Relating, reflecting and routinizing: Developing project competence in cooperation with others

Jonas Söderlund a,b,*, Anne Live Vaagaasar a, Erling S. Andersen a

a BI Norwegian School of Management, 0442 Oslo, Norway
b Management and Engineering, Linköping University, Sweden

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Abstract

In a world where projects represent an increasingly important organizational and economic unit, the capability of generating and executing projects becomes critical for company performance and sustainability of firm-level competitiveness. Despite recent contributions to the area of project-capability building, many of the challenges remain largely unexplored areas of research. The aim of this paper is to increase our understanding of how firms develop competence in a focal project. To accomplish this, we use an in-depth study of a complex development and implementation project. Applying a ‘process approach’ to the study of project competence, we identify three separate learning mechanisms: relating, reflecting and routinizing. We show how these mechanisms contribute mutually to the expansion and utilization of the resource base of the project.

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1. Co-creating project competence

Project management research has shown increased attention to the processes of how to facilitate learning and competence development in project environments. Previous research has looked at the criticality of inter-project learning and cross-project learning (e.g. [25,6]), and how projects may stimulate learning and thereby function as arenas for learning [20]. Given the ongoing ‘projectification’ of a number of industries and sectors, we would assume that the firm-level development of the ability to generate and execute projects is a determining factor for competitiveness and firm-level performance in the future. In other words, projects not only represent unique instances for generating new knowledge and communal learning, but they also provide firms with the possibility of using and re-using existent knowledge. However, the dual challenge of using what is already known and coming up with novel solutions seems to be particularly demanding in a project context. Although we will not give a complete answer to the exploration–exploitation dilemma facing project-intensive firms in this paper, we will offer a new and complementary way of analyzing the development of project competence.

In line with Hedlund [11], we believe that studies of knowledge development and capability building, in general, should pay closer attention to the temporary project and its inter-organizational aspects. Such studies would not only improve the understanding of the practice of project management and learning in projects, but also improve the knowledge of the difficulties of establishing firm-level project competence and project capabilities (see e.g., [5,28,29]). The latter is important in gaining an understanding of the qualities of individual learning in an increasingly important work setting and for identifying important characteristics of ‘project-based learning’ [7].
We argue that mainstream analyses of project competence tend to neglect the interrelatedness of the competence developed at the project-level and the competence developed at the organizational level. Building on an in-depth case study of the GSM-R project at the Norwegian Rail Administration, we highlight the ‘co-creational’ character of competence development at the project and firm-level and between the project and its environment. The project under study posed several challenges and forced the members of the project management team to seek new knowledge, and to establish new routines and a new way of working with stakeholders. The project entailed both exploitation of what was already known within the project management team and in the rest of the base organization, and exploration activities and development of new knowledge.

In our version, project competence cannot merely be seen as a firm-level, organizational capability. Additionally, competence should be investigated at the project level, observed in the actions of the project management team, and developed through the hurdles and challenges facing the team throughout the project [33]. We describe and analyze how project-level competence develops over time and identify important learning mechanisms of such a development. We argue for the value of a detailed analysis of the combination of relating, reflecting and routinizing within the project. Moreover, we point out how analyses of project-level learning mechanisms may contribute to the knowledge of organizational capability in a particular type of project-based context.

We first review the literature on project capabilities and project competence. Second, a discussion follows about our approach to project competence and a presentation of the aim and research questions addressed in the paper. Third, we outline the case study methodology and a few key issues of the study reported here. We thereafter continue with presenting the case study and the major events observed in the project, describing the case project in a chronological fashion. Finally, we end with an analysis of the project and conclusions, and a few avenues for future research.

2. Project organizing and project competence

Research and writing about project management and project organization have developed rapidly in the past few decades. From being largely dominated by a planning-oriented approach, the area of project research today shows a remarkable degree of plurality. One emerging set of studies, coming from strategy research, has argued for the need of studies of individual projects—i.e., detailed analyses of project-level activities to understand the development of new organizational capabilities and corporate renewal. For instance, the work of Bowen et al. [1] explained corporate renewal by focusing on single projects. Our paper follows a similar development trait in the way that we seek to illustrate the importance of looking at individual project activities to understand capability development. Relying on previous work within this area, most notably the work of Davies and Brady [5] and Brady and Davies [2], we offer an alternative model of capability development in project contexts.

