. defining the project’s scope into broad tasks rather than detailed work packages and based on the required function. Delivering tasks does not necessarily result in delivering the function. The emphasis should be on the function in order to deliver the value.

The implementation of enablers belonging to the flexibility of ‘how’: decisions should be made interactively with the close involvement of stakeholders; information exchange should be open between the parties involved in the project and information sharing should also be enhanced; alternatives should be evaluated in terms of their relevance and the most relevant ones need to be kept on board; a proactive approach regarding opportunities and threats is required; and contingencies should be considered to help deal with unforeseen circumstances. Moreover, the project team is suggested to be self-steered rather than being steered only by a project manager; managing interfaces is seen as a shared task rather than being done by a project manager, through building and maintaining trust among the involved parties, establishing management support from top management in the organisation

and reducing the hierarchy in the organisation to form a flatter type of project organisation.

The implementation of enablers belonging to the flexibility of ‘who’: these enablers are about how to organise the project team in terms of collaboration and structure. In terms of team collaboration, this involves establishing the mind-set of team priority over individual priority and valuing team members by considering them as valued stakeholders in the team. In terms of team structure, it means delegating responsibilities to team members, reaching consensus in key decisions among the team members and establishing a stable team rather than building the team per project.

The implementation of enablers belonging to the flexibility of ‘when’: this is about having short feedback loops and locking (fixing decisions) continuously in an iterative way.

The implementation of enablers belonging to the flexibility of ‘where’: this is about establishing a joint project office (either physically or virtually) for the project team.

- **Step 4: Improvement**

This step aims at improving project performance by the application of certain flexibility enablers. In Section 7, it was discussed that flexibility of ‘how’ has a positive significant effect on project performance. It means that if ‘how’ flexibility is applied in practice, the performance of the project will improve significantly. This area of flexibility includes: interactive decision-making, close involvement of stakeholders, open information exchange among different groups, contingency planning, seizing opportunities and coping with threats, visualised project planning and progress, self-steering of the complete project team, shared interface management, trust among involved parties, standardisation of the process and design, possible alternatives, network structure rather than hierarchical structure, continuous learning and management support.

Step 2, importance, is about practitioners’ perspectives. What do these perspectives mean for Step 4? The three distinct perspectives (trust, scope flexibility by contractual flexibility and proactive management) all include some high-ranked enablers from the ‘how’ flexibility enablers. For example, in the perspective of ‘trust’ from the clients’ point of view, ‘shared interface management’, ‘open information exchange’, ‘visualised planning and progress’, ‘seizing opportunities and coping with threats’ and ‘possible alternatives’ were ranked high. In the perspective of ‘scope flexibility by contractual flexibility’ from the consultants’ point of

