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CREATING ORGANIZATIONAL CHANGE AND INNOVATION

**AN ACTION RESEARCH ORIENTED STUDY
OF PARTICIPATIVE ORGANIZATIONAL
CHANGE AND INNOVATION IN
THE NORWEGIAN AEC INDUSTRY**

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CREATING ORGANIZATIONAL CHANGE AND INNOVATION

AN ACTION RESEARCH ORIENTED STUDY OF PARTICIPATIVE ORGANIZATIONAL CHANGE AND INNOVATION IN THE NORWEGIAN AEC INDUSTRY

DOCTORAL THESIS IN CHANGE MANAGEMENT

BY

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This is a doctoral thesis about creating processes of organizational change and innovation in practice. It is my strong conviction that such processes cannot be managed or controlled in any sensible way, only *participatory* created in adequate arenas for dialogue and collective reflection. The corporate world and management academics have in recent years to an increasing extent shifted their attention strongly toward focusing on the phenomenon of knowledge as a basis for innovation and competitive advantage. The four books *The Fifth Discipline* by Senge in 1990, *The Knowledge-Creating Company* by Nonaka and Takeuchi in 1995, *Organizational Learning II* by Argyris and Schön in 1996 and finally *Enabling Knowledge Creation* by Krogh, Ichijo and Nonaka in 2000 have strongly contributed to the spread of the general thinking and practice about “knowledge- and learning-based” production and change. The widespread growing of the field “*Knowledge Management*” focusing on managerial recipes for linear implementation of change and innovation in organizations is one major trend in this shift¹. A dominating rationale in this “knowledge-trend”, however, is a strong bias in favor of Web technology or tools for measuring knowledge as sufficient means aiming at controlling or managing the innovation process.

In this thesis I outline a critique of the control oriented and management-biased “knowledge-creating” approaches to change and innovation as seen in some of the more prominent contributions by Senge, Nonaka, Krogh, Argyris and Schön. The thesis concludes that there are no universal management recipes, organizational structures or interventionist strategies for managerial control of knowledge facilitating innovation.

From my perspective organizational or collective knowledge is a crucial part of companies’ everyday practice and consequently for innovation. In order to facilitate the ability to harness, employ and represent this collective knowledge, I have found that it has to be created and shared through *participatory* processes emphasizing the emancipatory potential

¹ The widespread use of the different “e-disciplines” (electronic or Web-based) like “e-business”, “e-learning” and “e-commerce” among e.g. commercial consulting firms is one example of “knowledge management”-trends.

of reflective conversations. By this I mean that all people of the organization, both top management and shop floor workers, have to start reflecting *together* on their personal experiences and collective work practice in proper *arenas* for dialogues and continuous reflection aiming at keeping the conversation going.

Consequently, this thesis provides a new practical model for thinking about change, innovation and competitive advantage in organizations, not another managerial recipe. Central in this innovation model is the necessity for participative visualization of a *common frame of reference*. This is a shared understanding *visualized* as a joint enterprise image of the *whole* of the parts and the relationships of the processes in actual collective work practice of the organization. Moreover, three different *arenas* for collective reflection come to play in the model in which each arena has a specific learning focus. First of all, there is an arena for joint visualization of a common frame of reference focusing on *power-knowledge* dynamics in collective practice. The crucial learning focus for collective reflection here is: “*Why* or *For Whom* to do it?” Second, there is an arena for *debating* relationships as part of operative collective work practice through using the joint enterprise image as a communicative and reflective device. The learning focus here is: “*What* to do?” At last, there is an arena for *designing* structures of operative collective work practice through using the joint enterprise image as common and shared information architecture in Web technology supporting collaboration and communication. The central question for collective reflection here is: “*How* to do it?”.

The thesis’ main conclusion is that this is a model that contributes to increased understanding how to spread innovation and knowledge in practice. Consequently, I conclude that innovation conditions three forms of arenas for dialogue in which the knowledge content in and between them is dynamic and interdependent.

The writing of a doctoral thesis is a *social* construction. What I want to say by this rather odd and philosophical statement is that even though thesis work periodically is felt as a lonely, selfish and anxious activity, it is primarily the product of a process formed in dialectic interplay with the surroundings. That is, the thesis work is a product of my own thoughts and reflections formed in a mutual relationship with other scholars both at NTNU and Stanford University and with people in collaborating companies and, not least, with close friends and dear ones. In these surroundings there are many acknowledgements due.

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Summary

This thesis contributes to the understanding of how to create organizational change and innovation in companies of the Norwegian Architects, Engineering and Construction (AEC) industry. The thesis, then, inquires into the conditions necessary for how the collective practice of collaboration and execution in building projects can be changed emphasizing the emancipatory potential of conversations in arenas for dialogue. The aim is to achieve new useful collective practice in projects, which in the end entails increased competitiveness for the companies involved. This implies that organizational change and innovation ultimately encompass the total value-creating chain of all the actors involved in the building project. That means all from the finished building including the physical construction process on the building site and the end-consumers that are going to use or own it, to the initial programming stage with the first drawing sketches of the architect. The thesis will argue that organizational change and innovation in AEC companies does not emerge on its own through for instance “linear-control” oriented models of planning and subsequent plan implementation or models for increased managerial project control. To the contrary, the thesis will show that processes of change and innovation are created through active and broad *participation* by all actors directly involved in the project, companies as well as single individuals in arenas for dialogue.

The objective of this thesis, then, is to contribute to how organizational change and innovation can be created, that is; *what* are the conditions necessary to achieve organizational change and innovation in AEC companies? And next; *how* can organizational change and innovation be spread among the companies in the Norwegian AEC industry? These are the two major research questions of the study. The thesis is an action research-oriented case study based on collaboration with a Research & Development (R&D)-program called The Integrated Building Process (the SiB – Samspillet i Byggeprosessen) jointly sponsored by four Norwegian AEC companies and the Research Council of Norway (RCN). My doctoral grant, including abroad stay as a visiting research scholar at Stanford University, California, USA, summer 1998 and fall 1999, was 100 % sponsored by the RCN, the Industry and Energy division. The field research was carried out in a 4 ½-years period from 1997 to 2001.

The theoretical part of the thesis starts out in Chapter 2 addressing organizational change and innovation basically as *continuous collective learning processes*. In justifying collective learning as a central condition for change and innovation, I inquire into the paradigm of philosophical pragmatism. I thus develop a pragmatist approach viewing knowledge and organizations as intrinsically socially constructed in which the social or the *collective* has the primacy over the single individual in meaning construction. This paradigmatic position I argue has two crucial implications at the practical level of inquiring and creating organizational change and innovation. First, it implies a methodological claim involving an intrinsic link between theory and action rejecting the positivist-based dualism of theory and praxis. Hence, I develop the position that scientific findings have to be grounded in action. Second, it implies an epistemological and ontological claim emphasizing the creation of *collective* forms of knowledge through a continuous process of collective inquiry. Consequently, I present a perspective viewing organizational change and innovation as a collective, social process of *continuous* reflection in and on practice for the empowerment of concerned actors facilitating organizational *diversity* aiming at keeping the conversation going, not individual consensus making.

In order to understand the context of the thesis I outline in Chapter 3 the status and challenges for companies in the Norwegian AEC industry. This includes an overview of the SiB R&D program and some of the prevailing ideas and theory perspectives of management and organization applied in building projects today.

In Chapter 4 I provide a critique of the traditional rationalist and “linear-control” oriented planning-model perspectives applied in building projects. Building on the pragmatist approach to knowledge developed in Chapter 2, I argue for the necessity of *visualizing* a shared and collective understanding of actual collective practice in projects. For this visualized understanding to be common and shared I argue for the necessity of creating *arenas* for collective reflection aiming at collective and whole understanding of a building project through democratic and participatory-based processes. The emerging argument is that organizational change and innovation conditions mechanisms or ability for creating and sharing the collective knowledge of the organization by appreciating diversity of viewpoints and experiences, *not* managerial consensus making. I refer to this form of collective knowing as *a common frame of reference*. This collective form of knowledge is about how to act and coordinate together as a *whole* in daily collective practice of the building project.

In taking into account that collective knowing as a common frame of reference is socially constructed, it has to be visualized by all actors directly involved in the building project. Hence, I argue that *broad participation* in creating organizational change and innovation is critical. For the purpose of facilitating broad participation and organizational diversity, three focus of learning come to play in which each learning focus implies an *arena* for collective reflection. These are *Why-learning*, *What-learning* and *How-learning*. The three arenas address organizational change and innovation as a Deweyan inquiry process of collective learning through visualizing knowledge related to organizational design, relationships, structures, routines and technology together with language and models into one common frame of reference. The common frame of reference is visualized as a *Joint enterprise image* representing a joint visualization of the main work processes of the building project. I further claim that each of the three learning centers is constituted by a learning form conditioned by a *continuous* process of externalization and internalization between tacit (embedded) and explicit forms of collective knowledge (encultured).

The theoretical part of the thesis is concluded in Chapter 5. Based on the argument in Chapter 4 regarding three arenas for collective learning, I present in Chapter 5 a model representing an added perspective to what creates organizational change and innovation in the companies of the Norwegian AEC industry. The following two paragraphs applies directly to the thesis' two research questions respectively:

- 1) A description of the conditions necessary to achieve organizational change and innovation in AEC companies. I provide an argument for what collective knowledge is, i.e. what are its prime characteristics and why is collective knowledge as such critical for the companies directly involved in the building project. The outline describes the following three conditions and the dynamic and interdependent relationship between them: (1) *Visualizing a common frame of reference*: Externalizing and visualizing knowledge related to work processes through joint construction of an enterprise image for a common frame of reference emphasizing Why-learning; (2) *Collective reflection-on-practice*: Using the Joint enterprise image as a communicative and reflective device *debating* collective practice emphasizing What-learning; and (3) *Collective reflection-in-practice*: Transforming and internalizing explicit knowledge of the joint constructed enterprise image into *an artifactual* common frame of reference through Web technology *designing*

collective practice by emphasizing How-learning. The dynamic and interdependent relationship between the three conditions constitutes a practice I refer to as *collective reflective practice*.

- 2) Based on the three conditions indicated in (1) I provide a *model* for how organizational change and innovation can be spread among the companies in the Norwegian AEC industry. I call this a *practical innovation model*. The model consists of three elements that I refer to as three different arenas for reflection in facilitating real broad participation and diversity: A Startup-gathering (Reflection Arena-1 (RA-1)), Reflection and evaluation gatherings (Reflection Arena-2 (RA-2)) and Development and use of Web based project tools (Reflection Arena-3 (RA-3)). Each reflection arena corresponds to the conditions indicated in (1) respectively. It is emphasized that the three arenas relate to each other in a dynamic and interdependent way creating collective reflective practice as emphasized in (1).

The indicated characteristics of the innovation model for recognizing organizational change and innovation enable in turn a structured discussion of the thesis case story outlined in Part Two. I strongly emphasize the point that the innovation model is not to be viewed as a traditional management recipe for organizing building projects. To the contrary, the model is to be viewed as a framework for thinking about *democratic* change, diversity and participation in organizations in aiming at keeping the conversation going.

The Part Two of the thesis is the case story. It describes how change and innovation were promoted as participative processes in the AEC companies that were directly involved in two building projects. The two case building projects are Rekkevik Brygge and Bergheim Amfi. The story consists of three stages in which I took active part. The first stage of the story starts out in Chapter 6. It is called *The Initial Process* and includes the story during a one-year period from the SiB Lysebu-seminar in April 1997 to the Pilot enterprise visualization conference held in Trondheim in April 1998. This stage then tells about how the first part of the *SiB Enterprise Modeling-project* (the EM-project) was developed with a method for participatory visualization of a common frame of reference as a Joint enterprise Image of actual collective practice in building projects.

The second stage of the case story continues in Chapter 7 and is called *The Case Building project I: Rekkevik Brygge (RB)*. This stage includes the story of the first case building project called Rekkevik Brygge (RB for short) and the aftermath of RB. The story indicates

why it was so difficult to find a pilot building project trying out the second part of the EM-method as demonstrated on the Pilot conference in Chapter 6. The hard part was the effort of trying out Web-based enterprise visualization in a pilot building project. This stage of the story documents changes in some of the involved AEC companies over a 3-year period of time. The story focuses on the changes with regard to the use of information technology (IT, or the Web) and consequently how parts of the daily collective practices in projects changed. It describes the starting point with no use of IT at the startup of the Rekkevik Brygge project in the summer of 1997 and to the situation of more advanced Web-based information sharing practice in the late spring of 2000 with the project tool called ProsjektHotellTM. These changes constitute the necessary background for the third and last stage of the case story. This is about what eventually made the two most central SiB consortium companies in the summer of 2000 actually find the building project Bergheim Amfi an appropriate pilot project for the enterprise visualization method as told in the next stage.

The last and third stage of the case story goes on in Chapter 8 and is called *The Case Building project II: Bergheim Amfi (BA)*. It documents how organizational change and innovation actually is spread as a *participative* process among the AEC companies involved in the Bergheim Amfi building project during a year from the summer of 2000 to the summer of 2001. This description includes the story of a spreading process toward new useful collective practice in the building project of BA. It describes the planning and execution of the three arenas for collective reflection in accordance to the innovation model provided in Chapter 5. The story describes the implementation of the three arenas called the initial Startup gathering (RA-1), the organization of Reflection- and evaluation gatherings (RA-2) and eventually development and use of Web-based project tools for collaboration and information sharing (RA-3).

In Chapter 9 I provide the concluding discussion of the case story summarized above in light of the practical innovation model presented in Chapter 5. First I discuss the conditions for organizational change and innovation and the relationship between them based on a pragmatic knowledge notion with a strong value commitment to participation and empowerment. Second, I discuss the two case building projects and the possibility to use the innovation model in thinking about spreading participative processes of organizational change and innovation among AEC companies. During the first years of SiB it was

Interconsult that was the driving force for the effort of industrializing the method of integrated Enterprise Modeling (the EM-project). The case story shows then how it ends up as a success story in a Veidekke building project and now with Interconsult totally on the sideline. In sum the case story has provided a fruitful co-generative learning process of how organizational change and innovation actually can be spread among companies in the Norwegian AEC industry.

Finally, I outline the thesis' conclusion and my key findings of the thesis. I make a contributing argument to the understanding of how organizational change and innovation can be created in companies in the Norwegian AEC industry. The key finding is that the three provided conditions for organizational change and innovation – namely (1); Visualizing a common frame of reference, (2); Collective reflection-on-practice and (3); Collective reflection-in-practice – relate to each other in a dynamic and interdependent way underpinning what I call a *collective reflective practice*. Each condition refers to a specific arena for reflection in the actual building project with a corresponding learning focus. This implies the argument that organizational change and innovation – as described in the provided innovation model, is a collective reflective practice. The development and use of the *Joint enterprise image* functions as a common frame of reference in all the three reflection arenas of the model. Consequently, the model functions as a new practical way of thinking on how organizational change and innovation can be spread among companies in the AEC industry. Hence, the use of the Joint enterprise image in the three arenas constitutes the dynamic and interdependent relationship entailing new useful collective practice to be spread among the AEC companies involved in the actual building project.

Chapter 1

Setting the scene

1.1 Introduction

In the spring of 1997, I was introduced to join an exciting interdisciplinary research group in a new R&D program (Research & Development) within the Norwegian building industry (or AEC industry – Architects, Engineering and Construction). The topic of the program was organizational change and integrated process development in the building process and it was called “The Integrated Building Process”, abbreviated The SiB after the Norwegian name “Samspillet i byggeprosessen”. The research group consisted of an interdisciplinary mix of Ph.D. candidates and researchers at NTNU coming from a wide variety of scientific and professional fields representing different relevant actors of the AEC industry in Norway. I became a member of the group and its Ph.D. program and we called ourselves HSK (Totality, Integration and Knowledge – Helhet, Samspill og Kunnskap). The HSK was organized as a sub project in SiB and an industry-based consortium that consisted of some of the leading companies in the AEC industry in Norway owned HSK². This owner relation made the HSK deeply and well anchored in the industry ensuring the research work

² The four consortium board members of SiB were Veidekke ASA, Interconsult ASA, ABB Installasjon AS and L.A.Lund AS. See Chapter 3 for a brief overview of SiB.

to keep focus on the most important challenges of the industry. This was an important strength of HSK considering that the consortium companies then had committed themselves to follow up and to test out needed efforts on organizational change and integration through pilot projects. The Ph.D. program, the pilot projects and the close connection to SiB thus formed a unique and privileged situation for us academic researchers to work on real processes of organizational change in the perspective of the building project as a whole and thus for the better for the whole AEC industry.

Based on a thorough pre-project analyzing existing practice of organization and management of building projects, the basic aim of HSK was to initiate and implement a process of participative organizational change among a group of leading AEC actors. One important purpose of having a group of leading actors was that change processes then could be more easily spread among the other companies in the AEC industry. Thus the SiB consortium placed the analytical focus of its R&D program on the building project executing the project from the initial architect drawing to the finished building facility. The aim of SiB was to achieve improved organizational understanding and integration of the overall building project as a whole.

I was introduced to the SiB R&D program with the SiB consortium actors expressing a clear and ambitious goal in mind, namely a goal that was more oriented towards real change rather than improvement of existing practice. Existing practice emphasizes a focus on contract-based standards for project execution while “real change” refers to a shift in focus towards processes and relations between the participating actors involved in the actual project beyond those specific and traditional contracts. The SiB actors expressed the understanding that effective change processes condition change in basic behavior or work processes in order to utilize the full enabling possibilities and potential of the new Web technology facilitating network collaboration. This understanding underpinned the basic point that important changes in processes demand an “inductive approach” to technology³. But this understanding was expressed with concern when taking into account the situation of the whole industry at that time. The need for better collaboration and relations between the actors of the AEC industry was underpinned by negative and more stigmatizing expressions like the ones stated by one or several key people and resources from the industry at the startup conference of SiB⁴ at Sundvollen in 1995: “*AEC industry is the only*

³ See Pre-project plan “Samspillet i byggeprosessen” 23.juni 1995.

⁴ These quotations are documented in SiB report no. 01.

industry I know that loose money both in good and bad times”, “The industry lacks ability and understanding for utilizing connections and synergies between industrial, consulting and production oriented parts of the industry”, “The AEC industry is characterized by a cowboy culture; we shoot from the hip and we are proud of that”, “In the AEC industry they can neither read or write”, “The AEC industry in Norway is not exposed to competition”.

1.2 Some basic assumptions

In order to pose the research questions I make some basic assumptions on how to create change and innovation in companies of the Norwegian AEC industry: Instead of incremental change or small steps of improvements of existing work practice focusing on traditional contract standards, there is a striking need for a shift towards focusing on organizational processes and relationships across the organizational borders of the AEC companies involved in the actual building project. That is, a shift towards focusing on how organizational change and innovation can be spread among companies in the AEC industry. *Projects* are the organizational form that is the core of the knowledge and learning processes constituting the basic value creating activities in AEC companies. The main end product from building projects is a knowledge intensive service, not only the physical building or facility in itself. To the difference from most traditional industries repetitive and highly standardized work processes to a less extent characterize the collective work and execution practice of a modern building project. To the contrary, contents and work forms in projects vary often a lot. And the projects are per definition both cost and time critical. This provides special challenges with regard to both gaining learning on experiences in projects (learning *in* projects) and reusing knowledge from former projects (learning *from* projects). Given the increasing complexity of building projects today, the thesis will assume that there is an increasing need for all actors concerned, companies as well as individuals, directly involved in the project to collectively reflect *in* and *on* the collective practice of the project as *a whole*.

There is a fact that building projects are composed of many – and much often very small – actors collaborating in constantly varying constellations with geographical diffusion, and on new places each time. Thus, projects are communication-, knowledge- and coordination-

intensive all at the same time. During the execution of the project there are great demands put on coordination of all the work processes. This means that facilitating and maintaining the flow of information and knowledge across organizational boundaries of the AEC companies involved in the project are demanding operations. There is a critical need for effective access to the needed project specific information resources and thereby to activate the potential of the related experience and knowledge involved in the actual project. In that connection, the use of information technology (IT or Web based project server) provides an infrastructure for this. The Web may thereby enhance the critical knowledge creating ability of the projects. This is about using IT to enable new forms of collective practice in projects and thereby to provide a new arena for collaboration and integration in and between AEC companies involved in actual building project.

Considering this steadfast focus of time and cost in building projects of today one should believe that there are small rooms for improvement of existing work practice and especially when it comes to efforts of organizational change and innovation. Also when the literature within organizational change provides very few cases from the AEC industry (if any at all?), one should really wonder where to start. Nevertheless, much of the literatures argue that continuous organizational learning and “business process integration” are two essential elements in successfully spreading organizational change and innovation among modern companies of today. Still, the practical understanding of how to achieve this process of continuous learning and integration is limited, and in particular, cross-organizational learning and value chain integration have seen little empirical research. However, some researchers have studied organizational learning and business process integration within single companies, and Nonaka and Takeuchi (1995) have listed five factors needed for how to keep alive continuous “knowledge creating processes”. Such processes are according to the two Japanese authors seen as necessary to facilitate organizational change and innovation. The contribution from Senge (1990) and his five disciplines for a “learning organization” is another more popular version of “management-techniques” when taking into account the spreading of his bestsellers among many business oriented airport bookshops.

A problematic issue in the Nonakian “knowledge-approach”⁵, the Sengian “learning-approach” and other contributions to the mapping and “re-engineering” of business processes (BPR)⁶, however, is their rationalist bias towards an outspoken expert and management-oriented perspective on organizations⁷. The basic assumption in most of this best-selling “management-literature” is that the presented “management-recipe” (like e.g. the “BPR-model”) has a rationale that employees more or less automatically will follow when being “implemented” by the management as described. This management perspective to change does not take into full account or rejects the aspect of power and consequently that knowledge is intrinsically socially constructed. It takes for granted then that issues related to power and participation is in a sense “clarified” before “change implementation” starts. In Chapters 2 and 4 I criticize this rationalist approach to knowledge and power.

Nevertheless, the basic principles related to process orientation or process modeling, process support, information structuring and knowledge work supported through IT, may be a promising approach when taking into account the addressed challenges of the AEC industry. Process modeling relates to the development and use of Web supported learning and work processes that in turn may enable the possibility for spreading of change and innovation through processes of continuous collective learning in and from projects. A critical issue in spreading of process modeling is that the knowledge and learning processes are tightly integrated with the actual business processes and technology processes so that they become part of daily collective work practice as in the case of the operative execution of building projects. This joint ability for *participative* organizational change and innovation I will refer to as collective competence, or simply *collective knowledge*⁸. I state that the real challenge for the AEC companies is about how to create and maintain this collective knowledge becoming relevant for the present needs of the industry.

⁵ In his newest book, Krogh, Ichijo and Nonaka (2000), the rationalistic management-biased perspective from Nonaka and Takeuchi (1995) is reinforced and re-emphasized in a more “practical approach” for how to “implement” the “knowledge-creating processes” in practice.

⁶ Central BPR and management-biased approaches to organizational change and innovation are Davenport (1993), Hammer and Champy (1993), Hammer (1996), Hamel and Prahalad (1994).

⁷ For an excellent introduction to the state of the art of the field of “*knowledge management*”, with an outspoken management-perspective, see Nonaka and Teece (eds.) (2001): *Managing industrial knowledge: new perspectives on knowledge-based firms*.

⁸ *Participative* organizational change, which contrasts the management-oriented perspectives of change and innovation referred to above, will be discussed in Chapter 2 by outlining action research based practices and conditions for *spreading* of change as a continuous collective learning process. Herbst (1976) presents an alternative perspective on conditions of spreading change through efforts of democratization and broad participation building on the inquiry concept of Dewey (see Chapter 2) in his *Alternatives to hierarchies*.

Regarding what issue to focus on, there were some conditions stipulated by the Ph.D. program in HSK; Namely to focus on conditions for a *model of change* regarding how to achieve and spread change and innovation among the AEC companies involved in the actual collective practice of building projects, and especially related to integrated process development and IT supported process modeling. In viewing change and process modeling as an empowerment process, it is a major point of my thesis' argument not to go into the formal, technical and rigid representations of workflow of the building projects.

1.3 Research questions

The aspect of change and innovation I have chosen to focus my thesis work on is the one related to *social construction* of the work processes constituting the collective practice in executing the actual building project as a whole. The second main aspect is change related to construction of Web technology or *an enterprise portal*⁹ that supports the actors directly involved in the project in their daily and operative collective practice. This integrated approach to change I will argue is a process of organizational change and innovation in which the project and technology are jointly designed and developed in a task- and need-oriented way by all the participating actors involved in the project.

In HSK we used the notion *enterprise modeling* or *Web-based enterprise visualization practice* for this integrated approach to change and innovation. In practice I like to refer to “enterprise visualization” instead of “enterprise modeling” because the term modeling may give the impression of something exact and static.

Web-based enterprise visualization was the topic of a sub project in HSK that I was to focus my thesis work on. The main purpose of focusing on work process modeling, including modeling supported by IT, is the social construction of a visualized and shared enterprise image. I argue that this joint constructed enterprise image representing a shared collective understanding may constitute an answer to the industry's need of a shared and *whole* understanding of the complex parts and relationships of collective practice in building projects. In the development of Web-based enterprise visualization, I also make

⁹ The enterprise portal is a Web-based portal available through the Internet browser for all the actors directly involved in the project.

the basic assumption that *participatory* construction and use of the Web¹⁰ is an important lever for spreading organizational change and innovation as a continuous collective learning process.

A basic supposition for my research was that it should involve SiB as a resource and that the SiB consortium companies should experience my research on organizational change and innovation as useful in the way that it should contribute to a more competitive AEC industry in Norway. The main goals of HSK's enterprise visualization project, then, were related to construct a joint and generic enterprise image for the industry in general composed of process images of selected work and sub processes of the building project. The aim was to enhance the organizational understanding of the building project as a whole. The HSK-group wanted to industrialize this as a methodology for use among AEC companies. The methodology combined development and learning with participatory design and implementation of a Web-based project server as a way of working in building projects and related organizations.

My own Ph.D. project was then set to contribute to this aim in two ways. First, it should explore into the conditions necessary for achieving integrated organizational and technological change and innovation in AEC companies. Second, based on those conditions it should try to indicate possible ways of spreading organizational change and innovation among companies in the AEC industry. A central condition for my study was then to understand change and innovation in a basic learning and knowledge perspective adjusted to the real needs of the AEC industry.

Against this background, I pose the thesis' main research question:

1) *What are the conditions necessary to achieve organizational change and innovation in AEC companies?*

¹⁰ I will from now on use the notion 'Web' instead of the more general term 'IT' (information technology) referring to the specific Web technology supporting information sharing and communication through the Internet.

2) *How can organizational change and innovation be spread among the companies in the Norwegian AEC industry?*

In order to answer the two questions, I start the thesis by inquiring into the paradigm of pragmatism in coming to terms with how organizational knowledge, change and innovation are socially constructed. In line with this knowledge perspective I argue that creating processes of change condition the ability to create collective forms of knowledge through continuous collective learning processes. The organizational change and innovation processes are in turn conditioned by broad participation in the process.

1.4 Thesis overview

This thesis' objective of developing a model for how organizational change and innovation can be created in companies of the Norwegian AEC industry has been framed in the sections above. In Part One of the thesis, the chapters 2, 3, 4 and 5, I review and discuss the theory in order to provide the model. Thus, chapter 2 provides the basic argument and discussion for understanding and thinking about organizational change and innovation as a continuous collective learning and inquiry process emphasizing collective forms of knowledge.

Chapter 3 provides a brief overview of the SiB project and a review of the prevailing theory and planning perspectives used in building projects today. In Chapter 4, I criticize the prevailing rationalist and "linear-control" oriented planning models applied in building projects by building on the Deweyan pragmatist approach in Chapter 2. This implies the argument that organizational change and innovation conditions collective forms of knowledge referred to as a common frame of reference created as a Joint enterprise image. Consequently, there are three different arenas for collective reflection in projects each having its specific focus of learning.

The thesis central chapter, Chapter 5, concludes the theoretical discussion. This chapter indicates the model and its way of thinking for how organizational change and innovation can be spread among the companies in the Norwegian AEC industry.

In Part Two, the chapters 6, 7 and 8, I provide the case story as well as the discussion on the way. Chapter 6 describes the initial development process with a Pilot modeling conference. Chapter 7 describes the search process of finding a pilot building project in addition to the collective practice of the Rekkevik Brygge project, while Chapter 8 describes how the process of how organizational change and innovation actually was spread as a participative process among the AEC companies directly involved in the Bergheim Amfi project.

The final Part Three, the chapters 9 and 10, provides the concluding discussion. Chapter 9 discusses the case story and provides answers to the research questions posed in Chapter 1 in addition to the questions and assumptions posed in the thesis central theory chapter, Chapter 5. In Chapter 10, I make the final conclusion by summarizing the central findings of the thesis. Then I provide interesting directions for further research on organizational change and innovation.

Finally, there are two appendixes. Appendix 1 describes the methodology and the research process of this study. It is an action research oriented case study design. Appendix 2 provides the presentation slides from the End Report of the Bergheim Amfi Pilot project (the action research oriented case study of Bergheim Amfi told in Chapter 8) at an internal seminar for a management team in Veidekke in June 2001.

PART ONE:

Knowledge for Innovation

In this Part One of the thesis I present the basic theoretical perspective or paradigm of the thesis providing the argument that knowledge is intrinsically socially constructed. This knowledge view lays the foundation for understanding why broad participation in the process, collective reflection and a common frame of reference are seen as necessary factors for creating organizational change and innovation. In order to make this theory review and discussion adjusted to my initial two research questions posed in Chapter 1, I have divided it into four chapters.

In the second chapter I provide the thesis' paradigm of pragmatism addressing how organizational change and innovation is socially constructed basically as continuous collective learning processes building on the pragmatist approach of Dewey. This theory position constitutes the basis for answering more specifically to the two research questions in the Chapter 5.

The context of the thesis regarding the status and challenges of companies in the AEC industry is outlined in the third chapter. This includes an overview of the SiB R&D program.

Based on provided pragmatist position I criticize then the prevailing rationalistic and “linear-control” oriented planning models of the AEC industry in the fourth chapter. Hence in the fifth chapter I provide a model for spreading organizational change and innovation in the AEC industry drawing on Deweyan pragmatism of inquiry (Chapter 2) and Flood and Romm (1996)’s idea of *diversity management*.

Chapter 2

Knowledge for Participative Organizational Change: A Pragmatist View

*“The future belongs to the companies and organizations that have the ability to harness, represent and employ the **collective knowledge** of the organization.”¹¹*

In an attempt to legitimize the thesis’ argument on organizational change and innovation, this theory chapter will provide a thorough discussion of the literature and theory regarding knowledge, organizational learning and change processes. I provide the theory discussion and review in two major steps.

¹¹ Computas AS home page: www.computas.com, my **bold**. The importance of **collective knowledge** in organizations is emphasized to an increasing extent in general management literature. See e.g. von Krogh, Ichijo and Nonaka (2000): *Enabling knowledge creation – How to unlock the mystery of tacit knowledge and release the power of innovation*. But the crucial and philosophical question still remains: What is collective knowledge and then, *how* to create and share it? Throughout this chapter I will provide the necessary epistemological basis in order to criticize these theories of knowledge creation and organizational learning and thereby to answer these questions as part of the thesis major research questions posed in Chapter 1.

2.1 Introduction

First, I will discuss the contextual aspect of organizational knowledge and skills in methodological and epistemological terms. I argue that methodological individualism -- by discussing the position of Max Weber in his studies of modern “*bureaucracies*” (Weber 1990) -- is a kind of heritage from the traditional view of knowledge, namely Aristotelian episteme and logical positivism.

Second, and in contrast to this, I claim that the holistic approach in the pragmatism of Dewey is a fruitful basis for understanding organizational processes of innovation, learning, and politics. I will discuss the paradigm of Deweyan pragmatism in order to reject the positivist-based dualism of theory and praxis. The main trust of this discussion is to show that through a pragmatist view rejecting the dualism of thought and action I come to the stance that knowledge and learning are context-centered and consequently that valid knowledge have to be grounded in real action or practice. This rejection implies the primacy of collective forms of knowledge. Thus, I argue that a common and shared frame of reference, continuous collective reflection in and on practice and then organizational diversity for democratic participation and empowerment of concerned actors are important factors for creating organizational change and innovation.

Hence, by arguing in line with a Scandinavian approach to action research (AR) called *pragmatic AR* and its concept of *co-generative learning*, I claim that change and innovation can be viewed as processes of collective learning grounded in real action fully consistent with the Deweyan pragmatism of inquiry. Through this I show that change and innovation aims at collective reflection in and on collective work practice. This implies the argument that the collective learning process in itself is the goal and thereby that the change and innovation process as continuous collective reflection is taken over by the concerned actors themselves.

Based on the Deweyan pragmatism of inquiry I consequently provide my own approach to organizational change and innovation. I criticize throughout the chapter that theories of organizational learning and knowledge creation – including the three most prominent contributions of Senge (1990), Nonaka and Takeuchi (1995) and Argyris and Schön (1996),

represent a positivist-oriented and faulty harmony view to organizational change and innovation. This means that they in the last instance emphasize individual consensus making by “learning away” processes of power and diversity in organizations. In contrast to the harmony position, I will show that this Deweyan inquiry opens up for viewing organizational change and innovation more as *participative* processes of *continuous* collective reflection for necessary incorporation and facilitation of conflicts, diversity, politics and democracy.

2.2 Knowledge and skills in organizations

All the time since the ancient Greece with Aristotle, Plato and Socrates, the concept of knowledge has caused great concern and efforts. The fascinating point in this is that the problem of knowledge has much of the same appeal and causes the same wonder for people of today all from scientific research, professional consulting services¹² and regular work life as it did for the Greek philosophers. An interesting aspect of this heritage of knowledge seems to be that it is possible to identify an obvious tendency among practitioners in conventional social science¹³ and industrial organizations to act as if Plato’s assumption is still valid; namely that *true* knowledge or episteme exists in an independent and objective world beyond the control of the consciousness. This Aristotelian tradition of knowledge resulted in the idea of the primacy of the thought and 'episteme'¹⁴ over action and practice, that is, the pure thought governs our practice, or what we do.

This idea was underpinned and emphasized by Descartes and Hume in the Western scientific revolution of the 17th Century¹⁵. Descartes reinforced the rationalistic tradition from Plato and Aristotle by stating the *dualism* between mind and body or between consciousness and action as valid. That is, the mind or the human reason is the only valid constituting instance for true knowledge or episteme. Hume developed the tradition of empiricism by stating that pure sense-data in the use of induction is the only fundament for

¹² Here I refer to conventional consulting practice as seen in most of the management oriented approaches to consulting in firms like Accenture (<http://www.accenture.com>), McKinsey (<http://www.mckinsey.com/>) and KPMG (<http://www.kpmg.com>) to name a few.

¹³ The thesis’ action research (AR) based position is outlined in Appendix 1. In this chapter the AR-position will be contrasted to the position of conventional social science.

¹⁴ Mitcham 1994: 118.

¹⁵ Here I will not dwell into any comprehensive discussion of the field philosophy of science. For an excellent introduction to the field see Mitcham (1994) and Hacking (1983).

finding true knowledge. The latter come to underpin the scientific ideal of “logical positivism” of the 20th Century, which also is a Cartesian heritage in the sense of seeing true knowledge -- episteme, as purely objective and context-free.

The founder of “Scientific management”, Fredrick W. Taylor, is probably the one who to its most extreme present a theory of management being consistent with the Cartesian dualism and logical positivism (Taylor 1967). His theory implied a fundamental division of labor between management and the workers by proposing increased productivity through the use of “scientific” managerial procedures to control the organization and operation of work. Thus the Cartesian dualism and The Taylorian “school” of scientific management have in turn affected managerial thinking and techniques about organizational knowledge, innovation and productivity in most kinds of large-scale enterprises during most of the 20th Century.

There are continuous efforts in conventional social science and conventional consulting practice of today to officially reject logical positivism and Taylorian labor division as a knowledge ideal. But despite those efforts in which the imperatives of knowledge as contextual and socially constructed are taken for granted, the full implication of that rejection seems not to be taken into account. When talking about skills in the scientific practice of conventional social science and in the mainstream learning practice of academia, knowledge is still treated as 'episteme' in the Aristotelian way - that is, as *if* logical positivism is a valid knowledge imperative. This has to do with the simple point that the ideal of the scientific enterprise in natural science still “works” effectively; to generate general context-free knowledge and theories for the progress of i.e. technology and medicine. Such a successful enterprise has kept the epistemic tradition influencing the general knowledge imperative in conventional social science indeed.

This is to say that the practice of social science to a large extent works according to the ideal of natural science in the sense of just *revealing* existing objective knowledge -- sense data -- that is assumed not being dependent on the concrete contextual praxis of the organization or the individual action in the organization. I see this impact in much of the position of conventional theory of organizational learning in which organizations are treated primarily as regulatory systems emphasizing cognitive elements in “stimulus-response models” and emphasizing individual consensus making by disregarding the

meaning of power and organizational diversity (March and Simon 1958, Huber 1991, March 1991, Levitt and March 1988, Fiol and Lyles 1985, Nelson & Winter 1982, Weick 1991, Cohen & Sproull 1996). Taking the stance of such a position might be referred to as social realism; the social world with its institutions and structures exists in a way independently of the individual appreciating it, that is, the individual itself does not construct it.

This position is to a certain extent adopted by Lysgaard in his book *Arbeiderkollektivet* in taking the stance of methodological collectivism¹⁶ or what we also might refer to as the system perspective (Lysgaard 1985). Lysgaard focuses on the situation of the workers in the context of the informal worker collective in an organization. In this the workers are seen to exist in a collectivity as a self-governing association of individuals in protection against the technical-economical system. This means that the collective system is seen to have a structural existence in itself beyond the effects of the individual actions. These structures affect the individual by operating unconsciously¹⁷. But in terms of understanding organizational change, the large and thorough empirical work of Lysgaard (1985) contributes strongly when it comes to understanding the role of informal group norms (the collective) on organizational behavior¹⁸.

In following Lysgaard (1985), some structural norms may be productive concerning individual learning and skills but some other norms may be counterproductive. Among the latter are norms that often emerge in teams or larger collectives of subordinates who are relatively isolated from the managerial ranks of the organization - that is, collective norms that imply a more or less permanent state of suspiciousness and distrust. Thus, Lysgaard's point is that if such subcultures are allowed to develop, the result might often be a collective unwillingness in contributing to organizational change and innovation, since

¹⁶Methodological and epistemological collectivism is here meant as outlined by Durkheim (1966): *The rules of sociological method*, in which the society has the primary role over the individual; social structures and institutions exist independently of the individual. The point in Durkheim's analysis is to explain how the social phenomenon in itself as a system affects the individual, that is, the individual can only be understood on the basis of the social phenomena and not the other way around as Weber (1990) points out (I will discuss Weber further below).

¹⁷Collectivism has parallels with the position of social post-structuralism as outlined by Foucault (1970) who states that the individual is the product of power structures. Foucault is holistic in the sense that he takes into account the total of historical contingencies of the structures.

¹⁸The contributions of Brown and Duguid (1991) are to a large extent consistent with Lysgaard (1985) in their concept of 'communities-of-practice'. I will relate to Brown and Duguid (1991) later in the thesis, especially in Chapter 4.

human resource development initiatives might be interpreted as just another managerial idea that has to be fought. In his empirical studies, Lysgaard uncovered a mentality that distinguished sharply between "we" (the subordinates) and "they" (the managers), laying bare largely antagonistic cultures in the organization. In such contexts, then, Lysgaard's points to that there will often be implicit rules among the subordinates regulating the amount of effort that should be spent working for the firm, something which implies negative sanctions of those breaking the rules by working too much or too efficiently. Thereby, it should be reasonable to assume that the amount of knowledge and skill acquisition is similarly regulated and accompanied by sanctions to ensure that nobody exceeds the limits and rules set by the collective.

In contrast to Lysgaard, Max Weber in his theories of modern "bureaucracies" takes the position of methodological individualism (Weber 1990). Weber argues that a complexity of social phenomenon (capitalism, organization, state, etc.) is to be reduced to its most simplistic components (analytical reduction). That is, it is reduced to the social *actions* of the individual. Thus, Weber's starting point is the individual action. But the precondition for an action to have meaning in Weber's analysis is that it needs to have *subjective* meaning for the individual actor. The point in Weber's perspective, then, is that the individual actor in itself *constructs* the social reality in a social ensemble with other individuals. In reducing every social phenomena to individual actions, Weber follows to a certain extent the scientific ideal of logical positivism by leaving out the meaning of the holistic aspect of the society; that is, in not taking into account that intersubjective relations are something qualitatively more than simply the sum of the individuals. In that respect, Weber also tends to be a social realist by focusing on the meaningful actions of the individual as ideal units of analysis.

The challenge in that respect is how to understand the collective effects as emphasized by Lysgaard (1985); how the power of social patterns shapes and influences individual beliefs and organizational behavior and conceiving of individual actions as influenced more by non-rational rather than rational forces. In this connection March (1991) takes a position in line with Lysgaard by emphasizing the importance of taking into account the effects of the enabling and limiting structures of domination that is constituted by the collective norms and values imposing social obligations and constraining choices. Thus, the valid criterion according to March in refining exploitation in the short run, then, is *appropriateness* rather

than consequential optimality which enforces skills, knowledge and organizational learning to be conducted by duties and roles rather than anticipated decision making. This is to say that following Lysgaard institutions and organizational change are created by systems of normative expectations and internalized obligations, which initially are constructed by the individual actions.

But when it comes to understanding knowledge and skills of the individual in the context at the organizational level, I argue below that March and Simon (1958), Berger and Luckmann (1967) and Nelson and Winter (1982) to a large extent follow the line of Weber (1990)'s position of methodological and epistemological individualism¹⁹ by focusing on the *cognitive* elements of the individual. Such a cognitive approach implicates what is referred to as the social constructionist vision of reality (Berger and Luckmann 1967) in which processes of power and diversity in the last instance for the practical outcome are rejected.

Donald Schön in his book *The Reflective Practitioner – How professionals think in action* – building on Polanyi (1983)'s concept of “tacit knowing”, portrays organizational skills or what he calls professional expertise as developed through a lifelong learning process and that competent practitioners are characterized by their ability to reflect on their actions while doing them (Schön 1983). This he calls processes of “*reflection-in-action*” and “*reflection-on-action*”. This capability is developed during practical experience and is a kind of “feeling” which is particularly visible in situations of uncertainty, uniqueness, instability and value conflict. Schön (1983) suggests that practitioners elaborate this capability to include reflection on their own practice. Such a reflection stimulates individual and collective learning. First, practitioners become aware that they actively create their own mental models, which in turn is a precondition for generating new models regarding their role and practice. Second, reflection processes facilitate the externalization of the practitioners' tacit knowledge.