Recent research has documented the widespread value of ‘dynamic capabilities’ [31] and the importance of these capabilities to create, extend and modify the ways firms operate. Here, dynamic capabilities refer to ‘the firm’s ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments’ [31, p.516]. In this paper, we draw on the idea of dynamic capabilities; however, we particularly center on how such development processes are to be understood at the project level. Relying on the definition of Helfat et al. [12], we take interest in the processes of how a project/temporary organization increases and improves its ‘capacity...to purposefully create, extend, or modify its resource base’. The focus here is then on the single project and the acts of the project management team. Such a general approach may not only contribute to the overall understanding of dynamic capabilities, but perhaps equally importantly, to the role and practice of project management teams—a region of research that is largely unexplored [27]. We also believe that a study of how competence and capabilities are developed within a project might add to the understanding of critical capabilities in a project-based or project-led organization [15]. Our analysis of competence building acknowledges that projects are processes of knowledge development and learning. In our version of competence building, we also acknowledge projects as carried out in a complex web of relationships between project members with formal affiliation to the project team and other stakeholders, including project owners and subcontractors.

The idea of dynamic capabilities in project-based firms is not new. Drawing on the classic research on organizational capabilities, Davies and Brady [5] and Brady and Davies [2] have contributed to the understanding of how processes of capability building are to be understood within project contexts. The authors launch the concept of ‘project capabilities’ as those capabilities required for firms to move technology and market base. In their view, projects represent important mechanisms for experimentation, and equally, that learning must be transferred to coming projects to allow for the economization of past experience. In other words, economies of repetition are fundamental in the building of firm-level project capabilities. In the type of project examined in this paper, we particularly analyze what happens at the project-level. Accordingly, project-capability building then seems very much to be a matter of both repeating and concurrently exploring new knowledge areas. Managers of projects struggle with new challenges almost on a daily basis—competence development is therefore to be seen as a continuous process tightly integrated into everyday managerial and organizational action.

To help us understand project competence development, we suggest a ‘process approach’ in the manner that it has
been presented by, for example, Weick [36], Van de Ven et al. [34], and Tsoukas and Chia [32]. A process approach, in its ultimate form, assumes that reality is made from events of experience [37]. These events connect and form various types of interaction patterns. We therefore assume a fundamental interconnectedness of all things, and that entities that are connected mutually define one another and make one another significant [37]. Accordingly, the development of project competence closely resembles the act of sensemaking and the importance of “assembling interdependent ongoing actions into sensible sequences that generate sensible outcomes” [35]. The project/temporary organization assembles various knowledge, skills and experiences to cope with its task as the members of the project perceive it. This means temporarily placing portions of reality in a framework of time and space connections, even though they occur temporally and spatially dispersed [35].

As a consequence, projects and competencies are locally defined and strongly “situated”. This means that knowledge is a matter of social construction and therefore it can neither be objective nor stable. The learning processes and their outcomes are therefore seen as evolving matters of pre-selection, variation and retention [16]. This also means that the development of project competence is contingent upon the challenges that the project organization faces and the actors with whom it interacts. In short, we presume that the project, as it acts and makes sense of its actions [36], develops knowledge, skills and aptitudes to handle the multiplicity of challenges ahead. Projects then become arenas where different knowledge bases can be integrated and could therefore constitute occasions for the development of strategic competencies [26], although this process is far from straightforward given the situated and local character of competence development in complex projects.

3. Research Methodology

The empirical basis for this paper is a multi-year study of a large-scale technology development project in Norway. One of the authors has followed the project and the project management team (henceforth ‘the PM team’) from November 2002 until the end of 2005. To obtain background information, we analyzed documents such as the project handbook and descriptions of the planned project management processes. However, the most important sources of information have, in accordance with the ethnographic approach, been systematic observation and semi-structured interviews [10].