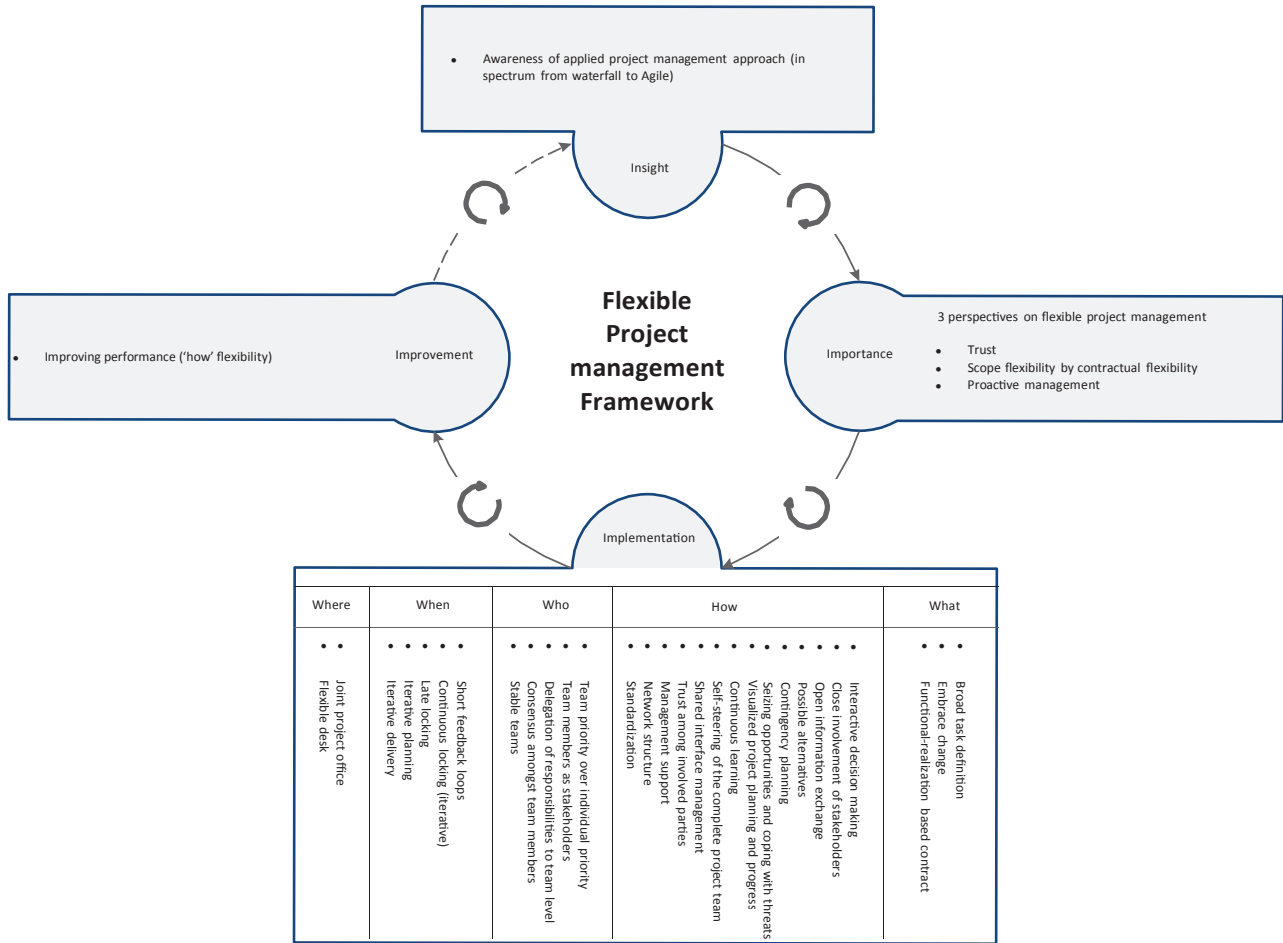


Fig. 4: Flexible project management framework: full proposed framework.

view, ‘seizing opportunities and coping with threats’, ‘possible alternatives’ and ‘open information exchange’ are three examples of flexibility enablers that are ranked high. In the perspective of ‘proactive management’ from the clients’ point of view, ‘seizing opportunities and coping with threats’, ‘trust’, ‘self-steering of team’ and ‘possible alternatives’ are ranked high. It can be seen that the same enablers such as ‘trust’ are ranked high in different perspectives.

Therefore, improving project performance seems possible regardless of the perspective adopted in Step 2. Nevertheless, understanding the different perspectives among team members is recommended for any project in order to prioritise the application of flexibility enablers (see Step 2 of the framework).

It has been mentioned that the framework has an iterative character. This appears not only in the forward sequence of the steps; backward moves are also possible. The iterative character of the framework helps continuous improvement in practice, as indicated in the literature about Agile project management (Augustine et al. 2005;

Cobb 2011). Therefore, the flexibility framework developed in this research follows an iterative process in a circular manner. The framework includes multiple and reverse arrows, which acknowledge the iteration in any direction depending on the situational circumstances and required improvement actions.

The full proposed framework is presented in Figure 4.

9 Validity of the framework: support from practice

The proposed flexible project management framework was the main outcome of the inductive research, which contributes to the theory as well as practice by providing a practical guideline to embed flexibility in project management processes. In Phase 4 of the research, where the effect of flexibility on project performance was studied, the participants were asked to give examples of the flexibility enablers they have applied in their

project and whether it had any effect on project performance. In order to check the validity of the proposed framework, those examples were coupled with the results derived from all the other phases of the research. In this section, a few of those examples from practice will be discussed. Table 5 presents 24 cases, in which respondents pointed out the application of flexibility enablers or the lack of flexibility that they recognised in their projects.

First, it was investigated whether the existence or lack of flexibility in general has been recognised by practitioners. As can be seen in Table 5, there are some cases in which the lack of flexibility in project management processes in general has been recognised. For example, in Case 23, the respondent highlighted the fact that too much effort was devoted to the project management processes because a new system was introduced. He also mentioned that flexibility was not an objective for their project management system. The authors truly believe that recognition of what flexibility has to offer to the practice of project management is an important step in embedding flexibility into practice. This is in line with Steps 1 and 2 of the proposed flexible project management framework. First, practitioners need to understand how flexible their practice is, and second, they can explore what kind of flexibility they require before embedding flexibility into their project management practices.

