Project Execution Models and Knowledge Management

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Abstract: Projects are one-time activities that are aimed at achieving a particular objective within limited time and limited resources. Though projects are per definition unique, they also have known elements, such as known methods, approaches and solutions. Hence, projects are considered as learning arenas where new knowledge is developed (knowledge exploration), and existing knowledge is shared with other members of the projects (knowledge exploitation). Several measures are taken to ensure effective and efficient execution of projects. One such measure is to use project execution models. These models provide guidelines for project managers to conduct their projects effectively. They are developed based on the best practices and lessons learned over a period of time. They give a standard way of conducting projects in organizations. In this regard, it is interesting to look at project execution models with respect to knowledge management. This paper describes the connection between the application of project execution models and knowledge management by looking at concepts / theories that are related to knowledge sharing and learning. It also takes into consideration the topics of organizational structure and organizational culture to discuss the use of project execution models. Information about project execution models that are used in two municipalities in Norway serves as a background for this paper. Qualitative research method was applied in this study. Interviews were conducted to collect data. In addition to the interviews, document study was carried out to obtain more detail about the project execution models that are used in the municipalities. The study on which this paper is based, is connected to a pre-project that is financed by Project Norway. Project Norway is a national competence center for the development of future project processes through research and knowledge sharing.

Keywords: Reflection and learning, Continuous development, Knowledge sharing, Project management, Team development, Learning organizations

1. Introduction

Projects are considered as popular work-form, and several organizations conduct projects to achieve specific objectives within limited time and resources. Though projects are per definition unique, they also have known elements, such as known methods, approaches and solutions. Hence, projects are considered as learning arenas (Pemsel, 2012; Duffield & Whitty, 2015) where new knowledge is developed (knowledge exploration), and existing knowledge is shared with other members of the projects (knowledge exploitation). Several measures are taken to ensure effective and efficient execution of projects. One such measure is to use project execution models (PEMs). These models provide guidelines for project managers to conduct their projects effectively. They are developed based on the best practices and lessons learned over a period of time. They give a standard way of conducting projects in organizations.

The overall research question is: What is the connection between the application of project execution models and knowledge management? In this regard, this paper considers PEMs that are used in two municipalities in Norway to describe the connection between PEMs and knowledge management by looking at concepts / theories that are associated with knowledge sharing and learning. The aim is to contribute to building a conceptual foundation for PEMs from the knowledge management perspective.

2. Research Method

An interview-guide was developed, and interviews were conducted to gather data. A total of six interviews were conducted online. Project managers and department heads from the municipalities participated in the interviews. The interviews lasted approximately one hour. The interviews were semi-structured, thus providing a certain degree of flexibility to discuss relevant topics spontaneously and naturally. In addition to interviews, documents from the municipalities were used to gain a better understanding of the municipalities' PEMs. Those who participated in the interviews are mentioned as respondents in this paper.

3. Relevant Concepts / Theories

This chapter presents some concepts that are relevant for discussing the results of this study in Chapter 4.

3.1 Project Execution Models (PEMs)

PEMs are one of the central themes in project management. There are several processes, methods, and tools that support the effective execution of projects. PEMs are one of them that provide an overarching view of how a project can be carried out systematically. There are several definitions and descriptions of PEMs. According to

Rolstadås et al. (2023), a project model presents aspects related to a project; for example, criteria for evaluation, organizational solutions, procurement guidelines, division into (project) stages and phases, and control and decision points. The authors note that a project execution model – compared to project model – is more specific in terms of specifying phases, control gates, and decision points.