In total, the study is based on more than twenty ‘formal’ interviews and many more informal conversations with key players in the project, especially the project manager. We selected open-ended interviews as one important source of information to be able to capture the development of the project and also document the personal experience of the people involved in the project. Another source of information was systematic observations [10]. We have applied this method extensively to provide valuable insights into the project practices.

We have regularly followed the weekly internal PM team meetings for more than a year and a number of other meetings to understand the organizational interfaces operating in the project. The following three interfaces proved especially interesting: (1) the project-project owner interface, (2) the project-subcontractors interface, and (3) the project-users interface. We also followed the PM team’s meetings with various user groups, special meetings with subcontractors and open information meetings. The principal investigator also participated in a wide spectrum of occasional activities, ranging from the monthly “salary beer” to the celebration of 150 years of train operation in Norway.

We have chosen to present the empirical material as a story to not only preserve plausibility and coherence, but also to embody the past and present [36]. This is important, especially since we have suggested that project competence can be adequately understood as a situated practice. Moreover, the material we collected was rich and ambiguous which also favors storytelling, so that we are able to capture both “feeling and thought” ([36]: 60). This allowed us to make sense of the material without forcing predefined categories on it. Of course, the full story cannot be told in a single paper. What is presented here is a summary of emergent findings on the development of project competence to make a point of some issues associated with the understanding of project competence. A detailed account of the life and hurdles of the project and the PM team is presented elsewhere (see [33]).

4. A journey of unforeseen challenges and relationships

This paper focuses on a large-scale development and implementation project of GSM-R that was launched by the Norwegian National Rail Administration (henceforth JBV) in 2001. The GSM-R is a Europe-wide standard for railway communication – which so far has been installed by 11 of the more than 30 countries that have decided to implement the system. Compared to the conventional GSM standard, the GSM-R offers a range of additional features to meet the requirements of railway operators, which include emergency calling, call prioritization, fast connection and group calling. The core idea of the system is to ensure communications between train driver and traffic control.

Over the years, the focal base organization has executed a number of large-scale development and implementation projects. Still, the GSM-R project appeared as a great challenge to this organization, and in particular to the PM team in charge of development and implementation.

The project was initiated in 2001 and completed at the end of 2007. The estimated budget was about 200 million Euros. The system was implemented from 1 July 2007 for all railway lines planned – in total 4000 km. The system was implemented within the set time limits, with good
economic margins and to the satisfaction of the owner organization, which on behalf of the Norwegian Ministry of Transport and Communications, holds the responsibility for quality control.

This project was not only challenging in terms of the size of the project, but also because of the many technological uncertainties and the requirements of close cooperation with subcontractors. The transition created by the project was expected to alter work routines and communication patterns for and between those who operate the trains, those who supervise the train traffic and those who provide systems maintenance and service. All of these people would need to acquire new competencies as a result of the project. The most important premise providers for the GSM-R development were the two departments of the JBV that manage technical and traffic regulations. Other stakeholders of the project included local and central politicians, and the neutral control body under the Department of Transport and Communications that held the final authority to accept or reject the system. Additionally, two major subcontractors were involved, referred to in the case description as Alpha Ltd. and Beta Inc. (code names).

5. Involving the top forces

In the beginning of the project, the PM team worked extensively with problem-solving dialogues and activities to develop knowledge and competence. Even though the team had been set up to possess the required competence and skills, it was engaged in extensive exploratory activities. As the team acted and made sense of the actions, the team members were able to develop shared patterns of beliefs and perceptions. In many ways, these shared patterns of perceptions centered on various processes at technical and organizational interfaces. From mainly being based on a trial-and-error logic, the PM team’s dialogues grew to contain more experience-based reflections. Broadly speaking, one might say that the learning efforts of the PM team developed from emphasis on direct problem-solving by applying a trial-and-error strategy, to refining and maintaining the competences required. This also suggests that the team, since it had developed knowledge through exploration, would exploit this in its future activities. Such exploitation, it seems, was made possible by the PM team’s efforts to develop codes and routines of operations. For instance, several manuals were developed and presented to other actors and stakeholders in the project; an activity that helped and eased the problem-solving activities on their side. A particular example was the team’s rewriting of the procedures for the design work after new practices had emerged while the parties worked with the design. As a consequence, not only were practices for operations developed, but also the more fundamental procedures and principles were revised. The first year of the project was characterized by numerous examples of trial-and-error when it came to operational problem-solving: “We just had to act and see what happened” (Interview, Project Manager, 10 November, 2003).