Apart from recognition of flexibility in general, the analysis includes identification of flexibility enablers, which can directly be linked to the case based on the described situation, i.e. improvement points mentioned by the respondents as well as the points that went well in their practice. In the following paragraphs, some examples are described. These examples are presented to support Step 3 in the proposed framework (Figure 3).

- **Management support**

Management support as a flexibility enabler can be recognised in Cases 1 and 15. In both cases, the respondents mentioned that governance and management of the team were poor and that there was no freedom for the management team to manage independently. This situation confirms that management support increases the flexibility in project management processes by giving freedom to the management team.

- **Close involvement of stakeholders**

In a few cases (Cases 2, 3, 9, 17, 21 and 24), the respondents mentioned that their projects were complex due to the

number of stakeholders involved. Such an organisational complexity (Bosch-Rekvelde et al. 2011) can be managed by increasing the flexibility via ‘close involvement of stakeholders’. For example, in Case 3, the respondent believed that there were scope changes because of scope underestimation by the client. This could be avoided if the client and/or other stakeholders are involved sufficiently in the process.

- **Trust**

Trust, as an enabler of project management flexibility, can be linked to situations where the relationship between the involved parties was not trust-based or when too many stakeholders are involved in the process with different expectations, managerial systems or corporate cultures. For example, in Case 12, working in a trust-based environment was one of the reasons that the management of the project went well. The respondent mentioned that the management team tried to maintain the trust among all the involved parties throughout the project.

- **Network structure and self-steering of the complete project team**

Hierarchy hinders flexibility. Therefore, a few flexibility enablers, such as ‘network structure’ and ‘self-steering of the complete project team’, contribute to less hierarchy in the team. For example, in Case 3, the respondent believed that having less hierarchy helped in maintaining the flexibility to incorporate the changes.

- **Short feedback loops**

Shorter communication lines increase flexibility. In Case 20, the respondent mentioned that short-term cyclic meeting for the management team and subteams worked well in their project and enhanced flexibility in project management. This item is directly linked to ‘short feedback loops’ in the flexibility framework.

- **Iterative planning**

Step 4 in the flexible project management framework is about improving project performance. In a few cases (Table 5), the respondents pointed out that flexibility was required in order to improve their project performance. For example, in Case 5, by applying the iterative process (Agile), the project team could manage the project well in terms of scope, time and costs. Or, in Case 21, the project was managed well in terms of quality, stakeholders and time. The respondent from this project believed that

Tab. 5: Examples of flexibility from practice

Case	Situation	Flexibility score	What has to be improved in flexibility	What went well	Related flexibility enabler (s)
1	Inadequate governance Strict budgetary regulations, inflexible procurement law, constraints from permits	3	Full and adequate support from project owner to have freedom to operate project management		<ul style="list-style-type: none"> • Management support
2	Complex project environment due to number of involved stakeholders Required changes	9		Involvement of all the parties in the process	<ul style="list-style-type: none"> • Close involvement of stakeholders
3	Scope changes because of underestimation of the project scope by the client	8		Less hierarchy to enhance possible changes	<ul style="list-style-type: none"> • Close involvement of stakeholders • Self-steering of complete project team • Network structure
4	Little trust with the client Predefined tight scope	8	Close collaboration with client (and other parties) More flexibility and less rigidity, in similar cases	Capturing the lessons learned here to manage similar projects	<ul style="list-style-type: none"> • Continuous learning • Close involvement of stakeholders • Trust • Broad task definition
5	Good scope, time and cost management	9		The Agile team Committed team	<ul style="list-style-type: none"> • Team priority over individual priority • Iterative planning (Agile)
6	Involvement of multiple governmental parties with different management systems	9	Building trust for the involved governmental parties	Consensus in decision-making	<ul style="list-style-type: none"> • Trust • Consensus among team members
7	Took the lead by a single party in a joint-venture collaboration		Less hierarchy	Daily meetings to solve the problems	<ul style="list-style-type: none"> • Network organisation • Self-steering of complete project team • Short feedback loops
8	Keeping the balance between a number of managerial procedures to follow	8		Multidisciplinary team (education, experience, attitude, soft skills, gender diversity) Providing a safe environment to discuss the problems Right person for the right task	<ul style="list-style-type: none"> • Self-assigning tasks to individuals • Team members as stakeholders
9	Poor team cooperation both internally and with external parties	8		Good results because of the application of non-standard approach	<ul style="list-style-type: none"> • Close involvement of stakeholders • Trust
10	Focus on delivering within conditions (time, budget, etc.) while applying the changes	8		Adaptation to the changing circumstances	<ul style="list-style-type: none"> • Embrace change • Broad task definition
11	Unstable scope in early phases of the project	5	Management of changes during the project's progress		<ul style="list-style-type: none"> • Embrace change • Broad scope definition
12	Clear goal, flexible path, creative team, maintaining trust	9		Open to alternatives Reflection on the way of working Trust-based working condition	<ul style="list-style-type: none"> • Trust • Possible alternatives • Short feedback loops