PEMs also provide information on who (the role / responsibility) does what, when and how (guidelines). One of the purposes of PEMs is to simplify communication internally and externally, so that the project is executed effectively. There are many advantages to using PEMs. Here are some of the advantages (Rolstadås et al., 2023, p. 133):

- standardize the way projects are executed
- ensure knowledge transfer and shared knowledge development as well as
- create predictability for those involved in the project

3.2 Reflection

Argyris and Schön (1996) are two of the key contributors to the development of the concept of organizational learning. When they discuss how learning can occur in organizations, they mention that reflection on a mismatch between expected outcomes and actual outcomes of an action or event can initiate a learning process. Inquiry into the mismatch leads to finding a solution to eliminate the discrepancy. This can occur in two ways:

- Single-loop learning: When a mismatch is experienced, one looks at existing procedures, rules, routines, and norms to correct the situation within that framework.
- Double-loop learning: This involves finding a solution to eliminate the mismatch by asking critical questions about existing norms, procedures, and assumptions. Here, questions such as "why do we do that we do?" are posed to uncover possible outdated assumptions and norms.

Another concept that can be related to the discrepancy (between expected outcomes and actual outcomes) is sense-making. Karl Weick is a key figure who has researched this concept. Here is a description of sense-making:

> *"Explicit efforts at sensemaking tend to occur when the current state of the world is perceived to be different from the expected state of the world, or when there is no obvious way to engage the world. In such circumstances there is a shift from the experience of immersion in projects to a sense that the flow of action has become unintelligible in some way. To make sense of the disruption, people look first for reasons that will enable them to resume the interrupted activity and stay in action. These 'reasons' are pulled from frameworks such as institutional constraints, organizational premises, plans, expectations, acceptable justifications, and traditions inherited from predecessors. If resumption of the project is problematic, sensemaking is biased either toward identifying substitute action or toward further deliberation" (Weick et al., 2005, page 409).*

The concept of sense-making requires reflection on what is happening or has happened. It is hence relevant to look at reflection on practice (that is, reflection on what one does or on one's experience).

Donald Schön (1998) discusses to types of reflection on practice in organizations:

- "Reflection-in-action": This involves reflection on an action (or event) while the action is taking place.
- "Reflection-on-action": This involves reflection on an action (or event) after the action has been completed.

Both types of reflection contribute to learning. The following quote illustrates how reflection can lead to learning – particularly, double-loop learning:

> *"A practitioner's reflection can serve as a corrective to over-learning. Through reflection, he can surface and criticize the tacit understandings that have grown up around the repetitive experiences of a specialized practice, and can make new sense of the situations of uncertainty or uniqueness which he may allow himself to experience" (Schön, 1998, page 61).*

Learning through reflection can occur at both the individual and organizational levels. To take a closer look at the process from individual to organizational learning, it is relevant to consider a model described by Nonaka and Takeuchi (1995), known as the SECI model.

3.3 The SECI-Model

The SECI model shows four processes for creating knowledge in organizations: Socialization, Externalization, Combination, and Internalization. The authors (Nonaka & Takeuchi, 1995) state that through these processes, interaction occurs between tacit knowledge (the type of knowledge that cannot be easily expressed directly in words) and explicit knowledge (which can be easily expressed in words) to create organizational knowledge / learning (Figure 1).