6. Towards the first milestone

In the autumn of 2003, the construction works and systems development started to show positive results. The atmosphere was positive and enthusiastic and the PM team was eager with regards to problem-solving. The PM team worked towards the first milestone set at 31 December 2003, the accomplishment of which proved to be a bit more troublesome than initially assumed. To solve the issue, the PM team used not only the idea of ‘just act and see what happens’, but also included the logic of information-decision-action. Time was also no doubt a key factor in the project since the project manager mentioned that they sometimes acted too fast because of perceived time pressure.

“We just start acting at the background of how things are and then they do not turn out the way they were assumed or the way we wanted them to. At times, we arrange meetings to talk and not at least to listen to their complaints. We listen to their anger and also discuss what to do next. So it goes on, hm...” (Interview, Project Manager, 15 April, 2004, talking about first initial delivery).

The perceived lack of time forced the PM team to act without having sufficient experience to determine in which direction these actions most likely would take them. The project started out very much as an abstract entity, an idea vaguely embedded in a charter and some premises, but with few characteristics and limited experience. As the PM team acted to see what would happen, it laid the groundwork for the development of competencies. Through this problem-solving activity of ‘act – and make sense of it and see what happens’, the ‘situated’ project competency development was established. By following the PM team, we saw how they engaged in analytical exercises, trying to determine the aspects of a given situation, what parties would probably be involved along with their expectations and requests. As the bases of these exercises, the PM team approached various stakeholders. Analytical exercises, followed by interaction with stakeholders, were repeated in the PM team’s activity and interaction patterns. The PM team did not take the project’s existence for granted, but rather regarded, it as a continuously changing, social construction of relations. The project appeared to be a coalition of stakeholders that needed to be kept happy in order to keep the project afloat.

7. Turning every stone

Over time, severe problems surfaced and the PM team took actions along two lines to solve the problems. One was pushing the decision makers and stakeholders to act; the other one was to work intensely with problem-solving activities. To solve the problems, the PM team engaged in extensive dialogues, trying to turn every stone and look
into every option to find solutions. An example of such problem-solving was observed at the PM team meeting on 13 March 2004 where various alternatives were discussed and tried out. The main alternative was to investigate how the routines for operation could be changed to compensate for the lacking system functionality. However, it was determined that this would produce noise, and a number of other difficulties, and most probably frustration for the people involved. It was difficult to compensate sufficiently for the lacking functionality; hence the PM team decided not to opt for this alternative.

After lengthy and detailed discussions about the situation, one of the PM team members concluded that the system could not be implemented by 1 April 2004. He finished by asking what to communicate to the Inspectorate. One of the PM team members followed up with “we need as little fuzz as possible”. The project manager suggested to “turn it all upside down – to emphasize how much of the system one could implement”. A proposal was made to buy time for the Inspectorate’s treatment of the case by providing the information little by little, but this alternative was rejected. Another suggestion discussed was to implement the GSM-R only as a back-up system: “We can focus on how the speech communication system will be provided and not mention the emergency communication” (Project Team Member A). The PM team also rejected this solution arguing that it would be too much trouble, both for them to organize it, and for the users since it would be difficult with regard to logistics and to the training required. Moreover, “it might cause a lack of faith in the system and in the project, in general, if it works out badly” (Project Team Member C). The conclusion of the meeting was to start working with how to implement it as a GSM-net, not GSM-R, and then implement the railway specific functionality little by little.

In the above account of the PM team meeting, we see how the PM team members discussed the solutions it aimed for and possible solutions to upcoming problems. They combined reflection with problem-solving and engaged in numerous discussions involving mental experimentations with possible problems–solutions–consequences to facilitate learning. The PM team was also conscious about how their discussions affected and related to the different actors, mentioning the Inspectorate and the user groups. The PM team showed awareness of how system delivery was entwined with training, logistics and faith.