March and Simon in their thorough and well-written book *Organizations* portrayed organizational behavior as resulting from and organized around *decision making*, viewing organizations and humans as “decision making” and “complex information-processing” systems respectively (March and Simon 1958). Exploring the parallels between human

¹⁹ Their focus, as in line with Weber (1990), is the 'action organization' putting it in the words of Brunsson (1989), which will be discussed later in this chapter.

decision-making and organizational decision-making, they argue that organizations can never be perfectly rational, because their members have limited information-processing abilities. They point out that the observed order in organizations is a cognitive order, which is based on shared premises, rules and performance programs. This is explicated through emphasizing the assumption that there are consequential reasons for action. That is, March and Simon argue that it is possible to predict behavior in and by organizations on the basis of assessing the expected *subjective* individual meaning of courses of action. This point is emphasized in their notion of organizational “performance programs”. March and Simon concluded that individuals and organizations settle for a *bounded rationality* based on simple rules of thumb and limited search for information in order to *satisfy*, not maximize.

In emphasizing this notion of programs, then, March and Simon (1958) put focus on organizations as collections of roles, identities and assemblages of rules in which appropriate behavior is connected with recognized situations. Thus, they argue that organizational learning might to a large extent be conducted by assemblages of rules developed through collective reflection and experience and then stored as standard performance procedures referred to as organizational memory.

The sociologists Berger and Luckmann in their systematic treatment of “common-sense knowledge” in *The Social Construction of Reality* point out an additional element to this cognitive approach to knowledge and skills (Berger and Luckmann 1967). That is, in addition to that shared conceptions were produced and constructed in a social context, having been produced, were *perceived* as objective and external to the actors - not as nearly man-constructed, but a natural and objective order. In this, meaningful knowledge emerges in the mutuality between on the one side ascribing meaning to objective reality (internalization) and on the other side the individual expresses its subjective world to the external or objective reality (externalization). Thus, not only individual but also collective actors are socially constituted. Cultural systems, then, provide models for how to construct organizations and other social institutions.

Hence, according to a cognitive perspective, organizations, innovations and all other socially constructed parts of reality, are not so much bundles of regulations or collections of norms, but knowledge systems. This way Berger and Luckmann (1967) and also March and Simon (1958), advocate the view that cognitive systems controls behavior by controlling

our conceptions of what the world is and thereby what kinds of actions can be taken by what kinds of actors.

Nelson and Winter (1982) evolutionary perspective on innovation processes is also in line with the Weberian individualism in understanding human knowledge and skills as they state:

"The behavior of an organization is, in a limited but important sense, reducible to the behavior of the individuals who are members of that organization. Regularities of individual behavior must therefore be expected to have consequences, if not counterparts, at the organizational level."
(Nelson and Winter 1982: 72)

This means that the evolutionary approach of Nelson and Winter (1982) emphasizes the importance of cultural conceptions for the functioning of organizations, but locates these elements primarily in the habits and skills of the *individual* worker. The point in such an evolutionary theory for understanding organizational change, then, is the argument of the incremental development of the *tacit* knowledge embedded in the skills of the individual in itself which is the main carrier of organizational routines. In this context, the routine of the organization is understood flexibly as referring to

"...a repetitive pattern of activity in an entire organization, to an individual skill, or, as an adjective, to the smooth uneventful effectiveness of such an organizational or individual performance" (Nelson and Winter, 1982:97).

The organizational routine, then, is carried out by the "organization member", which is defined as a unit that can accomplish on its own and typically has certain skills. Analytically, the organization member refers to an individual, but it can also be referred to an organizational subunit. The set of skills and routines of the organization member is referred to as the "repertoire". The repertoire constitutes the set of genes of the individual organization member and thereby of the organization as a whole. Thus, Nelson and Winter (1982:99) strongly emphasizes the meaning of the organization's production of action for organizational change by stating that the routinization of activity in an organization constitutes the most important form of storage of the organization's specific operational knowledge. This is expressed in the claim that organizations remember by doing, analogue

to the idea that individuals remember skills by exercising them, as a large part of the knowledge of the organization as well as the individual is tacit.

However, I oppose Nelson and Winter's use of the routine notion claiming that organizational knowledge can not be reduced to the collectivization of individual pieces of knowledge. For this I argue in line with Polanyi (1983): "The operations of a higher level cannot be accounted for by the laws governing its particulars forming the lower level". Accordingly, organizational capabilities are directly affected by but not reducible to the characteristics of the individual skills.

In sum, I argue that the Weberian individualism as seen in the social constructionist position of Berger and Luckmann (1967) is a line that is followed up by Nelson & Winter (1982) and March & Simon (1958) in understanding the action oriented behavior of organizations. In the next section, then, I will review and criticize an approach to organizational change and innovation that to a large extent adopts the individualistic stance of Weber.

2.3 The Argument of *Organizational Learning II*

This Weberian positivist-oriented and individualistic line is also to a large extent adopted by Argyris and Schön in their valuable work of *Organizational Learning II*²⁰ where they present a very systematic and general treatment of the field organizational change and innovation (Argyris and Schön 1996). In their argument on change and innovation in organizations, Argyris and Schön starts from the individual and working outwards in line with Weber's positivistic methodology. This means that Argyris and Schön (1996) takes the stance that the main effort in organizational change and innovation is by making assumptions clear and getting down to the actual facts of the matter. Through their argument of the distinction between "single-loop learning" and "double-loop learning" outlining a theory of action separating "espoused theories" and "theories-in-use" they

²⁰ See also Argyris and Schön, *Organizational Learning: a theory of action perspective*, (Reading, Mass.: Addison-Wesley Pub., 1978), the precursor of Argyris and Schön, *Organizational Learning II* (Addison-Wesley series on organizational development. Reading, Mass.: Addison-Wesley, 1996). Here I rely on the latter.

conclude that it is possible to obtain *consensus* among each individual participant of the organization about what the situation and the solution is.

Argyris and Schön (1996) make a valuable and contributing effort in reviewing and discussing the literature of the evolving field of organizational learning. In their own approach to organizational learning they draw on the Deweyan idea²¹ of inquiry in outlining their understanding of “*organizational inquiry*” for what they define as “productive” and ultimately a “general” theory of organizational learning for practitioners. According to Argyris and Schön, “theories of action” refers to strategies of action, the values that govern the choice of strategies and the assumptions on which they are based (Argyris and Schön 1996:13). Thus a theory of action may take two different forms. First, what they call “espoused theories”, namely theories of action that is advanced in order to justify a given pattern of activity. Second, what they call “theories-in-use”, namely theories of action being implicit in the performance of a specific pattern or activity. They emphasize that a theory-in-use is not “given”, but that it has to be constructed from observation of the actual pattern of action. Such theories of action may further be *tacit* or *explicit* (Polanyi 1983), where they emphasize that tacit theories-in-use may not be consistent with the espoused theory of the organization. This point is analog to Brunsson (1989) pointing to managers who use “hypocritical talk” to calm down conflicting situations where the “distance” between espoused theory and theory-in-use is in a sense “too large”.

Hence, Argyris and Schön (1996) define *organizational learning* as a change in the organizational theory-in-use resulting from organizational inquiry that “must become embedded in the images of organization held in its *members’ minds...*” (Argyris and Schön 1996: 16, my *italics*). Consequently, there are two types of organizational learning that they refer to as single- and double-loop learning. Single-loop learning is instrumental learning in a sense of detecting and correcting errors changing strategies of action while still leaving the underpinning values and norms unchanged. Double-loop learning emerges when there is a change in those values and norms as well as in its strategies and assumptions. Experience and reflection are not supposed to be perceived as a kind of shortcut towards new knowledge and organizational change. On the contrary, being able to cope with change requires the skill to focus on the possibilities that are provided by the situations that carry a

²¹ See next section below where I discuss Dewey’s philosophy of pragmatism.

potential for change. That is, being able to conceptualize experience in a meaningful way and by shedding multi-angled light on new experiences. Hence, double-loop learning refers to the capacity to take effective action by focusing on the preconditions for what to do for learning a new organizational frame of reference (Huber 1991:93). In contrast to this, single-loop learning emerges; namely, being without the ability to reflect on these preconditions for learning, it is very likely that the practitioner only improves *what is* already learned.

In order to create real processes of organizational change and innovation, Argyris and Schön introduce the concept of “*organizational learning system*” consisting of the behavior, cultural and structural features that facilitates or inhibits organizational inquiry. They make a dualism between two kinds of learning systems, namely the *Model O-I* and the *Model O-II*. Their main concern of the book, then, is a proposal for a *model of intervention* helping organizations to create real change and innovation towards the Model O-II learning system. An organization with a Model O-I learning system is highly unlikely to create real change, and therefore it has to undergo a shift to an alternative system, namely the O-II system.

When human beings deal with issues that are threatening and embarrassing, Argyris and Schön argue that their reasoning and action conform to the Model I theory-in-use. The actors then try to preserve control over the situation, other people and their own feelings. The individual Model I theories-in-use produces defensive reactions and creates self-reinforcing feedback loops, which reinforce both the strategies of action and the Model I theories-in-use (Argyris and Schön 1996: 89-103). This makes up in turn a limited learning system. They use the terms *skilled incompetence* and *skilled unawareness* to emphasize that the organizational learning disabilities are connected to a theory-in-use. To cope with the learning disabilities they propose organizational *deuterolearning*²² connected to the Model II theory-in-use and consequently the Model O-II learning system. Deuterolearning is a kind of double-loop learning through which the members of an organization may discover and modify the learning system that conditions prevailing patterns of organizational inquiry. They claim that the critical governing variables for action of Model II and hence

²² Here Argyris and Schön (1996) refer to work of Gregory Bateson and what he calls deuterolearning (Bateson (1972): *Steps to an ecology of mind*). Deuterolearning is also closely connected to the concept of *reflective practice* as developed by Schön (1983) as discussed below.

crucial conditions to create Model O-II learning system are *valid information, free and informed choices* and *internal commitment*. Their model of intervention or program for organizational change and innovation towards O-II tries then to accommodate these conditions.

In this thesis I strongly oppose Argyris and Schön (1996)'s utopian interventionist stance of "learning away" power, diversity and conflicts in organizations through a kind of individualistic and positivist-oriented consensus making facilitating what they call "double-loop learning"²³. In order to come to terms with an alternative notion of knowledge and model for change that eventually takes the full implication of the rejection of the Cartesian dualism, I discuss in the next section an alternative epistemology building on the Deweyan philosophy of pragmatism. As Argyris and Schön (1996) also draws upon the idea of Deweyan inquiry, I will make a thorough discussion of Dewey in order to show what justifies this alternative model for *participative* organizational change and innovation.

2.4 Dewey's pragmatism: an alternative epistemology for participative organizational change and innovation

I claim that processes of creating organizational change require an understanding of knowledge as being intrinsically socially constructed (Berger and Luckmann 1967). Moreover, I argue to take this detour into philosophy of pragmatism for coming to terms with an alternative form of knowledge that to a large extent extends the individualism of Berger and Luckmann (1967). Thus in contrast to this Weberian individualistic oriented position criticized above, I will show that the pragmatist approach provides the necessary epistemological basis in achieving a realistic understanding for dealing with the issues of power, diversity, participation and learning in facilitating participative processes of organizational change and innovation.

²³ Despite my critical stance, I emphasize that Argyris and Schön (1996) provides an excellent and critical review of the growing field of organizational learning. I will to a certain extent relate to Argyris and Schön (1996) throughout the chapter.

The emerging point in this alternative epistemology is to look at knowledge as a continuous process of inquiry. This process entails creating knowledge to act through communicative discourse in *arenas* for dialogue. Eventually, I argue for the need to take the full implication of the rejection of the positivist based Cartesian dualism in our understanding of forms of collective knowledge. In that effort I argue in line with the paradigm of naturalistic inquiry as outlined by Lincoln and Guba (1985).

In this thesis' approach for understanding knowledge I draw upon the pragmatism of the American philosopher John Dewey (Dewey 1938, 1971 and 1991)²⁴. This Deweyan approach is consistent with the argument of Lincoln and Guba (1985) in their naturalist paradigm that is summed up in five main axioms and contrasted to the positivist version. Basically, the naturalist axioms according to Lincoln and Guba (1985) say that 1) realities are multiple, constructivistic and holistic, 2) knowers and known are interactive, inseparable, 3) only time- and context-bound working hypotheses are possible, 4) all entities are in a state of mutual simultaneous shaping, so that it is impossible to distinguish causes from effects and 5) inquiry is value-bound. These axioms entail what naturalistic inquiry state in methodological terms, namely the understanding that the process of creating new knowledge presupposes an intrinsic link between action and thought or reflection in a unified process - there is no such Cartesian dualism.

The logical implication of this refusal of Cartesian dualism according to Dewey is to go beyond the distinction between theory and praxis and instead look at the *process* of inquiry as the basic instance in which our knowledge about the world is constituted and created. Thus, the process of inquiry is a reflective *praxis* activity that aims at the creation of meanings in which the construction of theories is a special case of the use of the productive skill. Dewey points out further that inquiry is intrinsically a technological process because inquiry is the mean of effective control of our surrounding environment. Thus inquiry is also a productive skill whose artifact is knowing, which is characterized as *tools* that have their meanings only in use in concrete situations. Thus, all knowledge is *context-sensitive* due to the primacy of praxis.

²⁴ John Dewey (1859 – 1952). Dewey was one of the leading American pragmatists, among them William James (1842 – 1910) and Charles Sanders Peirce (1839 – 1914). When referring to Dewey, I will mostly draw upon three of his books, namely Dewey (1938): *Logic: The theory of inquiry*, Dewey (1971): *Experience and nature* and Dewey (1927/1991): *The public and its problems*.

In his critique of technology and knowledge, Dewey (1938, 1971) clearly despises all dualisms, and he emphasizes that artifacts (including habits such as goals and ideals) only have their meaning in relation to *production*. Dewey moves well beyond theory and *praxis* where the habits that are learned as the result of previous inquiry, are characterized as tools that have their meaning only *in use in concrete situations*. Thus, it is obvious that my discussions above in relation to the technological world that we interact in as a social construction apply to Dewey. In this connection he emphasizes that the construction of theories is a special case of the use of productive skill. Our knowledge about the world is constituted by *inquiry*. This means that Dewey rejects the methodological positions of both realism and idealism. He goes well beyond those positions and calls his view "instrumentalism", later "experimentalism" and eventually "technology" (Hickman, 1990).

Dewey points out that the significant technological character of inquiry is that every reflective experience is instrumental to further production of meanings. The reason why he calls inquiry technological is that inquiry is "the means of effective control of an environment that is not what we wish is to be."²⁵ Thus inquiry is a productive skill whose artifact is *knowing*, which is relative only to situations. The goal of inquiry then, is not epistemic certainty, but instead constant interaction with the surroundings by different tools in order to find out what beliefs work with success, an interaction in which the question of truth is decided. This is to be called the pragmatic stance by viewing technology as a constructive inquiry process in order to give meaning to the surroundings and consequently provide social order.

For Dewey, technological tools include not only material matter, but immaterial things as well, such as logical entities, e.g. "if", "or" or the " number 3". His point is that ideas and theories do not exist mentally or physically, there is no difference between "abstract" and "concrete" tools: they are all just tools that arise out of the techniques of *control* that constitute all our actions in practice, including the use of language. Even the most abstract phases of the inquiry that scientist and mathematicians undertake, constitute a tool-using activity and therefore a form of practical, productive skill. The inclusion of immaterial entities as having the status of technological artifact is a logical consequence of Dewey's

²⁵ Hickman 1990: 41

paradigmatic rejection of the Cartesian dualism between body and mind or between the organism and the environment.

What we see here in Dewey is that he takes into account the *real* implications of today's declaration of social sciences, namely the rejection of this Cartesian dualism. By doing this, Dewey criticizes what most of social the sciences still persist at doing, despite the rejection of the Cartesian dualism, namely consider *skills* as the application of theoretically based rules. In addition, Dewey has stressed the traditional separation of knowledge and action, and he has articulated a theory of inquiry that has served as a model for coming to terms with how to render possible the democratization of technology, a model which has been applied to scientific and technological methods, as well as to social practice; Dewey emphasized the meaning of practice as a precondition for learning as in line with Polanyi (1983) and Ryle (1949)²⁶, by arguing for the primacy of '*learning-by-doing*'.

Indeed, Dewey has no specific definition of technology, because he uses that term to characterize various activities. Hickman (1990) describes Dewey's view on technology in the following way:

"..[according to Dewey] technology can be said to be the appropriate transformation of a problematic situation, undertaken by means of the instrumentalities of inquiry, whatever form those instrumentalities may take."²⁷

According to Hickman, then, Dewey emphasizes that inquiry is a *technological activity* because where inquiry takes place there is a shift from passive acquiescence toward the beginnings and endings of nature, its contingencies, to the active construction of artifacts to affect their control. Dewey defines inquiry in terms of the concept of control:

"Inquiry is the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole"²⁸.

²⁶ Polanyi (1983, 2000) and Ryle (1949). Ryle means that there is a kind of practical "knowing-how" which can not be understood as a result of theoretical knowledge about the relationship between means and ends, and which is not a result of theoretizing or derivations from logical proportions. In the same sense Polanyi means that we always know more than we can explain, a part of our knowledge will always remain hidden or as he called it, *tacit* knowledge.

²⁷Hickman 1990: 45

²⁸ Dewey 1938: 108.

Further, Dewey emphasized that 'controlled or directed' in the above formula refers to the fact that inquiry is competent in any given case to the degree to which the operations involved in it actually terminate in the establishment of an objectively existential situation.

Dewey regards technological activity as one of the most basic of human enterprises, and calls the search for effective control "*a revolution in the whole spirit of life, in the entire attitude taken toward whatever is found in existence... The attitude of control looks to the future, to production*"²⁹. The important point to make here, is that Dewey treats knowing as something instrumental, a kind of tool for emancipation and self-realization in the way that

*" [...] Instrumentalism makes knowing a technological activity, a kind of production and construction at their most fundamental levels [...]... that the meaning of a proposition is not determined by or uniquely associated with its syntactic structure, but by its **function** in inquiry"*³⁰.

In that sense Dewey argues that the meaning of words is always dependent on the context of communication, that is, that we constitute ourselves through communicative inquiry into a public or an organizational reality.

Dewey sees the socially constructed reality as the fundamental context for meaning construction. This means that words do not correspond uniquely to objects or events. Wittgenstein in his "*Philosophical Investigations*" made precisely the same point a few years later -- Wittgenstein called them "language games" (Wittgenstein 1958). Dewey emphasizes, then, the significance of the social reality where inquiry takes place, as the fundamental common arena to understand the link between technology as our primary activity and democratic intervention, or broad participation. For Dewey it is meaningless to discuss technology without taking into account the question of democracy. Expressed the other way around, the question concerning democracy intrinsically involves the concept of technology.

Let me emphasize at this point that this is not turning into a tautological argument. The question of democracy and broad participation from Dewey's point of view concerns the possibility for arranging society in such a way that it fulfils the conditions for individual

²⁹ Dewey 1929: 80-81

³⁰ Hickman 1990: 55.

emancipation and self-realization. However, in order to ensure that society fulfils its concerns for individual improvement, the individual or the organizational actor needs to take part in this social inquiry that in itself is a technological activity and a productive skill whose outcome or artifact is knowing. Technology, then, means a *process* in which the individual constantly interacts with the surroundings by those different tools in order to control and then consequently to *construct* and give meaning to the surroundings.

In the next section I will claim that this Deweyan concept of democracy and inquiry are consistent with the position of actor-network theory (ANT) and other constructivist views of technology (Latour 1987, Williams and Edge 1996). Although I argue that ANT does not link construction processes to the question of any emancipatory ideas or social improvement. The only point for Latour (1987) in his argument of ANT, then, is to show how technological facts and artifacts are initiated and become meaningful through the social and strategic construction process of 'black-boxing' based on network of manipulation constituted by both human and non-human actors. According to ANT the need to open the black box for outsiders is emphasized only in order to solve the outstanding technological controversies of political concern.

2.5 The Argument of Actor-Network theory (ANT)

I claim that the Deweyan position of philosophical pragmatism of inquiry discussed above is fully consistent with and deepens the positions viewing organizations as actor-network (Latour 1987) as well as forms of knowledge viewed as social constructions (Berger and Luckmann 1967). Thus, in order to show this consistency to Deweyan inquiry, I review in the following a position of actor-network theory (ANT) as outlined by Latour (1987), Law (1992) and Monteiro (2000). In so doing, I will firstly review some main points from Williams and Edge (1996) and the 'social shaping of technology' (SST) –tradition, including a more modern notion of technology as contained in the approach which can be defined as 'the social construction of technology' (SCOT)³¹.

³¹ Here I look at the main proponents of this approach, namely Pinch & Bijker (1987) and Bijker (1995).

Williams and Edge (1996) address the issue of choices both in regard to the design and the direction of innovation programs. Through a critique of the ‘technological determinism’ SST emerged by stating that there is no inner technological logic but a product that is socially constructed conditioned by the involved interests and pattern of use. These social factors in addition to the more narrow technical relations together in a mutual way condition what choices are taken concerning the shape, the content and the social implications of the technology. Eventually, Williams and Edge stress the importance of going beyond the other turn also, namely to go beyond social determinism that views technology as shaped by a single rationality, e.g. the economic or the political imperatives, for instance the idea that the content and shape of technology exists only as a result of evolving market demands.

Another central point addressed in the SST approach according to Williams and Edge (1996), is the phenomenon of interpretative flexibility, the process of closure (Pinch and Bijker, 1987, Bijker 1995) and the possibility to gain insight through inquiring into this of going back and taking a look at the facts and artifacts at the point where they are being produced (Latour 1987). Interpretative flexibility tries to show that any fact or artifact may have multiple interpretations – there exists several parallel variants, while closure attempts to illustrate how social mechanisms limit these interpretations or limit the possibility of further discussion.

Berger and Luckmann (1967) point out that the reality is produced and constructed in a social context, that is, a dialectical process between the individual and the society. In the end, when the single individual has gone through the processes of externalization, objectivation and internalization, the result is a subjective reality, which in turn is externalized. Hereafter, in the context of discussing organizational change and innovation, I have chosen to refer to Berger and Luckmann’s subjective and objective reality by using the notions *local* and *organizational* reality respectively.

Latour (1987) elaborates this position of social construction of reality by outlining the position of *actor-network theory* (ANT) where he emphasizes technology and reality only as a matter of interaction between interests by stating the existence of *strategic action* in the sense of enrolment and binding allies. Latour is concerned with how those facts and

artifacts are produced and become "black-boxed" which in the end constitute the organizational reality. He emphasizes the necessity for the inquiry into this of going back and taking a look at the facts and artifacts at the point where they are being produced. Thus the challenge according to Latour is first to enroll supporting forces into his or her project, and second, to keep them in place. The effort of enrolment is then achieved through translating the interests of the enrolling actors. And the keeping-in-place is accomplished through building the forces into the artifact, so that it becomes unavoidable and, thus, as taken-for-granted; an "obligatory passage-point" in the every-day practice³².

With Latour's help, I am coming to terms with how organizational reality including integrated technological and organizational innovation may occur in practice, which presupposes the change of its allies (or interest partners), according to Latour's idea of the network. Its allies will involve the authorities, e.g. the top management of the organization. This is, according to Latour, the critical stance on the emphasis of opening the black box for 'outsiders' or opening for broad participation in technology is legitimized in order to solve the organizational and technological controversies. Thus the question of change becomes a political and strategic matter. But Latour only focuses on the possibility to affect its allies in order to figure out how production and change of organization and technology might be generated. Latour's contribution can in those terms be seen as a manual for manipulating the world, or for initiating change in the organization in the first place.

According to Law (1992), those translation processes are the processes that generate ordering effects such as organizations, power and actors. That is to understand how such network effects hold together the elements of which they are composed, and thereby to note that it could have been otherwise. Hence, ANT according to Law argues that the socials, e.g. the structure of organization, or any other actor like an individual person, are interactive effects that recursively stabilize and reproduce themselves in a translation process generated by a network of heterogeneous, interacting, materials. That is the network is not only composed by humans, but also of non-humans like e.g. technological artifacts. So when it comes to understanding organizations, Law concludes that ANT treats the characters of the organization "as an effect or a consequence – the effect of interaction between materials and strategies of organization."³³

³² See Rip, Callon and Law (1986)

³³ Law 1992: 389.

In building on this argumentation of SST and ANT, Levin (1997) states that technology is a product of a social process in which the actors or actants³⁴ engaged in constructing and shaping it, humans as well as non-humans, are constructed as part of that actual end product and can therefore *not* be separated from it. To use the technology conditions insight into the network effects constituting that technology, or, the knowledge and cultural understanding “built into” it. Thus, the point is that introduction of new technology, especially like IT, entails a process of organizational change in which organizational structure and work processes are reconstructed and reshaped together with the employees and the other actors in the network that constitute the actual technology. And thus the organization emerges as an effect of the social interactions between the involved actors or as an effect generated by a network of the heterogeneous interacting actors (Law 1992). Levin (1997) states the point, then, that there is a need of mutual adjustment in the interface and interplay between technology and organization.

The point of Levin (1997) also draws on the argument of the socio-technical systems theory (STS) emphasizing the fulfillment of psychological job demands (Trist and Bamforth 1951, Trist 1981). Thus STS stress the *joint* optimization of the technical and the social system for the ultimate efficacy of semiautonomous work groups based on intrinsic self-regulation. This moves on the argument of *continuous adaptive learning systems* in which the increase in workers capabilities are assumed to extend their decision space towards an overall gain in flexibility. Consequently, in the case of e.g. a technology transfer process is seen as an integrated organizational and technological process of change (Levin 1997).

In brief, Levin (1997) focuses on organizational change and innovation in relation to technological transfer. He argues that technology transfer entails the process of change by going through the argument that technology as part of reality is socially constructed. He draws on the argument by Pinch and Bijker (1987) and STS in stating that technological development is a complex social process involving different actors that interacts in the social construction process. Thus, there is a complex web of actors in which different interests merge into a social understanding of what solution should be chosen and that this choice very well could have been a different one (Bijker 1995).

³⁴ Latour proposes this definition of actants: “*I propose to call whoever and whatever is represented actant*” (Latour 1987: 84).

In taking into account the contextual conditions of technology and organization as entities being continuously socially constructed and reconstructed as stated in our review of ANT and STS, there is no meaning in talking about the existence of any objective true model of organizing or general best way of organizing. It is the actual context that matters, that are the actors, the constituting network and the social relations between them that in the end decide the actual shape and content constituting the entity we call organization. Therefore the change process conditions the insight and contribution from each and every actor involved, e.g. that each and every employee of the organization as being relevant actors to the change and innovation process. This is to argue for the very need of broad participation in aiming at a real change process towards achieving the continuous learning processes and also the competence to create the continual learning organization.

Levin (1997)'s argument of change as a continuous learning process is fully consistent with Monteiro (2000)'s argument of ANT in emphasizing the phenomenon of *an information infrastructure* as an aligned actor-network. Here Monteiro (2000) makes the point that the aligned actor-network is an "*achievement* of a process of bottom-up mobilization of heterogeneous *things*"³⁵. Thus patterns of use and stability are a result of translated interests conditioned by the process of *inscribing* pattern of use into kinds of a 'medium' or a material. Inscription turns out as a central notion referring to the way artifacts "embody patterns of use" (op.cit). Monteiro then makes the argument that translations and patterns of use need to be inscribed into something. This entails the point that the achievement of a process or organizational change is conditioned by the strength of the inscription or the *irreversibility* of the actor-network into which the change process is inscribed. Thus patterns of new useful collective practice for organizational operation and collaboration needs to be sufficiently inscribed into a system or network of translated actors and artifacts. The question for an organizational change process is *how* to inscribe the changed practice, or patterns of use, and into what.

In sum, the outlined position of ANT and STS is fully consistent with Dewey's concern for individual active engagement in technological making discussed above. The central point, though, is that Dewey moves on to deepen ANT's argument by emphasizing that the need

³⁵ Monteiro 2000: 72.

for broad participation in technology does not only rely on the matter of solving the controversy in itself, but also on the possibility for securing social improvement for the individual citizen through participation. Dewey reconceptualizes or extends the meaning of technology epistemologically by seeing technology as our most fundamental inquiry process in the effort to control the surroundings and consequently to provide social order. Consequently, the process of organizational change and innovation must in the end be taken over by the concerned participants themselves. In the last section of this chapter, I will thus come back to the argument of viewing change and innovation as a continuous collective learning process as taken over by the concerned.

In the next section, then, I will inquire more into the power issues of change processes by relating to the Deweyan self-realization or self-governance concept.

2.6 Power and democracy at the workplace

In order to develop a critical notion of democracy for our purpose of understanding conditions for organizational change and innovation, I need to be more specific about how to understand such a notion as an intrinsic value in itself. Based on a pragmatic critique of technology as discussed above, Dewey emphasizes the faith in the capacity of every human being to govern him or herself with wisdom:

“The foundation of democracy is faith in the capacities of human nature; faith in human intelligence and in the power of pooled and cooperative experience. It is not belief that these things are complete but that if given a show they will grow and be able to generate progressively the knowledge and wisdom needed to guide collective action.” (Dewey (1991) in Greenberg 1975) [...] *“In its deepest and richest sense a community must always remain a matter of face-to-face intercourse. This is why the family and neighborhood, with all their deficiencies, have always been the chief agencies of nurture, the means by which dispositions are stably formed and ideas acquired which laid hold on the roots of character. The Great community, is the sense of free and full intercommunication, is conceivable. But it can never possess all the qualities which mark a local community. [...] Democracy must begin at home, and its home is the neighborly community.”* (Dewey 1991: 211-213)

This Deweyian normative and ethical thinking of democracy is consistent with the emphasis of the democratic personality related to participatory modes of behavior as outlined by Pateman (1970):

The theory of participatory democracy is built round the central assertion that individuals and their institutions cannot be considered in isolation from one another. The existence of representative institutions at the national level is not sufficient for democracy; for maximum participation by all the people at that level socialisation, or 'social training', for democracy must take place in other spheres in order that the necessary individual attitudes and psychological qualities can be developed. This development takes place through participation itself. The major function of participation in the theory of participatory democracy is therefore an educative one, educative in the very widest sense, including both the psychological and the gaining of practice in democratic skills and procedures. Thus there is no special problem about the stability of a participatory system; it is self-sustaining through the educative impact of the participatory process. Participation develops and fosters the very qualities necessary for it; the more individuals participate the better able they become to do so. Subsidiary hypotheses about participation are that it has an integrative effect and that it aids the acceptance of collective decisions.” (Pateman 1970: 42-43, my underlines)

In relating these political notions of democracy and participation to the question of technological systems, it is important to note that participation is not to be confined to what we normally think of as politics, but that it encompasses the total society (Dewey 1991)³⁶. The practical problem in this connection might be that it is doubtful that the

³⁶ von Krogh et al. in their article "Corporate Epistemology" make the assumption that a 'participatory system' is self-sustaining through the educative impact of the participatory process by using the notions of identity and self-referentiality based on an alternative knowledge notion from autopoiesis theory outlining a theory of management and strategy (von Krogh et al. 1994). However, the underpinning argument in autopoietic theory has its origin from Luhman that argues that the principles of autopoietic systems can be generalized to include social systems. The starting point for von Krogh et al. is to try to contrast autopoiesis theory to the traditional cognitivist perspective of knowledge. As he puts it:

"..the cognitivist perspective assumes that the world is pre-given, and that the goal of any cognitive system is to create the most accurate representation of this world.....Unlike the cognitivist perspective autopoiesis theory suggests that the world is not a pre-given state to be represented, but rather that cognition is a creative act of bringing forth a world. Knowledge is a component of the autopoietic (self-protective) process, it is history-dependent, context-sensitive and, rather than being oriented towards problem solutions, knowledge enables problem definition. Moreover, at the individual level, knowledge is not abstract but rather is embodied in the individual.”(von Krogh, 1994, p.57-58, my underline).

average citizen will ever be as interested in decisions made at the collective level of the nation as he would in those made at the local collective level, i.e. the workplace. But despite this possible objection, the point is that participation in those alternative areas equips the citizen with better appreciation of the connection between *the local and the national politics*³⁷. By participating at the local level, at least, the citizen will be more trained for assessing the performance of the representatives both at the local and state level.

In stressing a link between the local (private) and the public (collective) sphere, Pateman (1970) argues, then, for an extension of the scope of the term 'political' to cover non-governmental systems as well, such as industry, technology, and different kinds of organizations. In her concern that the individual should be an educated, public citizen, Pateman emphasizes the importance of participating in decisions at the workplace as well as in those non-governmental systems that constitute the common public or collective.

It seems profitable for our purpose in this thesis of working out a model of organizational change and innovation, to relate the meaning of Pateman's political view of the relations of participation at the *workplace* and the *public* to Dewey's ethical notion of self-realization. This is so precisely because of the stress she puts on the link between the local and the public described above. For this purpose, I will take into account

By assuming this notion of knowledge, it means that knowledge development is self-referential and intrinsically connected to observation, which is to say that knowledge generating includes reference not only to past knowledge, but also to future knowledge, and that information is a process of interpretation where knowledge is acquired. But the fundamental presupposition for this knowledge notion is that it requires an adequate self-description that constitutes the identity of the individual and the collective itself (von Krogh 1994: 62). For the individual to give meaning to its surroundings, that is, to have any meaningful experience at all, this knowledge is necessary to construct an individual identity and then consequently, a collective identity. Thus, on the basis of this self-referential knowledge that is continuously created and recreated, it is assumed that we develop our vital individual identity in a mutual process with the collective identity, that is, to belong to a collective is in principle necessary in developing an identity. This knowledge is then only available through communication with others, that is, in order to maintain as an individual in an ever increasing 'knowledge complexity', our personal identity will continuously has to be enhanced in a never-stopping need to confirm the status/position of the identity in relation to others. The argument of an individual will in this autopoietic perspective, takes the individualistic and positivist-oriented position of Weber as criticized above. Still the contribution of von Krogh et al. (1994) is a valuable one in its critique of the cognitivist position of knowledge.

³⁷This connection is analog to Dewey's distinction of the public and the private sphere in Dewey (1991).

Dewey's pragmatic critique of technology based on his concept of inquiry as discussed above.

First, according to Dewey's notion of inquiry, it implies the fact that the activities of human beings produce consequences both for themselves and for others, and that means are sought to control such consequences. In this context, artifacts are developed and used where political and social life is technological. That is, they are both con-structive and pro-ductive. Second, it implies the rejection of the structural distinction between the "*individual*" and the "*society*" which has been replaced by the introduction of a *functional* distinction between what is *private* and what is *collective*. The reason for the abandoning of this structural distinction according to Dewey is the understanding that *communication* is the fundamental condition for the meaning of the individual, and thus communication is a technological artifact according to Dewey's argument of inquiry. It is therefore only on the basis of technological artifacts that human beings are able to *construct* a meaningful world.

In that sense the concept of the *individual* can only exist as such as an abstraction from its historical and cultural context, and thus it is a secondary concept in relation to the concept of the *collective*, which has the overall primacy. Dewey explains the functional pair collective/private in terms of control (Dewey 1991). People are private when they are deprived of their public (collective) position, while the collective is

*"all those who are affected by the indirect consequences of transactions to such an extent that it is deemed necessary to have those consequences systematically cared for."*³⁸.

The collective, then, is constituted by a structure that limits the actions of private people. Thus, the meaning of "*the collective*" is partly based on the belief that each and every one of us is indeed related to other human beings in the sense that existence and childhood are dependent on prior human relations. In addition, the intrinsic features of *being* include associations to fellow human beings in the sense of hope, desire, rights, and value-commitments which are bound by material conditions where participation in technological achievements are of central concern. This Deweyan notion of the collective is in line with Kant's and Rousseau's ethical stance, namely, that for a human

³⁸ Dewey 1991: 15-16.

being to be fully free, and as they call it, an autonomous person, he or she needs to fulfill certain claims and duties as a collective person which restrict the actions of the private person.

Against this background it becomes clear that each human being *should* participate in the making of technology that influences his or her own life situation. But to ensure the exercise of effective control of the many problematic situations that may emerge in the collective, e.g. when parts of the collective operate either covertly or overtly for ends that are private, the collective referred to as the public require agencies and officials. In this sense there is a need for a larger collective institution called a state. Dewey says about the state:

The only statement that can be made is a purely formal one: the state is the organization of the public affected through officials for the protection of the interests shared by its members. But what the public may be, what the officials are, how adequately they perform their function, are things we have to go to history to discover... there is no a priori rule which can be laid down and by which when it is followed a good state will be brought into existence.[..] In concrete fact, in actual and concrete organization and structure, there is no form of state which can be said to be the best: not at least till the history is ended, and one can survey all its varied forms. The formation of states must be an experimental process." (Dewey 1991:33)

In contrast to Aristotle, Dewey has no ontology of the state. However, Dewey emphasizes a clear criterion for finding out how democratic a state is. In this connection, Hickman outlines Dewey's criterion:

"A state is to be measured in terms of the extent to which a public is organized so as to solve certain difficulties, and in terms of the extent to which the public officials are capable of and do in fact exercise effective control of the public interests." ³⁹.

By this criterion Dewey wants to express what is to be thought of as a *representative democracy*, which is one that seeks to control that the representative function prevails over the private function.

³⁹ Hickman 1990: 172.

The point Dewey wants to make here, is that first of all, according to his concept of inquiry mentioned above, he rejects the traditional separation of knowledge and action. Knowledge and meaning are constituted through practice in which technological artifacts are used. In emphasizing these points, and by saying that both the state and democracy are *technologically* constructed artifacts resulting from social inquiry, there is little left which is not to be called technological artifacts. In that connection it does not make much sense to follow Dewey strictly in an effort to understand what the potential of democracy really should mean in relation to technological systems or for our matters of understanding organizational change. Democracy is more than just a tool; it represents the basic value in human inquiry. But despite the fact that Dewey's concept of technology and democracy may seem to be too general in this connection, Dewey's underpinning real concern in his humanistic pragmatism is the focus on the ethical need for democratizing technology on the basis of what I have now referred to as his 'pragmatic critique of technology'. It is not an exaggeration to say that the focus on this need is the most important point of his entire philosophy. This can be viewed as justified because his pragmatic critique was inspired by his thoughts on social and educational reforms with emphasis on concern about the technological development of his time⁴⁰.

In sum, the contributions from Dewey in this context, may seem too idealistic and unproblematic for our concern, namely to justify the values of democracy and broad participation. So in an attempt to legitimize the relevance of Dewey's arguments for processes of organizational change and innovation, I will in the next section problematize this somewhat idealistic stance by discussing in rather *narrative* terms the relation between the concepts of power and rationality.

2.7 Power and rationality

The basic and most significant assumption I will argue for in this connection is that there is an intrinsic association between social power and technological knowledge. First of all, to

⁴⁰ In contrast to this value-based Deweyan democracy, "The management school" as outlined by Greenberg (1975), emphasizes participation not as a democratic value in itself, but strictly as expedient means for increasing productivity and profit. This school according to Greenberg got widespread popularity both in management-oriented literature and among American business leaders for a period during the sixties. Nylehn (1994) is another valuable contribution to the understanding of democracy and participation in work life. Still, parts of his argument regarding a strict distinction between participation and co-determination contradict clearly the Deweyan notion of democracy as outlined above.

put very simply, I will assume that there is a mutual influence between rationality and power, in the sense that power produces rationality, and rationality produces power, but in a different proportion, where power fundamentally dominates rationality. To paraphrase a well-known quotation of Pascal, we may say, “the power has a rationality that the rationality itself does not know”. Conversely, the rationality does not have a power that the power does not know. This is why there are different proportions between those two. Francis Bacon was right when he said that knowledge is power, but conversely - and this is the point here -- that *power is knowledge* in the sense that power influences the production and distribution of knowledge. Out of this, an important assumption emerges, namely that rationality and power, knowledge and power, truth and power, and then reason and power are best understood in a dynamic non-dualistic ensemble (Flyvbjerg 1991).

The significant situation emerges when the power operates within the framework of a formal democracy: the power typically cannot be performed as rough power, but has to be performed in a more legitimate way. In practice, then, a simple relation of domination cannot describe the relation between power and rationality, where power dominates rationality. More complexity has to be allowed for in the relation between the two concepts.

Flyvbjerg⁴¹ describes that complex relation by ten statements, which he arrives at on the basis of a large empirical work from a case study of both the planning and the accomplishment phase of an environmental- and technological action program for the city center of Aalborg, Denmark. The ten statements according to Flyvbjerg (1991) start by focusing on the rationality of power and then gradually move towards the description of the power of rationality:

- **Statement no.1:** Power defines reality. This means that power does not limit itself to defining a certain conception of reality. Power defines physical, technological, economic, ecological and social reality. Power is more concerned with the defining of reality than with understanding how reality is constructed. Flyvbjerg argues that this is the most important single characteristic of the rationality of power, i.e. of the strategies and tactics employed by power in relation to rationality.
- **Statement no.2:** Rationality is context dependent, the context of rationality is often power, and in the context of power there is a floating border between rationality and rationalization.

⁴¹ Flyvbjerg, 1991, vol.II, p.424-427.

- **Statement no.3:** Rationalization described as rationality is a key strategy in the rationality of power. By this statement Flyvbjerg points claims, in line with Garfinkel and other ethnomethodologists, that the participants themselves produce rationality in a given activity first of all. This point is nicely confirmed by the case-study project. When powerful participants want to use rationalization instead of rationality, rationalization is produced. Given that one distinguishes between *formal* politics and *real* politics in the study of political processes, one ought to distinguish between formal rationality and real rationality in the study of technology and decision-making.
- **Statement no.4:** The greater the power, the less the objectivity.
- **Statement no.5:** Stable relations of power are more typical than antagonistic confrontations.
- **Statement no.6:** Relations of power are not given, but are constantly being produced and reproduced.
- **Statement no.7:** The rationality of power has more profound historical roots than the power of rationality.
- **Statement no.8:** In an open confrontation rationality yields to power. This is the cynical finding in Flyvbjerg's studies. He underpins this by using Michel Foucault (1970)'s analysis of power and refers to statements such as "Truth is the first victim of war". He emphasizes this by arguing that the use of naked power typically works better in the context of open confrontations than in any appeal to objectivity, facts, knowledge or rationality, even if feigned versions of the latter, i.e. rationalizations, are often used in attempts to legitimize naked power. The observation that rationality yields to power in open confrontations can be seen as a borderline case of observation no.4.: Rationality yields completely to power where naked power finds the maximum conditions for free play, i.e. in open, antagonistic confrontations.
- **Statement no.9:** Rationality-power relations characterize stable relations of power to a larger extent than confrontations. That is, the ensemble between rationality and power affects relations of power in a typically stabilizing way, and in real terms makes them constitutional.
- **Statement no.10:** The power of rationality is based on stable relations of power, not on confrontations. The power of rationality, that is, the force of the argument of reason – or to speak with Habermas (1990)'s argument of communicative rationality, is weak in the context of antagonistic confrontations.

Thus, Flyvbjerg (1991) argues that the force of rational argumentation gains maximum influence in stable power relations characterized by negotiations and consensus-seeking. Therefore, it is of paramount importance to the power of rationality that power relations be influenced and controlled in a way that makes and keeps relations non-antagonistic and stable. This argument by Flyvbjerg opens up the relevance of what I have discussed about Dewey so far, namely that power relations need to be stabilized, and I will claim in line with Dewey and Habermas (1990) that this requires broad participation in arenas of dialogues.