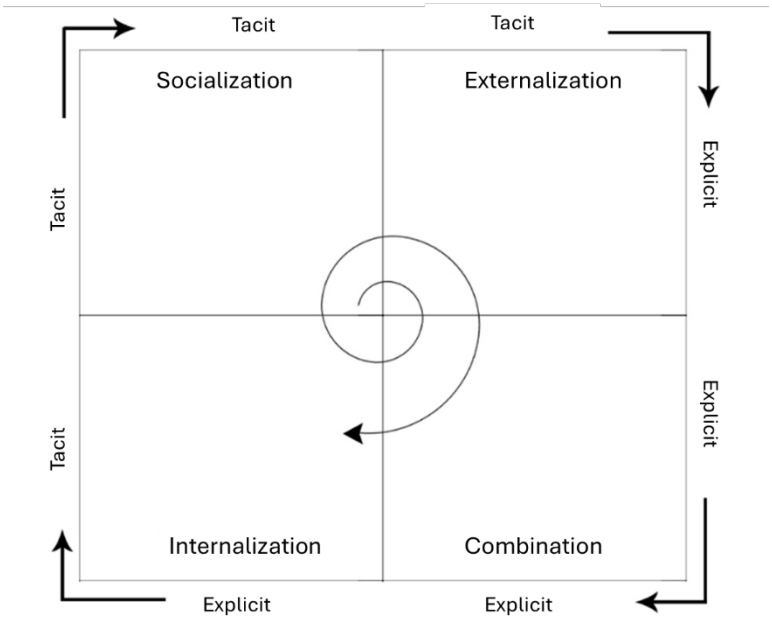

Figure 1: The SECI model (Nonaka & Takeuchi, 1995)

Here is a brief explanation of the four processes mentioned in the above figure:

- Socialization (Tacit to Tacit) – Socialization is a process for sharing knowledge, including observation, imitation, and practice. New employees work with their mentors in the organization to gain knowledge through direct interaction, imitation, observation, and practice.
- Externalization (Tacit to Explicit) – Externalization is the process that transforms tacit knowledge into explicit knowledge, where knowledge is crystallized and can thus be shared by others, becoming the foundation for new knowledge. At this point, personal tacit knowledge becomes useful to others as it is expressed in a form that can be interpreted and understood – for example, written documents.
- Combination (Explicit to Explicit) – Combination involves organizing and integrating knowledge, where different types of explicit knowledge are merged in a harmonized manner. The new explicit knowledge is then shared with other members of the organization.
- Internalization (Explicit to Tacit) – Internalization is about a process where a person receives and applies the new combined knowledge, so that knowledge becomes that person's personal knowledge (over time).

The internalization process usually occurs in several rounds. Kolb's model of experiential learning can be used to take a closer look at how this process takes place.

3.4 Experience-Based Learning

Experiential learning, introduced by Kolb, suggests that concrete experiences provide the basis for observation, reflection, and abstract conceptualization. Kolb's experiential learning model consists of four stages that develop in a spiral (Kolb, 1984):

1. Concrete experience
2. Observation and reflection on that experience
3. Formation of abstract concepts from that reflection
4. Testing of the new concepts

As one goes through the four stages, there is an opportunity to understand the new knowledge more and more in each round and gradually internalize the new knowledge.

Learning and knowledge sharing play an important role in collaborative work-settings such as projects. In this regard, it is relevant to look at another topic: Team development in projects.

3.5 Team Development

When a selection of people who do not know each other well is assembled into a group, they must go through a process to become an effective team. This process has five stages (Klakegg et al. 2023; Karlsen, 2023):

- Stage 1 – Forming: In this stage, the group members get to know each other. They show enthusiasm for starting something new, something exciting. They have positive expectations. They are eager to know their roles and tasks. Generally, the atmosphere is good at this stage.
- Stage 2 – Storming: In this stage, group members begin to find their place in the group/project. They try to figure out specifically what their tasks, responsibilities, and authority are. This stage can be characterized by frustrations, as some group members may be disappointed that their previous expectations about the project (their roles, the nature of the tasks, the collaboration situation, etc.) do not align with reality. Group members may try to position themselves, which can result in a kind of power play. Such disappointment and possibly the effects of the power play can contribute to increased frustration among group members. This will affect the group process moving forward.
- Stage 3 – Norming: In this stage, team members begin to understand each other more and more. There is better communication flow. They build trust within the group and dare to express their opinions and provide critical feedback (in a constructive manner) if needed. The group tries to avoid destructive conflicts moving forward. Each group member feels a sense of belonging to the group and accepts other group members as part of the team.
- Stage 4 – Performing: Interaction is very good in this stage. There is a high degree of trust among group members. Open communication and mutual understanding help coordinate activities better and manage changes and uncertainty effectively. Team members feel like part of a community and take pride in the work they do. Effectiveness is at its highest level in the process.
- Stage 5 – Adjourning: This is the concluding stage of teamwork. Since there is no long-term need for human resources in the project, members prepare to leave the group. They may begin to think about what happens after the project is completed. Will there be a new collaboration after this? What will be the work situation in the next project? Such thoughts can create concerns and/or frustrations among some team members, and this can negatively affect effectiveness.