(Continued)

Tab. 5: Continued

Case	Situation	Flexibility score	What has to be improved in flexibility	What went well	Related flexibility enabler (s)
13	Rework due to external changes and uncontrolled risks	8		Broad overview of the process, knowledge of change Management	<ul style="list-style-type: none"> • Embrace change • Seizing opportunities and coping with threats • Contingency planning
14	Little flexibility in process	6	Application of fixed procedures and processes		
15	Difficulty in management of internal organisation Scarcity of right people in the team	8	Problems in following the standard procedures	Implementation of flexibility Top management support	<ul style="list-style-type: none"> • Management support • Network organisation
16	Dealing with a lot of changes during the execution phase to fulfil the project	2	Flexibility towards the changes		<ul style="list-style-type: none"> • Embrace change • Broad task definition
17	Implementation of new management process with attention to schedule and control systems	8	Good and visible communication with mother organisation Clear stage gates with politicisations for go/no-go decisions Paying attention to all involved stakeholders	Keeping the focus on project objectives	<ul style="list-style-type: none"> • Close stakeholder involvement
18	Management team comprises people from three different companies	8	Flexibility in cooperation between involved companies	Keeping the balance between organisational interests and project interests Learning by doing and improving	<ul style="list-style-type: none"> • Close stakeholder involvement • Trust • Team priority over individual priority • Interactive decision-making
19	Major scope changes, hierarchy in design- management team	8	Less flexibility in individual task performance due to high workload	Flexibility to apply scope changes Less attention to budget barriers	<ul style="list-style-type: none"> • Embrace change • Broad task definition • Functional-realisation-based contract
20	Tight deadline	9		Periodic planning (every 6 weeks), weekly progress meetings for management team, daily progress meetings for subteams	<ul style="list-style-type: none"> • Iterative planning • Short feedback loops • Open information exchange
21	Good management of quality, time and stakeholders but not costs	9	Flexibility at all times and not at specific moments only	Close contact with customer, dealing with all the issues by a very flexible modus operandi	<ul style="list-style-type: none"> • Close stakeholder involvement
22	Rigid project management process between the lead advisors from multiple companies in the Consortium	8	Generating information regarding project management (time-consuming and not always used)	Flexibility to manage client expectations, team members and involved organisations Working together in the same location in order to manage interfaces, Align decision support information and provide insight into the process of activities	<ul style="list-style-type: none"> • Network organisation • Open information exchange • Joint project office • Interactive decision-making

(Continued)

Tab. 5: Continued

Case	Situation	Flexibility score	What has to be improved in flexibility	What went well	Related flexibility enabler (s)
23	Too much effort on project management process due to introduction of a new method	5	Flexibility not an objective of project management system at the company	Coping with unexpected incidents	
24	Poor relationship with the client, enormous amount of changes	8	Too much focus on controlling the budget and not much on customer satisfaction		<ul style="list-style-type: none"> • Close stakeholder involvement • Embrace change

having a flexible *modus operandi* in their project management was successful. In his eyes, flexibility should be applied continuously, not only in certain moments.

These practical examples illustrate the four stages of the proposed flexible project management framework.

10 Discussion

Answering the four research sub-questions on current flexible project management approaches, the enablers of flexibility, the practitioners' perspectives and the contribution of flexibility to project performance resulted in a framework of flexibility (Figure 3).

Terryn et al. (2016) specify that developments in terms of projects have become increasingly complex, which makes the future of such developments hardly predictable. They argue that the existing theories and frameworks for the evaluation and planning of such complex developments do not take into account the complexity and uncertainty of project delivery. According to them, these frameworks have linear or circular logic, focused on several feedback loops and assumed causal links in the organisation, planning and performance of a project. What they propose as a solution is a situational approach based on the nature of planning issues and the playing field. They believe that in situations where the playing field is highly dynamic, undefined and volatile, the developments need to be highly open, flexible and innovative (Terryn et al. 2016; Boussauw and Boelens 2015). In such conditions, a co-evolutionary approach would be required. This, however, is not conflicting with the flexibility framework, as presented in Figure 3.

In our research, the idea of flexibility in project management acknowledges the importance of iterative processes for the achievement of improvements based on short feedback loops. Therefore, the flexibility framework developed in this research follows an iterative process in

a circular manner. The framework includes multiple and reverse arrows, which acknowledge the iteration in any direction depending on the situational circumstances and required improvement actions.