Through the above statements about power and rationality, Flyvbjerg (1991) underpins Dewey's pragmatic critique of technology, in the sense that Flyvbjerg's emphasis of the meaning of the context of power deepens Dewey's concept of the collective⁴². This is the case because the central substantial point in Dewey's pragmatism of inquiry is the assumption of the collective's primacy over the individual. That is, the social, or in our sense, the socially constructed reality, or what I also refer to as the *collective practice* of the organization, constitutes the context in which the individual's identity is generated and made meaningful through communication and in the sense of the language (Wittgenstein 1958).

Flyvbjerg (1991) argues that the power has a rationality that the rationality does not understand, and most importantly, that power *is* knowledge, which ultimately means technological knowledge. Power acquires fundamental significance when it comes to the construction and introduction of technological systems that shape and produce basic patterns of action for i.e. the collective practice of organizations. An action is meaningful only in relation to a certain context, and in that sense, according to empirical works⁴³, the power to decide what should be meaningful actions to those influenced by the technological system, should not rely on only a few technical experts. Consequently, participation has to take place in the workplace and among the "collective of the organization", primarily to avoid alienation and ensure empowerment among the individuals. Thus, it is possible to keep relations non-antagonistic and thereby overcome the "problem" about the rationality of power pointed out by Flyvbjerg in statements 1-4 above. The point is that Flyvbjerg (1991)'s statements no.3 and 6 underpin this possibility where he emphasizes that this rationality is produced or constructed by the participants themselves. It is therefore reasonable to assume that through this form of general participation, as pointed out by Dewey, the individuals will be empowered and thereby able to develop sufficient moral competence, or as Dahl (1985) puts it:

⁴² In Dewey (1991) the notion *public* is used rather than collective, but I emphasize that the meaning of my use of the concept of collective is equivalent to Dewey's public.

⁴³ Here I mainly rely on the empirical work of Flyvbjerg (1991) and Gjersvik (1993) who have studied through large case studies the aspect of power in a large city-planning project and in the introduction of new technological systems respectively.

It is true that a democratic regime runs the risk that the people will make mistakes. But the risk of mistake exists in all regimes in the real world, and the worst blunders of this century have been made by leaders in non-democratic regimes. Moreover, the opportunity to make mistakes is an opportunity to learn. Just as we reject paternalism in individual decisions because it prevents the development of our moral capacities, so too we should reject guardianship in public affairs because it will stunt the development of the moral capacities of an entire people. At its best, only the democratic vision can offer the hope, which guardianship can never do, that by engaging in governing themselves, all people, and not merely a few, may learn to act as morally responsible human beings.” (Dahl 1985: 51).

Here Dahl emphasizes the potential of improvement or learning in human beings through the fundamental idea of 'learning by doing', which is a basic assumption in Dewey's pragmatic social philosophy⁴⁴. The argument of 'learning-by-doing' fully supports Dewey's assumption that people have to participate directly, in the sense of broad participation, in the process of governing the development and use of technological systems that influence their life-situation, if the people or actors of the organization are supposed to be empowered and then to exploit technology in a responsible, effective and ethical manner in their everyday life. Benjamin Barber most profoundly describes what it really means to be a citizen in the context of *strong democracy* (Barber 1984):

To be a citizen is to participate in a certain conscious fashion that presumes awareness of and engagement in activity with others. This consciousness alters attitudes and lends to participation that sense of the we I have associated with community ... Indeed, from the perspective of strong democracy, the two terms participation and community are aspects of one single mode of social being: citizenship.” (Barber 1984: 155)

Here Barber emphasizes that being a citizen of a technological society implies that the development and implementation of technological systems are political processes in itself that can be compared to the effect of legal decisions along the same line as political processes in all other respects. Despite the underpinning so far of the very optimistic ideas of Dewey, Barber and Dahl, Flyvbjerg (1991)'s power-rationality study at the same time fundamentally undermines the validity of the basic premise of their arguments, namely their view of the individual's potential for improvement, especially in his cynical finding in statement 8. Flyvbjerg (1991) legitimizes by his findings expressed in those ten statements

⁴⁴This is further discussed in next section regarding action research.

that there is no basic and universal rationality in the context that can function as a guarantee for a regulative ideal for *what* this social improvement and empowerment of individual, collective, and then for the society as a whole, is supposed to involve.

According to Flyvbjerg (1991), there is no guarantee that a power relation shows up that is capable of redefining the whole meaning of the normative frame as explicated through the Deweyan self-realization of the individual and social improvement, to support a special interest at the expense of other social values. Flyvbjerg reveals, then, that the Deweyan pragmatic inquiry process may not have the substantial content we originally searched for. Flyvbjerg (1991) does not come up with any real solution to this "relativistic problem", but emphasizes that the point is that by becoming more aware of this power-rationality relationship in terms of how it really functions in the actual context -- an awareness to which his case-study is supposed to contribute -- a chance arises to intervene and control power relations in a way that makes them less antagonistic and easier to handle for a functioning democracy.

I will assume and show that concerning the question of the democratic potential for controlling technology, Flyvbjerg's "solution" is too pessimistic, and that his objection to the validity of Dewey's arguments does not hold its own. By arguing in line with Dewey, the meaning of the context is constituted by rational communication through the language itself in *arenas* of dialogues. In addition, in this context of communication, by arguing along the idea of Habermas (1990) that there is rationality called *communicative rationality* (rationality of discourse) that is embedded in the pragmatical use of language (Wittgenstein 1958). This argument is a basic assumption in Jürgen Habermas⁴⁵ ethical discourse theory. Like Dewey, Habermas ascribes to the collective a decisive role in his theory of ethics and politics. But the point here is that Habermas (1990)'s argument of communicative rationality emphasizing *arenas* of dialogues undermines Flyvbjerg's "power objection" (see the list of 10 statements above) and re-establishes the validity of Deweyan inquiry for human empowerment. That is, Habermas (1990) underpins the substantial point in Dewey's argument about the improvability and self-realization of the human individual in the socially constructed reality through inquiry.

⁴⁵ See Habermas (1996): *Between facts and norms*. It is beyond the scope of this thesis to provide any thorough discussion regarding Habermas' discourse theory and theory of communicative action. Here I will only refer to Habermas' arguments in brief.

Thus, by following Habermas (Habermas 1990, 1996) I argue that it is possible to distinguish between positive and negative self-realization or quality of knowledge, and between the power of rationality and the rationality of power. This is due to the emancipatory potential of communication that is embedded in the pragmatic structure of language as emphasized by Habermas (1996). As technology is not only an artifact, there is the question of transferring the skills and knowledge, which introduces Deweyan inquiry as learning as an important aspect. This underpins the view of power as outlined by Flyvbjerg (1991); namely that power is knowledge, that is, power as a question of the possibility to possess knowledge.

However, it is important to note that the constructed meaning of technology as a Deweyan inquiry is an ongoing and continuous discourse as in line with Habermas (1990); technology in use is continuously being reinterpreted dependent of the context. Thus, the emerging point here, in the perspective of the social construction of reality, is that power becomes desubstantialized. This opens up and reinforces the validity and realism in Habermas (1990)'s notions of collective and communicative rationality. So, power, as socially constructed reality is real. It might be said that power in many ways is real to people in the same way as technology might be looked upon as real. But power becomes different from technology when it is seen as something that people have, in the sense that power is part of human relations. Contrary to technology, relations are not seen as fixed. Nevertheless, structures of domination may be seen as fixed as long as they are built into the physical and structural parts of the technology and thereby political and social institutions, companies, and the collective.

But if we apply a social construction perspective, nobody really has any power. Power becomes a mere construction, something that is given to individuals by everybody else. Power, then, exists when "we act as if it exists" (Gjersvik 1993). Power is an act of subordination, and thereby not an intrinsic quality of any objects or structure. But in order to give meaning to our surrounding reality, power then of course becomes a part of the whole system of meanings. Broad participation is then a question of developing the power to overcome structures of domination, that is, to empower the affected parties in arenas of

dialogues⁴⁶, to go along with Habermas (1990). Thus, I argue that Flyvbjerg's description of power is the way in which power really works among people. That is, these empirical statements of power should be borne in mind while at the same time seeing the collective practice of organizations as socially and “strategically” constructed in the perspective of an actor-network (Latour 1987).

Here it is important to remember the assumption behind Habermas (1990)'s idea of communicative rationality as a regulatory ideal -- a basic assumption in our understanding regarding participation and inquiry -- namely that the point of communicative forms in arenas of dialogues is not that they ought to be primary, they *are* primary. The main point, then, is that reason as communicative reason is embedded in the pragmatic structure of language (Habermas 1990). That is, communicative rationality is constituted by this communicative reason. This point in combination with the view of technology as a potential structure of domination makes it possible to see a connection between the physical structures of technology and the structure of language. Language is generally the basic structure for communication because of the intrinsic quality of language to create meaning (Wittgenstein, 1958). In the sense that language makes it possible to speak, it also determines what can be said (Polanyi, 1983, 2000)⁴⁷. The same is the case with what we may call the basic structure of technology. Any technology needs to be built on existing knowledge, routines and artifacts, both to be constructed and to have any meaning (Gjersvik, 1993). The basic point here goes in concert with Habermas (1990)'s idea of communicative rationality or reason as an intrinsic capacity of language, where the meaning that we ascribe to our surroundings including technology, has to be communicated through language (Wittgenstein 1958).

Against the background of what we have now discussed, it is legitimate to assume that this Habermasian idea of a pragmatic communicative rationality (Habermas 1990) is reliable for opposing Flyvbjerg's “power objection”. This will be shown evident in the next section as the field of action research (AR) as outlined by Elden and Levin (1991)⁴⁸ draws on the

⁴⁶This point will be discussed in next section; strategies of how to empower the workers. That discussion will be based on the contributions from a Scandinavian approach to action research that presupposes the validity of Habermas (1990)' idea of communicative rationality and ideal speech situation.

⁴⁷This has connection to Polanyi (1983, 2000) 's assumption of tacit knowledge, namely that not everything what we know and can perform in practice, can be expressed in language, which goes in concert with Wittgenstein (1958)'s fundamental assumption that private language does not exist.

⁴⁸ See also Appendix 1: Research and methodology, where I outline my own action research process.

ideas of Habermasian discourse theory and Deweyan inquiry as discussed above as cornerstones to strengthen democratic values and empowerment in work life. According to our discussion of Dewey above, there is no distinction between action and knowledge, that is, our knowledge about the world is constituted through praxis, the most basic of which is the *use* of language consistent with Wittgenstenian language games (Wittgenstein 1958). Consequently, due to this reliance on the role of language in the context of communication as emphasized by Dewey and Habermas (1990), an important assumption underpinning AR practice is that we, or everybody; the worker, the manager, together need to start reflecting in and on our actions in everyday life. Thus, we need to explain to each other in arenas of dialogue the very meaning of our actions through language in order to realize each other's individual responsibilities for fulfilling and exploiting the role of a participant in the social.

In the next section, then, I will inquire into a Scandinavian approach to action based social research that is fully consistent with the Deweyan pragmatism of inquiry discussed so far. Throughout the thesis I will argue in favor of AR as a fruitful basis for understanding and inquiring into processes of creating *participative* organizational change and innovation. In Appendix 1 I outline more specifically about practicing a variety of AR practice in my own research process.

2.8 The argument of *pragmatic action research*

In the book *Introduction to Action Research* Greenwood and Levin provide a thorough introduction and overview to the field of AR practice where they outline and call their own variety *pragmatic action research* (Greenwood and Levin 1998)⁴⁹. Based on the discussion of Deweyan inquiry above, I will in the following argue in favor of pragmatic AR as a fruitful point of departure for thinking about and inquiring into organizational change and innovation. By arguing in line with Greenwood and Levin, the pragmatic AR approach builds upon and is fully consistent with Dewey's pragmatism of inquiry as discussed above.

Argyris et al. (1985) states that the aim of AR is the following:

⁴⁹ In Appendix 1 I outline the pragmatic action based research process as practiced in this study, and which also outlines the historical aspects of AR.

"is to generate knowledge in the service of action. Such inquiry requires an epistemology of practice, that is, a theory about the kinds of knowledge relevant to action."⁵⁰.

The point is that knowledge that guides us in practical matters also includes a normative position that offers a basis for *criticism* of the status quo. AR according to Argyris (1985) clearly opposes the positivist separation of fact and value and argues that moral reasoning has to be considered the most central aspect of practical reasoning, which deals with questions of how to act. This is indeed in line with Dewey's most important concern discussed above. In this sense AR has to a great extent adopted Habermas (1990)' influential critical theory of ethical discourse in emphasizing the construction process of social inquiry that seeks to *unite* knowledge and action, theory and practice, as our most fundamental constitutional activity in our construction of both local and organizational reality. This underpins the point we have legitimized through our discussion of Dewey's pragmatic critique of technology above, namely that technology is the dynamic process of production for giving meaning to the surroundings and constructing social order.

The Scandinavian approach to AR⁵¹ has moved toward worker participation based on *value commitment* to industrial democracy, in the sense of directly supporting and contributing to laws and national public policies aimed at democratizing working life. These ideals are familiar from our discussion of Pateman (1970) and Dewey above. The key in this approach is to install more democratic forms of work organization through different *reflection groups* providing arenas of dialogues in leading segments of industry in order that self-managed organization forms and empowerment would spread among industry companies. From the beginning in the 1960s, different AR programs had explicit political goals both in Norway and Sweden, as well as a strategy that involved national political sponsorship. This has provided leverage for workplace democratization, which aims at spilling over into democratizing social change in work life in general. This goes in concert with Dewey's pragmatic critique of technology, namely viewing technology as an ongoing dynamic construction process of inquiry; it is *continuously* being constructed and reconstructed in the production process of externalizing meaning to the surroundings. As a result of this, the democratization of technology is a never-ending process; there is an

⁵⁰ Argyris et al. (1985), p.45.

⁵¹ See Elden and Gjersvik (1994), Gjersvik (1993), Elden and Levin (1991), Chisholm and Elden (1993), Engelstad and Gustavsen (1993).

ongoing need to democratize technology, to keep “the conversation going” aiming at creating spaces or arenas for dialogues and collective reflection (Greenwood and Levin 1998: 86).

Hence, the crucial element in Scandinavian AR is the form of participation. In their own pragmatic approach to action based social research building on the Deweyan pragmatism of social inquiry discussed above, Greenwood and Levin (1998) emphasize the democratization of research, intervention and working life with a strong value commitment to the kind of full democratic participation aiming at solving real-life problems in actual context (Greenwood and Levin 1998, Greenwood and Levin 2000). Democratizing research and intervention means active involvement of the insiders (the local stakeholders) as *co-researchers* in the change process. Thus the outsider (the professional researcher) is assumed to work in accordance to the Deweyan ideal of inquiry in which the insiders and the outsider act and collaborate as co-learners for mutual and *co-generative learning* in proper *arenas* for communicative action (Greenwood and Levin 1998: 116-9). A major challenge in creating organizational change and innovation, then, is to design adequate arenas for communication and collective reflection facilitating a process that in the end is taken over and controlled by the participants. Levin (1997) argues that the change process is viewed as an organizational learning process in which

“the organization changes its way of working based on the employee’s participation. The core essence of an organizational development process will thus be the facilitation of learning to shape new understanding and the skills necessary to change the organization” (Levin 1997: 302)⁵²

In this argument, Levin (1997) has a certain parallel with the argument of Argyris and Schön (1996) in the sense of viewing the process of organizational change as a never-ending and continuous process of improvement through reflection in- and on common organizational action or collective practice⁵³. The effort of changing the collective practice of the organization means that the insiders have the competence for e.g., always asking for “to do the right things”, not only to “do the things right”, which is instrumental learning or

⁵² The notion of integrated organizational and technological development process as emphasized by Levin (1997) is here used equivalent to my notion of ‘organizational change and innovation’.

⁵³ This has its origin from Schön (1983)’s reflection-in-action and reflection-on-action argument, where theory-in-use refers to the concept of tacit knowledge that was outlined by Ryle (1949) and later Polanyi (1983). I discuss closer the meaning of tacit knowledge in my review of Nonaka and Takeuchi (1995) later in this chapter.

single loop learning (Argyris and Schön 1996). That is, learning and competence that asks for productive change in the organizational norms, knowledge, values and structural framework that underpin the daily practice of total organizational work processes. But for the change processes to be effective says Levin (1997), broad participation and facilitating organizational diversity is the very tool both for achieving those reflection processes taking place in arenas developing the competence to create the learning organization.

Arguing in concert with Dewey as discussed in the previous sections of this chapter, pragmatic AR claims that the aim of the collective inquiry process for organizational change, then, is not epistemic certainty, but constant interaction with the surroundings in order to find out what beliefs work with success. Building on Dewey's idea of inquiry as outlined above, this is what emerges as the validity criterion of knowledge according to pragmatic AR. This is referred to as the *workability* premise of knowledge for creating new shared understandings (Greenwood and Levin 1998: 81-82). That is, what beliefs bring solutions to problems perceived as important and whether they increase the possibility for control over own situation.

Thus, a basic assumption that underpins pragmatic AR and Deweyan inquiry, then, is the belief that a meaning of a doctrine is the same as the practical effects of adopting it. This has its background from the Deweyan idea of pragmatism that belief in the truth on the one hand must have a close connection with success in action on the other. The substantial argument that underpins this assumption relies on the idea that natural selection must have adapted us to become cognitive creatures because beliefs have effects: they work.

In this connection it is interesting to note how the line of Deweyan pragmatism discussed above has developed: it can be found in the period when the new scientific paradigm of the Galilean world view was establishing when Galileo developed the experimental method of natural science. The line of pragmatism is followed up by Kant's doctrine of the primacy of praxis over pure reason and continues to play an influential role in the theory of meaning and truth and in scientific practice in the work by Peirce, James, Dewey, Heidegger, Wittgenstein (pragmatism of language), Habermas (communicative action), Kuhn and then eventually for the development of the approach of social constructivism in sociology as outlined by Berger and Luckmann (1967).

In a context of the historical side in the philosophy of science, then, Kuhn (1970) in his groundbreaking book “*The structure of scientific revolutions*” conducted the real and definite challenge against the enterprise of science as the “linear” Aristotelian episteme. Namely the Kuhnian rejection of the belief that those context-free scientific statements derived out of observations and experiments represent the only pure and objective truth. Kuhn's challenge underpinned the scientific validity of social constructivism and thereby pragmatism - that scientific claims and statements are intrinsically contextual in which action and reflections are unified.

The challenge further from this, is to decide whether the contextual in methodological and epistemological terms means the single individual in itself in relation to its surroundings – individual-society relation which is referred to as 'individualism'⁵⁴ – or if the primary meaning of the contextual is to take more of an holistic-collectivistic approach (Lincoln and Guba 1985: 37). Building on the discussion of Dewey's pragmatism above, I argue in line with Lincoln and Guba (1985) and Greenwood and Levin (1998) for the position of the latter one. The emerging point here is that the understanding of the contextual aspect of scientific claims in the end has implications for how to understand the practical meaning of notions like knowledge and skill and in the last instance for how to go about creating organizational change and innovation in real world organizations.

In the social construction of reality perspective, as it is outlined by Berger and Luckmann (1967), the concern is the social construction of social practices in which the primary constituting instance is the single individual itself. That is, the contextual understanding of methodology and epistemology here is individualistic in the sense that society is the sum of the individuals. As in line with my discussion above, this methodological individualism is a heritage of the epistemic tradition in logical positivism despite its emphasis on the contextual aspect. This individualism is in opposition to the pragmatic and holistic epistemology as outlined by e.g. Dewey, Wittgenstein, Habermas and Kuhn. The holistic view of Wittgenstein and Habermas, and as elaborated by Lincoln and Guba (1985), is distinguished by their emphasis on the meaning of a total language (in Habermas (1996)'s terms a total language is referred to as a *form of life*) as having the primary constituting role of meaning construction, which then is intrinsically linked to the Deweyan inquiry process of solving real practical

⁵⁴ See my discussion above in section 2.2 regarding Weber (1990).

problems. Pragmatic AR according to Greenwood and Levin (1998) emphasize this meaning of language in their argument on the meaning of *discourse*. They here outline the participatory condition and how to cope with power, in their argument that the inquiry process requires a mutually understandable discourse that is achieved through letting the involved actors live together over time in which they share experiences and act together. As they point out the argument:

This discourse that enable communication is much like what Wittgenstein (1958) describes as practice. Language creates meaning because it identifies actions that are meaningful for the actors. New knowledge, which we have identified as emerging from an action-reflection process, accordingly shapes a language that is relevant for describing actions, and the learning arising from them. In some situations, outcomes or experiences arising from actions initiate collective reflection processes that subsequently create new meaning. (Greenwood and Levin 1998: 80)

What distinguishes pragmatic AR and Deweyan inquiry from orthodox scientific activity – as exemplified by Weber above, is just the concern about how to act in order to cope with power and thus to improve practice. This concern is in principle a moral and political question aimed at achieving social democratic reforms for the better for all organizational members or, for that matter, citizens. The contextual aspect of methodology thus emerges in the notion of Deweyan inquiry that refers to a self-corrective process (organic) conducted in a specific historical and cultural circumstance (holistic). In that way – as I already have discussed by following Dewey, *inquiry* has no foundation in certainty and then the creation of new knowledge is just what is warranted through this inquiry process.

In outlining the naturalistic paradigm, Lincoln and Guba (1985) – arguing in concert with Dewey, criticizes what orthodox social science still persist at doing despite its declaration of rejecting the Cartesian dualism, namely to consider skills as the application of theoretically based rules. Thus, on the basis of stressing the traditional separation of knowledge and action, pragmatic AR emphasize the meaning of Deweyan inquiry as serving as a model for coming to terms with how to render possible the democratization of organization and technology. This is a model that might be applied to natural scientific and technological methods, as well as to social practice. This is to emphasize the meaning of praxis – that is, the *action-reflection* process – as a precondition for effective organizational change. This is consistent to the argument of Schön (1983), by arguing for the very primacy

of 'learning-by-doing' in the creation of new organizational knowledge (Greenwood and Levin 1998).

Pragmatic AR argues, then, strongly in line with Schön (1983) in emphasizing the meaning of a practical “knowing-how”⁵⁵ which cannot be explained as a result of theoretical knowledge of the relationship between means and ends and which cannot be the outcome of logical statements. This “knowing-how” contrasts “knowing-that” which refers to the traditional perception of knowledge as Aristotelian episteme. Moreover, Schön argues that we always know more than we can explain and that a part of our knowledge always will remain hidden, which he refers to as the 'tacit' knowledge building on the argument of Ryle (1949) and later Polanyi (1983).

Against this background, in stating the primacy of action or praxis over thought in the creation of new knowledge that in the last instance guides us in practical matters, there is a point that this knowledge also includes a normative position offering a critical basis. Out of this pragmatic AR states in line with Argyris et al. (1985) that the dualism of fact and value has to be rejected by stating that moral reasoning is to be seen as the most central aspect of practical reasoning (Schön 1983, Greenwood and Levin 1998, Lincoln and Guba 1985: 38; axiom 5, Dreyfus & Dreyfus 1986). This constitutes knowledge that in the last instance deals with questions for how to act.

Thus the critical basis in pragmatic AR and Deweyan inquiry includes an ethical notion of individual self-realization (which constitutes the subjective reality in Berger and Luckmann's (1967) terms, or what I refer to as the local reality). The collective practice of the organization is knowledge that is co-constructed and includes all kinds of artifacts and facts, power relations, social and language structures, problems, talks and cultures. All knowledge as being socially co-constructed has thus a critical value aspect that claims the inquiry process as intrinsically democratic. Pragmatic AR according to Greenwood and Levin (1998) argues then that participation in that sense has become a methodological and epistemological claim in which every individual participant in the inquiry process is seen as a co-learner that co-generate new collective knowledge through discourses (Greenwood and Levin 1998).

⁵⁵ “Knowing-how” is a concept that has its origin in Ryle (1949).

Hence, the *collective practice* of the organization (which corresponds to Berger and Luckmann's (1967) external objective reality), then, is constituted by a structure that limits and enables the actions of the individual actor as an organization member (Nelson and Winter 1982). The meaning of collective practice as a organizational reality in the sense of being a part of the constructed social reality is thus partly based on the belief that each and every one of us is indeed related to other human beings in which existence and childhood are dependent on prior human relations (Dewey 1991).

Based on the discussion above regarding the concept of co-generative learning in AR, a participatory oriented perspective views organizational change as processes of collective reflection in- and on-action, which are on-going and never-ending processes as in line with Schön (1983). Thus by building on my discussion of Dewey above, I claim that the change process has to be totally participant controlled in which the aim is enhancing organizational diversity through the learning process in itself.

In Schön's approach to change and learning in organizations, the concept of reflection is emphasized in relation to the cognitive learning processes of the single individual. This view is further elaborated in Argyris and Schön (1996), emphasizing change and innovation as only a matter of interventionist-based and individualistic oriented consensus making (see Section 2.3). This utopian harmony idea of organizational change and innovation contrasts the more collective idea of learning in pragmatic AR, emphasizing social change as an on-going co-generative process (Levin and Greenwood 1998). This means that change, as dialogues, conversations and discourses constitute the fundamentals of practice to further strengthen the incorporation of diversity, participation and democracy. Skills are then intrinsically connected to an ethical or normative stance, namely the commitment to self-realization and thereby to the potential of social improvement of all human beings (Dewey 1991).

Hence, building on the Deweyan idea of inquiry as discussed above, I view organizational change as a process of inquiry in which the participants takes an active interest in the managing of developing the collective practice in the common good of the fellow organization member who interact with and impact on each other mutually. This point is underpinned by the social construction argument of STS and ANT above that the total of

society precedes and shapes the constitution of the individual organization member. In taking into full account the social construction perspective, it follows that personal self-realization of the participants requires active involvement in changing the collective practice of the organization.

Thus, in involving fully in the inquiry process of the organization, the participants need to appreciate the dynamics that is being generated through learning about diversity, conflict and power. Hence, the inquiry process according to pragmatic AR constitutes the process of organizational change through collaborative communicative processes in which language is the most basic tool.

Arguing in concert with pragmatic AR, then, I claim that organizational change process aims at inquiring to solve real practical and organizational problems that each involved participant consider as important. The inquiry process is then intrinsically linked to the daily actions taken. This is to say that inquiry is context-bound in which individual self-realization emerges through contextual learning-by-doing. The outcome of the inquiry-based process of organizational change is then judged in terms of whether the solution resolves the initial problem, namely the *workability* of the solution as discussed above (Greenwood and Levin 1998). Also, in Schön's (1983) terms, then, the meaning of self-realization turns into improved "knowing-in-action" through the process of "*reflection-in-action*" and "*reflection-on-action*". Knowing-in-action refers to what is so far mentioned as skills. Thus Schön's reflective practice is parallel to what Greenwood and Levin (1998) call the workability criterion in judging the *quality* of the new knowledge generated by the inquiry process, namely whether it increases the possibility for self-realization of every individual.

In contrast to Argyris and Schön (1996) that focus on the individual as having a primary constituting role in the inquiry process of organizational learning, pragmatic AR according to Levin and Greenwood (1998) emphasizes the *holistic* situation constituted by the *whole* of organizational routines and members. When arguing in line with Dewey, it is legitimate to say that this whole of organizational collective practice has the primary constituting role in the meaning construction process with regard to both the individual and its skills. That is to understand the inquiry process as a *collective* process in which the individual continuously construct and reconstruct the collective practice. Dewey thus attaches the

primacy role of meaning construction to the *ensemble* of the collective group of inquirers. That is, the primacy of collective knowledge in meaning construction.

However, as I agree in, Schön (1983) points out that the meaning of reflection as a process as being the same on both levels; the individual and the collective or organizational. But moreover, while Schön keeps the primary object of reflection to be the individual's own sense of reality, I emphasize by arguing in line with the Deweyan idea of inquiry and pragmatic AR that the reflection activity has to put focus on the *ensemble* of the interacting individuals as a collective group in facilitating the organizational diversity of viewpoints.

Based on my discussion on Deweyan idea of inquiry above, I strongly oppose Argyris and Schön (1996)'s dualism of O-I and O-II learning system for being able to cope with organizational change. This is related to my argument opposing the view that the aim of the learning process should be consensus among the participants or organizational members. In Argyris and Schön's model of organizational learning, then, the only matters of concern are the norms and action strategies of the single individual in interaction with other individuals disregarding the political aspect and the more fundamental dynamics of power and diversity in participation as showed in my discussion Dewey. I will come back to the argument later in the chapter in my discussion of collective reflection as a condition for real organizational change and innovation.

But first I will review and criticize some management-oriented perspectives on organizational change and innovation by referring to the contributions of Nonaka and Takeuchi (1995) and the “learning organization” perspective of Senge (1990).

2.9 Organizational change as management-oriented “knowledge creating processes” or “learning organizations”

Building on my above discussion of Deweyan inquiry and the pragmatic AR approach, I view organizational change and innovation as participative processes of collective inquiry

primarily aiming at knowledge for organizational diversity. This means that the participant based learning processes in itself becomes the very goal of the change process.

In contrast to both the Deweyan inquiry approach of pragmatic AR and the interventionist-based approach of Argyris and Schön (1996) as discussed so far, the Japanese theorists Nonaka and Takeuchi take the real management turn in presenting an “universal management style” for creating the processes of organizational change and innovation in their book *“The Knowledge-creating Company – How Japanese Companies create the dynamics of innovation”* (Nonaka and Takeuchi 1995)⁵⁶. Instead of using the concept “organizational learning” they use the more “management friendly” concept “knowledge creation” while still building on parts of the organizational learning-tradition⁵⁷.

Nonaka and Takeuchi (1995) emphasize that creating organizational change and innovation is not simply a matter of learning from others or acquiring knowledge from the outside. They state that knowledge has to be “built on its own”. Thus they claim that the “essence” of innovation is “to re-create the world according to a particular ideal or vision”. Their main theoretical contribution lies in their argument of organizational “growth of knowledge” that conditions the conversion of tacit knowledge to explicit knowledge and vice versa presenting the continuous “knowledge spiral” in making tacit knowledge explicit.

Nonaka and Takeuchi (1995) stress the perspective of how to go about creating new knowledge within and between organizations. The starting point for their theory is case studies of Japanese companies. The major empirical findings have led them to conclude that the processes of creating new knowledge condition the insight into two dimensions of knowledge, namely the tacit and explicit dimension. They emphasize the meaning of tacit knowledge by contrasting to the tradition of Western companies that focus more on explicit knowledge. The difference between explicit and tacit knowledge is outlined in figure 2-1 (Nonaka and Takeuchi 1995: 61):

⁵⁶ In a recent book, von Krogh, Ichijo and Nonaka (2000): *Enabling knowledge creation – How to unlock the mystery of tacit knowledge and release the power of innovation*, the management-oriented arguments from Nonaka and Takeuchi (1995) is re-emphasized but now in a more “practical approach” as they put it.

⁵⁷ In the book, Nonaka and Takeuchi refer specifically to the argument of Schön (1983) and the first edition of *Organizational Learning* by Argyris and Schön published in 1978. See Section 2.3.

<i>Tacit Knowledge (subjective)</i>	<i>Explicit Knowledge (organizational)</i>
Knowledge of experience (body)	Knowledge of rationality (mind)
Simultaneous knowledge (here and now)	Sequential knowledge (there and then)
Analog knowledge (practice)	Digital knowledge (theory)

Figure 2-1 Difference between tacit and explicit knowledge according to Nonaka and Takeuchi (1995).

They claim that the focus on the conversion between tacit and explicit knowledge represents “the new approach for *managing* the process of knowledge creation”. They move on focusing on the individual itself in continuous interplay with others in how the individual’s tacit knowledge dimension is constituted by two elements, namely the *cognitive* (mental models such as beliefs, perspectives and viewpoints) and the *technical* that is emphasized as concrete know-how and skills. The distinction between the two is shown in Figure 2-1, and the features of the two are listed in a corresponding manner. Tacit knowledge is for example knowledge of experience that is both physical and subjective, “here and now” refers to tacit as created in a practical, specific context in an analog way. The main point in this perspective is that human knowledge is constituted in a continuous social interaction between the two types of knowledge. Nonaka and Takeuchi argue that new knowledge is created through this interaction. They call this interaction as the knowledge conversion process and emphasize that this conversion is social and not cognitive. According to Nonaka and Takeuchi there are four kinds of knowledge conversion that show a strong resemblance to the model of Berger and Luckmann (1967).

Nonaka and Takeuchi’s knowledge conversions are 1) socialization; from tacit to tacit or sharing tacit knowledge, 2) externalization; from tacit to explicit, 3) combination; from explicit to explicit knowledge and 4) internalization; from explicit to tacit knowledge. They point out that socialization, combination and internalization are the three conversions that is treated in traditional or mainstream organization theory, where e.g. internalization resembles strongly with conventional perspectives in organizational learning (Huber 1991, March 1991, Levitt and March 1988, Fiol and Lyles 1985) and “learning by doing” (Schön 1983). The conversion process of *externalization* is to a large extent disregarded they argue. The creation of new organizational knowledge is triggered by a continuous and never-

ending dynamic interaction between tacit and explicit; between those different kinds of knowledge conversion. This interaction between those conversions shapes a cycle that they call the ‘knowledge spiral’, where the outcome of e.g. the internalization conversion is operational knowledge such as project management. The epistemological dimension of knowledge creation emphasizes the interaction between the tacit type of knowledge and the explicit type of knowledge. They state as an important point that each and every individual in the organization has tacit knowledge that is both part of and constitutes the foundation for the process of knowledge creation. Thus the process requires that the organization mobilize and reinforce the tacit knowledge of each individual through those four knowledge conversions in a spiral process moving up through groups and communities of practice up to the interorganizational level. For how to promote the development of the knowledge spiral in and between organizations, Nonaka and Takeuchi argue for the existence of five enabling conditions or challenges. These are 1) *organizational intention*, that is, commitment to a *collective* will expressed either as organizational standards or goals, 2) *autonomy*, that is, promoting self-organizing and cross-functional individuals and teams co-acting on the basis of the whole, 3) *fluctuation and creative chaos*, that is, by stimulating to active interaction between the organization and the environment or other organizations, stimulating involved actors to face a breakdown of routines, fundamental thinking and mental models. This requires a focus on arenas for dialogue in achieving social interaction and thus stimulating to reflect-in and –on-action⁵⁸ in striving for doing things right, 4) *Redundancy*, that is, intentional overlapping of information in an effort to promote a required sharing of tacit knowledge and in that way stimulating individuals to sense others problems or articulation. And at last 5) *requisite variety*, to stimulate organization’s internal diversity in coping with the external diversity, and coping with many contingencies by providing equal, free, fast and flexibly combined access to information throughout the organization. Nonaka refers in this connection to a case with a computerized information network that enabled equal and flexible access to corporate information.

By integrating the time dimension into the knowledge creation model, Nonaka and Takeuchi argue for an ideal integrated five-phase model of the process: 1) *sharing tacit knowledge*, that is socialization, 2) *creating concepts*, shared tacit knowledge is converted

⁵⁸ This draws on Schön (1983) and his argument on ‘reflection-in-action’ and ‘reflection-on-action’ as a precondition for second loop learning.

to explicit knowledge like in the form of a new concept, a phase that is similar to externalization, 3) *justifying concepts*, that is the organization finds out whether the new concept is truly worthy of pursuit. Conditioned by a “go-ahead”, the next phase 4) *building an archetype* converts the concepts into an archetype corresponding to combination.

This is a complex phase that requires intensive dynamic and flexible cooperation in a cross-functional manner. An example of this phase is a prototype in the case of a new product development process. Eventually, the last phase, 5) *cross-leveling knowledge*, extends the created knowledge to others, across to other parts of the organization and to outside collaborating organizations which includes consumers or affiliated companies, e.g. the network organization. The point is that this knowledge creation is a continuous and never-ending process moving dynamically in an interaction between the two knowledge spirals. One spiral moves from tacit to the explicit dimension and back again and where the other spiral takes place in the ontological dimension between the individual and interorganizational level back and forth. It is the transformation process between the two that constitutes the knowledge creation. Once a new concept is created and justified, a new cycle of knowledge creation is triggered at another part of the organization or it mobilizes knowledge of collaborating firms in a dynamic interaction. An example of that of facilitating knowledge creation in this phase can be frequent rotation of personnel.

Eventually, Nonaka and Takeuchi points out appropriate “*management style*” for a “new organizational structure” that fundamentally supports the knowledge creation process as described. That is a structure that tries to combine the best from both “top-down”- and “bottom-up”-management, to something they call “*middle-up-down management*”. As Nonaka and Takeuchi points out that top-down has its most basic roots in the scientific management tradition of Taylor who prescribed a “best method” for how to implement a job by focusing on time and motion (Taylor 1967). This was followed up by March and Simon (1958)’s information-processing perspective and the concept of bounded rationality. This view contended that the cognitive capacity of the single individual is inherently limited and that tacit knowledge as emphasized by Polanyi (1983) is disregarded or viewed as noise. Eventually, March and Simon (1958) contended that organizational structure is derived only from problem-solving processes and rational choices of the single individual⁵⁹.

⁵⁹ See discussion earlier in the chapter (section 2.2 and 2.3).

Nonaka and Takeuchi argue that the “top-down management-school” is a positivistic heritage that neglects the essential capacity of both individuals and organizations as collectives to create knowledge out of creative and collective intention.

Moreover, bottom-up management perspective with its basic heritage from the human relation school and the Hawthorne experiments, overemphasizes the meaning of tacit knowledge and autonomy. Instead of hierarchy and division of labor, Nonaka and Takeuchi argues that bottom-up style emphasizes the autonomy of the individuals at the bottom insisting that neither vertical nor horizontal interaction between individuals is seen to have any central meaning. This perspective entails that knowledge is very difficult to disseminate and share within the organization. The third way, then, they presented as the “*middle-up-down management*”, the middle managers are seen to play the very key role of the knowledge creating process. The middle managers enable the knowledge conversion from tacit of both top and bottom to explicit by facilitating knowledge spirals both within and across organization borders.

The management-oriented contribution of Nonaka and Takeuchi (1995) parallels to a large extent Senge (1990)’s prescriptive approach to organizational change and innovation or what he calls “the learning organization”. Senge (1990) combines the method of system dynamics with ideas adapted from Argyris and Schön (1978)’s theory of action perspective, especially an awareness of the importance of Schön (1983)’s mental models⁶⁰. Senge (1990) claims that the organizational learning disabilities are connected to the concept that the world is created of separate, unrelated forces. He proposes a system dynamics perspective to shift the mind from seeing the parts to seeing the *whole*. This is parallel to Argyris and Schön (1996)’s shift from “Model O-I” towards “Model O-II” learning system⁶¹. This includes a practical model for learning organizations, which are:

“..organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking is nurtured, where collective aspiration is set free, and where people are continually learning to learn together.” (Senge 1990: 3)

⁶⁰ For a discussion of Argyris and Schön (1978/1996) and Schön (1983), see Section 2.3.

⁶¹ See Section 2.3. Still Senge (1990) does not refer to Argyris and Schön, but the “shift” to the “learning organization” has obvious parallels to the shift of “O-I” to “O-II” as presented in Argyris and Schön (1978).

According to Senge, managers must master the following basic interconnected disciplines: First, encourage *personal mastery* of their own lives. Second, facilitate *team learning*, including skills in dialogue and openness, not preservation. Third, build a *shared vision*. Fourth, bring prevailing *mental models* underpinning action to the surface and challenge them. And then fifth, adopt *system thinking* for seeing wholes and interrelations in things and happenings. Among the disciplines, Senge emphasizes the latter that builds on the principle that organizations, like organisms, are open to their environment and must achieve an appropriate relation with that environment if they are to survive. This approach further defines organization in terms of interrelated subsystems, where individuals belong to groups or departments, which in turn belong to larger organizational divisions etc.

Nonaka and Takeuchi (1995) argue that Senge's model of "learning organization" has some affinity with their own model for organizational change and innovation through the knowledge-creating processes. Nevertheless, they criticize Senge for the disregard of the meaning of tacit knowledge referring to Senge's rejection of trial-and-error learning and his argument that learning from direct experience is viewed as impossibility. This regards to Senge's emphasis on the system wide consequences of decisions implying a total neglect of the practical concern for knowledge creation.

Moreover, they criticize Argyris and Schön (1978/1996)'s model of intervention⁶² for presupposing a Cartesian or positivistic premise in their argument that an outsider may take an "objective" position "knowing" how and when to put "double-loop" learning into practice. Nonaka and Takeuchi (1995) emphasize that Model O-II or double loop learning is not a special difficult task, but a "daily activity for the organization". In many ways, though, organizations as part of daily reflection on collective practice continuously create new knowledge by reconstructing existing perspectives and premises on a daily basis. Consequently, there is no need for a "natural-born" Argyris-Schönian interventionist presupposing the "objective existence" of any "right answer".

This sums up in brief the thorough arguments of Nonaka and Takeuchi (1995)'s "knowledge creation" and Senge (1990)'s "learning organization". Building on my discussion of Deweyan inquiry and pragmatic AR above, I argue that the five enabling

⁶² See section 2.3.

conditions that are required to promote the Nonakian “knowledge spiral” in the shaping and creation of organizational change and innovation are important in many ways, but not sufficient. Parallel to my critique of Argyris and Schön (1996) where I draw on the pragmatist argument of Dewey, I criticize Nonaka and Takeuchi for being too naive with regard to their concept of knowledge when not taking into account premises of power, or premises on quality of knowledge related to conditions for broad participation. Building on the argument of Dewey and pragmatic AR as discussed above, I claim that the heritage of the individualistic stance of Weber is present in Nonaka and Takeuchi (1995) as they emphasize that organizational knowledge creation relies on a individual process of personal and organizational self-renewal. They point out that individual learning is a precondition for organizational learning viewed as knowledge creation. As seen in their “knowledge-spiral”, the process starts with the individual and ends up with the individual, disregarding e.g. the diversity of viewpoints to have any meaning as a collective meaning construction process. This, I claim, shows the “hidden” positivist premise in Nonaka’s argument in presupposing a possible consensus among the participants. In the next section I discuss closer my own approach to change and innovation as a collective learning process building on Deweyan inquiry and pragmatic AR by referring to and contrasting my own position to the positions of both Nonaka and Takeuchi (1995) and Argyris and Schön (1996).

2.10 Organizational change and innovation as continuous collective learning facilitating organizational diversity and politics

Using inquiry in the Deweyan sense as discussed above regarding the broader meaning of skills, I adopt the Deweyan position that skills are intrinsically connected to an ethical or normative stance; that is, the commitment to self-realization and thereby to the potential of social improvement in all human beings. This entails insisting on the demands of the full development of individuals in their distinctive individuality, which is something that can only be achieved through continuous growth and modification of character. Thus, the individual can fully realize her or his freedom, distinctive selfhood, and skills only by fixing the social conditions of their exercise and by direct and *active* participation in sustaining associated life and the pursuit of the common good through regulating terms. This means that self-government becomes an intrinsic part of self-realization.