8. Building knowledge relationships

The once and initially clear-cut technical task appeared to be infused with troubles that made the entire project difficult to manage. The problem-solving seemed to evolve into an endeavor of relational work; even more so as the technical parts appeared to be less controllable. The team faced different challenges as it acted on the task, which led the team to establish relationships and intense cooperation with other actors. One challenge, mentioned by the team members on numerous occasions during our conversations, was the limited time for completing the scheduled deliveries. This perception triggered initiatives to generate and work on relationships with other groups, trying to facilitate the team’s own maintenance and also to buy itself time while getting access to the competence of other actors.

The observed pattern often started with one of the team members reporting on their situation. Following the report, the project manager would typically ask: “Is that a problem or will that be a problem regarding the planned delivery?” This question often referred to the time aspect of the delivery. Then, if the answer was affirmative, the next question would be: “What do we do?” The answer to this question was often: “Who is responsible for this at the main office, at the technical division or at the subcontractors’, and who can we talk to?” The PM team members discussed these questions and often identified the persons to approach and how to compel them to act. The team’s intention often seemed to be twofold: to affect decision-making processes and discuss matters in order to competently solve the problems.

The relational activity also seemed to be triggered by the technical development process as such. At the outset, the project had been regarded as straight-forward and manageable, however, working on it, the project seemed to require extensive exploration and new knowledge. This called for competence development. Even though the team had been pulled together to maximize the overall team competencies for this particular project, they lacked the necessary competencies as the task took on new aspects. This acknowledgement forced the PM team to seek out sources where knowledge resided and could be found. The PM team engaged in workshops with similar projects in other countries, and workshops were held with the subcontractors and users. During the winter and spring of 2003–2004, the project sought out quite a number of sources that proved more or less helpful, but as spring arrived the number of possibilities was reduced. There seemed to be a set of relationships recurring in the project’s exploration of competence. The ‘knowledge relationships’ that remained over time were mainly those that had evolved into so-called standing work groups. Thus it seemed that the PM team, after having sought various sources for knowledge, had found a limited set of relations where knowledge and advice, enabling problem-solving, could be accessed. Over time, the PM team learned how it could get access to this knowledge and how the knowledge could be efficiently used. In sum, recognizing that technical knowledge fell short, the team explored relationships to discover where useful knowledge for problem-solving could be found. The lack of technical knowledge triggered behavior that led to the development of relational competencies aimed at obtaining access to technical knowledge.

We identified two gradually emerging features of the project competence that were quite remarkable. One was that the PM team, over time, acted variably in the same relationship. The second feature was that the PM team...
differentiated its actions across relationships depending on the interests, expectations and characteristics of the actors with whom it related. In spring 2003, Alpha (a leading subcontractor within this technological domain) entered the project. Establishing the relationship, the interaction appeared procedural and formal, rather than informal. The PM team concentrated on drawing up contracts and getting basic routines established. The relations seemed friendly and polite. Six months later, the communication between parties increased in precision and detail as a result of starting the work and obtaining some experience with the project and its major technical challenges. When starting up, the PM team had emphasized the high competence level of Alpha. Over time, the PM team’s discussions increasingly elaborated on how to enable Alpha to do their work, among other things by changing their own organization to compensate for the shortcomings of Alpha. Alpha did not, however, deliver in accordance with the expectations of the PM team. This forced the PM team to take actions to increase the efforts of Alpha. From the spring of 2004, the PM team held a series of shared planning sessions with Alpha. In addition a member of the JBV team was transferred to the Alpha subproject to help out with the planning work. Moreover, the PM team worked to help Alpha by providing incentives, as well as threats of economic penalties. Gradually, the relationship stabilized as ‘troublesome, yet workable’.