The proposed flexibility framework covers both the people side of the projects as well as the process side of project management. The people side is mainly highlighted in Step 2, in which practitioners' perspectives are taken into consideration.

10.1 Scientific contribution and managerial implications

It is recognised that project complexity is increasing (Bosch-Rekvelde 2011; Bakhshi et al. 2016). Different management approaches are suggested for managing projects based on their complexity (Hertogh and Westerveld 2010). These management approaches can be categorised into two main management streams: a mechanistic stream and an organic stream. Some other scholars state that pure approaches, either mechanistic or organic, do not perform well (Geraldi 2008; Huchzermeier and Loch 2001; Koppenjan et al., 2011; Kreiner 1995; Olsson 2006; Osipova and Eriksson 2013; Wysocki 2007). Therefore, a fine balance in the spectrum of management approaches is required (Hertogh et al. 2008). Such balance is referred to as flexibility in the literature (Geraldi 2008; Osipova and Eriksson 2013). While literature acknowledges the need for flexibility in project management, it hardly identifies the enablers of flexibility and their effect on project performance. This research bridges this gap in the literature by proposing a flexibility framework.

The managerial implications of this research can be divided into two main categories: implementation of each step given in the proposed framework and the implementation of the whole framework. First, the implication of each of the four steps is discussed, followed by the application of the whole flexibility framework.

10.1.1 Insight: application of Agile project management and Scrum

In Section 4, the application of Agile management and Scrum, which is the most-known tool of Agile, was discussed. This research revealed some positive aspects of Scrum, as well as some challenges that might be faced while applying Scrum in the early phases of infrastructure projects. Practitioners would benefit from this case study research by working on the positive aspects of Scrum, such as teamwork quality, interchange of knowledge, rework reduction, increased efficiency and client satisfaction. For example, Scrum works well for integrating the team. Therefore, the teamwork quality can be improved by applying Scrum. Another example is about face-to-face communication in a Scrum working environment. Using Scrum, the efficiency is increased and reworks caused by miscommunication can considerably be reduced or avoided.

Apart from the positive aspects, attention should be paid to address some of the challenges faced while applying Scrum in the context of infrastructure construction projects: multitasking of team members, a high number of Scrum meetings, low client commitment level and uncertainty about the benefits of Scrum. The context of construction projects is different than that of the software industry, for which Scrum was developed. The intensity of Scrum meetings, such as sprint evaluation meetings, daily stand-ups and sprint planning meetings, has to be adjusted to the context where Scrum can be used. Daily stand-ups in the study phase of a construction project might be felt as too frequent. The idea behind daily stand-ups is short-cycle communication to exchange knowledge about the work in progress. The duration of these cycles should obviously match the speed of the project's progress in the specific context.

10.1.2 Importance: practitioners' perspectives

In Section 6, the practitioners' perspectives regarding the concept of flexible project management were discussed. This step of the research revealed similar (parallel) practitioner perspectives for client and consultant organisations. Knowing that practitioners' perspectives are the same in these organisations could facilitate their collaboration. Three main mind-sets for becoming flexible in project management were found: 'trust', 'scope flexibility by contractual flexibility' and 'proactive management'. Based on the project at hand, a project team could benefit from knowing these different mind-sets. The

team members, together with the project manager, can work on the application of the flexibility enablers that they ranked high. For example, if the project requires more flexibility in scope management and contractual agreements, the involved parties (clients and consultancies) can work together in understanding how they can empower the flexibility in this area to benefit from it in their project.

10.1.3 Implementation: making project management flexible

As discussed in the Introduction section of the paper, currently, complex infrastructure construction projects call for a more-flexible project management approach than a pure control-oriented approach. Section 5 presented the enablers of flexibility in project management grouped in five areas (what, how, who, when and where). Practitioners can decide to add a certain area of flexibility into their practice by applying the enablers that belong to a specific area or by focusing on specific enablers regardless of the area they belong to. The decision on which area of flexibility is required or should be optimised is left to the practitioners. Based on the projects' context and common practice, practitioners can decide where they need to increase flexibility. For example, if there is a lack of trust in their project, they can work on increasing the level of trust internally in their own team and externally with other involved parties. As a result of increasing the level of trust, the flexibility of project management will be improved.

10.1.4 Improvement: improving project performance

The intention behind making project management flexible might come from the desire to improve project performance. Based on the results of our study (Section 7), the focus should then be on the 'how' flexibility. By applying these enablers, project performance is expected to improve regardless of the project's complexity. For example, the project team can focus on 'open information exchange' by providing a platform to exchange information about the project with other parties to increase the chance of the project's success. Another example could be interactive decision-making. If the decisions are made interactively by the team, rather than by a single actor, overall commitment will be higher as varying opinions can be heard and taken into account. Implementation of any of the enablers in the 'how' category of flexibility has the effect of significantly improving project performance.