Hence, the meaning of the inquiry process according to Dewey is that the individual participant has to take an active interest in contributing to the collective in the common good of the fellow collective member who interact with and impact on each other mutually. In this, according to Berger and Luckmann (1967), the total of the society precedes and shapes the constitution of the individual organization member. This social construction perspective of the individual self is fundamental to understanding that personal self-realization of the participants demands active involvement in changing the organizational routines (Nelson and Winter 1982): The moral structure of the individuals, the patterns of their desires, and their purposes depend largely on the habits, thoughts and values that the organization encourages. Consequently, improving the organizational routines is essential to improving the quality of realizing the potential skills of the individual organization member. Thus, in involving fully in the inquiry process of the organization, the participants have to appreciate the dynamics that is being generated through emphasizing diversity and conflict. Hence, using Deweyan inquiry implies that the process of organizational change is viewed as collaborative communicative processes in which language is the most basic tool.

This point also turns out to be a main concern for Brunsson (1989) in his argument that the fundamental legitimacy of organizations is maintained by just conflict and problems rather than consensus and unity. In arguing for this, Brunsson identifies two main forms of organizations; the action oriented and the political oriented organization. This distinction is linked with the idea that the existence (that is: financially) of the organization is depended on its legitimacy. Thus, there are two principles of legitimating; the first emphasizes the exchange of resources with the organization's environment, while the second principle emphasizes incorporating and reflecting inconsistencies in the environment into the structuring principles of the organization (Brunsson 1989:14). In situations where the environment represents conflicting norms, what Brunsson refers to as inconsistent environments, the second legitimizing principle is more effective than the first, and outputs in the form of talk and decisions become more important than action or product. By acknowledging that real organizations normally reflect both being action and political oriented, Brunsson criticizes that orthodox organization research to a large extent has focused not on real organizations, but rather on the ideal of the action organization (e.g. March and Simon 1958 and Nelson and Winter 1982). Hence, the critique of Brunsson

underpins my argument based on Deweyan inquiry viewing change as an on-going co-generative process in which conversations and discourses constitute the fundamental praxis to further strengthen the incorporation of diversity, participation and democracy.

The ideal characteristics of Deweyan inquiry aims at solving real life problems, and emphasize the ideal of individual self-realization and self-empowerment through contextual learning-by-doing. This is parallel to the argument of Schön (1983) who states that most of the development of knowing-in-action is caused by tacit knowledge. However, Schön emphasizes that by reflecting in and on contextual action, that is, to use language in a discourse to conceptualize experiences about skills, it is possible to improve individual praxis. Such kind of knowledge generated by reflective practice is not limited to professionals – all can use it. In our framework as adopted from pragmatic AR, then, Schön's reflective practice represents the normative ideal towards the potential self-realization of every individual.

Building on the Deweyan inquiry and arguing in line with pragmatic AR as discussed above, my own approach to creating organizational change and innovation focuses on inquiry process in which inquirers are participants in a holistic situation. In addition, the total of the organizational routines as a collective practice is supposed to have a primary role in constituting the individual skills in the dynamics of collective learning as a Deweyan inquiry process. This goes on in a mutual way where the individual in a *collective* process continuously construct and reconstruct the collective practice. In this collective learning process in the Deweyan sense of inquiry – which is understood holistically, the need for appreciating diversity and pluralities in arenas of communicative action are seen as a fundamental precondition for the process of learning in creating change and innovation.

In opposition to this, Argyris and Schön (1996) and Nonaka and Takeuchi (1995) focus on knowledge and organizational learning as created only by “interacting” individuals as in line with Weber (1990). That is, they state that the individual as having a primary constituting role in the inquiry process, which is quite the contrary to the primacy role Dewey attaches to the *ensemble* of the collective group of inquirers. This goes in concert with the argument of Brown and Duguid (1991) saying that individual learning is inseparable from collective learning. As in line with Dewey, they claim that insight accumulated is not a private substance, but socially constructed and spread. On the other

hand, Argyris and Schön (1996) keeps the primary object of reflection to be the individual's own sense of reality, pointing out that individual learning is a precondition for organizational learning. In contrast to Argyris and Schön (1996), it follows from our discussion above that change is viewed as a reflection activity focusing on the *ensemble* of interacting individuals as a holistic collective. This implies that change takes place as a process of *collective reflection* in and on collective practice.

The only matters of concern in such an individual oriented approach to organizational change are the norms and action strategies of the single individual in interaction with other individuals. Thus it rejects the political aspect as emphasized by Brunsson (1989). Morgan in his books *Images of organization* (Morgan 1986) and *Imaginization* (Morgan 1993) also adopts this kind of Weberian individualism to change and innovation. As in line with Argyris and Schön (1996), then, Morgan stresses that the single individual in itself has the primary role in both initiating and conducting the process for social change and learning; as he puts it: "But the process begins and ends with the commitment and actions of individuals."⁶³ Morgan's emphasis on the use of the metaphorical images in organizational learning is more aimed at achieving consensus reflecting the right action (which is the characteristic of the action organization in the terms of Brunsson 1989; March and Simon, 1958:118⁶⁴) in line with Argyris and Schön rather than striving for appreciating pluralistic diversity and conflicts as in line with Deweyan inquiry. This point of organizational diversity is underpinned by the argument of Brunsson (1989) emphasizing and striving for appreciating the need for hypocrisy in organizations.

Thereby, my approach to organizational change and innovation as outlined so far focuses on the meaning of organizational diversity and conflicts, which includes seeing organizational reality as socially constructed through the process of collective reflection instead of individual "self-reflection" as emphasized by Berger & Luckmann (1967). The point as we have from Dewey then, is that organizational reality as co-constructed also includes all kinds of facts and artifacts, power relations, social and language structures, problems, talk, cultures, ideologies (Brunsson 1989); organizational institutions and

⁶³Morgan 1993: 293.

⁶⁴ March and Simon (1958) emphasize the meaning of consensus in this way: "...the group deems it important generally to arrive at a decision agreeable to all members (consensus), even though it may operate formally under another decision rule for resolving a deadlock."(p. 118).

routines, etc. This brings us to the other point of Dewey; namely the critical value aspect incorporated in all knowledge implicates the inquiry process as intrinsically democratic. This means in methodological terms seeing every individual participant in the inquiry process as co-learners that co-generate new knowledge on the basis of communication through discourses.

Thus, I emphasize that instead of viewing organizational change at an individual level as a process aiming at reaching common agreement, I call for reflection at a collective level in legitimating the political organization as in line with Brunsson (1989). In such a collective learning process, conflicts and diversity of different cultures and understandings instead of consensus making among the participants are being emphasized. This is assumed to create the necessary *dynamics* for the process of organizational change and innovation and thereby new possibilities for creating new knowledge for new organizational routines or collective practice.

Hence, in arguing in line with pragmatic AR discussed above, I claim that creating organizational change includes participation of equal co-learners that involves both the professional researcher or the outsider and the regular shop-floor worker in *co-creating* the learning process. That is, on the basis of change as a collective reflective practice, it implies a learning process grounded in real action becoming aware and thereby appreciating the meaning of the plurality of the diverse social practices among the practitioners in the organization. In the end and according to the pragmatic ideal of Deweyan inquiry the utilization of such a diversity and the legitimacy of the organization commits the organization to reflect inconsistencies in order to cope with both action and politics (Brunsson 1989:33).

Thus, creating change based on a pragmatic AR approach implies a situation in which the outsider and the practitioner collaborate actively in order to co-create new contextual knowledge for mutual learning. According to my use of Deweyan inquiry, the outsider has to appreciate and to prepare for improving the practitioner's knowing-in-action. This effort of co-creating involves the process of collective reflection in order to take into full account the appreciation of the diversity of the organization in order to fulfill i.e. constantly varying external demands.

Then, in accordance to the ideal of Deweyan inquiry process implying the intertwining of thought and action, there is a need for constantly reflection-in- and on-practice which means that the process of conceptualization - development of new knowledge and language - has to go hand-in-hand with the development of new praxis in a never-ending *collective reflective process*. Thus, the "scientific" ideal that states the need of context-free knowledge - episteme - as a necessary validity claim for the use of generalization, becomes irrelevant.

From the previous discussion of Deweyan inquiry process, I conclude that organizational change and innovation implies collective learning that is qualitative different from individual learning rejecting both the dualism of fact and value and the dualism of action and thought. This contrasts the traditional Behaviorist perspective viewing learning as a stimulus-response process by defining learning as a change in the probability for different responses (Weick 1991). As discussed above, Argyris and Schön (1996) present a convincing proof in this thinking as they view the experience of surprise, the mismatch of outcome to expectation, as essential to the process by which people come to see, think and act in new ways. This is furthermore underpinned by their highly positivistic inspired Model II-governing variables called *valid information* and *free and informed choices*. Here Argyris and Schön disregard the interpretative dimension of the non-rational parts of human interaction. Moreover, Nelson and Winter (1982) clearly reflects an analogue positivist stance as they see organizational learning as a process in which whole organizations or their components adapt to changing environments by generating and selectively adopting organizational routines.

Thus I conclude that organizational change according to the ideal of Deweyan inquiry involves a holistic approach emphasizing the individual in the setting of a continuous process of collective learning facilitating the organizational diversity of viewpoints and experiences⁶⁵. This is underpinned by the critical approach of pragmatic AR emphasizing individual self-realization through collective reflection in which the inquiry process itself means the support of "solution of the problems that are important for the local participants" (Greenwood and Levin 1998). Hence, the critical approach of pragmatic AR aims at

⁶⁵ This paradigm parallels more or less the outcome of uniting the Weberian action paradigm (methodological individualism) and the Durkheimian facts paradigm (methodological collectivism)(Durkheim (1966): *The rules of the sociological method*). The point is to understand the individual action in a holistic perspective.

overcoming the problem of power relations and politics through wide spread participation in accordance to democratic principles and by preparing for the primacy of praxis through the process of collaborative collective reflection. Thus, the outcome of such a participative change process is the process itself; that is “a way of keeping the conversation going” (Levin and Greenwood 1998).

This way, organizational change as Deweyan inquiry copes with power and politics as real aspects of organizations contrasting the harmony view of Nonaka and Takeuchi (1995) and Argyris and Schön (1996) that ignores important issues present in the perspectives on integrated technological and organizational change processes as emphasized in ANT and STS.⁶⁶ A major limitation of the Argyrisian, Nonakian and Sengian perspectives rests in its assumption on organizational well being as equal to a state of “functional unity”. This view usually leads to seeing political and other self-interested activity as abnormal or dysfunctional features that should be absent in the healthy organization. For instance, on the one hand, different interests are considered as a creative force, bringing different perspectives to the surface and challenging them. (Nonaka and Takeuchi 1995; Senge 1990; Argyris and Schön 1996). On the other hand, these theorists seem to argue that conflicting interests can and should be solved, thereby creating conditions for oneness and harmony throughout the organization. These perspectives ignore however the uneven formal and informal distribution of power pointed to by Pinch & Bijker (1987), Latour (1987), and Clegg (1989). In the final part of this chapter, then, I will elaborate these arguments.

First, by arguing in line with Flyvbjerg (1991) (see Section 2.7), it follows that *knowledge is power*, but also that “power is knowledge”. A political view on organizational structures, rules and regulation suggests that they can be seen as products and reflections of a struggle for political control. As stated by Weber:

“Bureaucratic administration means fundamentally the exercise of control on the basis of knowledge” (Weber 1947: 339)⁶⁷

Similarly, Taylor (1967) holds that authority can be based only on superior knowledge. According to Braverman (1974), Scientific Management was simply a means for

⁶⁶ See my discussion of ANT and STS perspective in Section 2.5.

⁶⁷ In Heckscher 1994: 117.

management to use their monopoly of knowledge to control each step of the labor process and its mode of execution. Thus, we can understand organizations as systems of government involving the activities of rulers and ruled. Moreover, since organizations are in large measure decision-making systems, an individual or group that can exert a major influence on decision processes can exert a great influence on the affairs of his or her organization. This draws attention to the key importance of knowledge and information as sources of power: By controlling these key resources a person can systematically influence the definition of organizational situations and create patterns of dependency. In addition, many aspects of organizational structure, especially hierarchy and departmental divisions, influence how information flows and are readily used by unofficial gatekeepers to advance their own ends.

Similarly, technology has a major impact on power relations (Gjersvik 1993, Klev 1993)⁶⁸. For instance, the machine bureaucracy is based on indirect supervision through standardization of work processes in the form of explicit routines and automation. Moreover, the introduction of a new technology can alter the balance of power. For instance, the control and use of centralized computer systems is often a “hot” issue as control of the computer usually carries with it control over information flows and the design of information systems⁶⁹.

Thus, organizational changes towards increased autonomy in structures or technology often mean creating major conflicts between managers and employees as managers have to give up “being in control” and give decision-making authority to local managers. Similarly, changing the traditional professional-client relationship towards a reciprocal collective *Reflective Practice*⁷⁰ is not unproblematic. As member of a “major” profession, the professional is expected to play the role of authoritarian, autonomous expert, but as a reflective practitioner he is to make himself controllable by his clients.

Second, Morgan (1986) – discussing organizations as political systems, claims that conflict will always be present in organizations because they are designed as systems of

⁶⁸ Both Gjersvik (1993) and Klev (1993) have an excellent discussion of the relationship between power and technology.

⁶⁹ For an excellent discussion of the issue of power in relation to IT, see Zuboff (1988)

⁷⁰ As suggested by Schön (1983)

simultaneous competition and collaboration. As previously discussed, organizations are not integrated rational enterprises pursuing a common goal. An organization embraces much rationality, since rationality is always interest-based and thus changes according to the perspective from which it is viewed.

This draws attention to the *third* major argument: Organizations are coalitions and are made up of *coalitions*, and coalition building is an important dimension of almost all organizations. As seen from Latour (1987), coalition development offers a strategy for advancing one's interests in an organization. Moreover, most approaches to organization actually foster the development of such cliques and coalitions, since functional and other divisions fragment interests by for instance allocation of different goals and activities to sub units such a departments or project teams.

Both Senge (1990) and Nonaka & Takeuchi (1995) emphasize that conflicts do exist in teams. Moreover, they view conflict as a productive, learning and creative force and one of the most reliable indicators of great teams. On the other hand, they apparently think that politics ideally should be absent in organizations. Senge (1990), for instance, make a clear distinction between the political win/lose game of *discussion* and the apparently non-political *dialogue* focused on the "free and creative" exploration of complex and subtle issues, a deep "listening" to one another and suspending one's own views. Senge's approach is obviously colored by Argyris & Schön's *O-I* and *O-II learning systems*, where the latter is governed by "valid information", "informed choice" and "internal commitment" (Argyris and Schön, 1996). Similarly, Senge's ideal team learning system is a "non political climate" where the team members share a common vision and see each other as "colleges" who "speak" openly and "honestly" about important issues (Senge, 1990).

I do agree that organizations may pursue goals and stress the importance of valid information, openness and informed choice. On the other hand, inspired by the argument of Flood and Romm (1996) (see chapters 4 and 5) emphasizing organizations as political systems, I find it relevant to ask: Valid, informed and open for whom? Whose openness is being pursued? What interests are being served? Who benefits? Taking into account my above discussion, it is valid to say that *rationality is always political*. Taking these aspects into account, I thus find that the learning and knowledge creating perspectives of Argyris &

Schön (1996), Senge (1990) and Nonaka & Takeuchi (1995) have a distinctly Utopian flavor. The aspects of interests, power and conflict cannot be “learned” away from organizations, or social interactions in general. Power, which according to Clegg (1989) is best approached through a view of more or less organized agents engaged in more or less complex games, is an essential part of organizational life, not an dysfunctional and optional extra. Thus, conflicts, interests, and power should be viewed as natural and ever-present parts of “learning” and “knowledge creation” organizations. Consequently, efforts to promote organizational change and innovation should take this as a starting point and develop strategies to deal with the political dimension, which are different from attempts to spirit it away.

In Chapter 4 and then finally in Chapter 5, I will draw on Flood and Romm (1996)’s idea of *diversity management* in addition to the co-generative model of pragmatic AR in order to present a model for organizational change in which the political dimension of organizations are taken as a real starting point for creating arenas of collective inquiry. This will show how collective inquiry and diversity in the Deweyan sense can be incorporated in the process of organizational change *itself* as a collective reflective practice. Consequently, this means *not* “towards” something “new”, but on the contrary, where the participants themselves inquire into the process as a continuous *collective reflective practice* for “keeping the conversation going” in proper arenas for communicative action.

2.11 Summary

The aim of this chapter has been to provide an alternative notion of knowledge for coming to terms with the *process* of organizational change and innovation. The main idea behind this effort has been to present a critique of the traditional view of knowledge in social sciences and organizational learning based on a pragmatic position in which action and thought are united. It is argued that this is due to the stated primacy of praxis over epistemic thought.

Building on Deweyan inquiry, this has led to a critique of methodological and epistemological individualism in the Weberian action paradigm and instead emphasizing

the holistic inquiry approach of collective reflection in which diversity and conflicts are facilitated. In order to cope with organizational change, then, collective learning implies the effort of facilitating wide spread participation, pluralistic diversity and conflicts according to democratic ideals instead of striving for common agreement.

In emphasizing the primacy of the collectivistic construction of meaning and knowledge in organizations, I have argued that there is a mutual influence between the individual and the collective meaning construction. That is, the reflection process can be both individual and collective. In such a collective process, conflicts and diversity of different cultures and understandings instead of consensus making are being emphasized. This is to emphasize the primacy of the holistic element in the social construction of meaning. Hence, by building on the pragmatist argument of Dewey, I have come to that there is a need for social improvement of all individuals through participating in arenas for collective reflection processes. Another important heritage from Dewey is the focus on diversity, conflicts and democracy in which the collective acknowledgment of diversity of experience and capacity constitutes the most basic dynamics of the learning process and thereby to create knowledge to act that solves the relevant practical problems at stake.

The Deweyan inquiry process is the knowledge creating process in which arenas for discourse according to pragmatic AR is seen as the primary method, as a way of “keeping the conversation going”. This is to say that the inquiry process aims at continuous collective learning through creating proper spaces and arenas for collective reflection for developing the new knowledge as a basis for acting in new and useful ways.

In the next chapter I outline the context of the thesis regarding the status and challenges of the AEC industry in addition to an overview of the SiB R&D program. This will provide the necessary basis for in Chapter 4 to outline a participative approach to change and innovation in the AEC industry building on the Deweyan inquiry approach as discussed in this chapter.

Chapter 3

The “linear-control” Oriented Project Management Perspective

In order to get oriented about the context of the thesis study, I will provide an overview of the SiB program (see Chapter 1) and some of the prevailing rationalist and “linear-control” oriented project planning models as used and advocated in the SiB program and in projects in the Norwegian AEC industry in general. In the next chapter, Chapter 4, I will position myself to these management-biased perspectives as practiced in the AEC industry. First, I will give a proper background map over the terrain we are moving into. I emphasize that the SiB was a huge interdisciplinary R&D program that had to take into account a high degree of complexity with all its different sub projects representing a wide variety of professional interests and academic disciplines that was intended to represent the whole building industry (Architects, Engineering and Construction – AEC industry) in Norway.

The notion “integrated” was used as a central notion referring to the aim of the SiB program; “integrating the building project as a whole through the “implementation” of business-process reengineering (BPR) models” (SiB-report). I will provide a glimpse of these management biased perspectives as they were practiced in the SiB program reflecting the very rationalist oriented “project planning” and “linear-control” oriented perspectives⁷¹ as practiced and applied in building projects (see brief discussion of management oriented “techniques” and BPR models in Chapter 1). In contrast to this, I will provide a

⁷¹ In management and organization literature there is a huge field called “project management” and “project control” which relies on strict linear and rationalist based “management techniques” for project execution. See e.g. Kolltveit og Reve (1998) for a broad overview. The AEC industry has a long and broad tradition of applying those “management techniques” for “efficient” project “control” focusing strictly on cost and time in which change as a social process including issues as politics, diversity and collective learning is totally disregarded or rejected.

participative oriented perspective on change and innovation in Chapter 4 building on the Deweyan argument of inquiry as discussed in Chapter 2.

In this chapter I do not intend to review the prevailing literature in the field of project management (for an excellent review of project management perspectives see e.g. Kolltveit and Reve 1998). I will only refer to examples of this literature in the following description of the SiB program in order to contrast my own position as discussed in the chapters 2, 4 and 5.

3.1 The actors and the objectives of SiB

The idea behind the SiB R&D-program was launched back in 1993 when the Common Board of Construction Industry took the initiative to accomplish a “Porter analysis for the AEC industry of Norway”. One of the conclusions from this study was that

“The AEC industry lacks the ability and the understanding needed to employ connections and synergies between the industrial, consulting and contracting actors of the industry”.

The results from this investigation in combination with the conclusion from a pre-project in 1995 called “A competitive Norwegian AEC Industry – strategic IT-application as competitive resource” formed as a trigger for and a background for the search conference at Sundvollen the same year collecting key persons and resources from the whole industry. The pre-project’s main idea was that “new management models” of integration enabled by IT could contribute to higher productivity and thus strengthen the international competitiveness of the Norwegian AEC industry. The conference triggered planning for the SiB that was approved and organized as an R&D program under the Building and Construction Committee of The Research Council of Norway (RCN) and owned by a consortium⁷² composed of the companies Veidekke ASA, IGP AS⁷³, ABB Installasjon AS and L.A.Lund AS.

Those four companies constituted a strategic alliance within the AEC industry in the sense that they all together complemented each other with respect to competence and technical supply needed in accomplishing a total building project with the exception of the architectural competence. So there was no coincidence that they “found” each other in an R&D program of this large size, the largest one in the AEC industry in history.

⁷² The consortium organization was composed of top management, a CEO, from each of the four consortium companies, a program leader and a representative from the Ministry of Local Government and Labor (1996).

⁷³ In January 1998 IGP AS merged together with two other engineering consulting firms into Interconsult Group ASA or ICG ASA. In June 2001 the name of the company was changed to **Interconsult ASA**.

The SiB consortium companies (SiB home page: <http://samspill.interconsult.com>):

The four companies are all leading in their respective professions in the AEC industry: Veidekke in total contracting, Interconsult in consulting engineering, ABB Installasjon in electrical contracting and L.A.Lund in manufacturing and supply of building commodities to the building site.

The consortium board of SiB composed of each of the four firms' CEO or vice CEO together with a representative from the Ministry of Local Government and Labor (1996). The board met regularly on monthly basis throughout most of the four years project period of 1996 – 1999.

**Veidekke ASA (www.veidekke.no):**

Veidekke is one of Norway's largest and foremost contracting companies. The firm has almost 5000 people employed (September 2000) and had 10.1 billion in turnover in 2000 (see financial report for 2000 at <http://reports.huginonline.com/810203/87139.pdf>). Veidekke has, as the only one of the four SiB companies been represented on the Oslo Stock Exchange since 1986, had continuous and solid growth over the last years. Veidekke's vision is to be the first choice of customers, suppliers and employees, and thereby achieve its aim to be one of the leading contractors in Scandinavia.

The firm has four divisions. The largest one, Regional construction, is the one offering advice and co-ordination of the entire building process from the idea-stage, project development and the construction of new buildings to renovation and reconstruction of existing buildings. Veidekke constructs all types of buildings from shopping centers, offices and warehouses to sports facilities and office blocks, to name but a few. One central ambition of Veidekke is to have teamwork within the organization combined with local expertise and gaining competitive advantage by competence in the various areas of activity in the firm.

**Interconsult ASA (<http://www.interconsult.com>)**

Interconsult ASA is one of Norway's leading multidisciplinary firm of independent and professional consulting engineers. The firm has more than 700 employees both domestic and abroad. The company is a result of a merger in January 1998 between the three consulting companies IGP AS, Gjettem AS and Interconsult AS. IGP AS was the original SiB-actor of the three. From June 1, 2001, the firm is officially named **Interconsult ASA**.

**ABB Installasjon AS**

(<http://www.abb.com/global/noabb/noabb069.nsf/OpenDatabase&mt=html&l=no>)

ABB Installasjon is Norway's leading electrical contracting firm with 2650 employees and with 1.9 billion NOK in income (2000). The firm is a total supplier of electrical equipment, installations and services both on- and offshore. Together with ABB Miljø they also supply total technical installations covering all services in VVS.

L.A.Lund AS (<http://www.lalund.no>)

L.A.Lund is one of Norway's leading firm in manufacturing and supply of construction goods, timber and tools to the AEC industry. There are a total of 320 employees in the firm and had 1.2 billion NOK in turnover in 1999.

Figure 3-1 A presentation of the four SiB consortium companies

In the evaluation and the wisdom after the SiB program, it was considered as a possible drawback that there was no architect firm participating in the program. The program had a full start-up from January 1996 and lasted till December 1999. The total budget spent on

the SiB program in the four-year period was 64 million NOK and the Research Council of Norway (RCN) financed nearly 40% of the total program cost.

The overall aim of the SiB was to contribute to the development of a more competitive Norwegian AEC industry through developing the productivity by focusing on innovation related to “integrated process development”⁷⁴ beyond the traditional organizational borders of the actors involved in building projects. As when RCN approved startup of the SiB, the four consortium companies together with RCN stated the goal of the SiB program to be:

*“The AEC Industry shall effectively and profitably deliver the construction products and services as demanded by the market at any time, and also develop and market **knowledge-based** solutions that consequently lead to added value for the customers or users.”*

The vision and the main aim of the SiB program should then be reached by focusing on the enabling potential of the IT with respect to “integrated process development” and “BPR-implementation”⁷⁵ in the organization and execution of building projects. In that sense the use and development of IT was seen as an important precondition for the success of the whole program. The program owners themselves then stated the main problem definition for the SiB program to be as follows:

- **How to organize for collaboration and integration in the *building process*⁷⁶ in order to improve the competitiveness of the companies in the AEC Industry?**
- **How and to what extent may effective IT-application contribute to such development?**

The business situation of the industry at that time conditioned that the four program owners (the SiB-actors) had to work with the problem definition under mutual influence. This was seen as a precondition in order to create information structures and IT-solutions adjusted as much as possible to real problems and challenges in the industry and at the same time to utilize the full potential of the IT technology. Another challenge to cope with is a dramatic low level of IT application among most of the actors in the AEC industry.

⁷⁴ This means basically the implementation of the management-biased BPR-models.

⁷⁵ See Chapter 1 for a brief discussion of BPR-models of change.

⁷⁶ The “building process” is described in a section later in the chapter.

3.2 A BPR approach to change in the AEC industry

The different companies constituting the AEC industry are often being described as an “assembly industry” in the way they contribute to the execution of building projects by assembling different parts and knowledge to a finished building or construction⁷⁷. How the different actors of the industry contributes to the execution process has changed over time and varies also due to what type of project and model of project execution that is chosen. The price that the owner or end customer pay for the finished end product is then depended on each of the actors’ effort in different forms of **collaboration** during the building project. In addition an effective and competent infrastructure is demanded in order that the building project may provide added value for the customers and profit for the building actors. This point can be illustrated in the figure below (Figure 3-2).

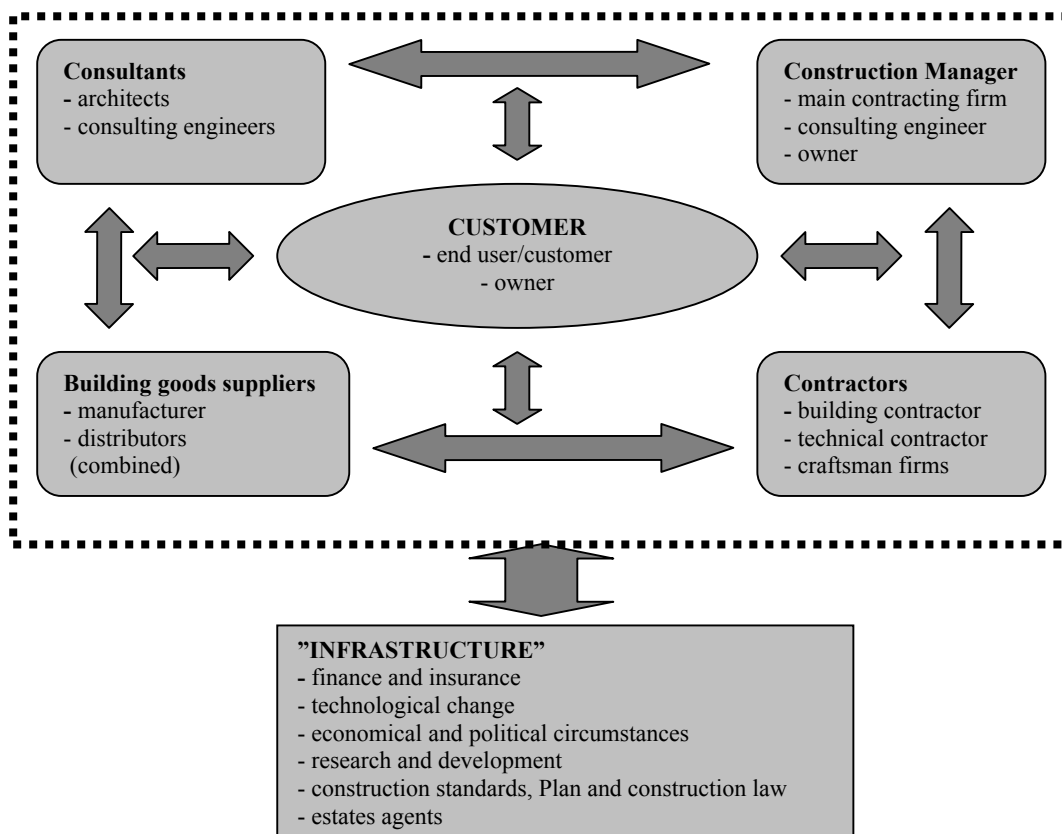


Figure 3-2: The value creation system of the AEC industry illustrating the complex relations between all the actors involved in the building project (illustration from a SiB consortium report).

⁷⁷ Here I refer to the annual company reports of the four SiB consortium actors. Also SiB consortium reports emphasize the “assembly line” description of the industry. See <http://samspill.interconsult.com>

The SiB consortium actors emphasized that there is an increasing need to *integrate* work processes and functions across those traditional industry roles and classifications. On regular building projects the distinctions and borders between the contractors, consultants, the project owner, building managers, building site leader, suppliers, etc, were to an increasing extent exceeded. The SiB consortium actors wanted to strengthen this development by focusing on the need of integrating work processes between the following three main types of work processes of the building project:

- **Projecting (or Design):** work processes involving consulting engineers and architects producing the project drawings and other project descriptions and basis for the actual physical facility or construction.
- **Production:** work processes for executing the building of the physical facility on the building site.
- **Procurement and supply:** work processes for supply and procurement of equipments, tools and construction goods from the manufacturers and dealers to the building site.

Figure 3-3: The main work processes of the general building project as emphasized by the SiB.

The fact that no one organizational entity hardly experience to have any control over the entire building project with all its different work processes and complex structure (the figures 3-2 and 3-3), makes it difficult for any building site manager or project manager to manage the project as a *whole*. So the most striking problem and challenge for the actors of the AEC industry today is a traditional tendency to sub-optimize the sub processes over which they have control. One timber ganger on a Veidekke building site emphasized this:

“To my experience there is always a lack of time and I feel that I always have to focus strictly on my own matters just to get things done. The thing is that all workers on the site feel the same way with

the consequence that no one really takes care for the whole on the site. The symptoms are many and unnecessary construction faults with increasing delay as a consequence, ... “

Sub-optimization has thus become a ‘tradition’ and has led much of the industry into a situation of becoming too fragmented, destructive and hostile conflict oriented and financially weak to cope with the challenges of the future. Also, this has led to an attitude of ‘product-minded’ way of working. That is, a strong focus on the product itself on the basis of pure professional discipline interests without being anchored in the end customer real needs or the project as a whole.

The point, then, is that this tradition has not led to any optimization of the project as a whole when judged by the quality of the end product⁷⁸, or any increased value creation or competitiveness among AEC companies involved in building projects⁷⁹. The industry and the setting of a building project are to a less extent distinguished by win-win situations, that is, when both parties are strengthened through change. To the contrary, most AEC companies seem to perceive collaboration as a ‘zero-sum game’ (that is: a state of ‘war’) in which a given profit is to be divided and where everybody wants to make sure to have the biggest share.

Thus, as assumed by the SiB consortium actors, and as a basic idea for the entire SiB R&D program, there is a huge potential for change and improvement regarding quality of end products. Consequently, increased value creation for all actors involved in the building project is the result if owners and contractors are willing to understand “optimization” of the work processes as a whole, even though the actors direct participation in the project only concern certain sub processes⁸⁰. This point the SiB consortium actors⁸⁰ summed up in the following assumption (1) below⁸¹:

SiB consortium assumption (1):

The quality of the end product is conditioned by the ability of the participating actors to develop optimization of the building project as a *whole* (or: organizational development in organizing the building project as a whole) and, thereby, to act upon a co-created and joint understanding of the building project as a whole.

⁷⁸ The end products are here understood as what comes out of the building project and that may include more than the physical facility in itself, e.g., satisfied customers, when seeing the building project as knowledge based service.

⁷⁹ These observations are concluded in internal SiB reports, see <http://samspill.interconsult.com>

⁸⁰ This point is in line with Senge (1990) and his system thinking for seeing wholes.

⁸¹ This assumption (1) is stated in a project plan description of SiB (Eriksen 1999)

By having the building actors the opportunity to act upon a co-created and joint understanding of the building project as a whole, the underpinning assumption is that the actors involved in the project also will co-create a joint *responsibility* for the whole and thus for the better for the quality of the end product that will be handed over to the owner or the end customer. One possible mean to develop this whole understanding and responsibility is related to involving more practical building site competence into early planning phase of the building project. Both workers on the building site as well as the projecting engineers and architects pointed out a need to integrate and involve more of practical and operative production competence into the more theoretically underpinned projecting phase.

The new Plan and construction law (the new PBL)⁸², which came into force from 1997, describes new roles of the building project in relation to public construction administration. In addition to the introduction of the new law, the SiB consortium actors experienced a change in the competition in which new actors with untraditional characteristics may threaten the position of the more traditional actors of the AEC industry. The SiB actors thus acknowledged the need for “process orientation” as in line with the management oriented “BPR models” (see Chapter 1) in order to increase the competitiveness of the actors involved in the building project. That is, they defined that the development of the execution *process* had to be the overall and basic focus of the SiB. The SiB therefore emphasized the importance of change and innovation directed more towards development and integration of *business processes* rather than products or technical solutions of the single building project. The focus was then set on the issue of the organization and management – that is, the *relational* aspects of the collaboration for the execution of the building project as a whole independently of the established industry roles and identities.

Up to the point of start of and during the SiB program, the SiB actors learned important lessons on the topic of integrated process development in building projects and how the involved actors in the setting of a building project may improve the total execution process towards a more whole value-creating chain including the end customer of the finished building. But despite those lessons learned the established collective practice in building

⁸² The new plan and construction law is outlined on this information site for the actors of the AEC industry, “BA-torget”: <http://www.ba-torget.no/kib/htm/godkjfor/gkframe1.htm>

projects still relied heavily on a traditional focus on formal procedures and contract standards. Those formal standards are not so practical to use in order to focus on wholes and enabling organization for more “creative knowledge processes” and learning in projects. The SiB actors acknowledged that probably the most important precondition and imperative in order to stay competitive is to look beyond those traditional roles and formal standards – put them more in the background, and instead focus on the work and collaboration processes itself. That is, to focus on the relational aspects related to organization and management for more integrated process development isolated from the formal information and communication procedures. Still the general practice in the AEC industry was heavily biased in favor of relying on the formal procedures, which to a large extent are a major obstacle for integration and development in the industry as a whole. These lessons learned in front of SiB were more like espoused theory, and not what Argyris and Schön (1996) call a theory-in-use.

Thus a main goal for the SiB actors were to take into account the striking need of the whole industry to gain knowledge of *how* to initiate and achieve real and significant *change* by emphasizing “integrated process development”. That is, how to organize activities in building project rather than people, and developing the relational aspects of the integration process. This ability focusing on how to achieve change focusing on the processes in itself the SiB referred to as management based *competence of change* as in line with the BPR approach (see Chapter 1).

In defining the goal for the SiB-project, the consortium companies expressed a BPR approach to change and process orientation composed of development related to two main elements or perspectives:

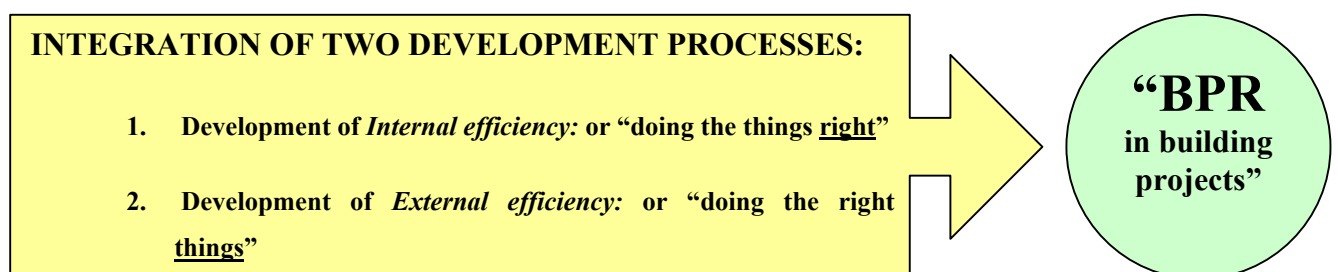


Figure 3-4 SiB’s BPR approach to organizational change and innovation in the AEC industry.

The first development process in Figure 3-4, internal efficiency, has a focus on development and learning for “doing things *right*”. This is an aim related to what extent the project management can produce and organize the building project with minimum resources or “maximum cost efficiency” with focus on “cost effective supplies and improved productivity” (Kolltveit og Reve 1998). This may imply constructions and buildings adjusted to standard elements for simple and safe installation work. Also it may be related to models of rationalization of planning by reusing of information and then by simplifying the sharing and use of information between the parties directly involved in the building project. The most important potential of improvement here is the *relations* between the participating actors of a specific building project. As a result of the focus on the internal efficiency of the building project, the SiB consortium actors stated that they had an expectation of “productivity improvement” as much as 10 – 20 %.

The second development process, external efficiency, is related to the ability of “doing the right *things*”, something that is seen as important from the building owner’s or user’s point of view focusing on work processes related to constructions delivered at the appointed price and time according to the functional, technical and architectural demands satisfying both short and long term needs. That is, in order to increase value creation among all the actors involved in the building project it is assumed as important to have a basic focus on the quality of the end products of the project. The external efficiency is, thus, the most essential one for developing the needed competitiveness of the whole industry as viewed by the SiB consortium. The ability of adding value preconditions the more fundamental life cycle perspective of the value chain of the total building project (see Figure 3-2).

Those two goals or development processes in building projects, external and internal efficiency, were defined by the SiB as mutually dependent on each other in order to ensure integrated development and consequently “improved competitiveness” of the involved AEC companies. That is, there is a need for an integrated development of external and internal efficiency creating a “BPR process” among the companies directly involved in the building project. In order to cope with this integrated approach to change in the AEC industry, the consortium companies organized the SiB into three program areas with a parallel development in all three. Those areas could not be seen as isolated from each other,

but still view the SiB as constituted by and organized according to the following three part subjects:

- **Program area (I):** focus on developing new models of *organization and management* for effective *integration* between internal and external efficiency in building projects (BPR-models).
- **Program area (II):** focus on developing new information structures in building projects.
- **Program area (III):** focus on developing efficient IT-solutions for building projects.

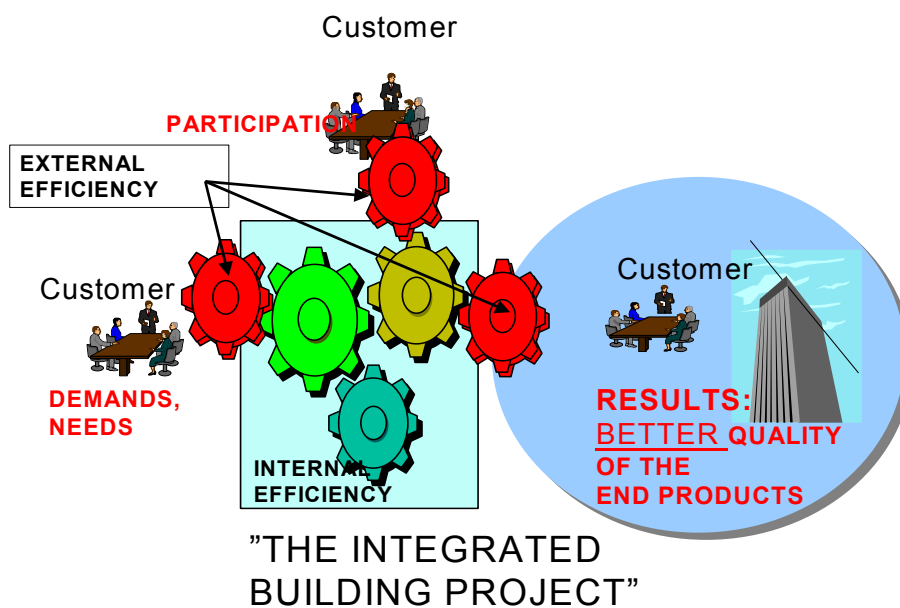


Figure 3-5. A BPR approach expressed as an integrated development between internal and external efficiency in building projects (illustration from Eriksen 1999: SiB-report).

In the figure above (Figure 3-5) a BPR approach to change in building projects is defined according to SiB as an integrated development of internal and external efficiency with an organizational focus on “measuring” the quality of the end products. Thus the relations between the three program areas are indicated. The red gear wheels indicate the interaction and integration between the external and internal efficiency (Program area I), the involvement and participation of the customer, and the form of the wheels indicates the standards of the information exchange (Program area II). The wheels work then as information carriers, by indicating, “how the information is floating through the system of the building project supported by IT” (Program area III). Thus IT was by the SiB actors

defined as a basic precondition for coping with the integration of internal and external efficiency in an effective way for creating “BPR-processes” of change.

The SiB-program was then organized according to the following organization model:

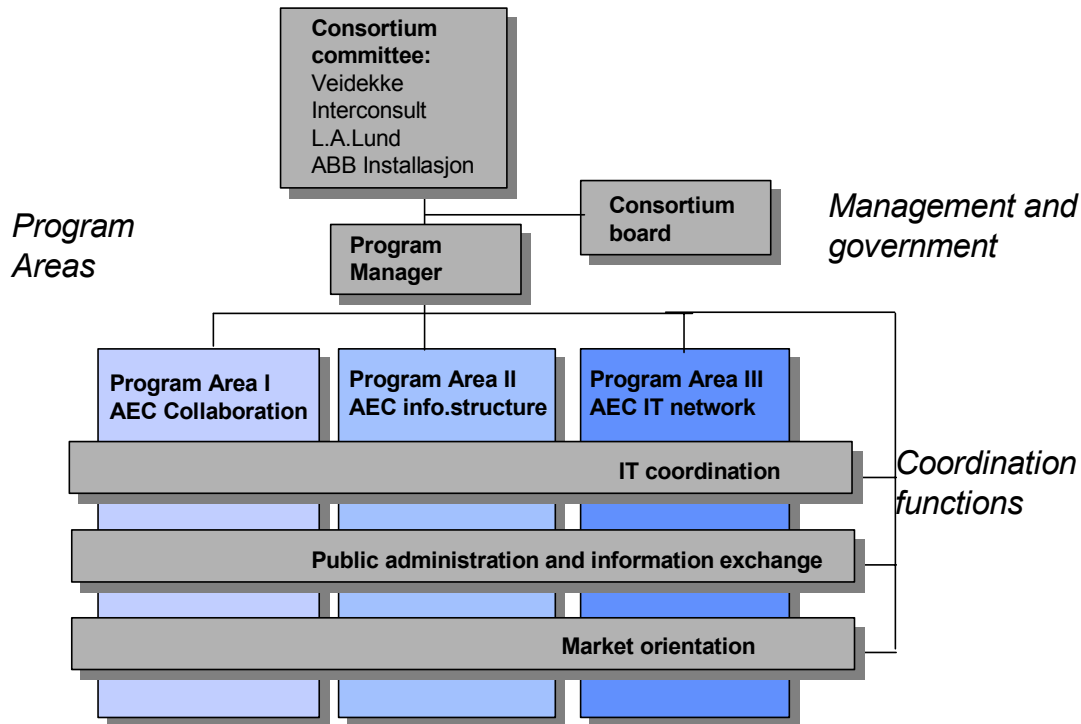


Figure 3-6 Organization model of the SiB with each project area having focus on the building process as a whole.