The PM team also developed an ability to act in different ways simultaneously when relating to various stakeholders. For example, in a situation where the project was not able to make its deliveries and its funding and further existence was at stake, the project produced ‘stories’. We identified a series of co-existing stories. The stories seemed to be developed partly to make other actors perform in certain ways that the PM team thought would facilitate problem-solving, and partly to maintain the stakeholders’ belief in the project. The content of the stories was different, depending on with whom the project interacted and on what kind of actions it wanted the other actors to take. In short, an emerging feature of project competence was the ability to fine-tune the communication of a situation, dependent on the presumed interests of various stakeholders at a particular point in time.

Because of the success in completing and installing the GSM-R system in 2006 on time, with acceptable budget costs, and with participant satisfaction through this novel and evolutionary process, it is considered to be a landmark project for JBV and a great success for advanced communications technology in Norway.

9. Theoretical interpretation

In the following sections we analyze the empirical material presented above. We focus on activities linked to the development of project competence and in particular what the PM team did to extend and transform the resource base of the project. In other words, we are interested in how dynamic capabilities are formed and developed in a project context. Analyzing such capabilities might not only increase our understanding of the role and practice of project management, i.e., how project management works to improve learning and knowledge development within a single project, but also how firms build organizational project competence and establish competitive advantage. In addition, such an analysis may improve our knowledge of the difficulties and limitations of transferring knowledge from one project to another. Given the empirical focus of our study, we take particular interest in the ways projects/temporary organizations engage in the development and implementation of ‘Complex Products and Systems’ (see e.g., [14]), and how they build necessary competencies to manage complex problem-solving activities. Such an organization normally struggles with the lack of previous experience from similar efforts and difficulties of sorting out necessary actions a priori. In many ways, the organization of complex projects is a matter of the skilful combination and re-combination of a diverse set of knowledge bases within and outside the organizational boundaries. As recognized by Løwendahl [19], the tasks and structures of complex projects “are constantly evolving and it is important for managers to allow them to change and to see that resources are reallocated as new information is discovered in the process of organizing”. The evolution and expansion of resources are therefore particularly important in the development of dynamic capabilities as the “environment is not something ‘out there’, fixed and immutable but can itself be manipulated” to serve the purposes of the organization ([25]: xiii). However, such evolution also illustrates the situated and recursive nature of project competence.

In the introductory sections, we laid the foundation for a ‘process approach’ on project competence building. We pointed out the importance of acknowledging the situated and recursive nature of such efforts. We believe that the process approach is especially valuable in the empirical context studied here – the case of managing a complex development and implementation project involving different organizations. Based on these initial theoretical standpoints and the empirical transcripts, we argue below that project competence might be understood as a combination of three related learning mechanisms, namely relating, reflecting and routinizing. In various ways, these mechanisms extend the analysis of the initial statements of the situated and contingent nature of competence at the project level.

10. Relating to expand resource base

As evidenced in the empirical case of the GSM-R project, the PM team devoted a great deal of time and effort to various types of relational activities. This had not only the purpose of dealing with the political environment influencing most large-scale projects, but also included a number of capability building exercises. If we treat the
dynamic capabilities as the configuration and extension of an organization’s resource base, then the relational work of the PM team is undeniably closely tied to competence development. The relational work is at first fumbling but, over time, its efficiency improves. This also means that the relational and networking process becomes a self-reinforcing learning process in itself where the team gradually develops its resource base, and specifically its ‘socal capital’ [22]. In other words, we cannot look upon the project/temporary organization as a closed-system endeavor that relies on the capitalization of existing resources, but must recognize the efforts to extend the resource base of the project. As many projects are nested in a complex web of connections [9], it seems that a large part of the project’s potential for problem-solving lies in its ability of relating. This has important effects for how we perceive a project. Drawing on the idea of the ‘project as a network’ [13], and as an interaction pattern, we notice that the project is a process that is undergoing continuous development and change. However, relational activity is not without problems in a project context. More than twenty years ago, Stinchcombe [30] showed that projects often violate the ‘decoupling principle’, forcing managers to coordinate activities across ‘authority systems’. Such work can be both time-consuming and tiresome, Stinchcombe argues, and may lead to severe cost and time over-runs for the entire project. In the case studied here, however, it is very difficult to think of a project that does not violate the decoupling principle. Instead, at times, the PM team wanted to violate the principle to involve external actors for purposes of extending the resource base of the project. Our empirical observations also shed new light on the role of stakeholder management in complex projects. Contrary to much mainstream research within this area that suggests a rather ‘defensive approach’ to stakeholders and argues for the importance of erecting boundaries around the project, our research shows that the PM team is quite heavily involved in crossing boundaries to improve the relational capability as a leverage for inter-firm cooperation [18].