Figure 2 illustrates the stages.

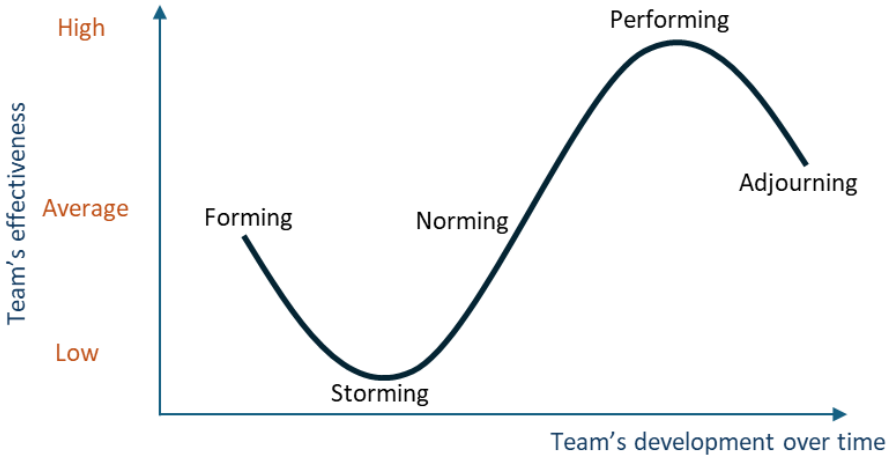

Figure 2: The five stages of team development (based on Karlsen 2021)

Some researchers (for example, Sjøvold, 2014) believe that a team development process does not have to go through all five of these phases. They argue that there may be groups that do not go through any of these phases. They also state that some groups experience these phases, not linearly, but as a sporadic mix based on varying

situations throughout the group process. This may seem natural to find, for example, in project processes that include many iterations where different specialists must solve problems together.

3.6 Systems Thinking and Learning Organizations

Systems thinking is about viewing a system not just as a collection of individual elements (that form the system), but also the relationships and interactions between the elements. Peter Senge (2006) addresses the theme of systems thinking in relation to learning in organizations. He is a central figure who has contributed to the development of the concept of learning organizations. He mentions that organizations that have a genuine interest and ability to learn something new and valuable to develop their competence can be referred to as learning organizations. Senge mentions five aspects that characterize learning organizations (Figure 3).

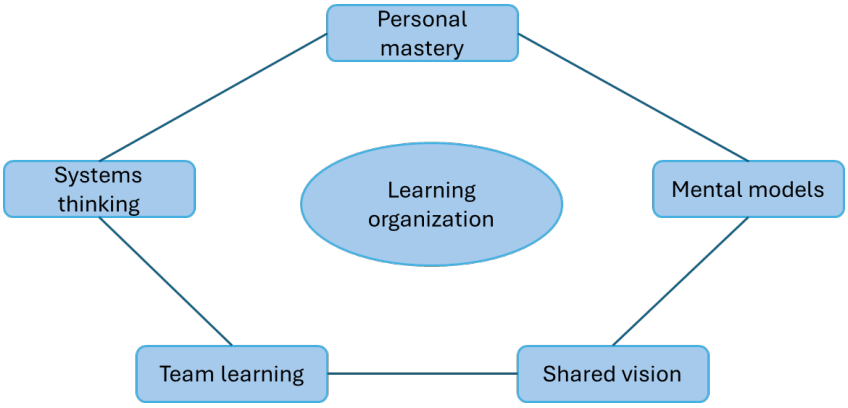

Figure 3: Learning Organization (Senge, 2006)