The first program area, AEC collaboration (I), was stated as the most essential one in realizing the change or the needed “BPR-process” in building projects and thus to attain the main goal of the SiB-program. The SiB consortium actors defined the development in this area as “business process reengineering” or BPR, as in line with and in inspiration from the more management oriented and traditional BPR efforts as described by Davenport (1993) and Hammer and Champy (1993) (see Chapter 1). The SiB consortium actors used those BPR perspectives as a model for change and development in the way of analyzing what they called “bottlenecks” and problems in today’s delivery systems between the players of the building project and, then, on the basis of the “bottleneck analysis”, develop and “implement” new delivery- and organizational models for building projects in general.

Internal and external efficiency were thus seen in close connection to each other for bringing BPR into focus and consequently into practice. Delivery processes include delivery of information (specifications, drawings and descriptions) and delivery of goods and also services of craftsmen.

3.3 SiB's definition of “*integration*” in building projects

A central vision for the work of the Program area (I) and thus as a goal for the process orientation efforts, was related to “integration”. That is, to develop collective practice in building projects and the AEC industry to become more “integrated” as based on the indicated integration between internal and external efficiency for a more total working value creating system (see Figure 3-7 below)⁸³. This thinking implied according to SiB to organize the building project in such a way that a better balance between efficiency of cost and user or customer orientation may be achieved. Consequently, it was assumed that the necessary BPR efforts could be achieved by having “the quality of the end products as a starting point for understanding the organization of the building project as a whole” (Eriksen 1999).

The SiB actors emphasized that such a comprehensive way of thinking provides for common goals and strategies for all involved actors of the building project. If this comprehensive and total view lacks, the building actors according to the SiB consortium may “sub-optimize out of immediate features at the expense of the total value creation and business ideas that may imply for more long-term competitiveness” (Eriksen 1999). The SiB actors emphasized here the need of the shift of mind from seeing the parts to seeing the wholes as stated in assumption (1)⁸⁴. That is, the aim was to stimulate for more system thinking for understanding the collective practice in building projects as a whole in order to improve the attitudes and the relational competence for more proactive collaboration and integration (Senge 1990).

⁸³ I will not explain “the BPR approach” in Figure 3-7 any further, just to indicate this as an example of the management biased perspective to change as discussed in Chapter 1.

⁸⁴ See SiB assumption (1) above.

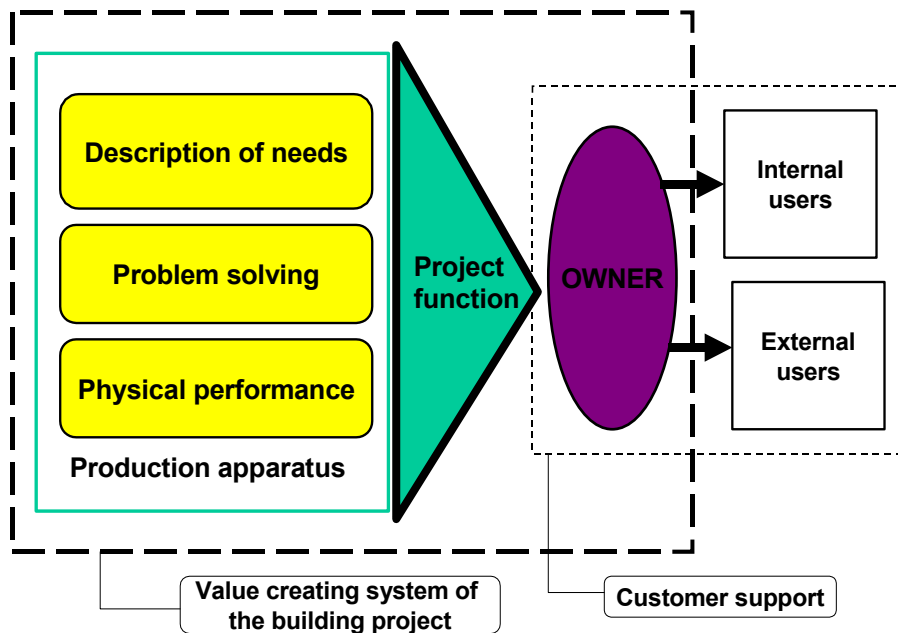


Figure 3-7 The “BPR-model” of change and integration in building projects according to the SiB consortium (Eriksen (1999), SiB-report).

The goal of Program area (I), was then stated to be, which then explains in a way the “application” of the “BPR approach” according to SiB (Figure 3-8):

Goal of SiB Program area (I):

Develop an organizational understanding of the building project *as a whole* by analyzing means for *closer integration* between work processes related to internal and external efficiency (as indicated in Figure 3-3) and thus for strengthening the *relations* between the participating actors of the building project

Figure 3-8: The goal of the SiB Program area number (I) by following a BPR-model to change

An important aspect of the term integration as indicated in Figure 3-8 is the *relation* between the actors involved in the building project. The purpose of attaining the goal of area (I), is linked to the point stated in the SiB assumption (1). That is, the SiB consortium⁸⁵ actors emphasized that there is an opportunity to make “important breakthroughs” for “re-engineering” processes (BPR-implementation) with regard to quality of end products, and

⁸⁵ This understanding was expressed by the top managers of the four consortium companies, stated both in SiB project documents and in interviews I had with them.

thereby developing the total value-creating ability by closer integration through “*optimization*” of the building project as a whole as indicated in the “BPR-model” in Figure 3-7.

Integration is a term often used in the AEC industry in addition to that it was defined as an important term for the entire SiB program. The term is rarely defined, and in particular, integration with respect to the building project as a whole has seen little, or if any at all, empirical research.

Insecurity and complexity are two basic characteristics of the collective practice in building projects, and which contribute to limit both internal as well as external efficiency. Integration is then according to Fergusson (1996) viewed as the key for increasing the total efficiency both with respect to the internal and external efficiency. Thus the SiB defined integration as the *flow of information and knowledge* in three dimensions or modes of coordination (Fergusson 1996):

- Vertically or between industry functions or between the core processes as indicated in Figure 3-3 (inter-functional).
- Horizontally or between the participating disciplines or trades (inter-disciplinary)
- Longitudinally or across time, by organizational and technical software and hardware. Two major time horizons are indicated here: the *within-project time* (learning *in* projects) and the *project-to-project* (learning *on* projects) function. Organization for learning and knowledge development in the building project as a whole is a major aspect here.

Figure 3-9: The three possible dimensions of integration for creating BPR-processes in building projects as adopted by the SiB (Fergusson 1996).

The SiB consortium concluded that the quality of the building project’s end products increase according to, that is, are conditioned by (strongly positive correlated) the degree of integration along those three dimensions, with an emphasis on the horizontal and the longitudinal integration. The three dimensions of process integration in building projects may be illustrated as in Figure 3-10 below.

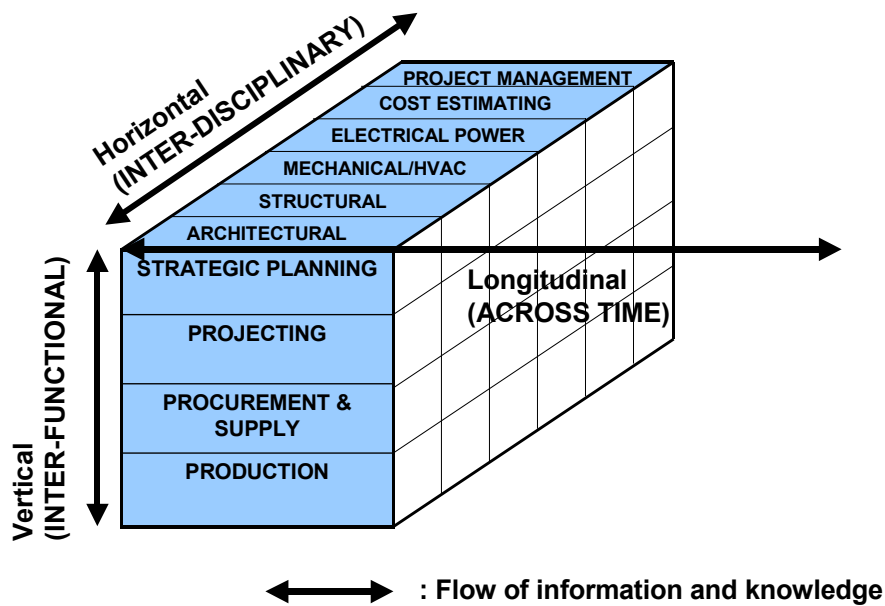


Figure 3-10 SiB's understanding of BPR-based integration of processes as the flow of “information and knowledge processes” in three dimensions in the building project as a whole (Fergusson 1996).

The main goal for SiB in Program area (I) was, then, as stated by the consortium actors, to find effective “management means” for integration between internal and external efficiency in those three dimensions for optimization of the building project as a whole. In relation to this point, the SiB consortium actors emphasized in one of the HSK reflection meetings that one possible mean for such BPR-based integration may be a method referred to as “enterprise modeling” (Totland 1997)⁸⁶. In that connection the SiB consortium proclaimed its second assumption to be tested out in one of its pilot projects (Eriksen 1999).⁸⁷

SiB consortium assumption (2):

The development and use of IT-based “enterprise modeling” is an effective mean for attaining effective BPR-based integration between the internal and external efficiency of the building project as a whole.

⁸⁶ Enterprise modeling means here “IT-based modeling” of organizations mainly for project management and so-called “decision support”. Totland (1997) gives an excellent overview of the field “enterprise modeling” from a technological viewpoint.

⁸⁷ This second SiB consortium assumption was stated on the HSK-meeting and documented in a SiB consortium report (Eriksen 1999)

3.4 IT-based information-sharing practice in building projects

The Program area number two (II) (see Figure 3-6) focused on the information structure in building projects. This area was mostly related to effects on “the information flow” by the introduction of the new plan and construction law (PBL), and the new routines and laws for communication of the public information and administration of the single building project.

The third Program area (III) focused on IT-solutions for standard application in building projects and testing new forms of collaboration enabled by IT. These solutions were the tools for aiming at and enabling the needed “BPR-based” process orientation for seeing wholes as outlined in Program area (I). The main goal was to establish a functional standard electronic arena for information sharing and communication in building projects in general. An ambition was that the physical solutions to the largest possible extent were based on existing electronic infrastructure and standards, which meant the introduction and use of the Web or the Internet.

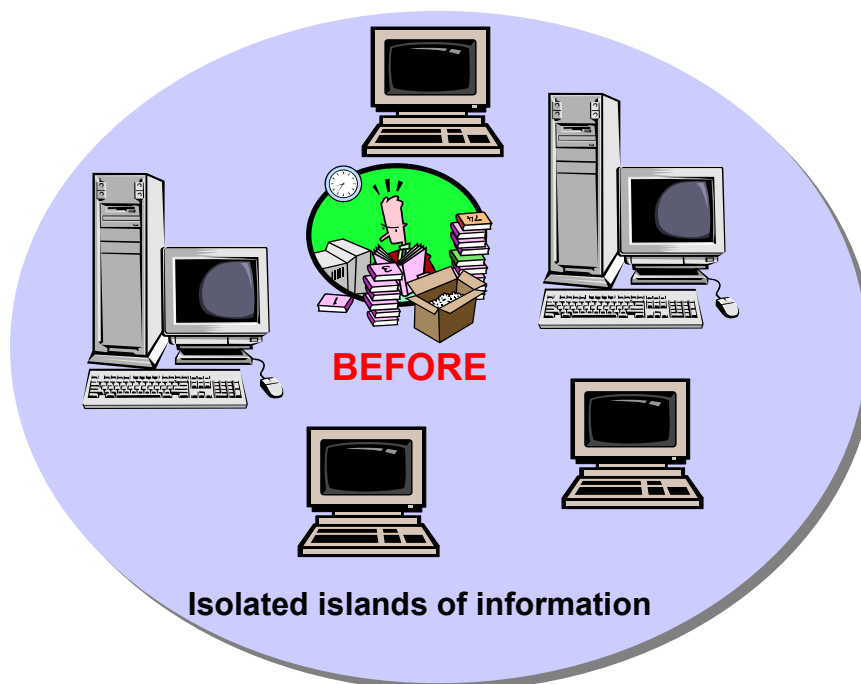


Figure 3-11: The situation *before* the introduction of the Web-based Internet.

The development and use of IT is emphasized by the SiB consortium to meet the needs for BPR-based process orientation, that is, to underpin the integration between internal and external efficiency, the need for a common and shared room of information, and thereby to provide a basis for a new arena for “project management”. The SiB explained the situation

of the use of IT *before* the Web produced information in the Figure 3-11 above, but did not necessarily lead to any better communication. The computers did not communicate to each other, same information was stored on more than one place and there was a paper-based information system in parallel with the electronic one.

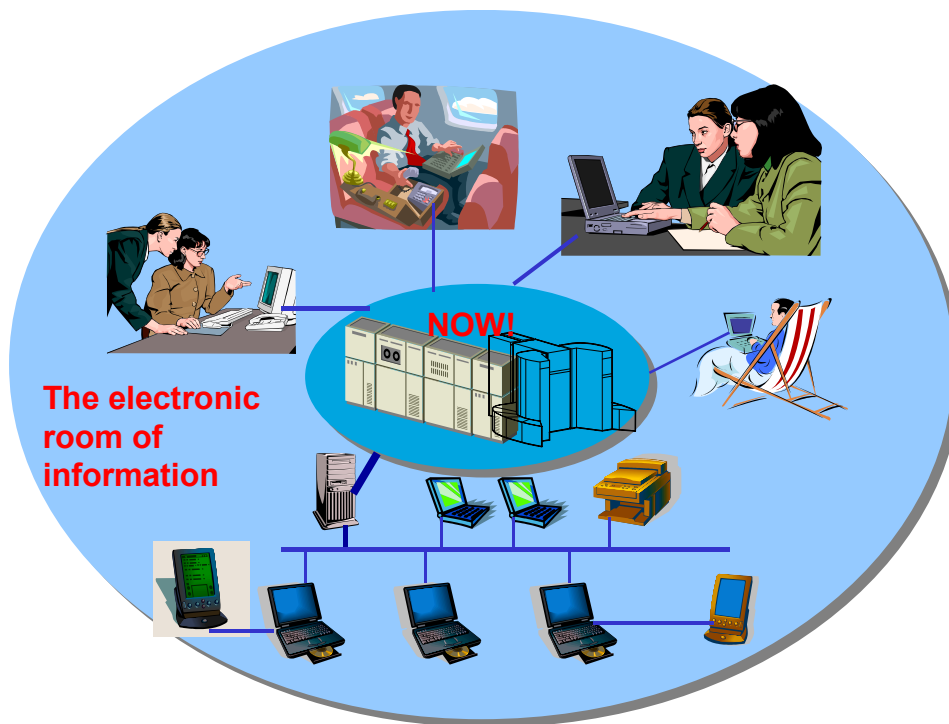


Figure 3-12: The third SiB Program area (III): The use of the Web-based Internet for IT supported information sharing in building projects creating “The electronic room of information”.

The situation as indicated in Figure 3-12 with the use of the Web-based project server, provides an effective infrastructure for the needs related to creating an effective practice of information sharing in building projects as emphasized by the SiB consortium.

Among the SiB consortium actors and in the AEC industry in general there has been a growing emphasis on technologies and standards of project management that are needed to support rapid development of facilities that requires distributed project teams during both the projecting and the production phases of the project (see Figure 3-3). The project teams were viewed as frequently operating geographically dispersed. This involved activities such as real time sharing of project data over communication links such as Internet, visualization

of project results so that problems can be quickly resolved by use of distributed design system.

There was a clear understanding in the SiB consortium, though, and also among the four consortium companies themselves, to the contrast from the AEC industry in general at that time, that the Internet has the opportunity to enable improved collaboration for distributed teams, new document management solutions (IT-based information sharing), and also fast platform-independent global access to up-to-date project specific, resource and contract document information. The technology to support e-commerce for core activities in building projects, such as procurement, engineering analysis and information exchange, are today understood as mature to the extent that the SiB actors have stated the ambition to contribute to that the e-commerce are going to become a standard reality in building projects in the foreseeable future.

On many building projects, though, progress and efficiency are hampered by poor communication of discipline- or profession-specific models. For example, architects use 2D or 3D CAD models and consulting engineers use CPM-diagrams, Gantt charts and spreadsheets to show their view of the project. One basic idea in this third Program area (III), then, was that IT supported visualizations of the physical construction could be used to integrate, relate or overlay these disparate models to understand cross-disciplinary impacts of design and construction. As the situation is for the SiB companies realistically today, the industry has to rely solely on the project participants' ability to interpret these rather abstract, discipline-specific models to form a mental picture of a proposed design and its corresponding construction and engineering approach. Even a good building plan and drawing too often get misinterpreted by some of the participants, especially on the building site, which then may lead to inefficient work processes executing the wrong thing.

A sub pilot project in SiB⁸⁸ focused on developing 4D CAD (3D plus time) that allows designers (architects) and builders (engineers and building site workers) to represent their view of the project and the physical construction in one common and sharable model. A main point in this sub project is that 4D-CAD is meant to communicate the design and the

⁸⁸ See description of the project at <http://samspill.interconsult.com>, 4D-construction project.

construction process visually, making the communication of design and construction decisions more comprehensive and faster.

The third Program area (III) was also part of a nation-wide project for developing a national IT-based network infrastructure for the AEC industry, which is part of a larger project financed by the Research Council of Norway (RCN) that includes a national network for both private and public sector⁸⁹. The goal of the project area is to achieve IT-solutions that may contribute to strengthen integration between the internal and external efficiency of building projects. As the AEC industry is to that extent so extremely coordination and information intensive, those IT-solutions may enable an infrastructure that meet the needs and high demands to information and communication in building projects in general. The IT-solutions have to be useful both for small and big actors, and second, that they are not depended on heavy investments and technical related IT competence.

3.5 A linear “management-biased” view on building projects

Taking into account the outspoken “BPR-focus” of SiB described above, the SiB-program advocated a very “linear-control” oriented project management perspective on building projects. This perspective was emphasized in a sub project organized as part of Program area (I) called “*Common theory basis for organization of the building process*” (or Common theory-project) focusing on outlining common theoretical concepts and “BPR-models” helping the project management in general to cope with “controlling” the ever increasing complexity of building projects (Eikeland 1998). The aim of the Common theory-project was expressed as:

*“The aim of a **common theory basis** is to develop and share knowledge in order to describe, analyze and understand alternative models of project management for different “building processes” with relation to both the internal and the external efficiency of building projects.”*

(Eikeland 1998: 2)⁹⁰

⁸⁹ This is as part of the NIN project – Norwegian INformation superhighway.

⁹⁰ This definition is very “cryptic”. I will not dwell into any further explanation of this, but rather as a mean just to show the very outspoken “linear-control” oriented project management view as advocated by SiB.

As defined by the SiB-program, “the building process” involves all processes that lead to or is a precondition for the planned physical construction. This means that the “building process” as a concept covers “a large numbers of sub processes of different characters”. Thus, the SiB-program viewed collective practice in building projects referred to as “the building process” illustrated as shown in Figure 3-13 below.

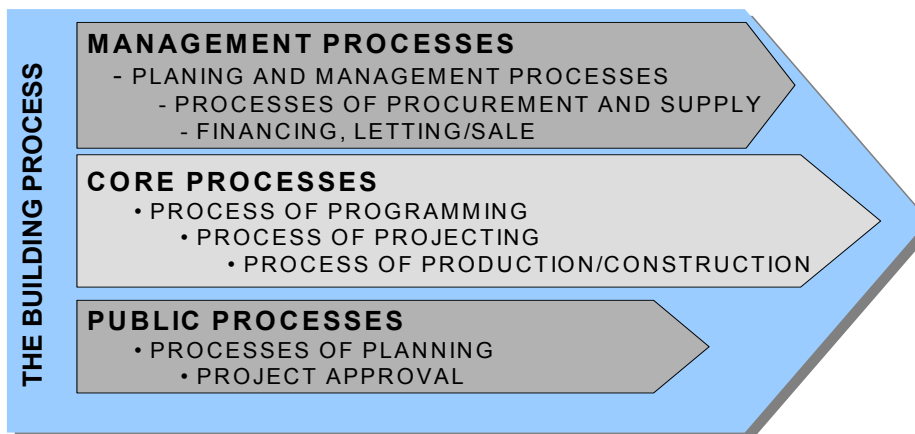


Figure 3-13: A “linear-control” oriented project management perspective on building projects (Eikeland 1998).

As indicated in Figure 3-13, the three core processes of the building project, viewed as “the building process”, are defined as *programming*, *projecting* and the *production* process. The programming process consists of identification of building and construction demands. The projecting involves development of drawings, formation and detailed description of the physical qualities of the construction, and then the production process that is the physical execution process of the construction facility or building. In order to organize and manage those processes with regard to more critical stages, Eikeland (1998) indicates that it is practical to classify “the building process” into four generic phases, namely the “idea phase”, “development phase”, “execution phase” and the “application phase” as indicated in Figure 3-14 below. The phases are viewed as strictly linear and generic in the sense that they will exist in greater or less extent in all building projects (Eikeland 1998).

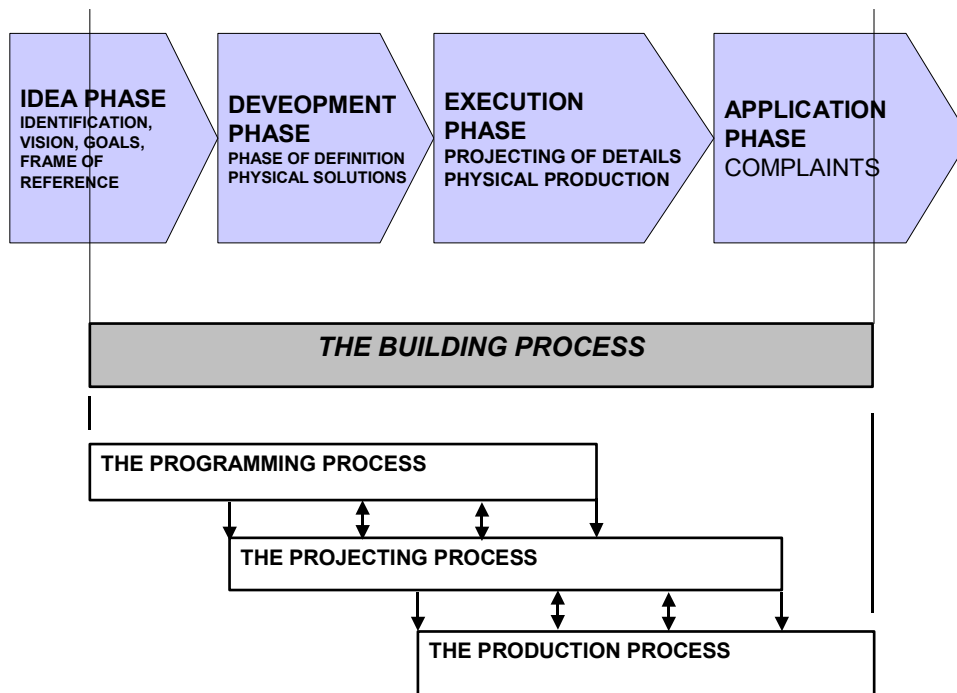


Figure 3-14: The four generic phases of “the building process” according to SiB (Eikeland 1998).

The generic phases of “the building process” follow each other in a strict logical and linear order. Also between the three core processes as indicated in Figure 3-14, there is a sense of order, but as emphasized by SiB there is a considerable overlap in time between the core processes. As documented in SiB reports and other empirical investigations (Fergusson 1996), it is emphasized that there is a continuous increasing overlap between the core processes. That is, the core processes are to an increasing extent emphasized to be organized in parallel as a consequence of the continuous increasing demands for saving time and project cost.

The consequence of this “parallel-processing” as indicated in Figure 3-14 is then viewed as increased demands to “project management control” in order to have even better managerial *control* with coordination, communication and management in building projects. Thus, according to the SiB-program the BPR-models for “implementing” increased “managerial control” is viewed as the answer to the industry’s challenge of the ever-increasing change process of a “knowledge-intensive” society⁹¹. The SiB consortium

⁹¹ For an excellent discussion of control in the context of management, see Ciborra and Hanseth (2000): “Introduction: from Control to Drift” in Ciborra et.al. (2000): *From Control to Drift – The dynamics of corporate information Infrastructures*, Oxford: Oxford University Press.

acknowledged that the industry had to increase the ability of “controlling” the feature of becoming more “knowledge-intensive”. This was viewed as a result of skilled incompetence regarding i.e. a widespread inability in getting rid of the practice of “sub-optimization” that was viewed as one of the industry’s major challenges or problems of the future.

3.6 Summary

This chapter has provided a sufficiently description of the “linear-control” oriented project management perspectives as advocated by the SiB R&D-program in addition to a description of some of the prevailing challenges of the AEC industry according to the SiB consortium. This outline of a management biased “linear-control” oriented perspective contrasts the argument of a *participative* model for creating organizational change and innovation in the AEC industry that I will provide in the next two chapters of the thesis.

Thus, building on the pragmatist view of collective *inquiry* as discussed in Chapter 2, I will devote the next chapter outlining a critique of the linear and management-biased planning perspectives described in this chapter. This implies an argument for facilitating *participative* processes viewing a common frame of reference and collective reflection in- and on-practice as necessary factors for creating organizational change and innovation in companies of the Norwegian AEC industry.

Chapter 4

Visualizing a Common Frame of Reference

In Chapter 2 building on the pragmatist view of Dewey I came to the position of viewing organizational change and innovation as processes of inquiry for continuous collective learning. This was based on the substantial argument of Deweyan inquiry stating the primacy of collective knowledge facilitating collective diversity of viewpoints and experiences, not individual consensus making. This collective form of knowledge is about how to act and coordinate together as a whole in daily collective practice of the building project. This pragmatist approach to collective learning contrasts the “linear-control” oriented and management-biased execution models of building projects as indicated in Chapter 3. These rationalistic and control-oriented project-planning models represent a prevailing practice among companies in the AEC industry in general.

In the following I will refer to the form of collective knowing as emphasized by Dewey and discussed in Chapter 2 as a *common frame of reference*. For this collective understanding to be really shared in a process of organizational change and innovation, it follows that it has to be *visualized* through broad participation conditioning *arenas* for collective reflection in- and on-practice. Drawing on Flood and Romm (1996)’s idea of *diversity* management, I claim that three focuses of learning come to play in the change process in which each learning focus implies a specific arena for collective reflection for the very empowerment of the concerned actors.

4.1 Enterprise Images – a way of creating a common frame of reference for participative change

An Enterprise image⁹² is a notion I have chosen in order to refer to the necessity of *visualizing* a common frame of reference in order to achieve *participative* organizational change and innovation in AEC companies. Following my discussion of Deweyan inquiry in Chapter 2, the notion refers to a participatory oriented inquiry process for collective learning through joint creation of *collective* understanding for *continuous* collective inquiry. This bottom-up approach to change contrast the traditional project management perspectives discussed in Chapter 3 emphasizing external factors like threats or top-down efforts in which the managerial perception of what are likely problematic issues for the organization in the future play a central role for change⁹³.

This alternative notion of enterprise image is inspired by a perspective outlined by Blackler (1995) in his argument of *knowledge- and communication intensive firms* where organizations are striving to achieve collective or shared understandings for the development of what he calls *encultured knowledge*. Encultured knowledge refers to the process of constructing a common frame of reference, which in the next turn facilitates communication and information sharing for better knowledge conversion both within and across organizational borders. In Blackler's assumption of such a knowledge-intensive organization there is the argument that the organizations' needs for more sophisticated coordination and information sharing facilities increase and thereby that the development and use of encultured knowledge constitutes the most critical resource for organizational change and innovation. That is not to say that other kinds of knowledge like embodied, embedded, embrained and encoded, are unimportant. On the contrary, they are important together in a whole interplay but where encultured as *the* collective knowledge turns out more critical for companies emphasizing ability for change and innovation.

⁹² In the following I will change between the notions *enterprise images* and *enterprise visualizations* indicating that they have the same meaning. Some times I use image and other times visualizations.

⁹³ "Traditional" perspectives on change include typical "best-seller"/airport editions of management theories like BPR, TQM or other "three-letter"-theories. See my discussion of management-oriented perspectives to change in Chapter 1 and Chapter 2.

This argument according to Blackler (1995) relies on the basic assumption that knowledge as such is a collective achievement that is constituted by a process of collective learning as discussed in Chapter 2. Using inquiry in the Deweyan sense, collective learning is here understood as a *social* process of inquiry emerged from the process of *practical collaboration* as in line with Brown and Duguid (1991)'s argument of *communities-of-practice*. This implies viewing continuous change in which change is based on collective inquiry for participatory construction of such a common frame of reference. This I will show takes form through joint construction of visualizations of whole enterprise processes and work processes (the Joint Enterprise Image). The participatory constructed enterprise image constitutes in the next turn a common and shared frame of reference for the continuous construction/reconstruction of the project's encultured knowledge.

The organizational perspective is emphasized due to the possibilities the organizational theories provide in understanding the social construction and the relational aspects of technology and organization in the building projects. In that connection the term actors is emphasized. Actors are defined as including a person, an enterprise or non-humans like technological artifacts as in line with Latour (1987). The actors are those units that act in the system. In building projects there are actors being assigned roles and tasks and they are carriers of their own interests, values, competence and resources. The building project is a temporary system with the goal of accomplishing the project within a limited time and cost frame in contrast to a regular organization or firm that have stronger focus on a long-term strategy for survival and therefore put more focus on conditions for increased return. This relates to an important aspect of organizations as socio-technical systems (Elden 1986, the STS perspective discussed in Chapter 2) that implies to see technology as a fully integrated part of the organization. Thus, the technology and the generic phases of the building project are integrated in the socially constructed structure of the building project.

The building project may be defined according to three of its main aspects, which are interdependent, namely (see Figure 4-1 below):

- a) *The end products*: the services provided by the involved AEC companies and the results of it.
- b) *The building process*: The operative work processes of the building project contributing to the physical construction on the building site, like e.g. the architectural and engineering processes.
- c) *The collaboration process*: management, coordination and communication for collaboration between all the participating AEC companies directly involved in the project.

The end products are the goals of the building project and involve all from a good working physical building, increased competency of the involved actors to a satisfied customer or user. The point here is that the type of goals here put conditions on and, thereby, put certain demands on the behavior of and the collaboration between the actors and also the complexity of the project's organizational structures that are socially constructed by the actors involved. The relations between the project as a business with its end products (a), the operative work processes of the building process (b) and the management and organization of the collaboration process (c) are so complex that it is necessary to take all three into account at the same time in order to focus on or understand only one of them. That is, there is a crucial necessity to see the building project as a *whole* and thereby creating a collective and shared understanding of the project's collective practice.

Thus, as a general view for thinking about change in building projects, *enterprise visualization* is a possible mean for integrating all those three aspects of the building project into one common frame of reference. This means creating adequate arenas for participatory construction of the necessary shared understanding as a common frame of reference of the organization and the relations of the building project as a whole as indicated in Figure 4-1 below.

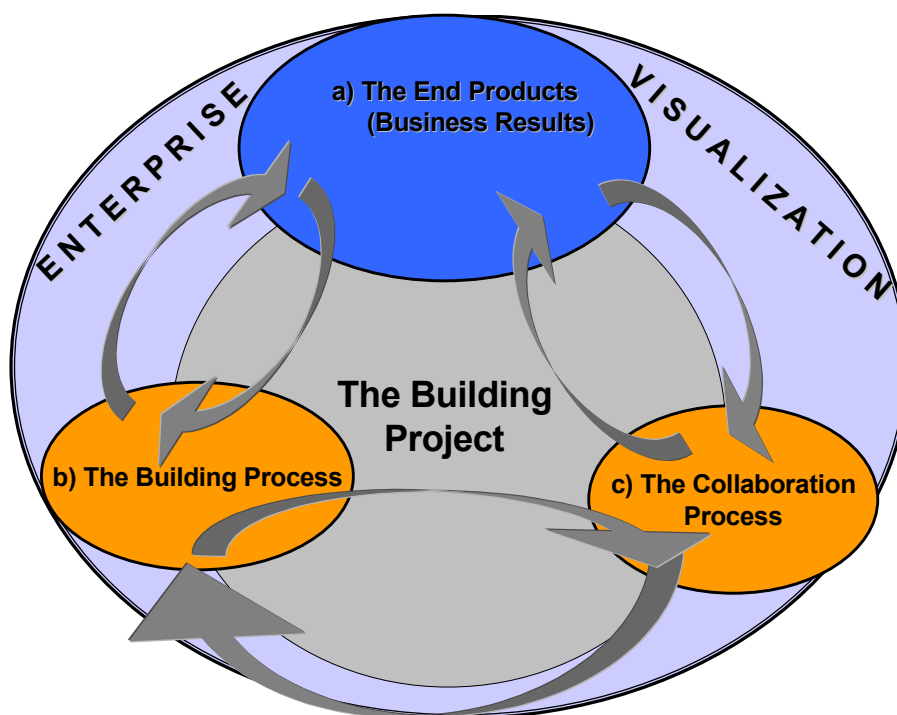


Figure 4-1 Enterprise Visualization in the AEC industry: focusing on the *collective practice* as the interdependent relations between “building process”, “collaboration process” and “end product”.

Thus I claim that creating arenas for participatory construction of collective understanding of the whole, the common frame of reference, as explicated through an enterprise visualization is the kind of explication needed in order to achieve the process of change as indicated so far. The visualized enterprise image, then, has to be co-generated through a Deweyan process of collective inquiry on the basis of the existing potential of competence and knowledge among the actors directly involved in the actual project. The enterprise visualization refers to an explicated and collective understanding of the parts and the relationships of the building project as a whole.

In contrast to the management-biased and linear execution model as practiced in building projects of the SiB actors discussed in Chapter 3 (see Figure 3-13), I argue in turn that the social and Deweyan inquiry-based development of enterprise images or visualizations may contribute to development of encultured knowledge for useful collaboration and networked organizations in the AEC industry (Figure 4-2).

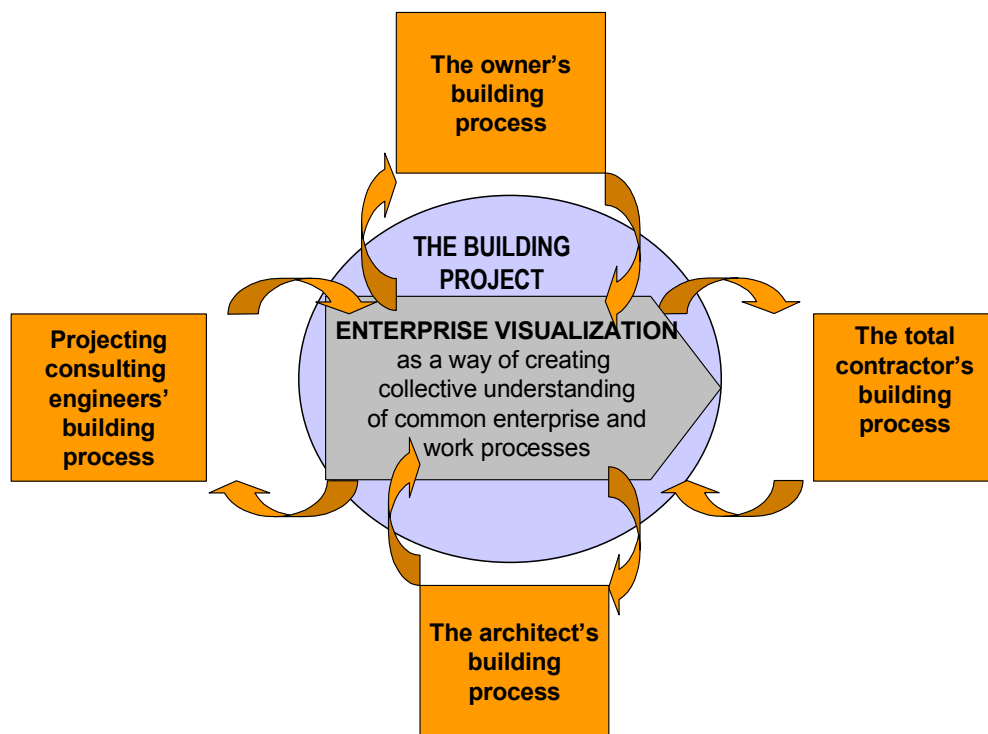


Figure 4-2 Developing *networked organizations* through *enterprise visualization* in building projects.

Process orientation, as expressed through the enterprise visualization in Figure 4-1, is thus a perspective on organizations more than a method or theory of change and innovation, in which the horizontal value creation has the general precedence in understanding organization as a social phenomenon. The holistic process perspective on organization follows from the reconstructed pragmatic notion of knowledge as discussed in Chapter 2 emphasizing a fundamental connection between knowledge and action and the primacy of collective processes over outcomes. This implies the participatory construction of meaning as a process of continuous inquiry. This Deweyan use of inquiry is consistent to the system thinking of Senge (1990), that is, participatory construction of shared understanding regarding wholes in partial elements or “things” forming a total whole.

Networked organizations are thus a practical term indicating the principal perspective viewing organizations as systems of horizontal value creation emphasizing holistic processes of knowledge processes (or enterprise or work processes) crossing organizational borders.

4.2 The need for *sharing* collective knowledge

Viewing the need for change and innovation in the terms of Drucker (1993), modern companies including the Norwegian AEC industry – operating in a continuous growing and rapidly changing market – are in the early stages of change in the shape of organizational structure and activity. From the industrial society with emphasis on production and the physical capital, modern companies are now facing profound processes of change towards building their competitive assets on knowledge or, “the intellectual capital” (Drucker 1993). Project based industries, like the very fragmented and diversified AEC industry, are probably as a consequence the most in need of a “learning culture” or becoming “knowledge based” in the terms of Drucker. That is, admitting collective knowledge discussed in Chapter 2 as a critical competitive resource. A key issue in this process of change is to become *process oriented*, or conditions for process orientation in managing and organizing projects and organizations. These conditions are related to processes for *creating* new organizational knowledge in a *collective way* – or “learning to learn” on a collective level through collective processes of Deweyan inquiry; rather than what to learn, to spread and share knowledge for effective organizational learning in and *between* networking companies (Raabe 1999; Chisholm 1998; Krogh and Roos 1996; Krogh, Roos and Kleine 1998; Krogh, Ichijo and Nonaka 2000; Business Week, Special Issue, August 24-31, 1998: *The 21st Century Economy*).

Hence, as a consequence of this shift towards relying on the intellectual capital, that is the *collective* knowledge for Deweyan inquiry, as *the* foremost competitive asset, the primary focus is no longer the single business unit alone. Further improvement potential is now to be found on the cross-organizational level, or in the linkages and relations between the business units, its suppliers and customers (Raabe 1999). Competitors in most business including the AEC industry acknowledge the need to look beyond own organizational borders and instead look at the value-creating chain as a whole including its suppliers and customers. Thus *networked organizations* are identified as a key form of organization in the evolving information society. In networked organizations, companies collaborate through interorganizational networks in order to integrate whole and linked work processes and thereby developing together joint collective competencies or knowledge beyond the organizational borders. That is, organizations that constitute the same network have the

relation that they can collaborate and compete at the same time, or what we call the ability for co-opetition. Companies organize themselves in smaller and self-managing units. This means companies move toward more project management based type of organizations through networks between companies with a strong emphasis on flexibility, interaction and competence of change. The challenge in this lies in how to manage the networked organizations (Raabe 1999). This challenge I will argue in the following lies in how to create sufficient arenas for broad participation in collective reflection.

In an effort to narrow down and hopefully then to shed some light on this complex issue of change and networking in companies of the AEC industry, I have in the theory Chapter 2 tried to clarify what are the most important practical conditions for managing and developing such a process of organizational change and innovation. This implies then for a participative perspective on change based on processes of collective learning related to developing that encultured knowledge or shared collective knowledge through arenas for dialogue. This is about organizing for continuous organizational change and innovation among all the networking companies involved in building projects.

In this approach to change, I claim that there is a need to focus on the conditions for process orientation and continuous improvement of the collaborative and *operative work processes* between the actors or firms directly involved in building projects. In questioning the project setting generally as a networked organization, I argue that the challenge is to decide and gain understanding for the enabling conditions for developing the collective learning processes in the setting of collective practice in projects. Following my argument of Deweyan inquiry in Chapter 2, I claim by arguing in line with Blackler (1995) that there is a need for constructing common and shared frame of reference (the collective knowledge as shared) and, in order for that to be really shared, the condition of broad participation. Enterprise visualization related to the use and development of a process oriented Web portal⁹⁴, I argue is one way for creating an arena for *participative visualization* of a common frame of reference. This regards the ability for collective design and debate of

⁹⁴ The possibility for participative construction of enterprise visualizations by the aid of Web-based information and communication technology (ICT-) systems will in the following be discussed as a necessary condition for creating and using a common frame of reference as an *arena* for reflection and dialogue and as seamlessly integrated basis for learning *how* to act together in daily collective work practice of the actual building project.

collective practice that provides effective and *real* support in *operative* collaborative work processes among the actors involved in the project.

The main challenge facing the actors of the AEC industry as argued in Chapter 3 is the lacking view of a shared understanding of the building project as a whole, or as a total value-creating system. As a consequence, there are very ineffective routines to organize collaboration and total linked work processes across business units boundaries involved in the building project. In order to underpin necessary change and innovation with regard to integrated process development in building projects, those experiences from the SiB show that competitiveness and competencies cannot be viewed within the context of one company alone. Therefore, the development of joint distinctive organizational competencies or collective knowledge are seamlessly linked with improvement of cross-organizational networks. Further, this is linked to continuous process improvement of whole and linked work processes across the single business units of the companies directly involved in the building project (Raabe 1999).