10.2 The application of the Flexible Project Management framework

Before starting to apply any aspect of flexibility, the practitioners need to know the current state of flexibility in their practice, especially if they apply any form of flexible approaches such as Agile project management. It is recommended to find the balance between the Agile and waterfall management approaches based on the specific project context. By understanding how complex the project is, practitioners can choose the right management approach. This management approach can be a hybrid version of waterfall management and Agile project management. For example, by planning the project in iterations (short or long), organising co-located teams, focusing on value delivery rather than task delivery and establishing stable teams, the project team can work with more agility.

In the second step, it is recommended to recognise the different practitioners' perspectives ('trust', 'scope flexibility by contractual flexibility' and 'proactive management') about making project management flexible and giving priority to the one (including its high-ranked enablers) that fits the project context based on its requirements and complexity.

After understanding to what extent the current practice is flexible (Step 1) and how important it is to be more flexible (Step 2), Step 3 focuses on embedding the enablers of flexibility in practice. In general, making project management flexible can be done by enabling flexibility in terms of the scope of the project (what), in terms of project processes (how), the project team (who), project scheduling (when) and the location where the project team is organised (where).

The fourth and last step focuses on improvement and, in this case, improvement of project performance. Here, focus should be given to the application of (some of the) enablers that belong to the flexibility of 'how'.

In this framework, an iterative way of recognising, applying, learning and improving is suggested. Based on the specific project context, the focus of the practitioners might be on any stage of this framework. However, no matter what is the starting point, it is about an iterative way of recognising, applying, learning and improving. The value will be gained when project management flexibility is improved upon experience and learning. Therefore, after Step 4, an assessment can be done again on recognising the status of flexibility, after which the steps can be repeated.

The practice of project management in the construction industry can benefit from this research in different respects. First of all, flexible approaches, such as

the Agile project management, are new in this industry. This research tried to enhance the application of such flexible approaches by highlighting the positive as well as some challenging aspects of Scrum as the most-used tool of the Agile approach. Moreover, the idea of flexibility in project management is relatively new in project management sciences. What practitioners find important regarding flexibility was quite unknown at the start of this study. The proposed framework makes the possible perspectives regarding flexibility more explicit for practitioners. According to the literature, the construction industry is lagging behind in applying the new developments in project management. This research helps practitioners move towards more flexible project management approaches as a way to catch up with the pace of other industries in terms of new developments in project management. This research also emphasises the importance of continuous improvement, supported by the proposed flexibility framework. The construction industry could benefit from all these different outputs of this research by adopting the different perspectives of flexibility in project management discussed in this paper.

10.3 Limitations and recommendations for further research

The limitation of the study is the limited testing of the applicability of the proposed framework. All stages of the framework were confirmed in different steps of the research, either statistically or by doing qualitative analysis. The applicability of the overall proposed framework, however, requires further research.

The newness of the studied topic of flexibility in project management leaves room for further research, even after this study. This is recognised in a few directions: the application of Agile, flexible project management and management of project complexity. Since this paper proposed a conceptual framework for flexibility in project management, it is recommended to study the applicability of the proposed framework in practice as well as its further development.

11 Conclusion

Project management is aimed at supporting practitioners to increase the probability and the successful delivery of their projects in a manner that stakeholders appreciate, and it includes both hard factors and soft factors of project management. It was developed in the 1950s and is

maturing continually, but it still has deficiencies, which arise as consequences of environmental changes and developments. Scientists' and practitioners' attention is drawn towards the study and understanding of project complexity in order to be able to manage it. Conventional project management seems no longer effective in managing project complexity and uncertainty. Therefore, to make project management capable of managing project dynamics, it is suggested to increase its flexibility. The objective of this conceptual paper was to propose a practical framework to enhance the embedding of flexibility into project management practice. By answering four research sub-questions, a flexibility framework was proposed. The four stages of the framework are insight, importance, implementation and improvement. The first stage's goal is to get an insight into the current situation in terms of the applied project management approach. The idea is to understand whether any flexible approach (such as Agile project management) is being applied or not. In this stage, the preconditions for making project management flexible should be explored. The second stage involves understanding what is important for flexible project management from the practitioners' points of view (creating awareness for the different perspectives) in the specific project context. The third stage is about making project management flexible. The input of this stage contains the list of 26 verified flexibility enablers in five areas of flexibility (what, how, who, where and when). The fourth stage is narrowing down the flexibility enablers to those that are shown to improve project performance. It was proven that, among all the five areas of flexibility, flexibility of 'how' had a positive significant relationship with project performance. It is, therefore, recommended to apply the enablers from the 'how' flexibility.