Here is a brief explanation of the five aspects (Senge, 2006; Klakegg et al., 2023):

- Personal mastery refers to an individual's genuine interest in learning and mastering something valuable, as well as the motivation, ambition, and vision they have to achieve it.
- Mental models relate to the assumptions, premises, and understanding one has, related to, for example, a task or a project. Some mental models are tacit – they are not explicitly expressed and may reside in the subconscious. It is important to reflect on and manage mental models, especially in a collaborative situation.
- Shared vision is important to ensure a common understanding (of, for example, a task or a project), team spirit, and a collaborative climate.
- Group learning involves sharing valuable experiences and knowledge that can ensure that one does not "reinvent the wheel." Sharing knowledge can also lead to developing new knowledge together.
- Systems thinking views a system not just as a collection of individual elements (that make up the system), but also the interaction/connection between the elements. Systemic thinking is about creating a holistic understanding to reap benefits: If a project team member understands how their task is linked to others' tasks, then it can be advantageous, for example, when they need to handle changes.

Senge mentions that learning organizations can effectively manage changes and uncertainty, increase productivity and profitability, and achieve sustainable competitive advantage.

4. Reflection and Discussion

Respondents mention that their PEMs contribute to ensuring effective execution of projects. This chapter discusses the use of these PEMs in accordance with concepts / theories presented in Chapter 3.

4.1 The Need to use PEMs

According to the respondents, PEMs are used in all phases from the start of the project to its conclusion. Not everyone actively uses the PEMs all the time; they are used when there is a need. The need for use may arise (1) when one does not know what must be done in a given situation, or (2) when one sees that there is some discrepancy between expected outcomes and actual outcomes related to an action or an event. Let us take a closer look at these two alternatives:

- Do not know what must be done in a given situation: This situation most likely concerns new employees. They may find it difficult to understand the situation – challenging with "sense-making" of the situation. It may be hard for them to figure out where they need to start. PEMs can assist them in this situation – providing an understanding they look for. Once the employees gain that understanding, then the outcome can be as follows:
- *They can obtain complete understanding and handle the situation immediately, or*
- *They can get a preliminary understanding and then they have become to know specifically what they need to know more about, so that they can handle the situation. That is, PEMs provide them with a foundation for determining what kind of details they need to learn more about. The need for details may vary from person to person, and it is not possible or appropriate to include all details in PEMs. When PEMs provide the basic information to the employees, then the employees gain a certain understanding first, which can help them to figure out specifically what additional information that they need to know more about to handle the situation. They can then utilize relevant sources to obtain that information /* knowledge. This can be seen as a process where sense-making occurs.
- Discrepancy between expected outcomes and actual outcomes: In this context, PEMs serve as a means to promote single-loop learning; that is, one looks at existing procedures, standards, and norms – which PEMs represent – to find a solution that can eliminate the discrepancy. If existing procedures and standards are not applicable to address the current situation, then opportunities for double-loop learning may arise. The resulting new knowledge can contribute to the work on revising and improving the PEMs. It is to be noted that the municipalities collect information on difficulties in using PEMs and improve their PEMs periodically.

4.2 Internalization and the SECI Model

The development of the municipalities' PEMs can be seen in connection with the SECI model. It appears that the development, use, and revision of the PEMs primarily concern the following components of the SECI model:

> *New knowledge (new best practices) has been identified and learned in collaborative / socialized settings, and the crystallization and development of that knowledge goes through externalization, combination and internalization processes.*

For a new employee (and others using a revised version of the PEM), the PEM contributes to the internalization process. The internalization process occurs in several rounds. Here, one can refer to the four stages in Kolb's model of experiential learning presented in Chapter 3. As one goes through the four stages, there is an opportunity to understand the new knowledge more and more in each round and gradually internalize the new knowledge.