Thus, considering this need for joint competencies across organizational borders, effective Web-based enterprise visualization practice as related to integrated process development is as a consequence also a strategic issue (Raabe 1999). In order to address the challenge of competitiveness in building projects and therefore to improve the total value-creating chain of the actors involved it follows that improved competitiveness is based on the development of joint distinctive organizational competencies. These competencies rest first and foremost on whole organizational work processes that are being continuously developed and improved, that is, continuously constructed and reconstructed, throughout the operative execution of the building project. This also has as a prerequisite to make close business relationships in cross-organizational networks. The point is that those joint competencies are underpinned by continuously improved total or linked work processes through collective reflection on- and in practice in arenas of dialogue as emphasized in Chapter 2. The effort of developing and improving these processes is also conditioned by an ability to develop selected cross-organizational networks or close business alliances

working effectively for all actors involved in the actual building project as emphasized by Raabe (1999)⁹⁵.

As emphasized in Chapter 1, I focus on the organizational competitive unit, that is, understanding processes and relationships on the organizational level through the collaboration for *joint organization* of building projects as *a whole*, and not on the level of the single individual. Though, I emphasize that single persons and interaction between these individuals are taken into consideration in both discussions and case descriptions, but that the overall concern and aim of the thesis is how to develop the collective ability, or the encultured knowledge of the involved companies to achieve useful joint organization and collaboration in the operative collective work practice of building projects. Consequently, this is therefore not about how to develop the skills of and relationships between these individuals. This point is also a logical implication of my argument in Chapter 2 emphasizing the Deweyan primacy of collective knowledge and inquiry for meaning construction.

In focusing on the need for broad participation in developing processes of continuous organizational change and innovation, I emphasize the necessity of facilitating the ability for dealing with power and diversity as discussed in Chapter 2 (Section 2.10). In focusing on power, I throw a light on premises for participation in constructing and using common frames of reference⁹⁶ as a basis for collective and communicative action and how to understand whole and linked work processes in building projects. In relation to power, the meaning of communication and arenas for dialogue are two challenges that need to be understood for coping with power in practice. Thus I argue in line with Flood and Romm (1996) that the conditions for how power influences possibilities for organizational change in a building project are the kind of *diversity management* that addresses concerns for power-knowledge dynamics as a starting point. Thus, building on the argument of Deweyan inquiry in Chapter 2, I claim that in addition to the question “*Why* should we do it?” (*might/right* management) as a starting point for change, it is necessary at the same time

⁹⁵ This condition is further discussed in Raabe (1999). It is beyond the scope of this thesis to discuss this condition of business alliances.

⁹⁶ ‘The common frame of reference’ refers here to the socially constructed enterprise visualization as will be showed in the participative construction of the Joint enterprise image in the Pilot conference told in Chapter 6.

also question “*What* are the right things to do?” (*debate* management) and “*How* to do things right?” (*design* management) (Flood and Romm 1996).

By building on Deweyan inquiry and the position of pragmatic action research as discussed in Chapter 2, I argue in line with Flood and Romm (1996) claiming that design (or How-learning), debate (What-learning) and might/right (Why/For whom-learning) are the three learning centers or reflection arenas that need to be addressed in a process of real organizational change and innovation. Especially related to What-learning there has been a change in regard to practice of strategy formation. The classical picture of strategy formation as an analytical rational process that only takes place in the committee rooms based on approximately perfect information is about to disappear (Mintzberg and Waters 1985). Strategy formation is rather taking a character for being a form of a *continuous* collective learning process, that is, the companies learn continuously how to organize based on practical and pragmatic experiences about what works and what does not work in operative and daily practice in the organization as in line with the *workability* criterion discussed in Chapter 2. Strategy formation takes thus the perspective that what makes a firm grow is the continuous accumulated and aggregated experiences and knowledge from within the organization (Penrose 1995). This approach represents an important turn in the field of strategic management thinking in the 1990s. The broader resource-based approach to strategy including the focus on the core competencies (Hamel and Prahalad 1994) emphasizes this stance on strategy formation and represents an important contribution to this turn. Another contribution emphasizing this new turn in strategy is the one from Nonaka and Takeuchi (1995), taking the stance to focus more on the practical conditions for *how* collective knowledge is created within or between the organizations (see Chapter 2 for a closer critique of Nonaka and Takeuchi). A basic premise in these approaches is the emphasis on the language and the use of it; namely the meaning of the arenas for dialogue for organizational discourse and consequently collective reflection as a useful practice in itself. The question still remains how the reflection processes are organized with regard to participation and consequently whether it is integrated into daily collective practice.

In this connection I claim that those three learning centers of diversity management as proposed by Flood and Romm (1996) – representing three different types of dialogues or languaging (Krogh, Roos and Slocum 1994), may constitute a kind of model for creating

organizational change in building projects. That is, I claim that those three focuses of development constitute a useful basis for development and innovation in AEC companies, and thus, what matter for our mission in understanding the conditions for creating organizational change and innovation.

As indicated so far, this is not about the organization or knowledge per se, but rather the processes and conditions for collective learning creating new useful knowledge, that is, what enables the AEC companies to harness, represent and employ the encultured knowledge of the organization for useful collective practice in building projects. Those conditions for organizational change also relate to how knowledge may benefit from cross-organizational collaboration or inter-organizational networks between the AEC companies, that is, network organizing in building projects.

In Chapter 2, I argued in favor of Deweyan inquiry emphasizing the primacy of collective knowledge. Based on this argument, I argue that a practice of process visualization preconditions arenas for participative development of a *shared* understanding of the whole of the processes and relationships of the building project's collective practice with regard to its end products. That is, I argue that the collective knowing of a common frame of reference created through arenas of participative visualization of the building project as a whole enterprise system is consequently a necessary mean in achieving change. This relates to fulfilling the conditions for increased competitiveness through integrating the involved companies' work processes into a more whole value-creating network (Raabe 1999). But in order for this image and common frame of reference to become a truly shared object for collective reflection and change, it follows from the argument above that it must be constructed through a broad participatory process. This way I will argue that participatory visualization of collective practice addresses the mode of collective reflective practice constituted by three principal *arenas* of reflection. These are namely the arena of design management of the process, the arena of debate management and eventually the arena of might/right management or the power issues (Flood and Romm 1996). This I will come back to in the next chapter describing closer a model of participative organizational change and innovation.

4.3 Enterprise image for development of encultured knowledge

Thus I claim that organizational change and innovation presupposes the mode of practice called diversity management that seeks the balance and tolerance between all the three discourses or reflection arenas as proposed by Flood and Romm (1996) through Deweyan collective inquiry. This model of change⁹⁷ as collective reflective practice, then, in facilitating continuous improvements processes, calls for the social and collective process of continuous construction and reconstruction of the shared and visualized enterprise images or process images. In this model – putting the political dimension and power-knowledge dynamics as a real starting point for change through the Why-learning arena, emphasis is put on the modeling or social construction process. In addition there is an emphasis on the operative use of the enterprise visualization in which the visualizations is fully integrated in daily collective work practice of the building project.

In arguing for this model of change in AEC companies as a continuous process of collective reflective practice and thereby as a way of constructing a common frame of reference or shared understanding, there is another important aspect. That is to promote the right practical conditions with regard to type of organization and form of knowledge. In the figure below (Figure 4-3) Blackler (1985) shows the relation between forms of knowledge and organization types indicating what focus of knowledge to have in the organizational change and innovation process.

⁹⁷ This model of organizational change and innovation I will describe closer in Chapter 5.

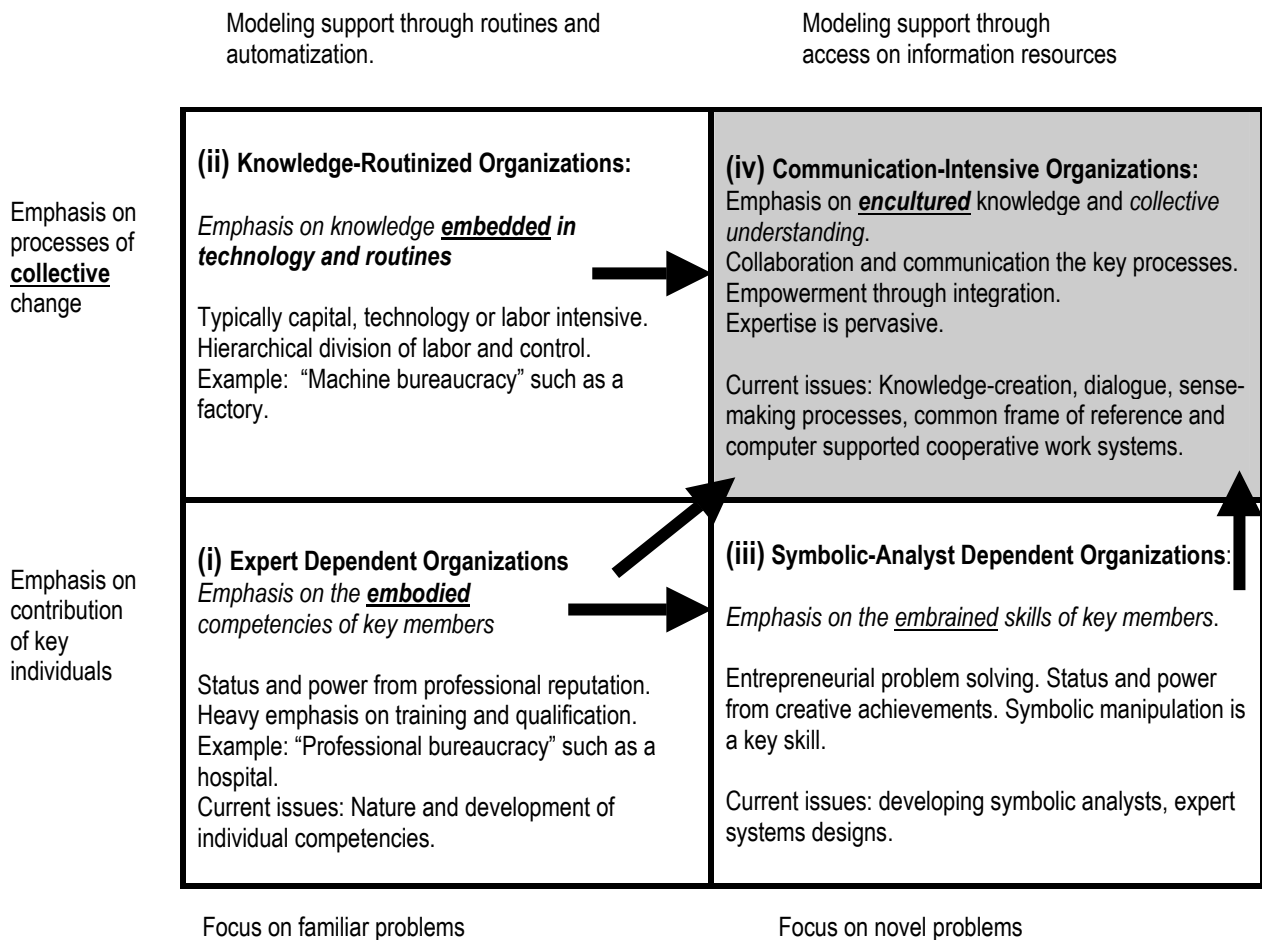


Figure 4-3: The relation between organization and knowledge types (Blackler, 1995) in which the arrows indicates the trend of shift taking place towards relying more on encultured knowledge in understanding processes of change.

On the one hand, Blackler (1985) distinguishes between collective and individual approaches to organizational change and innovation. On the other hand, he makes a distinction between modeling processes having focus on routine kind versus being occupied with unfamiliar issues or novel problems. Blackler indicates by this a possible shift that takes place in which companies to a continuous increasing extent emphasize the encultured knowledge or collective understanding. This does not mean that the other forms of knowledge are not important. On the contrary, the central point is the interplay between them in which encultured knowledge gets more crucial. This implies that also AEC companies are distinguished by the characteristics as outlined in (iv), namely by being as communication-intensive organizations relying mostly on the encultured knowledge type which fully underpins our Deweyan argument in Chapter 2 emphasizing collective inquiry and consequently shared understanding referred to as a common frame of reference.

4.4 Using Web technology for transforming the common frame of reference into an *artifactual* device for communicative and reflective action

In developing proper arenas for dialogue and collective reflection, I introduce the argument that Web technology⁹⁸ is a mean for creating the common frame of reference as a Joint enterprise image integrated *in* daily and operative collective practice of building projects. Broad participation as outlined in the first part of the theory chapter constitutes then a precondition in constructing the common frame of reference as a *joint* enterprise image being a shared conceptual model. Then, Web technology enables effective transformation from that conceptual model with its organizational and strategic concepts, to become an *operative artifact* naturally integrated in collective practice of building projects facilitating what Flood and Romm (1996) call the focus of How-learning. I argue then that the use of Web technology enables that transformation in a very easy way by using the joint constructed enterprise image as information architecture for supporting all information-sharing activities in building projects. Thereby I make the assumption that the Web-based common frame of reference easily will become an operative and *artifactual* tool naturally integrated in collective work practice supporting communication, reflection and learning.

This way the common frame of reference as a Web-based enterprise image may become a powerful part of collective practice in the way that it may dominate the local realities of individuals and actors directly involved in the building project (Gjersvik 1993, Gjersvik and Hepsø 1998). In transforming the conceptual enterprise image into an operative artifact facilitating a collective reflective practice, there is a need for a common frame of reference that constitutes a *minimum* organizational reality (Gjersvik and Hepsø 1998). This way the development and use of a participatory constructed Joint enterprise image may optimize the potential of organizational diversity of experience and viewpoints as a necessary resource for development, learning and innovation. This regards the challenge about being able to facilitate the necessary reflection arenas that can handle and see all the local realities as

⁹⁸ By using the argument of Gjersvik and Hepsø (1998) (see below) I introduce the phenomenon of Web technology as part of the argument for my model of change. I will not go into the technical details about Web technology in itself, but only state that I take it for granted that Web is a kind of technology that enables practical information sharing and that most private and business users have a kind of familiarity to Web technology as a tool for information sharing and communication on the Internet.

equally valuable and useful in the construction of the common frame of reference as a Web-based enterprise image being part of the collective practice or organizational reality. In turn, Gjersvik and Hepsø (1998) argue that there is a need to find the right balance between organizational closure and organizational *diversity* in maximizing possibilities for creativity and improvements or to optimize what Gjersvik (1993) has called *space of possibility*. As in Figure 4-4 below, this situation according to Gjersvik (1993) is illustrated with the dotted circle outermost showing the case in which i.e. an expert biased enterprise model⁹⁹ or Web based information system may dominate over the need for developing diverse understandings, organizational diversity and local realities.

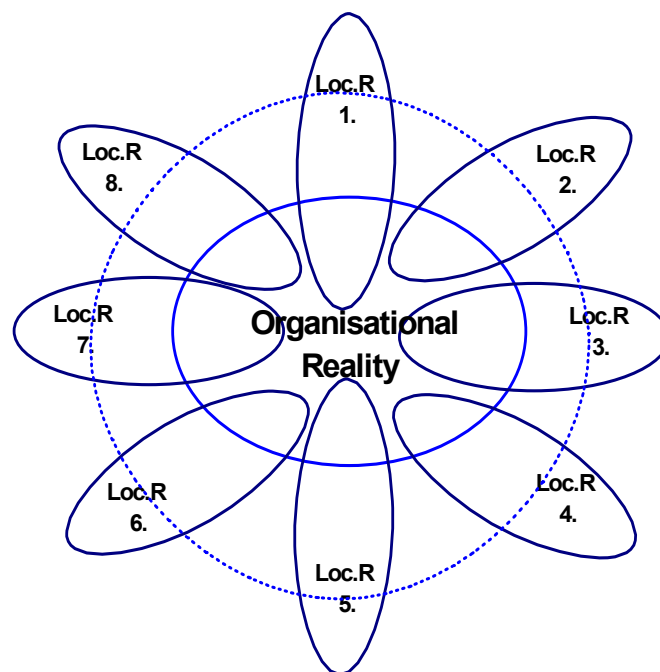


Figure 4-4: Local realities and organizational reality, a small (dotted) and a large space of possibilities (from Gjersvik 1993)

The inner circle in Figure 4-4, then, shows the situation of the Web-based enterprise image representing a minimum organizational reality in optimizing the potential of diversity and reflection in arenas of dialogue as in line with our argument of Deweyan inquiry and consequently for creating participative organizational change and innovation.

In the next chapter I will present a model in which the joint construction of a Web-based enterprise image is a necessary arena for maintaining a How-learning focus in a collective

⁹⁹ Totland (1997) gives an excellent overview of the field IT based *enterprise modeling* seen from a technological viewpoint.

inquiry process in the Deweyan sense and consequently for creating organizational change in the AEC industry. Thus, it is necessary to involve all actors in the project to participate in an arena for joint construction of the Web-based enterprise image to optimize the possibilities for collective Deweyan inquiry. This effort I will show both facilitates and spreads the inquiry process of diversity management in which three reflection arenas come to play. This way of facilitating collective inquiry through Web technology I will show in the next chapter creates a minimum organizational reality as emphasized by Gjersvik and Hepsø (1998) in helping to spread organizational change and innovation in companies of the AEC industry.

4.5 Summary

In this chapter – building on the Deweyan argument of inquiry from Chapter 2, I have basically provided the argument for why I consider the idea of *visualizing* a common frame of reference a necessary condition to achieve organizational change and innovation in AEC companies. Process orientation through the joint construction of enterprise images has been assumed as the starting point for collective inquiry.

This chapter indicates a model of diversity management as a way of sharing collective knowledge through broad participation in a Deweyan inquiry process in which three principal arenas of reflection or inquiry come to play each having its distinct learning focus. This implies the argument of taking the political dimension as a real starting point for change through the Why-learning area. Further it is argued that Web technology constitutes a necessary condition in transforming the common frame of reference into an artifactual tool providing an arena for How-learning helping to spread organizational change and innovation in companies of the AEC industry.

Chapter 2 concluded with the need to look into the political dimension of collective learning and inquiry as a starting point for change facilitating organizational diversity and democracy. Chapter 3 described in brief the prevailing practice of building projects, the SiB program and the AEC industry in which managerial control and rational management-

biased planning is emphasized at the very expense of and inhibiting those processes of organizational diversity and change pointed to in Chapter 2. The present chapter, Chapter 4, has provided the argument that visualizing a common frame of reference supported with Web technology are central to achieve collective inquiry creating organizational change and innovation in AEC companies. In the next chapter, I will explore further into these arguments, indicating the necessary conditions and arenas for reflection and collective inquiry constituting a collective reflective practice, and consequently a model for how organizational change and innovation can be spread among companies in the AEC industry.

Chapter 5

Diversity Management for Organizational Change and Innovation

In this chapter I will do mainly two things. First, I will provide a description of the conditions necessary to achieve change and innovation reflecting the first research question posed in Chapter 1. Second, I will provide the outline of a model for how organizational change and innovation can be spread among the companies in the Norwegian AEC industry reflecting the second research question posed in Chapter 1.

Chapter 2 looked into the Deweyan inquiry process of collective learning addressing the intertwining of theory and praxis for the primacy of collective forms of knowledge and consequently organizational diversity in emphasizing the political dimension as a real starting point for organizational change. Chapter 3 looked into the prevailing rationalist oriented theory and planning perspectives used in organization and management of building projects by outlining in brief the SiB program. In contrast to those linear perspectives of change as described in Chapter 3, Chapter 4 looked into the conditions of visualizing a common frame of reference in arenas for a collective reflective practice by drawing on the Deweyan pragmatist argument of inquiry from Chapter 2. The questions arising then are how to understand in more practical terms the conditions of common frame of reference and collective reflection-in- and on-practice as necessary conditions to achieve organizational change and innovation in AEC companies. Moreover, taking into account those conditions, the second question is how organizational change and innovation can be

spread among companies in the AEC industry. In this chapter I will indicate and summarize the possible answers to these questions

Based on the case story in Part Two – including the chapters 6, 7 and 8, the discussion in Part Three, including the case discussion in Chapter 9 and conclusion in Chapter10, will provide the answer to these two research questions as posed in Chapter 1.

5.1 Conditions necessary for achieving organizational change and innovation in AEC companies

In the two previous Chapters 2 and 4 I presented the perspective of organizational change and innovation as a social, collective process of continuous inquiry through reflection in and on practice facilitating organizational diversity. Consequently, I argued that the political dimension of organizations has to be taken as a real starting point for change. The Deweyan argument of the primacy of collective knowledge discussed in Chapter 2, implied for the necessity of creating a shared collective understanding through visualizing a common frame of reference. Eventually, by drawing upon the arguments of diversity management as outlined by Flood and Romm (1996) I claimed that there has to be three principal arenas for collective reflection each having its distinct focus of collective learning. I concluded then that these three learning focuses constitute the *collective reflective practice* as a Deweyan inquiry of “keeping the conversation going”.

I will claim that the interplay between the three reflection arenas constitutes the conditions necessary to achieve organizational change and innovation in AEC companies. Thus the three focus of learning that come to play – each implying an arena for collective reflection, are called *How-learning*, *What-learning* and *Why/For whom-learning* (Flood and Romm 1996). As a consequence, the relationship between the three conditions or the knowledge content of the arenas in constituting a practice of diversity management is intrinsically dynamic and interdependent. That is, the Deweyan inquiry process implies a continuous process of internalization and externalization between tacit (*embedded*: the common frame of reference as Web based operative artifact for information sharing and work process support) and explicit forms of collective knowledge (*encultured*: the common frame of reference as shared understanding through joint visualization) as illustrated in Figure 5-1 below. In the figure, the colored arrow symbol in the overlap between the three loops and in the laptop display is the symbol of the common frame of reference as a process oriented Joint enterprise image. This will be closer described in the next sections of the chapter.

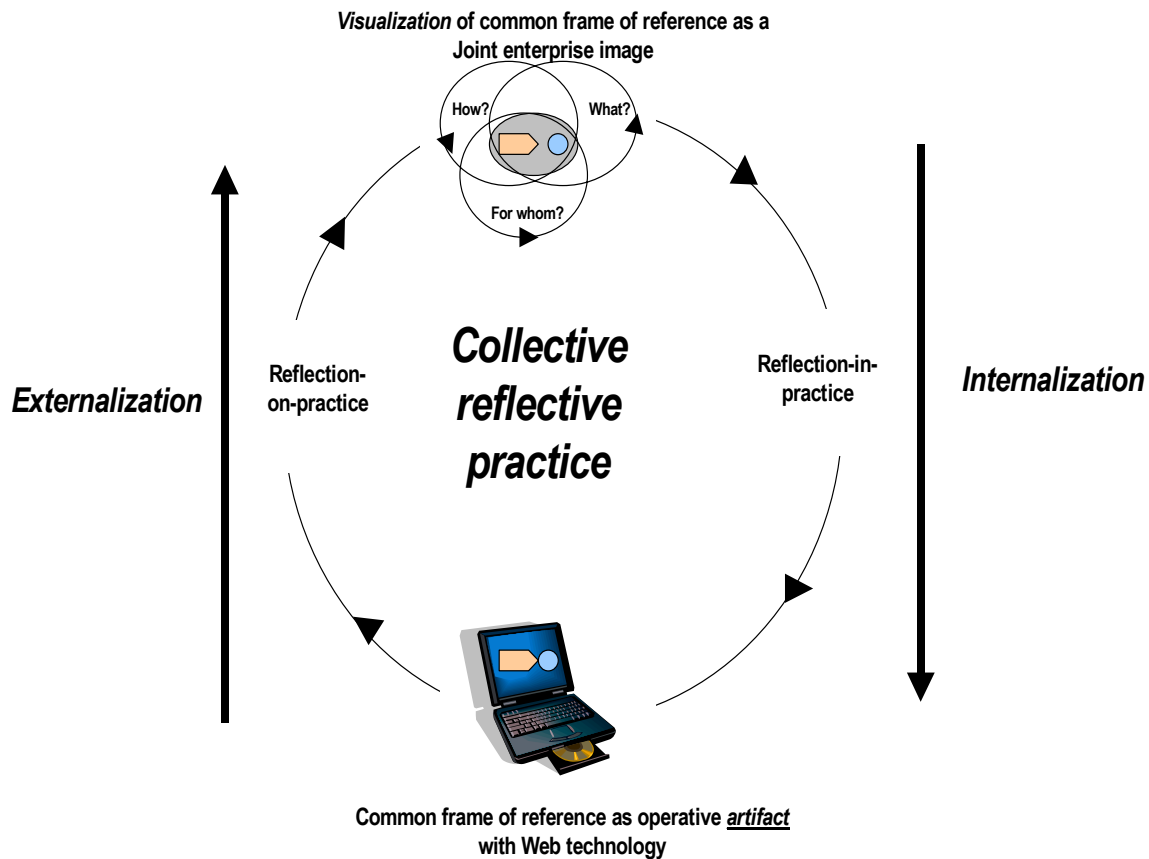


Figure 5-1 The interdependent and dynamic relationship between the knowledge content of the three necessary arenas for organizational change and innovation in AEC companies.

As emphasized in Chapter 4, Figure 5-1 also illustrates the point that Web technology enables the transformation of a conceptual common frame of reference in becoming an artifactual object for reflective and communicative action in operative collective work practice in the building project (Gjersvik and Hepsø 1998). Hence, building on the Deweyan argument of collective inquiry and pragmatism discussed in Chapter 2 I argue that the conditions necessary in achieving organizational change and innovation in AEC companies are basically the following three:

- 1) **Visualizing a common frame of reference:** This first condition regards the necessity of having an arena for continuous *visualization* and re-conceptualization of the actual collective work practice related to development and use of a joint enterprise image through participative enterprise visualization for a common and shared frame of reference. This entails a continuous process of conversion of tacit (embedded) to explicit collective (encultured) knowledge through joint construction

of an enterprise image (emphasis on visualization of level 1 with reference to level 2 in Figure 5-2 below). Building on the inquiry argument of Dewey, this joint construction of a common frame of reference regards the necessity of having the political dimension discussed in Chapter 2 as real starting point for the organizational change process. Thereby, using the argument of Flood and Romm (1996) this arena implies a *Why-learning focus* emphasizing the power-knowledge dynamics in collective practice. This point is further discussed in the next section.

- 2) ***Collective reflection-on-practice***: This second condition regards the necessity of an arena for using the common frame of reference (constructed as a Joint enterprise image) as a communicative and reflective device integrated in actual collective work practice *debating* collective practice emphasizing the *What-learning focus*. This is about having a process of collective reflection *on* the enterprise processes as a *whole* (open system thinking) by using the Joint enterprise image for developing relations between actors involved and continuous construction/reconstruction of both encultured and embedded knowledge (Blackler 1995). That is, visualization of core strategic processes as visualized in joint enterprise image¹⁰⁰ (emphasis on visualization of level 2 with reference to level 1 in Figure 5-2 below).

- 3) ***Collective reflection-in-practice***: The third and last condition regards the necessity of having an arena for transforming the visualized common frame of reference through Web technology (the Joint Enterprise Image) to an artifactual object *designing* the very structures of actual collective work practice emphasizing the *How-learning focus*. This is about having a process of collective reflection *in* the daily collective work processes of the project or organization. This implies the use of Joint enterprise image as Web-based information architecture to design structures for collective practice and hence for information sharing by visualizing more detailed work processes¹⁰¹ (visualizing level 3 and 4 in Figure 5-2 below).

The Deweyan inquiry thinking behind these conditions as listed here is consistent with critical system thinking (CST) emphasizing holistic concepts about the way the world is organized (Greenwood and Levin 1998, Levin 1994). In organizational terms, this goes in

¹⁰⁰ This is in line with Schön (1983)'s concept of reflection-on-action

¹⁰¹ This is parallel to Schön (1983)' concept of reflection-IN-action.

concert with the notion of open system thinking as outlined by Senge (1990) emphasizing the need to act and think in wholes as open systems interacting with its surroundings, which also goes along the condition of autonomy as outlined by Nonaka and Takeuchi (1995). This means to start with core enterprise processes by emphasizing the political dimension and organizational diversity as a starting point for change. Thus a main point is to visualize the organization or the enterprise as a whole with regard to activities and its corresponding end products instead of focusing on each single individual in the first stance. This is to emphasize the organization on the collective level, that is, the creation of shared understanding of actual collective work practice constituting the whole enterprise system aiming at the resulting end products in the actual building project.

Consequently, using a Deweyan pragmatist approach I emphasize the joint constructed enterprise image in participative visualization of the core work processes of the building project as a whole including its sub work processes. The enterprise image entails then the following four process levels (the following numbers refers to the process levels in Figure 5-2 below):

1. Visualizing the building project's core enterprise (value-creating) processes as a whole (holistic common frame of reference) crossing organizational borders with regard to the end products resulting in the main enterprise image (the Joint Enterprise image) with no reference to organizations/ people/roles.
2. Constructing images of main work processes with sub and sub-sub work processes crossing organizational borders or enterprises.
3. Deciding what work or sub processes of the building project to be detailed down to specific activities supported by what resources/personnel or companies involved.
4. Visualizing the specific activities executed on daily basis by what roles/people/ resources/information/knowledge.

In the figure below I show the four visualization levels indicating the principal thinking of the Joint enterprise image by starting to visualize the core processes (orange) of the enterprise system as a whole (the value creation system of the building project as a whole) with regard to its end products (level 1) and then down to the level of visualizing each task specific activity (the green area) being executed by relevant resources (people, knowledge, actors) directly involved in the actual building project (level 4).

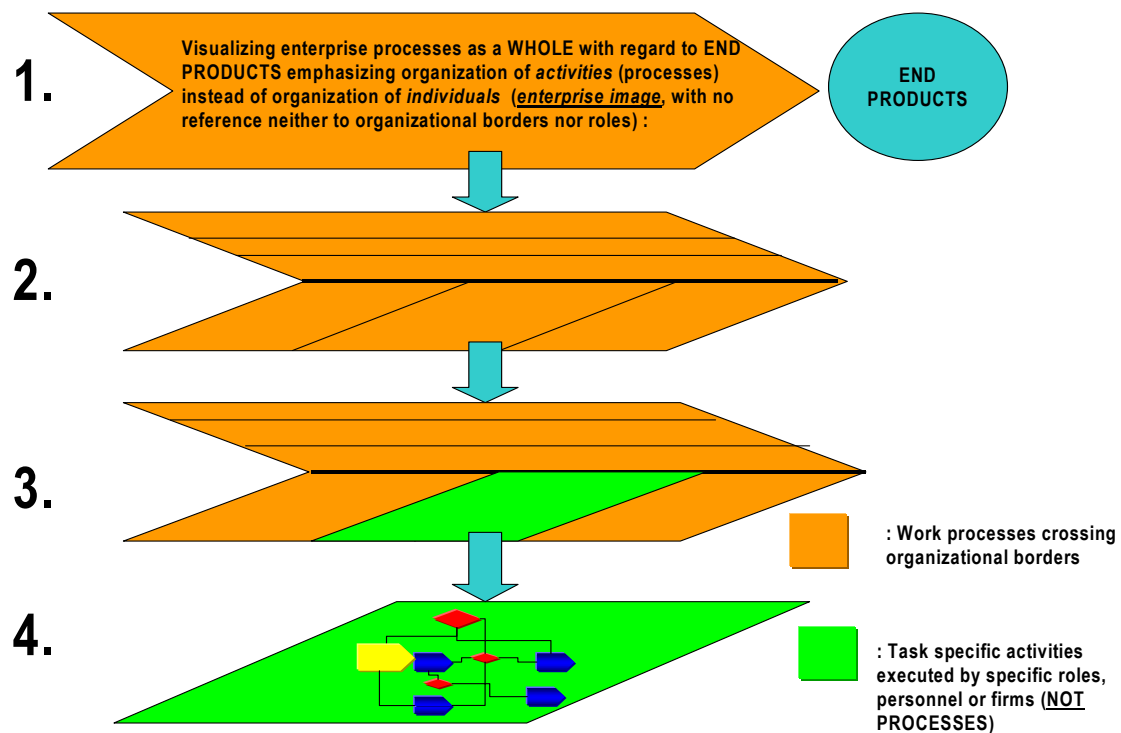


Figure 5-2 The four **visualization** levels of the Joint enterprise image: orange indicates **processes** and sub processes crossing organizational borders and green indicates **activities for a specific task linked to roles, personnel or firms**.

This process thinking as illustrated in principal in Figure 5-2 is further discussed in the first part of the case story in Chapter 6. As stated in the introductory Chapter 1, the objective of the thesis, then, is to look into how it is possible to create a process of organizational change and innovation in AEC companies involved in building projects. Further the relation between the knowledge content of these arenas for change underpin the three focuses of learning called “How-learning”, “What-learning” and “For-whom-learning” creating triple-loop learning as outlined by Flood and Romm (1996). Eventually in next section I will indicate how these conditions underpin a model indicating how to think about spreading processes of change and innovation among companies of the Norwegian AEC Industry.

These indicated conditions viewed as necessary to achieve organizational change in AEC companies include a practice of Web-based enterprise visualization as a central arena for creating collective reflective practice. The use of the common frame of reference in

constructing a Web-based enterprise portal by using it as an integrated reflective and communicative device is what in the last instance underpins a continuous collective reflective practice to actually take place among the AEC companies constituting the daily collective practice of the project.

This reflective practice refers to ability for collective and continuous reflection in and on collective practice executing the actual building project. I argue, then, that these conditions for a reflective practice underpinning the three focuses of learning indicates what enterprise visualization as continuous reflective practice is, and also shed light on some of its important aspects. This also provides an argument for why those process images in Figure 5-2 and the visualization practice represent a contribution of strategic value for the companies involved in the building project. Thus, this indicates why competitiveness and value creation may be based on collective knowledge as a shared understanding generated by joint visualization practice. This assumes a broader approach to competitiveness (Raabe 1999); namely competitive advantage as based on a participative and collective inquiry process of collaboration and “integrated process development”. This Deweyan inquiry process takes place through developing, improving and integrating information and knowledge flow underpinning the whole value-creating chain or network of the actors involved in a building project. Thus, competitive advantage of AEC companies is not only based on the single building actor’s own distinctive competencies. The complexity of the building project that normally involves up to several companies in close collaboration for a limited period of time calls for a process of strategy formation for the building project as a whole. These conditions then indicates what I believe are the conditions necessary for how to develop in practical terms the ability to harness, represent and employ the collective knowledge of the actors involved in the operative execution of the building project.

Then in the following I will describe more closely what characterizes each of the three conditions for change, in pointing towards a process of continuous organizational change and innovation as collective reflective practice. In the next section (5.2) I will discuss the implications of these conditions regarding a model for thinking about spreading organizational change and innovation among companies in the AEC industry.

5.1.1 Visualizing a Common frame of reference (1)

The first condition indicates the necessity to set the political dimension of organizations as a starting point for change in accordance to my discussion in Chapter 2. One way to create a common frame of reference or a shared understanding is to visualize a shared enterprise image of the building project's collective practice as a *whole*. This means an enterprise visualization or process visualization of the most important work processes. A basic precondition for this image to be really shared is that it has to be developed through a broad participatory process in which three basic focuses of learning are underpinned entailing a process of triple loop learning (Flood and Romm 1996). These learning loops are named *Why-/For-whom learning*, *What learning* and *How learning*. Such a participatory oriented arena for change is basically underpinned by the conditions for an integrated approach to development, namely integrated IT and organizational development in the networks between the AEC companies directly involved in the building project (Raabe 1999).

In emphasizing reflection on the whole of the collective practice visualized in a common frame of reference, this reflection arena has a special focus on the Why- or For whom-learning loop. This focus of development asking the question *For-whom?* or *Why?*, is more fundamentally about the dynamics of the relationship between power and knowledge-creating processes. Flood and Romm (1996) call this learning center or reflection arena *might-right management* that implies to face the challenge to look beyond what is perceived as immediate "truths" and typical norms for strategic validity and competitiveness, and rather start reflecting on values for organizational action, who has the power to influence structures and relationships including forms of dominance. In other words, the central question of this arena is "*Why should we do it?*".

This focus on power-knowledge dynamics is the consequence of the thesis' argument of Deweyan inquiry discussed in Chapter 2 regarding conditions necessary for continuous organizational change. This goes in concert with the argument of the pragmatic AR perspective (Chapter 2) in addressing the necessity for broad participation and thereby how to cope with power by asking for premises of the conditions for inquiry, participation and quality of knowledge. This is referred to as the inquiry premise of workability (Greenwood

and Levin 1998). Thus by following the argument of Dewey and pragmatic AR as discussed in Chapter 2, I state that there is an intrinsic link between fact and value and hence, between knowledge and action. Due to this emphasis on learning about values and appreciation of diversity of viewpoints, this learning center or reflection arena in practice turns out to be the most difficult and crucial one. The aspect of diversity rests on the argument of co-generative learning in pragmatic AR and Deweyan inquiry emphasized in Chapter 2.

These three core arenas for reflection or focuses of learning in the joint visualization of a common frame of reference underpin in the last instance what I have called a collective reflective practice. Thus I argue that this reflective practice of change is a kind of continuous practice seamlessly integrated in the operational business and work processes or collective practice throughout the total building project. The co-existence of these three learning loops constitutes the reflective practice of *diversity management* through the joint visualization of a common frame of reference as indicated in Figure 5-3 below (Flood and Romm 1996).

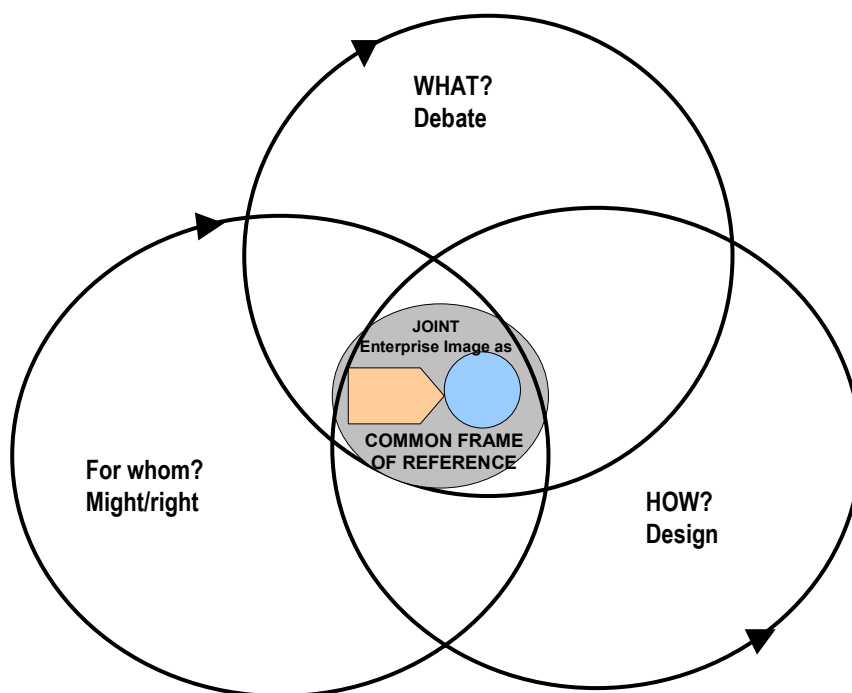


Figure 5-3 The three learning loops indicate the visualization of the Joint Enterprise image as a COMMON FRAME OF REFERENCE in the area for triple loop learning (Flood and Romm 1996).

The indications of conditions necessary for collective reflective practice point towards the mode of continuous process development of triple loop learning which wants to establish tolerance between all three focuses of learning and thereby enhance and preserve the necessary diversity between them (Flood and Romm 1996). This process mode is possible by bringing into consideration all the three loop questions at any one time into one overall awareness as a basis for collective action and joint responsible choice making. The point here is to loop between the three questions that help the actors to develop the crucial discourse for each focus of development or each reflection arena. In the process mode of triple loop learning the actors try to develop and manage the diversity of the centers of learning that in turn enhances the joint collective capability of diversity management.

5.1.2 Collective reflection-on-practice (2)

Second, there is the condition of or arena for collective reflection-on-practice by using the joint constructed enterprise image as a communicative and reflective device in the actual daily collective work practice in the project. This is contingent to the creation of the enterprise image as a shared and common frame of reference and focusing on development related to “What-learning?” in operative practice. What? is a learning loop evolving around possibilities for continuous learning and development through forms of debate. That is about more fundamental questions related to organizational capability for doing the right things, not only doing things right, that is, relationships for collective inquiry. In other words the question is “*What should we do?*”.

Through forms of debate, the point here is to facilitate and enhance the *quality* of processes of discussion, interaction or communication enabling actors to influence decision making, develop relationships and interrelations together. In practice, this reflection arena evolves around how to develop joint distinctive competencies together with actors and customers of the building project exchanging and creating knowledge across organizational borders.

These competencies as indicated depend in the end on the ability to develop ways of selecting and organizing alliances and cross-organizational networks, or relationship management, in which participating actors constituting the actual building project may

operate almost as a seamless and virtual business unit (Raabe 1999). The actors capability of joint development of organizational competencies is the basic prerequisite for competitive advantage based on debate management developing and improving together the whole value-creating chain of the building project.

5.1.3 Collective reflection-in-practice (3)

The third condition viewed as necessary for organizational change and innovation is an arena for collective reflection-in-practice, which regards the development of operative processes by focusing on “*How-learning?*”. This provides the foundation that the building actors can aspire towards effective and participative design of linked and total work processes beyond existing organizational boundaries. The reflection arena of How-learning is possible through using the Joint enterprise image as an operative artifact for communication and reflection through Web technology. This concerns reflecting on doing things the right way in relation to organizational and process design of the whole building project asking: *How to do it?*. Process design is related to structures for operative collaboration and structures for operative processes of collective inquiry. Typical examples here are efforts concerning process development (like TQM, BPR), but also reward systems and co-worker conversations. This learning center or reflection arena is what Flood and Romm (1996) call *design management*.