Even though the proposed framework has not been extensively tested yet, the data from 24 cases in which practitioners recognised the importance, as well as the existence or lack of flexibility in their practice, was used to support the framework's setup and content. Future research can investigate the application of the framework in practice.

References

- Aaker, D. A., & Mascarenhas, B. (1984). The need for strategic flexibility. *The Journal of Business Strategy*, 5, pp. 74.
- Abrahamsson, P., Warsta, J., Siponen, M. T., & Ronkainen, J. (2003). New directions on agile methods: A comparative analysis. In: *Proceedings of the 25th International Conference on Software Engineering 2003*. Portland, OR, USA, 3-10 May 2003, IEEE, pp. 244-254.
- Agile-Methodology. (2014). *What is Scrum?* [Online]. Available at: <http://agilemethodology.org>.
- Atkinson, R., Crawford, L., & Ward, S. (2006). Fundamental uncertainties in projects and the scope of project management. *International Journal of Project Management*, 24, pp. 687-698.
- Augustine, S., Payne, B., Sencindiver, F., & Woodcock, S. (2005). Agile project management: Steering from the edges. *Communications of the ACM*, 48, pp. 85-89.
- Bakhshi, J., Ireland, V., & Gorod, A. (2016). Clarifying the project complexity construct: Past, present and future. *International Journal of Project Management*, 34, pp. 1199-1213.
- Bateson, G. 1972. Ecology and flexibility in urban civilization. *Steps to an Ecology of Mind*, pp. 494-505.
- Beck, K., Beedle, M., Bennekum, A. V., Cockburn, A., Cunningham, W., Fowler, M., et al. (2001). *Manifesto for Agile Software Development* [Online]. Available at <https://agilemanifesto.org/> on Accessed 1 March, 2014.
- Blaikie, N. (2009). *Designing Social Research*, Wiley, Cambridge, UK.
- Blom, J. A. (2014). *Embracing Change: The Road to Improvement?* Master, Delft University of Technology
- Boehm, B., & Turner, R. (2003). *Balancing Agility and Discipline: A Guide for the Perplexed*. Addison-Wesley Professional, Boston.
- Bosch-Rekvelde, M. (2011). *Managing project complexity: A study into adapting early project phases to improve project performance in large engineering projects*. Doctoral of Philosophy Delft University of Technology
- Bosch-Rekvelde, M., Jongkind, Y., Mooi, H., Bakker, H., & Verbraeck, A. (2011). Grasping project complexity in large engineering projects: The Toe (Technical, Organizational and Environmental) framework. *International Journal of Project Management*, 29, pp. 728-739.
- Boussauw, K., & Boelens, L. (2015). Fuzzy tales for hard blueprints: the selective coproduction of the Spatial Policy Plan for Flanders, Belgium. *Environment and Planning C: Government and Policy*, 33, pp. 1376-1393.
- Chan, H. K., & Chan, F. T. S. (2010). Comparative study of adaptability and flexibility in distributed manufacturing supply chains. *Decision Support Systems*, 48, pp. 331-341.
- Cobb, C. G. (2011). Making sense of agile project management: Balancing control and agility, John Wiley & Sons, Hoboken.
- Collyer, S., & Warren, C. M. J. (2009). Project management approaches for dynamic environments. *International Journal of Project Management*, 27, pp. 355-364.
- Cooke-Davies, T., Cicmil, S., Crawford, L., & Richardson, K. (2008). We're not in kansas anymore, Toto: Mapping the strange landscape of complexity theory, and its relationship to project management. *Engineering Management Review, IEEE*, 36, pp. 5-21.
- Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage, London, UK.
- Geraldi, J. G. (2008). The balance between order and chaos in multi-project firms: A conceptual model. *International Journal of Project Management*, 26, pp. 348-356.
- Giezen, M. (2012). Keeping it simple? A case study into the advantages and disadvantages of reducing complexity in mega project planning. *International Journal of Project Management*, 30, pp. 781-790.
- Gil, N., & Tether, B. S. (2011). Project risk management and design flexibility: Analysing a case and conditions of complementarity. *Research Policy*, 40, pp. 415-428.