Some respondents mention that they rarely refer to their respective PEMs since they already know what it contains. This shows the effect of the internalization process. At the same time, it may be wise to take relevant measures to identify and address potential challenges related to the internalization process. However, a respondent says that it can be a challenge to determine how best to internalize what is stated in the PEM.

Relevant measures (for example, sufficient training and motivation) can help address this potential challenge. In an indirect way, the internalization process highlights an important point to remember regarding the use of a recently revised version of the project model: It is crucial to inform all involved parties about the revisions that have recently been made and to ensure that the new version will be utilized.

4.3 Modifying and Improving PEMs

By definition, projects are unique. However, there are both known and unknown elements in each project. Project contexts can vary. The PEMs used by the two municipalities generally work well in their projects. However, a kind of mismatch may arise between what the PEM suggests and what the project context requires. In such cases, a project manager must reflect on the practice (which is guided and shaped by the PEM). The concepts of "reflection-in-action" and "reflection-on-action" come into play here. The reflection can lead to a new understanding (sense-making) and create new knowledge through double-loop learning. The project manager questions the current practice (current procedures, norms, assumptions, etc.) in the light of the new context and seeks to find a new and better approach or solution to address the new situation. The new experience / knowledge will be communicated to senior management as a suggestion for further development of the PEM.

The new knowledge that the project manager gains in the new context can be tacit or explicit. If that knowledge is tacit, then efforts must be made to make the knowledge explicit. This is externalization, as mentioned in the SECI model. The explicit knowledge must be combined with other existing explicit knowledge (including other suggestions for improving the PEM) in an appropriate manner. Systems thinking is important here to ensure that both the new and existing knowledge are interconnected, make sense ("sense-making"), and lead to a better outcome than before. The combined knowledge can be utilized by other employees multiple times in the future so that the knowledge will become internalized. When all or more individuals in the organization use the new version of the PEM, internalization occurs at an organizational level.

In a learning context, it is important to question current outdated practices – for example, "why do we do that we do?" This can lead to (conscious) unlearning, which is also part of the learning process. New situations/contexts in projects may prompt the municipalities to reflect on the relevance and effectiveness of current practices and their PEMs. Those responsible for revising the PEMs continuously gather suggestions for improving / adjusting the PEMs and make changes to the PEMs at regular intervals. New ways of thinking and working require unlearning outdated practices as well as learning more effective solutions that fit the current context best. Research highlights the importance of unlearning in project contexts (Thiel & Grabher, 2024).

4.4 Team Development

Chapter 3 provides a description of different stages in a team development process. As the description states, storming is the challenging stage where project participants try to find their place (their tasks, roles, and responsibilities, etc.) and position themselves within the project organization. In this phase, misunderstandings can arise. Each project participant may understand their role and areas of responsibility in different ways. PEMs can help to manage this situation. They provide information regarding roles and responsibilities and describe what should be done if certain situations arise. In this way, PEMs can help to minimize the duration and negative effects of the storming phase in a team development process. As a result, the project team can move on to the norming phase where a harmonious work culture is established and reinforced.

4.5 Learning Organization

As we have seen earlier, the two municipalities developed their respective PEMs by reflecting on and studying their own and others' experiences and best practices. The municipalities actively work on revising their PEMs periodically based on what project employees have experienced, observed, read, or learned. This demonstrates a genuine interest in learning and improving project work. This is one of the important characteristics of learning organizations.

The use of PEMs can also be linked to the five aspects that Senge mentions regarding learning organizations. PEMs attempt to create a shared vision (for example, a common understanding of a task or a project). They can help raise awareness and harmonize different mental models (that various project employees have) in a work context. In this way, they can enhance team learning and team development. As we have seen, systems thinking is somehow intertwined in the development, use, and revision of the project models.

This study suggests that (well-functioning and effective) PEMs can potentially help an organization (or a unit) to become a learning organization. Projects are mentioned as learning arenas where new knowledge is developed and existing knowledge is shared with others. PEMs can be seen as a concrete example that illustrates how learning in projects manifests and creates a positive effect.