5.2 A model for spreading organizational change and innovation in the AEC industry

In order to follow the argument in the previous section 5.1, the three conditions necessary for achieving organizational change and innovation imply for a model of spreading those processes in the AEC industry indicating an answer to the second research question. The second research question is posed in Chapter 1: *How can organizational change and innovation be spread among the companies in the Norwegian AEC industry?* The answer to this question indicates a model I call a *practical innovation model*. The model for how organizational change and innovation can be spread implies using the model as a *standard tool* for thinking about democratic organizational change and diversity in AEC companies and not as a traditional management recipe. The model consists of the following three

reflection arenas and relationships reflecting the three conditions in Section 5.1 respectively:

REFLECTION ARENA-1 (RA-1): *A Start-up Gathering (or S-Gathering for short) in the beginning of the project for participatory visualization of Joint enterprise image.*

REFLECTION ARENA-2 (RA-2): *Reflections- and evaluation gatherings (or RE-Gathering for short): Use of Joint enterprise image in project- and evaluation meetings as reflective and communicative device.*

REFLECTION ARENA-3 (RA-3): *Development and use of Web-based project tools – an Enterprise Portal, for collaboration and information sharing: Use of Joint Enterprise image as information architecture for design of structures for collective practice.*

Based upon the discussion provided in Chapter 4 and Section 5.1, the dynamic and interdependent relationship between the three reflection arenas creating collective reflective practice for spreading organizational change and innovation in the AEC industry may be illustrated as in Figure 5-4 below:

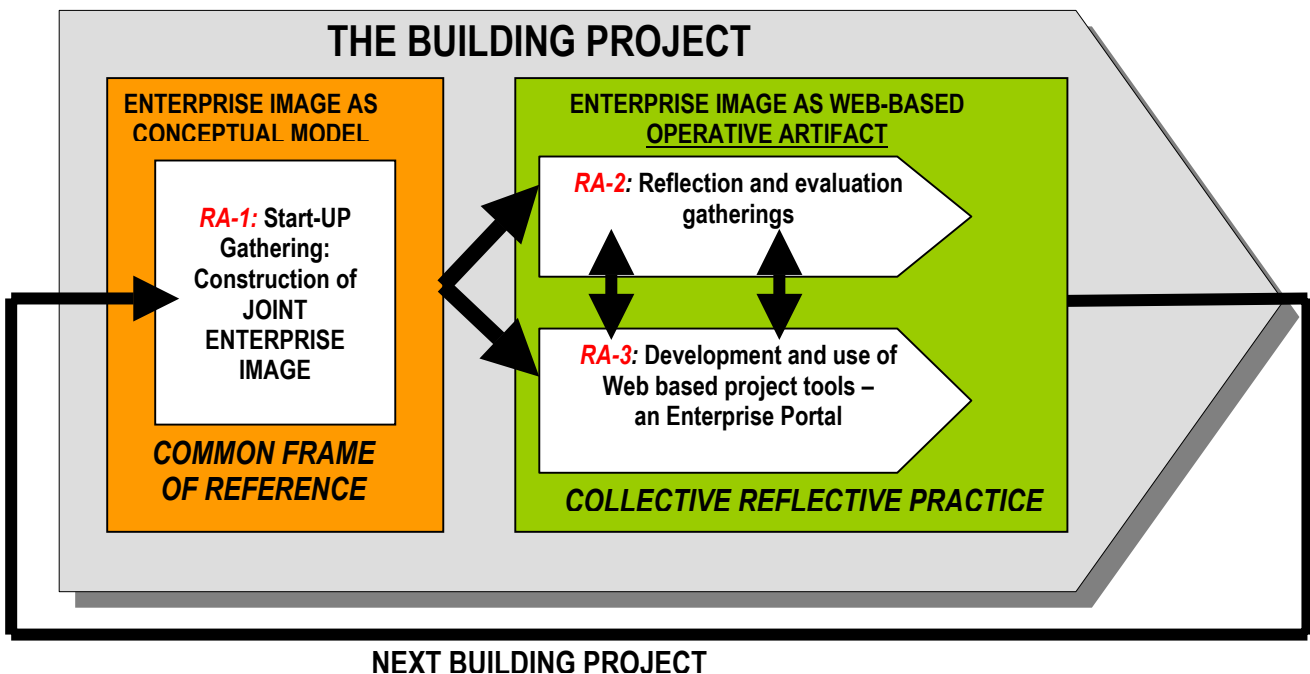


Figure 5-4 A practical innovation model for spreading organizational change and innovation in the AEC industry.

Thus, the three reflection arenas relate to each other in the way that by being integrated into the collective practice of the building project, the knowledge content of RA-2 and RA-3 mutually reinforces each other as a consequence of the reflection in RA-1. The arrows in Figure 5-4 indicate the dynamic and interdependent relationship between the three arenas and its knowledge content. This way the three arenas constitute a collective learning process that I have called collective reflective practice creating new useful collective practice in the actual building project (see Section 5.1). This is made possible by participative visualization of knowledge related to organizational design, relationships, structures, routines and technology together with language and models into one common frame of reference created as a Joint enterprise image. By taking into account the argument of the three conditions as presented in section 5.1 above, I summarize the use of the model as a tool for *thinking* about spreading of organizational change and innovation in AEC companies emphasizing diversity and democracy with the following five principal characteristics:

1. **WORKSHOP:** *The model* demands for and gives room for active participation for collective inquiry from every participant involved in the building project. Such participation provides possibilities for influence and ownership to the end products of the building project. The three reflection arenas (RA-1, RA-2 and RA-3) are different kinds of workshops in order to emphasize that the model requires active participation from all actors involved in the building project.
2. **PARTICIPATORY:** *The model* is based on *broad* participation among all centrally involved actors in the project. The point is that different actors look at the enterprise of the building project in different ways and that this *diversity* of local realities (see Chapter 4, Figure 4-2) is what constitutes the real potential for organizational change and innovation in AEC companies. This principal characteristic builds on the argument of the Deweyan inquiry as discussed in Chapter 2.
3. **VISUALIZATION:** *The model* demands for collective visualization of enterprise and work processes of the building project through *collective inquiry* according to the process levels as provided in Figure 5-2. This enterprise visualization constitutes in the next turn *a common and shared frame of reference* by using the visualization as an object for collective reflection and communication.
4. **OPERATIVE ARTIFACT:** *The model* demands for using Web technology in transforming the Joint enterprise image as a conceptual model easily into an

artifactual object of communication and reflection in facilitating change and innovation in the operative execution of the building project. This transformation facilitates in the next turn a process of continuous change as a process of continuous internalization and externalization through the development and use of the Joint Enterprise Image in the three arenas.

- LEARNING:** *The model* emphasizes basically embedded and encultured knowledge through diversity management as a collective inquiry process with the three focuses of learning in the building project (debate, design and might/right) as outlined in Section 5.1.

The use of this innovation model as based on these five principles implies for a main assumption of spreading organizational change and innovation among the companies in the Norwegian AEC industry presented in the figure below (Figure 5-5):

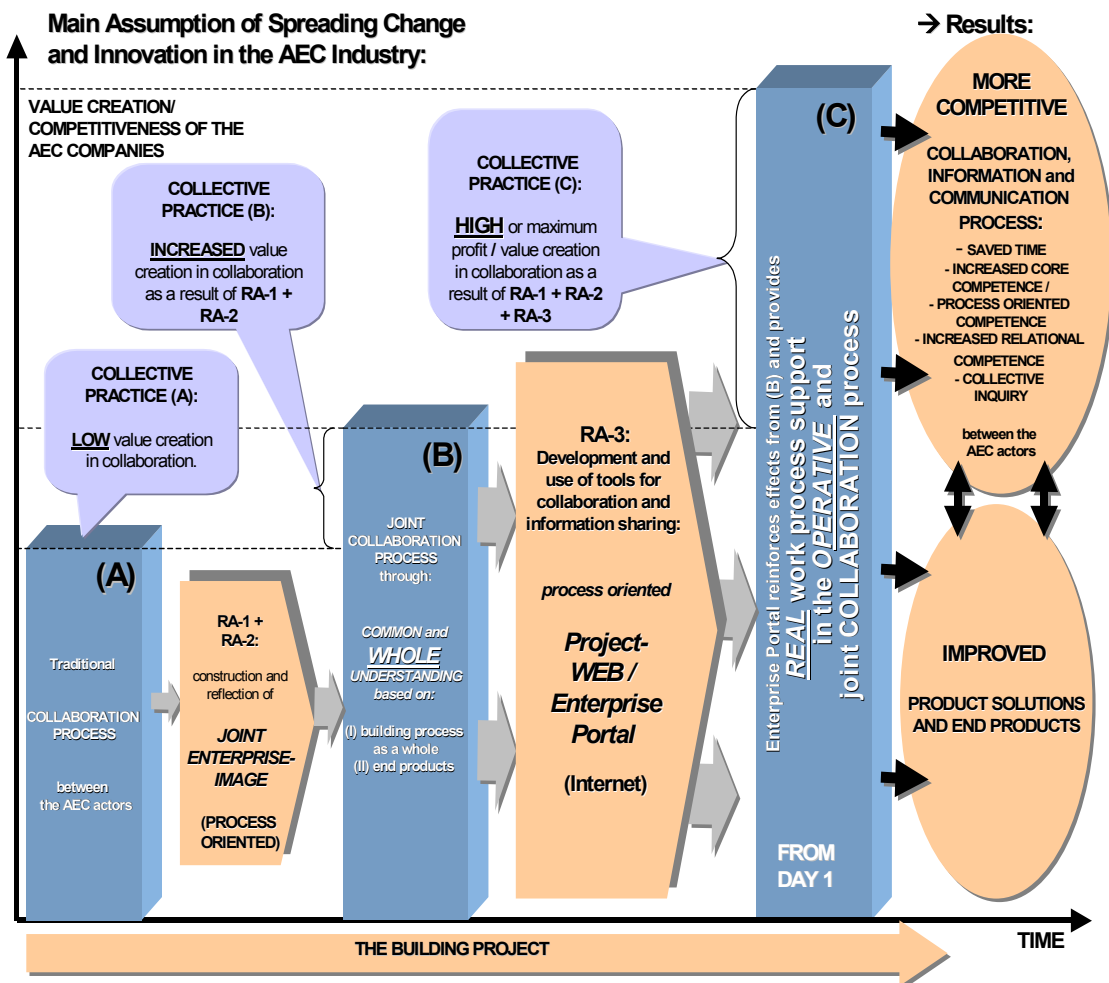


Figure 5-5: Illustration of a main assumption of spreading organizational change and innovation among AEC companies.

The assumption as illustrated in Figure 5-5 states that the use of innovation model provides spreading of organizational change and innovation among AEC companies by using the joint constructed enterprise image from RA-1 to develop a process oriented Web-based Enterprise Portal providing real work process support in the operative and joint collaboration process or collective practice of the actual building project. This entails the following main assumption of how organizational change and innovation can be spread in the AEC industry:

ASSUMPTION OF SPREADING OF CHANGE AND INNOVATION AMONG COMPANIES IN THE NORWEGIAN AEC INDUSTRY:

RA-1 + RA-2 + RA-3 → NEW USEFUL COLLECTIVE PRACTICE (the results are indicated in the two ovals in Figure 5-5) with sustained growth in value creation in AEC companies involved in the building project.

The use of *the innovation model* as illustrated in Figure 5-4 in thinking about creating collective reflective practice represents the necessary conditions for creating *new useful, collective practice* and thus a process of *continuous* growth in value creation including all participating actors involved in the building project.

Figure 5-6 A main assumption of spreading of organizational change and innovation in the AEC industry

Based on this main assumption regarding how change and innovation can be spread among companies in the AEC industry, I will in the following describe a bit closer the practical aspects of the innovation model corresponding to the conditions outlined above in Section 5.1 respectively. This assumption will be further discussed in Chapter 9.

5.2.1 Start-up gathering (RA-1)

The principal aim of the Start-up gathering (S-gathering), RA-1, is to provide a good *arena* for every participating project actor to put focus on the *goals* of the project, or the end products, and then to achieve a collective and shared understanding of the processes and activities constituting the collective practice of the building project as a whole (see Figure

5-2). The main product of the S-Gathering is a participative process of collective inquiry in the Deweyan sense in addition to the visualized Joint enterprise image with the explicated work processes and end products representing a visualized image of the project's collective practice.

The way of working on the S-gathering follows the idea of a Modeling Conference as outlined by Gjersvik (2000). The principal characteristic of RA-1 is a continuous change between traditional group work and plenum discussions for visualizing a common frame of reference as a Joint enterprise image (see Chapter 6 for a description of the activities at the Modeling conference). The main point with this way of working is to create an ideal speech situation (Habermas 1990) for collective inquiry in which all participants jointly contribute and develop a shared and collective understanding of the building project's collective practice. An important point is that this provides the participating actors a good opportunity to develop an ownership to the chosen form of project execution. Consequently with this way of working the participants develop an initial understanding of their own role based on the stated comprehensive goals and needs of the project as a whole.

The S-gathering may last for one or two working days and it is important that it is located in an environment outside the operative and daily reality of the project. The group and plenum work presuppose use of simple remedies and tools so that the participants are able to keep a continuous focus on the content and not on the tools in itself (Gjersvik 2000).

The principal aim with such a participatory and inquiry-based development process is to jointly *visualize* the work processes and activities of the project's collective practice explicated as physical arrows in which every process has a specific customer or product (Gjersvik 2000). Through this way of physical working and inquiry the S-Gathering becomes an arena for collective reflection focusing on the relationships and the power-knowledge dynamics of collective practice (For-whom learning). The political dimension is then taken as a real starting point for change as emphasized in Chapter 2.

5.2.2 Reflection- and evaluation gatherings (RA-2)

In order to keep alive consciousness and continuous collective reflection on the end products and the project's collective practice in operative and daily work, there have to be an arena naturally integrated as part of daily collective practice *debating* the issues from the S-gathering.

The innovation model implies for Reflection- and evaluation gatherings (RE-gatherings) that provide an *arena* to keep alive the collective reflection processes naturally integrated in daily collective work practice debating on doing the right things. This entails an arena for collective reflection-on-practice emphasizing the learning focus called What-learning as discussed above in Section 5.1. The RE-gatherings are then organized as e.g. “natural” and integrated parts of different building project meetings for communication and reflection in general. This means that the Joint enterprise image is used as a communicative and reflective device in debating issues around on the building site between e.g. operative joiners and project management. This way the Joint enterprise image turns out as a real common frame of reference in terms of shared language and thinking for all actors – individuals as well as companies, involved in the project.

5.2.3 Development and use of Web-based project tools (RA-3)

Building on the Deweyan inquiry argument from Chapter 2, the primary aim of RA-3 is to provide a good *arena* for everybody involved in the project to keep reflecting on design issues or reflecting-in-practice for doing things the right way (How-learning). This means that collective reflection is integrated in the project's operative collective practice. The innovation model implies then for using the Joint enterprise image as an artifactual object for communication and reflection integrated in operative practice supported with Web technology.

This implies that the common frame of reference visualized as a Joint enterprise image functions as information architecture in a Web-based project tool providing real work and collaboration support for the participating AEC companies involved in the actual building project. This way through the collective inquiry process of participative construction and

use of the Joint enterprise image implies that the involved actors will develop ownership to the project tool adapted to the real needs of the actual building project.

5.3 Summary

In this central chapter of the thesis I have summarized how organizational change and innovation can be spread among companies in the Norwegian AEC industry assumingly creating new useful collective practice in building projects. I have then provided an argument for creating organizational change and innovation in the following way:

- 1) An outline of the conditions necessary for achieving organizational change and innovation in AEC companies.
- 2) A practical innovation model for how organizational change and innovation can be spread among companies in the AEC industry.

The two sections links directly to the thesis major research questions posed in Chapter 1.

PART TWO:

The Case Story of Two Building Projects

This Part Two of the thesis is devoted to the thesis' case story outlining a story about a *development process* with regard to participatory-based and co-generated processes of organizational change and innovation in the AEC companies directly involved in two building projects¹⁰². The two case building projects are Rekkevik Brygge (RB) and Bergheim Amfi (BA). The story includes the development of a practical innovation model for spreading change through joint construction of enterprise visualizations, and in turn, a co-generated organizational change process in the AEC companies involved in the building project of Bergheim Amfi that I took active part of. The case story spans a time period of almost 4 ½ years from the spring of 1997 through 2001.

I will divide the case story into the following three major stages, each stage told in each subsequent chapter: (1) Chapter 6: Initial process – The Pilot enterprise modeling conference (April 97 – April 98). (2) Chapter 7: The case building project I: The Rekkevik Brygge (RB). (3) Chapter 8: The case building project II: The Bergheim Amfi (BA).

¹⁰² The research process is outlined in Appendix 1: Research methodology. Parts of the research process as discussed in Appendix 1 is action research oriented and *co-generated* as in line with the pragmatic AR approach discussed in Chapter 2.

Chapter 6

Initial Process – The Pilot Enterprise Modeling Conference

This chapter is devoted to the initial process or the first stage of the case story. I will tell about a development process among a group of AEC companies from the SiB program that led to the planning and execution of the Pilot enterprise modeling conference (Modeling Conference – MC) in Trondheim spring 1998. This Pilot conference turned out as an important event in developing one of the conditions viewed as necessary for creating organizational change and innovation, namely the condition for visualizing a common frame of reference and consequently for the development of the Reflection Arena-1 (RA-1) in the practical innovation model described in Chapter 5.

6.1 The SiB Lysebu seminar – an introduction to enterprise modeling in building projects

In April 1997 I attended a 2-days SiB seminar at Lysebu, Oslo, where I for the first time got the chance to meet and become introduced to all the members of the SiB consortium board. In the Lysebu gathering the idea about developing a method for changing the way the building project is traditionally executed was presented. This topic became the main subject of the seminar on the second day. The methodology was initially referred to as ‘*enterprise modeling*’. At the seminar the SiB consortium board with top management from each of the four consortium actors participated, with the exception of the top consortium representative from Veidekke¹⁰³. Together with 3 other researchers from the HSK-group, we were 18 people at the seminar.

On that second and last day of the seminar the main subject was Enterprise Modeling as a method of change for supporting more “effective” project execution in building projects. We sat down in small groups and worked with a training-task regarding how to organize enterprise modeling as a methodology for change. The most important result from that group work was not the document produced from the conference, but rather the training task itself, or the social process among the top executives of the SiB consortium actors in creating a joint understanding of the meaning of enterprise modeling for SiB and thus creating an ownership to the potential of the methodology for the AEC actors. Just weeks after the Lysebu seminar, the group work ended up in a plan for an R&D project on enterprise modeling called *Enterprise Modeling in the building process*¹⁰⁴ (EM-project for short) formally initiated as a sub project under SiB. The SiB EM-project was then launched with the following scope and goal:

¹⁰³ The aftermath of the absence of Veidekke’s top executive at the seminar is further below in the case description linked to the reason for why it took so long to find a pilot project for the EM-project.

¹⁰⁴ From now on I use the abbreviation EM-project for SiB’s *Enterprise Modeling in the Building process*. This sub project was the one that was seen as part of the core in the SiB program and as essential for realizing the main goals of the SiB related to implementing real change in the industry (see Chapter 3). Also the EM-project was the one that defended SiB’s position as a path-breaking project with respect to achievements related to change through cross-organizational learning and integrated process and value chain development in building projects.

Goals of the SiB Enterprise Modeling Project (EM-project):

- I. Develop a general methodology for collective construction of an overall and generic enterprise *image* of the building project, in helping the SiB consortium actors to develop a common and shared understanding of the building project as *a whole*.
- II. Based on the common and joint constructed enterprise image, develop a Web-based *enterprise portal* that will be used to structure, connect and aggregate the needed information and knowledge with simple and adjusted access for the user involved in the main work processes of the building project.

Figure 6-1: The goals of the SiB Enterprise Modeling project (EM-project) as stated in the SiB R&D program description plan. See <http://samspill.interconsult.com>

As stated in Figure 6-1¹⁰⁵, the goal of the EM-project was to develop a methodology for collective enterprise and process modeling that firstly, could help the SiB consortium actors to develop a joint understanding through visualizing an enterprise image of main work processes for “optimization” of the building project as a whole. Secondly, through this method, to use the jointly constructed enterprise image to make a common ground for the enterprise modeling in helping the involved actors to construct an operative and full interactive Web-based enterprise portal for structuring, connecting and aggregating the information needed in the different work processes of the project.

The next task for the HSK research group after the Lysebu-seminar was to keep on in a research process finding a practical basis for how to use enterprise modeling as a method adapted to the needs of the AEC actors involved in an actual building project. Hence, the aim was then to prepare for the practical planning in organizing a pilot conference for the participatory effort in constructing a joint enterprise image. In the research process that followed, the main activities consisted of interviews with all the main SiB actors and participative observations of operative work in project management and on the building site

¹⁰⁵ This goal was stated in SiB R&D project plan. See <http://samspill.interconsult.com>

in different building projects. In addition there were gatherings once a month in the HSK-group during the fall of 1997 through March 1998.

6.2 Preparing for the Pilot Enterprise Modeling Conference

The interview round with all the top consortium executives from the Lysebu seminar during the summer of 1997 combined with the research process on the HSK-meetings provided me the following valuable reflection: The goals that we set up for the EM-project were at that time considering the status in the AEC industry (see Chapter 3), a bit too ambitious. But even so, it was the consortium actors' top executives themselves that after a thorough discussion the second day on Lysebu agreed upon that the EM-goals as stated on a longer term were fully realistic for the AEC industry as a whole. It is important to bear in mind here that the SiB program itself was very ambitious and that it was the top management from each of the four SiB companies that together had made the joint decision to take the necessary measures as needed to change the collective practice of the building projects. So the goals for the SiB and in the EM-project related to the need for real change were deeply anchored in the consortium companies' top management. The SiB consortium board member from Veidekke, the vice CEO, emphasized this during a conversation in September 97:

*"I think that IT [for us as an central actor in the building process] is necessary as part of the effort in making the information effectively accessible and thus to **disseminate and share the knowledge** to a sufficient extent. But there is a problem if the employees on the building site don't have time to prioritize learning, but is all the time distinguished by 100% focus on operative work, then we stop our own development process. There has to be interplay between the operative part of the organization and the continuous development process of reflection and learning... but now the IT as a tool is fully available also for the AEC actors and there is no excuse any more to not to share the information that can be common. Such information spreading may be an inspirator in relation to starting processes that may change the attitudes of the organization towards becoming a learning organization..[]*

*And I would say that we are now turning into a situation of going from a state only focusing on being a supplier of capacity to a state where we also focus on becoming a **supplier of knowledge** to our customers in building projects."*

This statement expressed the line of common understanding among the top SiB consortium executives, as underpinned by the CEO of IGP (now Interconsult ASA), the SiB consortium board chairman, at the opening of the Lysebu seminar, April 1997:

“The use of IT is a precondition for effective integration between internal and external efficiency in the building process¹⁰⁶ and thereby to attain the process of real change in the operative practice of building projects. Development in building projects thus preconditions an integrated IT and organizational development process.”

This emphasis on the meaning of use of IT in building projects was also adopted by the vice CEO of Veidekke:

“..as we start to get used to IT increasingly more, then I think that the improvements regarding effective communication in e.g. between the disciplines will come faster than any one could ever believe. So far that has been shown by the digital development. So I think, as when we start to get used to electronic communication between the actors, then the development will start to evolve pretty fast due to a uniform technological platform and that you don't have to establish something new. But then it will take a while before the project participants acknowledge the full potential of the tool, but when it happens – and it will – then the organizational development will have the effect that the actors will be better to communicate and to learn.”

A methodology for enterprise modeling combined with IT, as pointed out on the Lysebu seminar, was then understood to be a tool that possibly could contribute to attain that needed change. But despite that anchoring and acknowledgement among the top executives of SiB, especially as this was expressed by two of the top leading AEC industry companies, Veidekke and Interconsult (IGP at that time), the most challenging and time demanding part still turned out to be the issue of just finding a case building project with AEC people available to participate in a pilot trial or conference for enterprise modeling. The best alternative was if people from each of the four consortium actors participated, but that option turned out least likely, as there were actually no building projects being planned with more than two of them participating in the same project. At least, there was a clear expectation of finding a case building project in which Veidekke and Interconsult collaborated respectively as the main contracting firm and main consulting engineer. This was reasonable when taking into account the background for why SiB was initiated in the first place, with close industrial relations between the two.

¹⁰⁶ SiB's understanding of internal and external efficiency is outlined in Chapter 3.

During the fall of 1997 it turned out difficult with finding any building project with all the SiB actors participating in the same project. This was in a sense very frustrating for the SiB consortium experiencing that the local departments of their own companies being responsible for the operative execution of building projects were not willing to do “experiments”. Taking into account the prosperous and very good market outlook for the industry at that time the top management of the SiB consortium board had really expected to find a building project that was willing to be a pilot EM-project. But as long as “everything” worked so well during the good times there was really no obvious reason for the local people “spending time” on experiments¹⁰⁷.

Due to the “lack” of appropriate projects with SiB actors, we in the HSK group were looking more and more toward the huge building project New Region Hospital in Trondheim – RiT2000¹⁰⁸ as an emerging and obvious choice. Then in February 1998, a sub project, called General Center in RiT2000, was considered as a possible candidate. The HSK research group thus decided in collaboration with the consortium board to use General Center as a case project for a Pilot conference for finding a basis to create a general enterprise image of collective practice in building projects. Despite the fact that nobody of the SiB actors were actually taking active part as actual building actors in that particular sub project, it was perceived as a good case for SiB due to that RiT2000 was a pioneering building project in all thinkable sense in regard to i.e. the size and the complexity. The RiT2000 General Center case was then believed as a possible “lighthouse case” for the SiB project.

6.3 The Pilot Enterprise Modeling Conference in Trondheim

Eventually, in April 1-2 1998 the SiB and the HSK group organized the Pilot Enterprise Visualization Conference (or Modeling Conference, MC for short) in Trondheim,

¹⁰⁷ This problem was due to experiences regarding “sub optimization” as discussed in Chapter 3.

¹⁰⁸ See <http://www.rit2000.no/english/>. The General Center project in RiT2000 was on the very early planning stage, in which the operative Project organization of RiT2000 being the only actor at that time. Any schedule for the physical building phase was not set yet.

Norway¹⁰⁹. The Pilot MC was not going to be an integrated part of a real building project, but only as a Pilot gathering to test out the modeling conference methodology in itself. This fact that it was not going to be a part of a building project, was in many ways a very disappointing fact for us in the HSK group. We were now in a real danger of experiencing the typical question “*What now?*” after the conference because none of the participating actors had committed themselves to use the result from the conference in a real building project.

But anyway, due to the delay and problems in finding a pilot building project for the EM-project in which all the SiB consortium firms could participate in, it was simply a better option to execute the Pilot conference now as an isolated experiment or “happening”.

In that Pilot gathering, which lasted for two days, 24 people representing all actors in a typical building project participated, including architects, consulting engineers, contracting firms, technical subcontractors, owners and users. It emerged that only a small fraction of the participants were from the operative RiT2000 project organization, in which more than 60 people were employed on full time. The rest were employees from ABB and Interconsult including the HSK group and myself. Also this time, as at Lysebu, I had wished broader participation from both the top management and the operative staff of Veidekke when considering their proclaimed strategy for being a central and active property developer in building projects they participated in. Also this was striking as when Veidekke was the only absent top CEO among the SiB actors at the SiB Lysebu seminar in April 1997.

During the two days the Pilot MC in April 1998 lasted, the conference, or the gathering, with its participating actors co-generated a likely generic *Joint enterprise image* of collective practice as experienced in building project in general. The image was visualized as process maps with related products of the most important sub work processes. The joint visualized enterprise image or the enterprise visualization (Figure 6-2) was then considered as one of the end products from the Pilot MC. The most important result was the social or collective inquiry process created on the gathering, which in turn resulted in a joint

¹⁰⁹ The method of the gathering was called The Modeling conference and was developed as a result of long time research of several of the researchers in the HSK group. For myself I made preparations to the conference by having two interview rounds including all of the top managers of the consortium companies and two weeks of fieldwork on a building site, the Rekkevik Brygge (see Appendix 1 Methodology).

visualization and understanding in which all participating actors had an ownership to. The methodology behind the Pilot modeling thus seemed to work successfully according to the preconditions for a co-generated learning process.

The main activity on the two-days Pilot gathering were the brown-paper sessions in which the participants used simple symbols to visualize the required relations and the main work processes (light orange), end products (blue) and intermediate products (see below). The idea was to make them reflect on their own work processes in relation to the building project as a whole, start discussions on what had been already described so far in project specific documents, experiences so far in the industry as documented by SiB (see Chapter 3), and thus identify the most important work processes of a likely general building project in which the described and visualized process maps were understood as generic for most building projects. I myself was an active participant as a kind of facilitator in one of the groups the first day and therefore I perceived myself as being an outsider (see Chapter 2) on equal terms among the local participants as insiders, something that gave me the great possibility to experience the very social construction process of *co-generating* the visualized process image and the role of being a facilitator in a very ideal manner.

The most dominant discussion the first day was how to understand or how to give meaning to the notion ‘work process’. Here we as the outsiders (professional research staff) started the discussion by presenting a method for collective enterprise visualization that relied on a pragmatic BPR-definition based on elements from two different approaches (Gjersvik 2000)¹¹⁰. The two traditions or approaches are called search conferences and process modeling. *Search conferences* (Emery and Purser 1996) are a method for doing democratic strategic planning of work processes in the sense of emphasizing the meaning of broad participation in the social construction process. *Process modeling* is a way to draw images of core work processes of an enterprise with the overall purpose of simplifying, reengineering or optimizing these processes (Hammer and Champy 1993). Thus, we presented a Pilot method for enterprise modeling that was based on a combination of these two approaches in the sense of doing enterprise process modeling or enterprise visualization through a work form implying broad participation of all concerned actors. The

¹¹⁰ See a brief discussion of BPR approaches in Chapter 1.

activities during the two days that the Pilot gathering lasted could be summed up as the following:

- The whole process went on in one room. All actors or AEC companies directly involved in the building project were presented or represented.
- The participants alternated between group work and plenary work.
- The participants primarily represented themselves and they were jointly responsible for the content of the conference (that is, the end product, which is the resulting enterprise image or process map)
- The staff, including myself, facilitated the work, and we were also responsible for the method.
- The tools and the method had to be simple, so that the participants could focus on the content.
- The main outcome or end product of the Pilot conference was the process model, or the **Joint enterprise image** (see Figure 6-2), which named the key processes of the building project and its products and roles.

This list of bullet points was also included as an explanation in the handouts distributed among the participants on the Pilot MC. We divided the 28 participants into four groups and each group had a large sheet of brown paper on the wall on which they worked to identify and visualize the main generic work processes of a building project as a whole. The construction and use of the enterprise visualization was emphasized in the way as presented in Figure 4-1 (see Chapter 4). All symbols they used to visualize the processes and their corresponding intermediate or end products were pre-cut by us, the staff, in advance, and the participants used the symbols to attach them to the brown sheet of paper. I could observe throughout those two days that these simple symbols for visualization of work processes provided great flexibility and intensive learning on practice (Schön 1983). The results of the group work were presented at plenary sessions for discussion and joint construction of the enterprise visualization. The methodology used for process visualization was very simple, based on simplified flowchart symbols that has been used in Norwegian work research in different versions since the late 1960s:¹¹¹

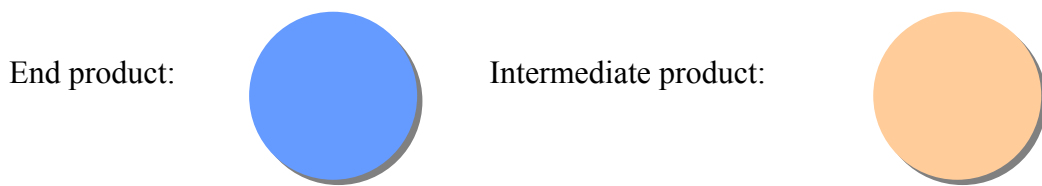
¹¹¹ See Elden 1986.

Process: A process is a series of activities or sub-processes that produce a specific product.

Processes may often go beyond organizational borders:



Product: A product is the result of a process, or it can also be seen as a demand from a customer. A process can have several products and we distinguished between *end products* and *intermediate products*:



The resulting outcome of the two days' Pilot gathering was the following general Joint enterprise image as shown in Figure 6-2 below:

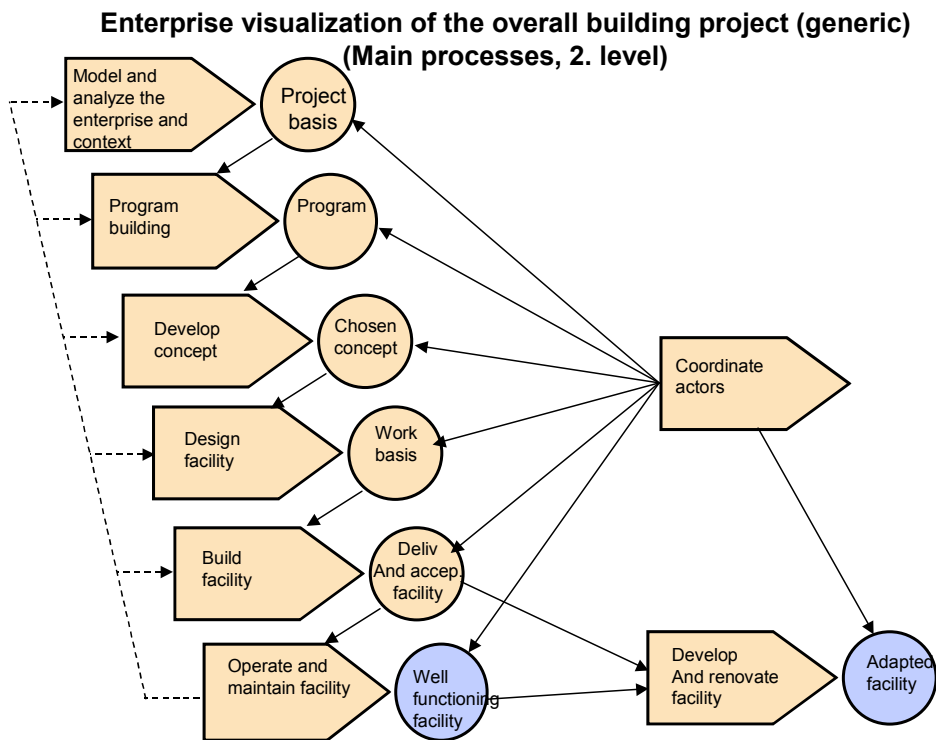


Figure 6-2: The Joint enterprise image of the overall building project, as constructed on the Pilot Modeling Conference (MC) April 1998.

An important aspect of this process image was the ownership that the participants seemed to develop through the participative construction process, which made the Joint enterprise image or visualization an important common frame of reference for further development of collective practice in real building projects. The participants from the RiT2000 project organization in assistance with the HSK research group continued to use those enterprise images from the Pilot MC in their own project, and in October 1998 the RiT2000 project organization arranged their own enterprise modeling conference¹¹².

The agenda of the Pilot MC was designed so that the participating actors developed visualizations based on their own local reality in the four distributed groups. That is, the actors started to work in four homogeneous groups with six people on each group in which people with the same background developed their “own” process visualization before they entered into the second group work with mixed or heterogeneous groups. After the first group work, the actors seemed more self-confident and comfortable with the tools and also their own point of view when they went into the second group work in which the whole visualization started over again and the actors had quite different local realities. At last after the second visualization, we as the staff had a challenging job of merging the visualizations from the four groups into the one as shown Figure 6-2. Firstly, the staff made a proposal of a merged process model in the evening after the first day, and secondly we presented the proposed version for discussion in a plenary session with all the participants during the second day.

The enterprise image as visualized in Figure 6-2, has thus eight main work processes. These processes are: model and analyze the enterprise and context, program building, develop concept, design building, build facility, operate and maintain facility, develop and maintain facility and at last coordinate actors. All these main work processes except for three of them; ‘model and analyze the enterprise and the context’, ‘operate and maintain facility’ and ‘develop and renovate facility’, were then, on the second day after the plenary consensus on the main process image, in the next turn described and designed on a more detailed level (3.level). On the supreme process level (or the 1. level), there are 4 processes: ‘the enterprise process of the users, customers and the project actors’, ‘public approval

¹¹² The Modeling Conference of the RiT2000 is another story that I will not go further into here.

process’, ‘the building process’ and ‘learning on the construction project’ as shown in Figure 6-3.

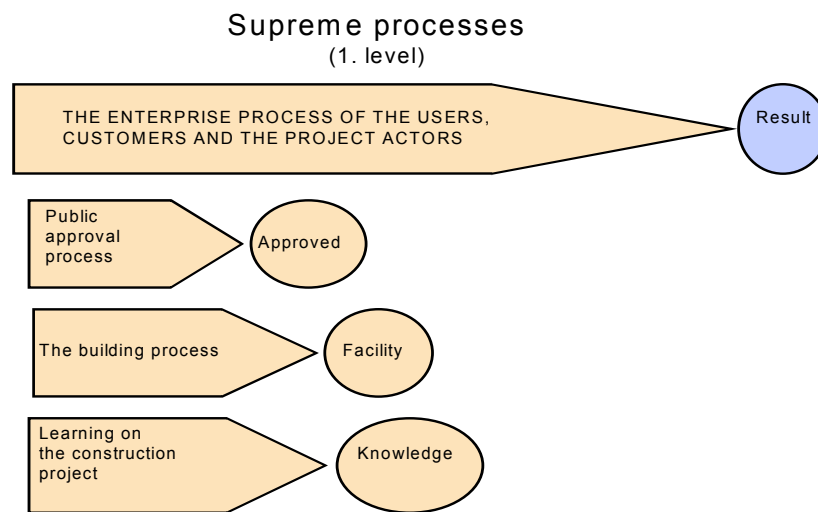


Figure 6-3: The supreme enterprise image of a building project, constructed on Pilot Modeling conference April 1998.

As shown in Figure 6-2, the end product of a building project is a ‘Well functioning building’ that is the product of the process ‘operate and maintain facility’. On the Pilot conference and in the plenary session, the participating actors had no problem to agree with this, but during the group discussions it was not obvious to all that this was to be the case. The process image also shows that a building project starts with the process ‘Model and analyze the enterprise and the context’. Also here, during the group discussion, this was not obvious to all, but again, that everybody had no problem to get to a common understanding on the fact that the resulting process view represented the most optimal visualization for all participating actors. Also there is a process named ‘Coordinate actors’ that has an important role in all sub processes of a building project in the sense of explicitly involving all management activities. This management activity of a building project was object for much discussion during the group works and also in the plenary sessions in both the first and the second day. In the group discussion where I made observations disclosed that this sub process ‘coordinate actors’ was not obvious to all as being part of the whole of the main process image in Figure 6-2. But again, as the discussions or debate in the plenary sessions went on, all participating actors admitted that the resulting process view for them represented the most optimal process view of the building project as a whole. In the figure

below (Figure 6-4) is showed the sub processes or 3.level of the main process “Build facility” as visualized by the participants on the second day of the Pilot conference.

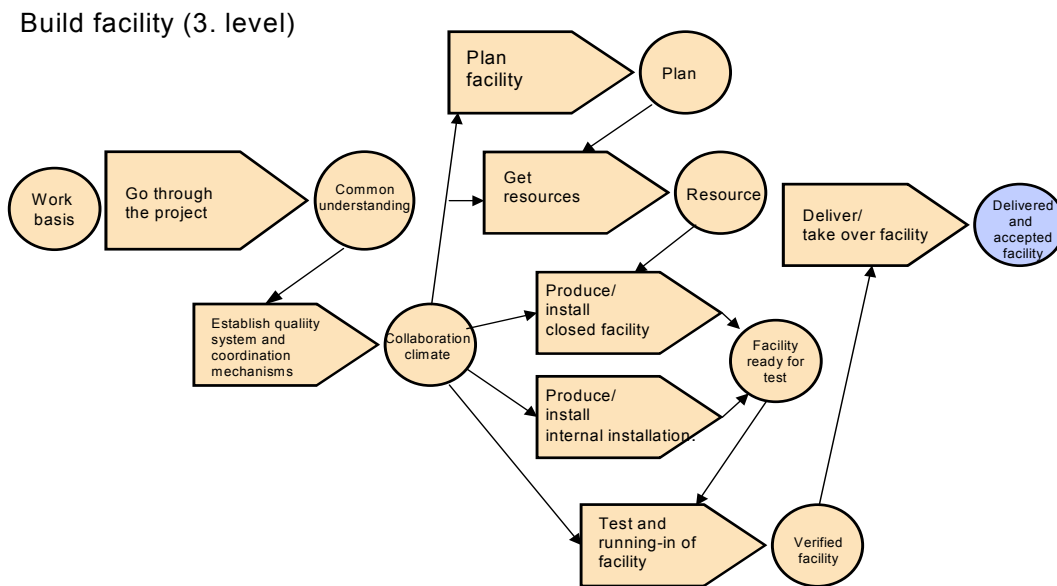


Figure 6-4: The co-constructed process image of “Build facility”, 3.level, constructed on the SiB Pilot Modeling conference April 1998, Trondheim

6.4 The aftermath of the Trondheim Pilot Conference – “What now?”

Based on observations during the Trondheim Pilot enterprise Modeling conference and on interviews I performed after the gathering of some of the participating actors, I together with my HSK researchers could conclude that the two days’ Pilot MC was a successful event in the sense of fulfilling the first goal of the EM-project as stated in Figure 6-1.

That is, the Pilot MC could be seen as an effective tool for participatory construction of a shared understanding of a building project as a whole constituting a common frame of reference for further development and execution of collective practice in building projects. The participating actors experienced the Pilot gathering as a powerful tool both for co-creating a common understanding of main work processes in building projects (team building and role clarification) and for using the constructed Joint enterprise image in designing a possible project Web or enterprise portal supporting operative execution of a

building project. Due to the experienced success of the Pilot gathering in Trondheim, the HSK research group started to plan for using and developing the MC-methodology on a real building project organized as a pilot project, and thus to fulfill the second goal of the EM-project (as mentioned in Figure 6-1). That is, the job was to find a suitable building project that could be a pilot in using the EM-method as demonstrated in the Pilot MC to develop a full-scale Web based visualization practice supporting the execution of a building project as a whole.

The effort of finding that building project being a pilot was not going to be an easy task at all. In the next chapter outlining the case story of the building project Rekkevik Brygge I will try to describe some of the reasons for why it was so difficult. All the actors participating in the Pilot MC in Trondheim and the SiB consortium with the CEOs from four leading AEC companies agreed upon that it was a successful event. In addition they stated that it very likely could be used as a useful tool or kind of startup event in most building projects aiming at creating that Web tool as mentioned in the EM-project in Figure 6-1. But despite that demonstrated success and outspoken common agreement among central AEC actors in the SiB for the usefulness of the Pilot MC for the AEC industry, there was a “collective” unwillingness among the AEC actors to take action, to try something “new”, to find that pilot building project for the EM-project. This I will describe closer in the next chapter.

6.5 Summary

This part of the case story has provided the description and parts of the case discussion of the initial process and consequently first stage of the thesis case story. I conclude that the Pilot enterprise MC in Trondheim was a successful event in terms of contributing to facilitating a shared understanding of collective practice in building projects. It also contributed to co-generating one of the conditions viewed as necessary in creating organizational change and innovation in AEC companies, namely the one called visualizing a common frame of reference. Consequently it also contributed to development of the reflection arena of RA-1 emphasizing a Why-learning focus (see Chapter 5) constituting one of the necessary arenas to spread organizational change and innovation among

companies in the AEC industry. Thereby in the next two chapters I will describe the inquiry process in the two case building projects developing the other two conditions viewed as necessary to spread organizational change and innovation creating new useful collective practice.

Chapter 7

The Case Building Project I: Rekkevik Brygge (RB)

In this chapter I tell the second stage of the thesis case story and which is about the case building project called Rekkevik Brygge (RB), the first building project I have followed as part of this Ph.D. project.

The chapter describes the collective inquiry process of the building project Rekkevik Brygge as it unfolds over a one-year period from summer 1997 to the fall 1998. The project is defined as a pilot project under SiB (see Chapter 3) emphasizing development of a pilot or prototype of a “Web-based project tool” or Web server supporting information sharing and collaboration among the participating project actors.

I start the chapter by providing the story why it was so difficult finding a pilot for the EM-project. Then I go on to tell about the development I have witnessed and been part of as a researcher in the Rekkevik Brygge project. As the initial process described in the previous chapter embraced the development of the first condition of visualizing a common frame of reference, the present chapter will inquire more into the second condition necessary in achieving organizational change and innovation in AEC companies, namely the condition of collective reflection-*on-practice* (see Chapter 5). The story will show at the end in this chapter how it links up to a third condition called collective reflection-*in-practice* that the next chapter, Chapter 8, will inquire more into.