Relating, as a learning mechanism, emphasizes the connectivity aspects of capability building and the fact that knowing “exists only through the interaction among various collective actors” [23, p.44]. As documented in the case study, the PM team involved stakeholders and outside parties to create interdependencies among project team members. This and similar efforts point to the fact that competence development was more than just a “mechanistic pooling of knowledge” [23, p.56], but rather a dynamic organizational effort of learning as people repeatedly interacted to create and extend the resource base of the project. The involvement of new actors also seems to have triggered a ‘generative dance’ of knowledge integration [4] that evoked novel associations, collective reflection and connections and clues, which, in various ways, led to new meanings and insights about the realities and actuality of the project [23].

11. Reflecting to improve use of resource base

The PM team tried to install various activities of reflection. Starting with a rather clear-cut task with a strong technical focus, the team, over time, became increasingly aware of its lack of knowledge. This seems to have been a surprise to the PM team and its management, especially since they had recruited the top forces within this particular area of technology with a broad base of competencies. As a consequence, problem-solving activities needed to be implemented and fostered. To increase the value of action and various types of experimentation based on a trial-and-error logic, the PM team had to generate value from experimentation. In this process, shared reflection played a significant role.

Drawing on the evolutionary idea of learning in projects, Lindkvist and Söderlund [16] describe three separate but overlapping phases of learning in projects. In their conception, project goals are important to trigger initial search and experimentation. In project contexts, such goals are normally tied to time pressure – when things should be done. In the project studied here, other types of goals were also relatively clearly specified – number of rails, number of radio base stations, technological features, etc., and the goals were quite stable over time. However, how to accomplish these goals was very much left to the project team. Despite the previous long history of working with large-scale projects, the JBV team lacked the necessary knowledge to solve the problem. This forced the PM team into a process of “just act and see what happens” [17]. Prior to this, they engaged in a series of exploitative learning efforts, including the reuse of routines and procedures developed in previous projects, and the recycling of old solutions and structures. However, these procedures did not fully apply in this new context. The turn to the experimentation logic also signaled a departure from an exploitative learning logic in favor of a more explorative learning approach [21], encompassing broad discussions of possible solutions, trial-and-error efforts and discussions with key stakeholders. The existing procedures still played an important role: by triggering the discussion with stakeholders and by detecting errors in the current technological solutions. What was particularly important then in the development of project competence was the team’s ability to engage in “real-time learning – analyzing and drawing lessons from the process while it was under way” [8, p.130].

Our observations thus support previous research on the criticality of reflection for learning and capability building. Reflection played a decisive role for the PM team’s effort to detect ‘system-wide errors’ [17] and for the generation of novel associations. The type of communal character of reflection also favored the conversion of individual, tacit knowledge into explicit knowledge, allowing it to be shared among the members of the project [24]. A few of these reflection efforts were turned into codified procedures and organizational routines which worked to incorporate previous experience into the resource base of the project.
12. Routinizing to secure resource base and improve relational activity

Often projects are considered to be unique and one-off endeavors with little similarity to previous experience. However, as Davies and Brady [5] argue, this does not fit with all project situations. Instead, firm-level project capabilities are built over the course of many projects – where ‘vanguard projects’ trigger exploration and search for knowledge that can be exploited in coming projects. In their view, putting too much emphasis on the unique character of projects may endanger the economic possibilities of capitalizing on previous experience. For instance, technological solutions, drawings, documents and ideas can be transferred to other projects without significant costs. In the GSM-R project, various types of routines played a significant role for integrating knowledge and building capabilities. Not only did the routines function as memories for the entire project but also for improving the efficiency of the other learning mechanisms. Drawing on the earlier discussion, we can see that routines led to different types of relational activity and enhanced the quality of knowledge exchange with external partners. Routines then contributed to the expansion of the resource base of the project and contributed to the establishment of project competence. Routines, however, also played a role for reflection in the project. By applying routines, the PM team could more easily detect errors and deviations in the project, and by rewriting existing routines and procedures, they could ensure that errors were not repeated. This conceptualization of routines then, not only treats routines as an organizational memory function, but it also acknowledges their absorptive capacity potential of the project/temporary organization [3]. Such a conceptualization is rather different from how routines have been treated in the previous analysis of dynamic capabilities in situations of low frequency tasks with high task complexity [38].