5. Concluding Comments

This paper considers PEMs utilized in two municipalities in Norway to illustrate the relationship between PEMs and knowledge management by exploring concepts and theories related to knowledge sharing and learning. The objective is to contribute to developing a conceptual foundation for PEMs from the perspective of knowledge management. Interviews and document studies were conducted to gather data.

The study shows that the PEMs used by these two municipalities generally work well. It points out that there is a strong connection between PEMs and knowledge sharing and learning. The following points illustrate this:

- PEMs can be seen as a collection of (reflected) experiences and best practices.
- By using PEMs, the (collected) knowledge is shared with others in the organizations.
- The municipalities revise and further develop their PEMs in accordance with changing environments and conditions. This shows that the municipalities have a significant focus on continuous learning and development (related to project execution and management).

With their PEMs, the two municipalities achieve several positive effects. Some of them are:

- Establishing/securing a common understanding and practice
- Active integration of experiences and learning points
- Better communication
- Creating/maintaining a good working and project culture

The last point shows a clear link between organizational structure (PEMs and corresponding guidelines – what must/should be done) and organizational culture (practice – what actually happens in the workplace). Organizational structure and culture influence each other. We will look closer into it.

Municipalities have developed their PEMs based on their project experiences and practices (best practices, lessons learned, etc.). This means that the development, at least to some extent, has taken into account both organizational structure (formal systems such as procedures, routines, technology, and the organization's infrastructure) and organizational culture (informal systems such as norms, values, interpersonal relationships, trust-building, and collaboration).

PEMs traditionally represent organizational structure (i.e., a formal and standardized way of doing things). A PEM that is not in accordance with the organizational / work culture may face considerable challenges in implementation and effective use of it. However, since the two municipalities have developed their own PEMs by reflecting on practice and work culture ("reflection-in-action" and "reflection-on-action") over time, it appears that they have taken cultural elements (norms, values, behavioral aspects, etc.) into account and integrated them into their PEMs. Since cultural elements are integrated / represented in the PEMs, it becomes relatively easier for the municipalities to use the PEMs effectively. This is one of the reasons why both municipalities have positive experiences with their PEMs.

This situation can also be seen in relation to systemic thinking. Organizational structure and culture influence each other. When studying an organizational problem or finding a solution to that problem, it is appropriate to view the situation from a holistic perspective (in other words, a systems thinking perspective) that covers both the structural and cultural dimensions of the organization and the interaction between these two dimensions (Figure 4).

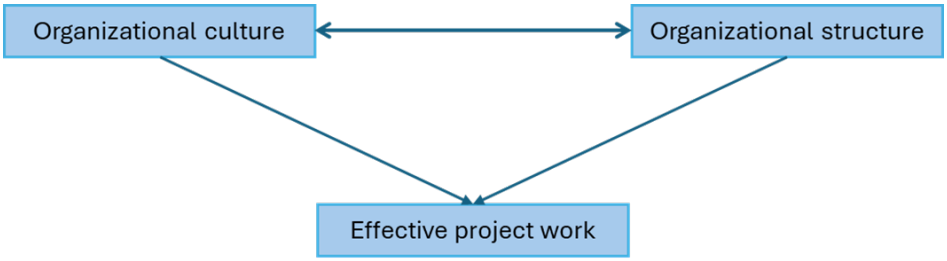

Figure 4: Project Culture and Structure

Even though project team members have different backgrounds, worldviews, and mental models, the PEM can in a way (raise awareness of and) harmonize their mental models in a work context.

For a new employee, PEMs provide a description of how the organization works with its projects. PEMs can help a new employee become familiar with the organization, collaborate with other team members, obtain important information and knowledge, and contribute effectively to projects. This can be seen as part of the internalization process mentioned in the SECI model. Furthermore, PEMs can strengthen the organizational / work culture, because they show the employees “what and how we do things here”.

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