- Gupta, S. K., & Rosenhead, J. (1968). Robustness in sequential investment decisions. *Management Science*, 15, pp. B-18-B-29.
- Harvett, C. M. (2013). A study of uncertainty and risk management practice relative to perceived project complexity. Doctor of Philosophy, Bond University.
- Hashimoto, T., Stedinger, J. R., & Loucks, D. P. (1982). Reliability, resiliency, and vulnerability criteria for water resource system performance evaluation. *Water Resources Research*, 18, pp. 14-20.
- Hertogh, M. (2014). *Opportunity Framing Management of Engineering Projects: People are the Key*. Nijkerk, The Netherlands NAP (The process industry competence network).
- Hertogh, M., Baker, S., Staal-Ong, P., & Westerveld, E. (2008). *Managing large infrastructure projects. Research on Best Practices and Lessons Learnt in Large Infrastructure Projects in Europe*, AT Osborne BV, The Netherlands.
- Hertogh, M., & Westerveld, E. (2010). Playing with complexity - Management and organization of large infrastructure projects. Doctor of Philosophy Erasmus Universiteit Rotterdam
- Highsmith, J. A. (2002). *Agile Software Development Ecosystems*. Addison-Wesley Professional, Boston.
- Huchzermeier, A., & Loch, C. H. (2001). Project management under risk: Using the real options approach to evaluate flexibility in R... D. *Management Science*, 47, pp. 85-101.
- Jalali Sohi, A. (2018). Flexibility in project management: Towards improving project performance. Doctoral Delft University of Technology.
- Jalali Sohi, A., Bosch-Recveldt, M., & Hertogh, M. (2018). Practitioners' perspectives on flexible project management. *IEEE Transaction in Engineering Management*, In press.
- Jalali Sohi, A., Hertogh, M., & Bosch-Rekveltd, M. (2016). Scrum in practice for infrastructure projects *EURAM 2016*. Paris.
- Kellenbrink, C., & Helber, S. (2015). Scheduling resource-constrained projects with a flexible project structure. *European Journal of Operational Research*, 246, pp. 379-391.
- Koppenjan, J., Veeneman, W., Van Der Voort, H., Ten Heuvelhof, E., & Leijten, M. (2011). Competing management approaches in large engineering projects: The Dutch RandstadRail project. *International Journal of Project Management*, 29, pp. 740-750.
- Kreiner, K. (1995). In search of relevance: Project management in drifting environments. *Scandinavian Journal of Management*, 11, pp. 335-346.
- Layton, M. (2010). *Agile Project Management for Dummies, For Dummies*.
- Olsson, N. O. E. (2006). Management of flexibility in projects. *International Journal of Project Management*, 24, pp. 66-74.
- Osipova, E., & Eriksson, P. E. (2013). Balancing control and flexibility in joint risk management: Lessons learned from two construction projects. *International Journal of Project Management*, 31, pp. 391-399.
- Owen, R., Koskela, L., Henrich, G., & Codinhoto, R. (2006). Is agile project management applicable to construction? In: *Proceedings of the 14th Annual Conference of the International Group for Lean Construction*, pp. 51-66.
- Perminova, O., Gustafsson, M., & Wikström, K. (2008). Defining uncertainty in projects—a new perspective. *International Journal of Project Management*, 26, pp. 73-79.
- Priemus, H., & van Wee, B. (2013). *International Handbook on Mega-projects*. Edward Elgar Publishing, Northampton.
- Sager, T. (1990). *Notions of Flexibility in Planning-Related Literature*. Nordic Institute for Studies in Urban and Regional Planning, Stockholm.
- Smith, D., & Irwin, A. (2006). Complexity, risk and emergence: elements of a "management" dilemma. *Risk Management*, 8, pp. 221-226.
- Terry, E., Boelens, L., & Pisman, A. (2016). Beyond the divide: Evaluation in co-evolutionary spatial planning. *European Planning Studies*, 24, pp. 1079-1097.
- Turner, J. R. (2004). Five necessary conditions for project success. *International Journal of Project Management*, 22, pp. 349-350.
- Vidal, L.-A., Marle, F., & Bocquet, J.-C. (2011). Measuring project complexity using the Analytic Hierarchy Process. *International Journal of Project Management*, 29, pp. 718-727.
- Wallace, W. L. (1971). *The Logic of Science in Sociology [Sound Recording]*. Transaction Publishers, New Brunswick & London.
- Williams, T. (2005). Assessing and moving on from the dominant project management discourse in the light of project overruns. *Engineering Management, IEEE Transactions on*, 52, pp. 497-508.
- Wysocki, R. K. (2007). *Effective Project Management: Traditional, Adaptive, Extreme*. Wiley Pub, Indianapolis, IN.
- Yin, R. K. (2002). Case study research: Design and methods. In: *Applied Social Research Methods*. Sage Publications, Inc., Los Angeles, p. 5.