13. Combined learning mechanisms

As argued above, three mechanisms of learning are important for the analysis of how the aforementioned recursive character of project competence develops: (1) Relating acknowledges the situated character of project competence; (2) Reflecting highlights the actions of importance for institutionalizing a common frame of reference and activities for stimulating shared reflection within the project; (3) Routinizing, finally, emphasizes the role of routines through the codification of procedures in building project-level competence. The above discussion also emphasizes the close link between these three mechanisms, for instance, that reflection plays a decisive role in the capitalization of relational activities. This is particularly important for understanding the development of project competence – that competence exists not outside the activities and experience of members, but is continuously shaped and reshaped in the dynamic interplay between actors within the project and their actions. Even though we here, for analytical purposes, treat them very much separately, in practice we must see them as tightly combined and nested. For instance, routines without reflection have limited value. The same is true for relating. Relating must be based on the other mechanisms of learning; reflection that improves the use of the resource base, and routines that secure the resource base.

Table 1 shows in what way these three learning mechanisms contribute to project competence development and how they are related to each other. The table presents the key components of each of the mechanism and gives a few examples taken from the empirical material.

14. Conclusions and contributions

This paper is based on a single, exploratory case study of a major project. The conceptual insights and ideas pre-
presented must therefore be further tried out and ‘tested’ in additional research of similar but also different types of projects. With this caution in mind, however, some interesting theoretical insights can be derived from the study. The paper has discussed three overall ideas: (1) the process approach on project competence, the situated, recursive and contingent nature of project competence; (2) the learning mechanisms operating in the process of competence development at the project level; and (3) the combination of learning mechanisms to build project-level competence, and how different learning mechanisms co-evolve to build project-level competence. Drawing on previous research on capability building [38], we believe that the process approach described in this paper adds a few interesting findings and extends our knowledge about the learning processes involved. Based on an analysis of relating, reflecting and routinizing activities, we pointed out the characteristics of competence building observed in our case study.

The paper contributes to previous research on project management and project capabilities by furthering the analysis of project-level competence. Contrary to previous research on project competence, we argue in favor of a much more fine-grained analysis of specific processes within focal projects. This, we believe, is particularly relevant in complex projects such as the one examined in this paper. Perhaps our findings are particularly interesting for the analysis of ‘vanguard projects’ [2] that move the firm into a new field, be it markets or technologies. Such projects may not only require exploratory learning efforts, but also economizations of previous experience from other, related fields. As our study indicates, building project-level competence is closely associated with the project team’s ability to respond to complexity. We argue that this capacity emerges as the project team acts to solve its task. Our study indicates that mechanisms of learning must be viewed in light of how groups of individuals manage to instigate processes of exploration and exploitation in complex situations. Learning processes may then be a way to deal with complexity and, at the same time, to implement mechanisms that trigger project-level learning. A case in point is when the PM team acted to involve an increasing number of players by relating in order to build competence and action capacity. At the same time, this behavior increased the complexity of the project. Various modes of such types of actions were illustrated in the case study analysis. The study generally illustrated the importance of cooperating with others to improve project-level competence in complex projects.

In projects similar to the one described and analyzed in this paper, project management is very much a strategic learning process. The findings presented in this paper may contribute to the understanding of how such processes are managed and what learning mechanisms are required to build the required project-level competence. Our study also illuminates the need of rather detailed studies of single projects to understand the evolution of organizational capability. Studies of individual, complex projects and project management practice, generally, might therefore contribute to the growing and important field of organizational and dynamic capabilities.

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