7.1 Introduction

There were several important claims that had to be fulfilled in order to find a building project that could be available as a pilot¹¹³ project for SiB in using the MC-method as demonstrated on the Pilot Conference in Trondheim described in the previous chapter. The Modeling conference as demonstrated at the Pilot gathering was now a method developed by the EM-project, contributing to both the first and the second goals of the EM-project as stated in Figure 6-1.

First of all, due to Veidekke's position as one of the leading AEC actors in Norway, it was important to find a pilot building project in which Veidekke was the total contracting partner. Secondly, the most ideal choice would be if the three other SiB consortium firms were sub contractors of that building project. In an intensive and optimistic phase of SiB, that is, in a period just after the successful Lysebu seminar in April 1997, the SiB consortium actors considered actually several building projects as possible to become a full-scale pilot project for the EM-project. But the main problem still was to find a pilot project where at least three of the consortium actors participated on the same project at the same time. This was an obvious point since one of the main goals of SiB was for each of the SiB actors to improve capacity and find models for more effective collaboration and integration between actors participating in a building project, that is: to improve "the integrated building process" (see Chapter 3). Thus the pilot project that turned out most successful in that sense as viewed by the SiB consortium actors – and that was the only pilot project in SiB in which all the four SiB actors was going to participate in – was the building project called Rekkevik Brygge (RB).

¹¹³ A pilot project was according to the SiB defined as projects in which the outsiders, or the researchers actually contribute to the execution of the project in addition to observing and documenting the process. The pilot projects were accomplished as "dialog based action research projects" implying that the external researcher and the local participants were as equal partners in a co-generative learning process (see Methodology-chapter, Appendix 1).

7.2 Focusing on Changing Collective Practice with IT, not Traditional Cost-cutting

The building project Rekkevik Brygge (RB for short) was approved as a Pilot project under the SiB-program from June 1997. The main goal of the Pilot RB project was defined in two sub goals. First, it was a goal to gain experiences with new and improved collaboration and communication routines with regard to the new Plan and construction law (*plan- og bygningsloven* - PBL for short) that came into force from July 01 1997. Second, it was defined as very important to gain experiences with introduction and use of new IT for a common Web-based project server or archive and thereby electronic or Web-based information exchange between the actors directly involved in the project.

A local based shipping company in Larvik named Norhval AS¹¹⁴ had since the early 1980s been working with plans with regard to a small apartment project in Rekkevik, just outside downtown of Larvik (Figure 7-1).



Figure 7-1 SiB's lighthouse project: Construction of the apartment complex Rekkevik Brygge (RB) with 18 apartments (the red buildings) in a modernistic wharf style just outside downtown Larvik.

Veidekke ASA and Norhval AS established as equal partners a joint venture called Rekkevik Brygge AS with Norhval as the owner and Veidekke as the total contracting partner. The mission was to build 18 apartments on a former wharf and shipyard area. The RB was planned to have the startup on the building site in June 1997, but due to some

¹¹⁴ Norhval AS is a small Larvik based shipping company that originally had made business on whale hunting located on a former shipyard in Rekkevik, just outside Larvik.

internal planning problems the startup was delayed by as much as 3 months. So the work on the building site did not start until last week of September 1997. The building project was finished in September 1998.

It was a fact that one of the great challenges of the Norwegian AEC industry in the 1990s has been how to attain improved quality of the constructed facilities. The public building institutions¹¹⁵ saw the new PBL as an important trigger and contributor in changing practice in building projects towards the much-needed improvement in quality of the physical building process on the site and the constructed building facilities. Important aspects in the new PBL in that regard were the efforts for implementing new quality systems in satisfying the demands for internal control and roles of responsibility according to the new PBL.

As the RB was approved as a Pilot project with all the four SiB consortium actors participating from June 97, the consortium actors were very enthusiastic about the possibility to use the RB as a learning case or “lighthouse project” with regard to improved collaboration routines for the whole AEC industry in Norway. The SiB consortium board viewed the RB as a pioneering pilot project on the use of modern IT and thereby as a lighthouse project for the whole industry with regard to setting new standards for improved collaboration and communication routines between the involved AEC actors enabled by the use of IT especially. Thus, investments in IT were not viewed as just another source of cost generation or as a mean for regular cost cutting, but rather as a mean for and a possibility for development and change in the AEC industry as a whole. The point that RB was going to be the lighthouse project was further strengthened by the fact that RB was the only Pilot project in SiB in which all the four consortium companies participated.

7.3 The Aftermath of The Lysebu-Seminar: The RB as a Possible Pilot for The EM-Project?

Just after the last group work the second day on the Lysebu-seminar in April 1997 (see Chapter 6), the SiB held its regular consortium board meeting still being in the optimistic and visionary tone of the seminar. The training task of the enterprise modeling-method that

¹¹⁵ Public institutions involved in building projects are both institutions of the state and the local council.

second day was a good introduction to that board meeting. But despite that optimistic mode on behalf of the entire SiB and the aim of the EM-project, the SiB actors decided by then only to postpone the decision of what building project that was going to become a full-scale pilot for the EM-project. But due to the delay for more than 3 months it became crucial not to risk any more delay in the RB project. The SiB consortium board decided then to focus on more short-term improvement impacts out of straightforward efforts like the PBL and “minimal” introduction and use of IT, rather than the more “long-term impacts” from the EM-project as emphasized in the presentation of the enterprise modeling-method on the second day of the Lysebu-seminar.

The SiB consortium board thereby postponed without any further notice the decision to find a full-scale pilot project for the EM-project. It was interesting to observe that despite the fact that the AEC industry experienced at that moment of time one of the most prosperous construction boom in history they were still in a constant “lack of time” for learning and development and consequently that a wide spread attitude was rather *“to finish each project as fast as possible in order to start a new one and earn even more profit”*¹¹⁶. It really seemed that this still was a widespread and notorious attitude that was going to take time to really get rid of.

In one of their board meetings the SiB consortium stated that the reason for the postponement of that decision was that they needed more specific information regarding mechanisms and resources for how to organize a full-scale pilot building project on enterprise modeling as stated in the EM-project (see Figure 6-1). Taking into account the general low level of IT-use in the AEC industry at that time it was seen as more important to use the RB-project to gain experiences about more straightforward improvements regarding collaboration and use of IT. Thus, more “short-term improvement” efforts were viewed as more important than the EM-project that was perceived by many insiders among the four SiB consortium firms at that time as too theoretical and academic oriented. It was now a common understanding in the SiB consortium that enterprise modeling is a very likely useful tool for the AEC industry. But despite this fact and despite the successful outcome of both the Lysebu-seminar and the Pilot Conference in Trondheim the year after,

¹¹⁶ This was a slogan used by most of the insiders I interviewed during my field work.

the board members acknowledged to focus more on the striking improvement needs by more simple means as they went back to the daily operative work.

The impression of enterprise modeling and the EM-project as somewhat too academic and theoretical was underpinned by the perception among most of the SiB actors that IT mostly was a “practical tool” for simple electronic archival routines. Examples of common routines supported by IT could be storing and exchanging static documents of drawings and meeting reports and to use the practical e-mail as most of the actors in a building project are geographically dispersed. In that sense IT was mostly viewed as a tool for simplifying and rationalizing existing work routines in regard to information exchange and archiving, not as a tool to enable new work processes and support new collaboration and communication routines. Also at that time in 1997 the Web-based Internet technology was perceived as too expensive and not mature enough to support the geographically dispersed project actors with advanced collaborative-supporting IT. The only affordable Internet connection at that time was by the call or the ISDN, and broadband network technology was far too expensive just for temporary installations for a building site far away in the “bush”. Even as the CEO of both Veidekke and Interconsult in interviews¹¹⁷ just after the Lysebu-seminar stated the obvious need to use IT to support collaboration, learning and development in building projects, it should take a lot more time before this effort of a more strategic use of Web technology in building projects – as proclaimed in the EM-project, picked up speed and became more widely accepted among operative personnel and project management staff.

However, it was the chairman of the SiB consortium board, the CEO of Interconsult (at that time IGP AS), who originally had the idea of and was the moving spirit for the EM-project (see Figure 6-1 in Chapter 6) and the effort of developing a general enterprise model in visualizing the main activities and generic processes of building projects. Since 1993 and as an initiator for the accomplished Porter analysis of the Norwegian AEC industry he became really the moving spirit for the SiB R&D program and to foresee and understand the central role that IT should come to play in the SiB program. As described in the overall SiB-project plan from 1995 the use of IT was assigned a pretty ambitious role (see also Chapter 3):

¹¹⁷ See interview citations in the beginning of Chapter 6

*“Integrated internal and external efficiency have emerged as a consequence of the diffusion of the information technology (IT) [...] Thus **IT** is a precondition to handle this strategic duality”.*¹¹⁸

This proclaimed role of IT was linked to the common understanding among the SiB actors that building projects were viewed as extremely information and coordination intensive mostly due to the variety of types of projects and constantly changing constellations of participating actors; *“.. a development of practice in building projects, then, cannot but integrate with the development of IT solutions for the handling of information”*¹¹⁹.

The statement of the highly respected, former CEO of ABB, Percy Barnevik, that *“All enterprises are IT-enterprises”* was adopted by the SiB consortium board stating that *“..this applies to the utmost extent for the information intensive AEC industry”*. This ambitious aim on behalf of the industry was further emphasized with regard to the consortium’s understanding of SiB as a *real* R&D program that *“..[] such an R&D program (the SiB) with focus on the interplay between IT and the organization of building projects has to stay ahead of the international development of the industry”*.

A SiB chairman as a moving spirit for the EM-project and a consortium board stating ambitious goals regarding IT on behalf of the entire SiB R&D program and the Norwegian AEC industry, was simply just not enough. Though, it was really a good starting point. Really to take off in an extremely conservative minded industry, however, the visions about the EM-project and more strategic use of IT needed more spokespersons or allies, a topic to which I shall return to later.

The growing and maturing awareness of the EM-project and of using IT to support new practices of collaboration unfolded then slowly over the years of the SiB program from 1996 to 1999. Nevertheless, the SiB visions with regard to IT and the EM-project gained momentum from several, including external sources like the management trends of tighter alliances and cooperation between the actors directly involved in building projects and the industrial development of new forms of contracts in which the total contracting firm like Veidekke tended to gain a more dominating and leading role in the overall execution of building projects they were involved in. But for the spreading of the EM-project and such a

¹¹⁸ SiB project plan, 1995. See Chapter 3 for a definition of “external” and “internal” efficiency.

¹¹⁹ SiB project plan, 1995

Web-based enterprise portal to become a success in building projects, it was necessary to develop the collective skills and the Web applications necessary helping the users navigating and exploiting existing systems used in projects, providing maintenance and support of existing IT systems.

Here it is important to bear in mind that before the RB building project started, the actors of the AEC industry had no experience at all in using IT to support information retrieval, communication and collaboration in operative execution of building projects. So in order to gain further experience with IT and strive towards more participative use of IT according to the goal of the EM-project and also according to the overall goal of SiB, it was important and very reasonable by SiB to employ a more “stepwise strategy” for deployment of IT. Thus Veidekke as the total contracting firm decided as a consequence to use a more “simplistic” oriented Web server in the Pilot RB project for the first time ever in a building project in the Norwegian AEC industry.

7.4 The Use of IT: Information Sharing in Building Projects

The most central goal of the Pilot RB project was to make the RB as a “lighthouse” project for SiB in aiming at – for the first time in the Norwegian AEC industry, establishing a “common electronic project archive” and achieving a common standard for electronic information exchange for the central actors participating in building projects of the AEC industry. That is, to share the project information between the central actors; the owner, total contractor, architect, consulting engineers, suppliers and the public authorities.

Taking into account the low level of IT in the industry at that time, this goal was in a sense an ambitious one. Though, all actors had some experience with IT but only as separate systems for internal use by project management and top management. Especially Veidekke was familiar with Lotus Notes for some years, but only as a system “to store” so-called “management-relevant” information accessible only for the top management and the Veidekke project management team involved in the building projects. And then there was the Microsoft Project that Veidekke used to make and set up an overview of the project

progress and to print out on paper a huge progress report that they taped up on the wall in the building site office.

Among Veidekke building site offices including the RB-project there was a tradition for taping up on the office walls the huge progress reports and also the most common architect- and engineering drawings in a huge paper format. There were absolutely no routines in using neither Lotus Notes nor other applications as a tool communicating project specific information relevant for the operative execution like progress reports between the companies or actors involved in a building project. All operative project specific information like meeting reports and drawings were stored statically and locally and communicated by fax machine, postal mail (snail mail) or actually by talking in the phone. Just to be short, common routines for using IT like e-mail to support communication or any standardized routines for retrieval of project specific information was absolutely non-existing in the AEC industry before the RB project.

The first pilot version of the RB electronic project archive, or the RB enterprise portal (the *Pilot RB-Web* for short), installed on the RB building project was a Web-based server available through the Internet and with all data stored statically in document format, either in Microsoft Office Word or in pdf-formats. Drawings from architect or consulting engineer were also stored statically both in dwf- and dwg-format in the way that drawings could be viewed either directly in browser or by having an AutoCAD-viewer installed locally you could view them with more extra functionality, like zooming in details. All users were already accustomed to the standard Microsoft Internet Explorer Browser, standard viewers and also to the use of SMTP based e-mail either by their own internal company system or by private use. The Pilot RB-Web had no integrated Web-based e-mail system; all users used their own local e-mail system independently of the Pilot Web.

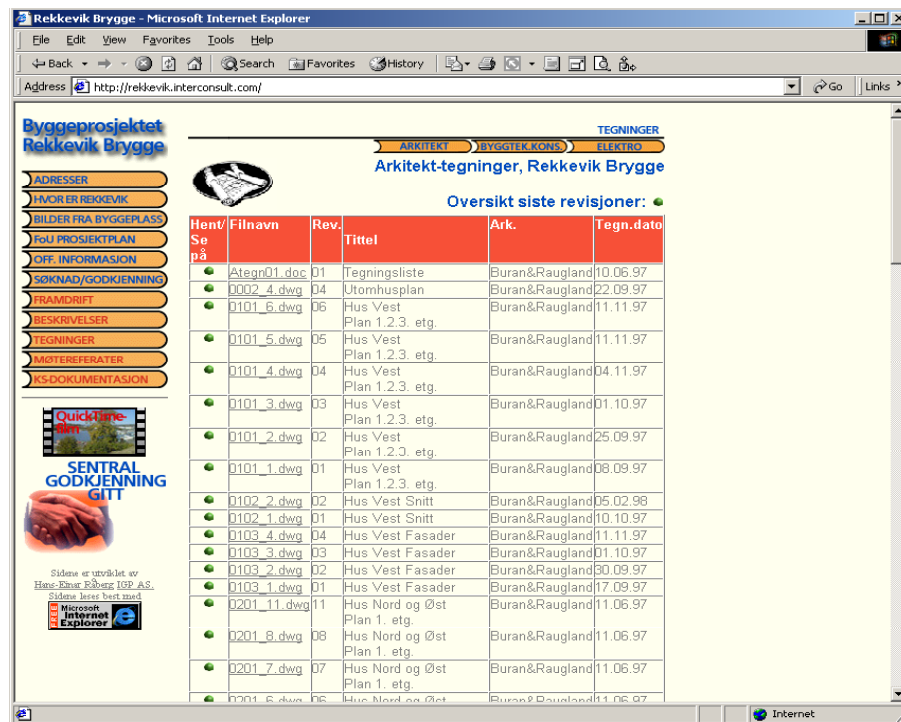


Figure 7-2 The pilot RB enterprise portal on the Internet (the Pilot RB-Web for short)

The fact that all users were already accustomed to the use of the Web and the Internet SMTP-based e-mail caused that there was no need for any organized training at the introduction of the Pilot RB-Web. Some of the users, like the building site manager, were assigned the responsibility of making all the meeting reports available on the Pilot RB-Web. The architect and the consulting engineers themselves were responsible of putting the drawings available on the Web. But because this was a pilot only the final version of the drawing was available, not the whole revision list. Also all information regarding the sale prospects of each of the 18 apartments in the apartment complex were available through the link "Public information" on the Pilot RB-Web, intended for the public interested in real estate and eventually searching the information needed to consider purchasing the apartments.

In advocating the use of IT and the Pilot RB-Web, Veidekke – due to its role as total contracting partner or property developer pursued a pretty straightforward strategy. That is, in order to get the meeting reports it was necessary to go online on the Web and get a copy yourself. The reports were not sent to the participants as attachments in the e-mail. In itself this strategy might seem a bit simplistic, but it rather implied the effort of overcoming a pretty challenging barrier regarding the use of IT, namely to use IT more as a

communicative tool supporting operative execution. Before the RB project started, no information was stored or sent electronically. Being able to use IT as a tool for retrieving and sharing information as part of collective practice – like in this situation to retrieve and share the meeting reports and the drawings, was in principal a very important step in contributing towards the ambitious goal of the SiB regarding use of IT. One of the goals of the SiB was to use IT more as a strategic and communicative tool in building projects, not only as a place “to store things for practical reasons”.

This was a kind of alignment strategy of the Pilot RB-Web through a common practice of information exchange and sharing by focusing on mutual cooperation between all actors or companies involved in the building project including the end customers or the buyers of the apartments. That is, the use of a common electronic project archive for documents and drawings were a key move for the spreading of Web-based portal infrastructure among the actors directly involved in the RB-project. This process of alignment of the Pilot RB-Web was reinforced by the following additional functions of the portal: electronic address books, digital pictures from the building site updated every hour during the whole building period, links to public information in accordance to the new building law (the PBL), electronic quality plan of the total contractor of the RB-project. The Web was then the primary format or resource for this kind of information.

7.5 Spreading of IT in the Pilot RB building project

As the Pilot RB building project evolved the participating project actors perceived emerging challenges with regard to the use of IT. One challenge was how to establish common routines for the information float with regard to the use of the portal itself, and then how each individual actor could be able to exploit the full potential of the information available by the Pilot RB-Web. Further it emerged as a challenge how to establish a security for the use of IT that the individual actors perceived as safe enough. Eventually, it was also a challenge that the local municipality in Larvik was not connected to the Internet during the project period. All exchange with the local authorities had to be done by the traditional “snail mail”.

The main efforts in meeting those challenges were based on a simple survey with regard to what software being used by the participating actors in the RB project and what knowledge the actors had about the use of Internet. This simple survey enabled the actors to find a common platform for use of IT and Internet technology, like e.g. common file formats for the electronic exchange.

The Pilot RB-project provided the participating actors experiences with new collaborative work patterns developed with Internet as a common information channel and a common electronic project archive. All participating actors got the knowledge that it really was a huge benefit to have the same information available for all by having information stored only on one place. Therefore the fast information sharing on the Web was experienced as a huge benefit, and also that it was a benefit to have a Web format that made the information easily adjustable to supporting own work in connection to e.g. production and interpretation of drawings or as direct input for own software. Further the pilot project showed that if the actors did not have the awareness for the situation in the building project as a whole, the full potential of a common Web-based project archive would not be fully exploited.

In most projects the building site office has had a need for traditional paper copies of the drawings in different format and with huge a administrative work to handle and maintain order of the versions, copies and sending. As the RB-project was a pilot only, that traditional practice of paper copies still was the kind of dominant practice with regard to handling information. Thus the main issue was still to have the paper copies sent to the building site on time and where the “update-procedure” of the electronic project archive on the Pilot RB-Web was perceived as a disturbing additional task, not as a task naturally integrated in operative and daily work practice.

Obviously, the experiences that were gained on using IT to support information sharing were reported by the Pilot RB-project as very useful for future practice. It was seen as evident that with another structure in the project, with for instance having electronic project archive automatically updated by the projecting actors, IT was seen as a potential enabler in spreading organizational change and innovation among the AEC companies. Such a genuine joint practice of information sharing that really breaks ground for a more communicative use of IT conditioned a very time demanding process of change with regard to both individual and collective attitudes of the actors involved in the project.

7.6 The Pilot RB Project as an Ally for Spreading the Joint Practice of Web-Based Information Sharing in the AEC Industry (What-Learning)

As Veidekke was the total contracting partner most of the employees working on the RB building site came from Veidekke. At most around 15 people were from Veidekke including most of the joiners and the concrete workers, and then 10-15 came from different contractors and suppliers. So all together there were about 25-30 people working on the site in the most intensive period of the project from December 1997 to April 1998. The organization map (Figure 7-3) shows all the four SiB consortium actors (see Chapter 3 for overview of SiB) as active participants in the Pilot RB project. As this was a rather small project the projecting manager (PJM) did not have his daily office on the building site.

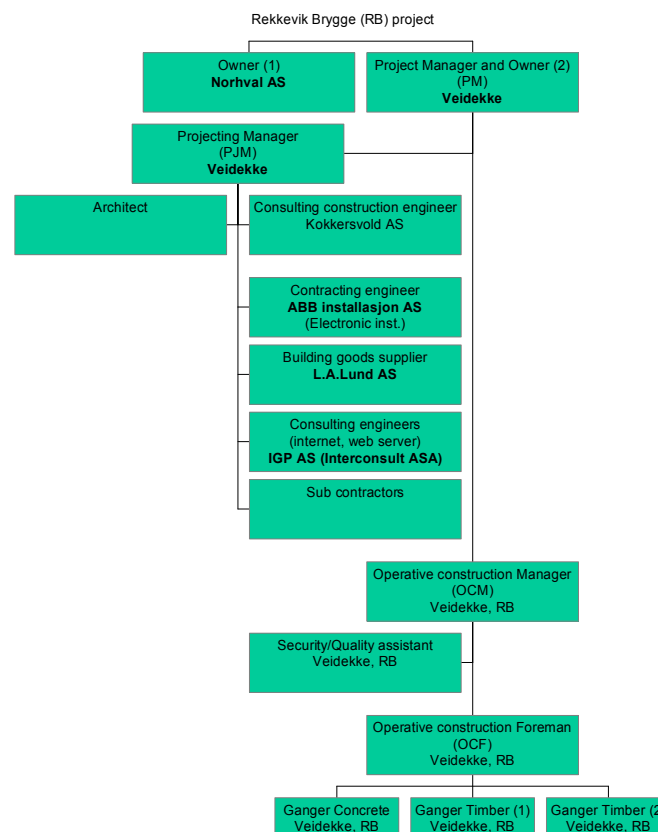


Figure 7-3 Organization map Rekkevik Brygge (RB)

All the employees of Veidekke were working on individual contracts and organized into three teams with one ganger on each team, one team of concrete workers and two teams of

joiners. There was one type of contract for the joiners and another one for the concrete workers. The contract of the joiners was lower than the contract of the concrete workers. Most of the joiners that I spoke to expressed some dissatisfaction with the fact that the contract was set lower for them, as one of the joiners said:

“I would rather prefer one common contract for all on the building site, not those individual contracts. A common contract would create more team feeling and also joint and mutual responsibility among all of us working on the site”.

As the work with the concrete could be more intensive and that it demanded more people in some periods, there were some work rotation between the joiners and the concrete workers. Due to the difference in contracts, it wasn't always so popular of being transferred from concrete contract and to the joiner contract.

Also there was a regular routine of rotation of people between different Veidekke building projects under execution within a geographical region. Especially rotation was more usual among the younger employees than the older ones, as the younger expressed to have more belonging to the company of Veidekke than to the specific building site. The younger expressed that they had more belonging to the company itself due to the good possibility of maintaining good communication and critique with both the building site management and the company management of Veidekke. In that connection the building site foreman played an important role in managing the project by taking an active role on daily basis out on the site together with the building workers. The foreman was very eager to emphasize the point that all people working out there out on the site, not only the Veidekke people but also the different sub contractors not belonging to Veidekke, were viewed as one building team independent of company belonging, namely the RB building team. The workers themselves perceived his active participation in the work out on the site as a very positive contribution to the collective motivation and team spirit on the whole building site. So the operative work processes of the project was very dependent on the ability of the foreman to perform effective verbal communication; to explain the drawings and the project progress to the Veidekke gangers, maintain order of oral and written agreements with the many sub contractors, agreement of supply of building commodities to the building site, etc. But there is a limit for how much information one person is able to keep a continuous survey of, as emphasized by the building foreman:

“I would say though, that the size of the project Rekkevik Brygge is what I feel is a kind of limit for what I’m able to keep a survey of on daily basis. But of course, even on this project, I often lose the track of the information I need to take good decisions, and then I have to take some “chances”. I would say though, that I have learnt how to handle those situations where I lack enough information, what I call experience, but, I see, as the Pilot RB enterprise portal is an example of, the need for more competence to handle that explicit project specific information, and to use a tool that could support me in bringing me updated information on supplies, drawings, progress reports, and so on.”

But at the same time, though, the RB site foreman emphasized the need for competent leadership on the building site even more, as he emphasized to view the management of the building project as a whole from the practical perspective seen from the physical building site:

“When it comes to leadership in a building project I will say that it is important that the central company management now and then on more regular basis drop in at the site in order to have a talk with the workers out there. That means a lot – both that the time-workers has a moment with the central management that in turn means a lot for the trust of the employer and the feeling of identity and for the second part, that it is important for the company top management to have understanding for the practical knowledge of the operative execution of the building project. It is of utmost importance that the management has a more active presence on the building site. To my experience, the management takes bad decisions for the company if they do not have the “feeling” for the practical knowledge of what’s taking place on the site and really talked to the people out there – I mean that it means so much for the employees to have contact with the company management on regular basis, not as a happening, but because it means so much for how we are as a company. This relates to what I mean is Veidekke’s role as a AEC company, namely to take the role and responsibility to manage and view the building project as a whole including all actors participating.”

The last point where the foreman emphasizes the natural role of Veidekke to take a more leading role when viewed in the perspective of the building project as a whole is really underpinned by the organization map of the RB project in Figure 7-3. This refers to the point that Veidekke in future projects wants to be more present, or to have a more crucial role in the early planning phase of programming in collaboration together with the architect. The new plan and construction law, the new PBL, in which the role of quality control is defined, also underpin this point. As the intention of the new law is to increase the very quality of the end products of the building project, according to the new PBL, the

function of the quality control require that the actor executing that control have the knowledge to understand the building project's collective practice as a whole. In practice that part of the new PBL, which really is a radical new thing in the AEC industry by implying new and decentralized roles of responsibility to each and every actor participating, imposes the responsibility as intrinsically interdependent between all actors or companies involved in the building project. This means that each individual actor involved in the project is responsible for executing work in accordance to the quality demands as imposed by the law. As one of the main roles of the total contracting partner, Veidekke, is to organize and execute the practical and physical building and construction on the building site, the new PBL has had a strong influence on Veidekke to take a more responsible role for the building project as a whole.

Routines for communication and interpretation of one of the most decisive information resources in a building project, namely the drawings from architect and consulting construction engineers¹²⁰ (the RIB) had a crucial influence on the project's collective work practice and progress for executing the physical building process on the site. Experiences showed that especially the exchange and interpretation of drawings between the building site foreman and the three gangers seemed to influence the behavior and collective work practice on the total RB building site. One emerging phenomena in that regard was insufficient routines on communication between the building site management, which means the site foreman and the architect and in turn between the site foreman and the other sub contractors. As one of the Veidekke timber gangers explained:

“Communication and exchange of information between the building site management, the sub contractor and the architect is very crucial for the production on the building site. This applies especially to the architect who always seems to be in arrears related to us, as we are the one who execute the physical production and experience the real practical problems in that regard. When the drawings are not in accordance with what we perceive as practically consistent, it takes too long before the architect has delivered us the new drawings. For that matter I mean it would have been an important improvement if there was a routine in which I could send a reply to the architect commenting on the drawing in order to let more of my practical knowledge come to play in the production of the drawings.”

¹²⁰ The consulting construction engineer is in Norwegian called 'rådgivende ingeniør bygg' or RIB for short.

In order to meet the challenges with information exchange between the building site office and the projecting actors including the architect, IT was increasingly seen as a potential enabler in the development process of improving the internal and external efficiency of the building project according to the goals of the SiB program. One effort that was considered as possible in that regard was that the gangers in the first round was given a greater possibility to be updated on information from the drawings as required by having routines for more active use of IT.

One of the timber gangers explained that he quite often brought the drawings with himself back home after work in order to make plans for the next day. In that connection he emphasized that it would have been a very practical improvement to use a home-PC or a notebook with modem and online connection to the Pilot RB-Web and the electronic CAD-drawings in order to prepare e.g. an electronic change-message to the site foreman or the architect regarding the actual drawing for the next day. The timber ganger explained that ordinary Veidekke employees like himself was not entitled to have a home-PC at home for free in the same way as in the case for the more “exclusive” project management who had their personal laptop.

The AEC industry is burdened with a strong tradition of independent craftsmanship where many of the joiners in Veidekke have worked as self-employed craftsmen. This has resulted in an organizational culture where the time employees on the building site are given a high degree of individual independence. It turned out that many of the employees on the RB building site, both joiners and concrete workers, had experience with taking responsibility for leading 3-4 people or more to work as a team for a couple of days up to as long as several weeks. The mission of those “project jobs” were either to solve limited practical problems with regard to experienced building or construction faults or to coordinate regular building work where a team could consist of e.g. electrician, a plumber and a joiner. Each of them was a specialized worker in their respective disciplines according to the strong craftsmanship tradition but where they at the same time enjoyed working in small teams emphasizing a shared responsibility and interdisciplinary communication and collaboration.

It was really interesting to observe how the kind of flexible and interdisciplinary working relations on the building site of RB were based on a great extent of mutual trust and responsibility between the site foreman and the time employees. But at the same time this

was also conditioned by an organizational culture in Veidekke emphasizing a new and younger generation of building workers that were willing to rotate with a pretty high frequency between different building projects within a specific region or geographical area having different progress. That effort was justified also as a mean to specialize the workers further in a set of specific tasks or roles in the way that as soon as they had finished that task in one project they went to the same type of task in a new building project. That could apply to both the concrete workers and the joiners. That kind of task could be everything from an organizational type, like e.g. the role of a ganger, or a building specific competence like e.g. paneled ceiling work or a type of advanced joinery like framework construction or half-timbering.

That competence and task classification of the time workers also led to a culture for rotating between different teams within the building site of RB. The different apartments under construction followed various progress or schedule where the house painter worked on one apartment and the concrete workers were doing the basic shuttering work on some of the others. Thus that kind of team rotation led to a more united team culture for the RB building site as a whole and at the same time a strong identity to Veidekke as a company due to the regular rotation between different Veidekke building projects.

This kind of rotation between different teams both on the same building site and also between other building sites in various phases of the building progress had several very positive consequences for both project quality and efficiency. One positive effect was that the employees developed both a strong discipline-based craftsman competence on those specific tasks and at the same time that they developed a strong culture for interdisciplinary communication and collaboration across those craftsman disciplines both within the same team and across the teams. In turn, this team rotation, not work or task rotation, led to that most of the Veidekke time workers developed more knowledge and responsibility for both parts of and the project's collective practice as a whole. In becoming deeply specialized in their specific tasks on the site, they experienced that they had to develop a mutual and shared responsibility to each other as even more inspiring and also to communicate and relate to each other even better in a continuous increasing extent. Thereby the workers due to this work process organization could understand more of how different parts and roles of the building project are interdependent or relates to each other and thus experiencing that

the building project really is a huge and complex coordination effort, as one of the RB joiners explained:

“For me this kind of team rotation, which I perceive is not especially well planned – I mean Veidekke could have benefited even more from this if they had a more thorough plan for that team rotation, has led to that I find my own work more exciting and inspiring as I understand more of what my role and work means for the project as a whole. At the same time I feel that this is my specialization and which I am confident with. Thereby I have started to feel more responsibility to the building project as a whole even as I often rotate between several executing projects within a geographical area. As I rotate between those different teams, it is a challenge to get into the work fast enough but the more motivating it is to find out about the new team of people and the new setting and thereby to actually know that I contribute to that specific building project.

I feel that the next natural step for me would have been to contribute more to the planning phase that is, in the production of the drawings. As I often feel that the architect drawings rely too much on theory, and too little on our practical knowledge on physical execution and what is practically consistent, I think we could have avoided many construction faults and thereby provided an important improvement to the building project as a whole if we with the practical experience were more involved in the planning. But also, the other way around, the architect and the engineer should be more present on the site. The real problem, however, is how to go about in practice to increase that communication and experience transfer between workers on the site and the projecting teams of architects and engineers.”

The point as stated by the RB joiner is that many construction faults could have been avoided by improved routines for information sharing and consequently mutual experience transfer between the projecting teams of architects and engineers on the one side and the more practical oriented time employees on the building site on the other. But as the joiner explained, the kind of team rotation in Veidekke was an important trigger or contribution to the steady increasing understanding of the need for taking more joint responsibility for the collective practice of a building project as a whole.

In turn, this need for a joint responsibility co-evolved with the need for a common practice of information sharing and experience transfer for a shared understanding in building projects. In addition there was the rapid folklorization of the Internet and the Web in media and for private use that was especially influential in Veidekke at the time. Additionally, the SiB R&D program as an external factor underpinned the growing awareness about the need to use the Web to support and develop together a practice of more communicative actions

and joint collaboration between all actors involved in a building project including the owner and the customer¹²¹.

In a number of ways then, the outside world of the RB-project including the restricted SiB program was enrolled in a kind of socio-technical compromise in developing together the joint collective practice of Web supported information sharing and experience transfer. This development was not as an instance of alignment by the SiB program. Inevitable, it was the SiB that initiated that particular pilot project of the RB at that time. Nevertheless, the understanding for the need of change towards using the Web to support information sharing and experience transfer for joint development unfolded slowly over time as a mutual construction process between the social and the technical.

Turning now back to the very constructive Veidekke-practice of relationship management between the time employees and the RB building site foreman as described above, which really showed that there was a steady growing awareness for doing the right things (What-learning), not only efficiency for doing things right (How-learning). Learning with regard to doing the right things¹²², or what we earlier referred to as external efficiency, was a practice that emerged out of the evolving practice of Web supported information sharing through the Pilot RB-Web. But on the RB building site, there was a constant increasing pressure of time almost all the time and especially in the last half of the project period. This time pressure almost destroyed the possibility of conducting that valuable relationship management due to the situation of destructive atmosphere of competition within an AEC industry having a strong and long-lasting tradition for small margins of time and a dominant focus of cost at the expense of learning and development. This had the consequence that it was more important and natural “to step on the gas” and get finished as soon as possible. I need to remind, though, that the project is a temporary organization and therefore it turns out as a pretty natural tendency to focus on minimizing cost and time at the very expense of learning and development. As emphasized by one of the timber gangers:

¹²¹ The owner means in Norwegian “byggherre” and customer means “sluttkunde”, that is, the buyer or the owner of the constructed facility or end product from the building project.

¹²² In theory and discussion chapter (chapters 4 and 5) I argue that the kind of learning as “doing the right things”, refers to change with regard to what Flood and Romm (1996) called *debate management* or What-learning

“To organize for greater time margins can provide a basis for increased profitability on the longer term because it provides the employees on the site a greater possibility to learn from experience and thereby in getting constantly better at doing the right things”.

This emphasizes the point that it was decisive for the SiB program in aiming for the goal of integrating internal and external efficiency to organize for more active participation in the planning and projecting phase among the time employees including the joiners and the concrete workers on the building site. But the issue of physically involving the building site workers in planning in any sensible way seemed to be too difficult as long as projects will be time and cost critical.

In that connection the actors involved in the RB-project underwent a joint development process in which that integration process turned out more and more likely to be achieved. Hence, this practice of integration meant that actors were focusing on learning to do the right things, that is, having the focus of *What-learning* for collective reflection-on-practice. As this was in principal the most central goal to the overall SiB program – that kind of integration through What-learning as part of or naturally integrated into operative work practice in building projects – the Pilot RB-project turned out then to be the most crucial pilot project in SiB. The RB-project provided the experience that the important practice of information sharing for joint reflection on collective practice as enabled for the first time ever through the Pilot RB-Web was to be seen as a decisive precondition for that kind of integration. Not only a precondition, but that the use of the Web as experienced in the Pilot RB-project was to be viewed as a very effective way of accomplishing any needed practice of information sharing. Consequently, the development and use of the Pilot RB-Web was a necessary condition in achieving the aim of “external efficiency” as a practice of learning together to do the right things or *collective reflection-on-practice*.

The emerging point in this case story is that the actors’ perception of information sharing with the Pilot RB-Web in a very crucial way represented a practice of broad participation in the shape and execution of the building project as a whole. This perception was especially present among the shop floor workers or the joiners and gangers on the building site. Still the Pilot RB-Web, during the operative execution of the RB-project, was not considered as any obligatory passage point among the participating actors due to its role as only a pilot-Web or prototype and not a full-scale and commercialized Web portal. The use of the Pilot

RB-Web represented in itself a very modest step in the direction of information sharing and participation. But the Pilot RB-Web was definitely perceived as a tool and also then as a very strong symbol for broad participation that was going to enable a more effective and integrated practice of information sharing and consequently work process integration, as emphasized by one of the RB timber gangers from Veidekke:

“ To my experience the Pilot RB-Web represents in principal an important information resource for the building project as a whole in the way that it represents a possibility to get access to and thereby share the same information instantly regarding all parts and phases of the building project something that for me represents a new dimension in integration and participation. I would say that I feel much more influence and more to say in the building project by the use of and the certainty of the existence of such a tool here on the building site. Here I especially think of the communication and exchange of information between workers on the site on the one hand and the projecting team of architects and engineers on the other hand. This is because I perceive all of us – the Veidekke building workers here on the RB building site, as one team, thanks to the good relationship between the site foreman and all the joiners and the concrete workers. But as soon as the RB-Web becomes a full-scale Web portal for the total building project I expect a broader practice of information sharing, like e.g. the diary of the foreman and the ganger and the change-messages from the gangers to the architect. The handling of this project specific information would then through a full-scale project Web be fully integrated in the operative and daily execution of the building project.

Take one example: As I’m one of the timber gangers, I see a very basic need for the possibility to look and plan more thoroughly on the most updated drawings – then I mean, always having the instant possibility to access the drawings in the format I want, level of details, to put on the colors I want in order to emphasize overview and progress on the drawings that I print out myself and bring with me around on the site. Now as everything regarding drawings is paper based, you need a huge and extremely bothersome system to keep track of the revisions, and because the exchange between the site and the architect is paper-based I risk that I too often for several days not using the correct or updated drawing, which thereby ends up in many critical construction faults. You could say that the architect is “protected” from contact with the building site because of this “paper mill”. Due to short of time, you sometimes take the chance not correcting the fault that in the end results in bad relation with the customer. This is by a matter of fact proven by the widespread “tradition” of speculating in customer complaints from faulty building projects. Here I am pretty sure of that I speak for all of us younger generation on the site when I state that the paper-based drawing system as it works today is very bothersome and out of date.”

As all handling and reading of the drawings on the building site were paper-based, the drawings were sent from the architect to the site in many different formats. Then the

drawings were archived and sorted in a huge rack inside the building site office that took a whole wall from floor to ceiling. Thus the drawings required a large physical storage space in addition to that the size of the format in many occasions were extremely unpractical in sense of providing any overview. In many ways as the same drawings were confronted up to several times each day by the ganger, the joiner and the site foreman, the drawings in many ways were the most decisive project specific information resource on the site. If the drawings contained errors, which they actually often did, it propagated outwards the whole building site with several misinterpretations, with delays in several levels, worries and less motivation etc. According to the timber gangers it was especially the architect drawings that too often did not correspond with what was perceived as practically consistent to execute. In addition the same drawings contained an obvious quantity of faults with regard to both measures of length and dimensions. The consequence of those faults were naturally widespread irritation and huge waste of time on executing extra control measures all over the site and to figure out and calculate practical adaptations because there were no time for any consultation with the responsible architect due to the large geographical distance to the architect office. The building site manager characterized these construction fault measures of the architect drawing as a constantly recurring nightmare, and he explained:

“ The communication and information exchange between us on the building site and the architects is very insufficient and the consequence is too many faults in the physical construction process here on the RB site. But I see that this kind of relation is more as a result of a long tradition in the industry; namely the strong discipline based traditions, and not as something special for this project. There is one aspect here, namely that the projecting manager [also from Veidekke, see Figure 7-3] has no regular contact with the site as he has his daily office in Tønsberg, except for the projecting meetings that is held here every second week. Nevertheless, the direct relation between the building site, including the gangers, the foreman and me on the one hand, and the architect on the other hand, requires a lot more exchange of information than it is today, and I definitely see the Web as the only enabler in that regard. Of course, we have the telephone and fax, but that has its obvious limits. The handling of the drawings requires a lot more instant exchange and sharing of information, and the Pilot RB-Web is an important contribution in the right direction.”

In addition, the building too often were actually constructed as in accordance with the drawings before the most critical faults in the drawings were discovered with subsequent huge loss of time and cost compared to the project's original progress plan.

An interesting observation in that regard was the architects' distant attitude to the practical aspects of the physical construction process on the building site. They expressed very explicit resistance against most forms of this kind of Web enabled practice of information sharing, as they felt that the use of the Pilot RB-Web was just as something in addition to their "real" work processes, namely "pure" production and supply of the drawings in accordance to the specified "written contract" of the project. In many ways then, consciously or unconsciously, the architect kept aloof from what happened in relation to the "practical stuff" on the building site and thereby related his own role in a very little extent to the individual building project as a whole. As one of the architects involved in the RB project explained:

"For me the end product is to produce the possibly best drawing in accordance with what is written in the contract. As I normally work by my self here on the office I seldom feel any identity to the building project I produce the drawing for. This is also something about the profession I work for; the architects are very proud of their profession where we learn very much about how to make good drawings and not so much about how it is practically feasible. So basically today I perceive the Pilot RB-Web as very much to be additional to my work as an architect [..]"

*But I must say though, despite my limited experience with the Web and that the RB project is the first project I have ever used such a tool, that the Pilot RB-Web has shown me that the Web definitely is a new and promising way to communicate with the other actors on the project, especially with the building site, and that it contributes in a very positive way to the feeling of **belonging** to a project and thereby to an increased perception of what your contribution means to the individual building project as a whole."*

This last point was a very positive statement from an architect with regard to the meaning of information sharing and especially his emphasis on the meaning of contributing to the actual building project as a whole. But still the architect's obvious resistance was connected to his fear of loosing professional based power; in the sense of letting other actors have more to say in regard to the influence in the governing of "the architectural aspects" of the building project. On the contrary to the architect, then, the building site management and the site gangers, belonging to the "practical" parts of the project, were pretty enthusiastic to the increased possibilities to participation and influence in the planning and execution of the building project through the enabling possibilities of the Pilot RB-Web and its instant information sharing features.

Although it was the case that the Pilot RB-Web was not considered obligatory at any time during the one-year project period till the end in September 1997, the prototype-based Web information infrastructure in RB still acquired a certain level of irreversibility. Still it was not by any means yet a final working infrastructure; but there were both visible and less visible factors that contributed strongly to keeping the Pilot RB-Web and consequently a full-scale project Web infrastructure in place. The more visible factors then were the considerable widespread use and folklorization of the Web through the Internet, the fact that every leading company in most industries has an Internet strategy with the Web as the basic tool for information sharing and experience transfer with a strong focus on collaboration with customers, partners and public authorities. The level of confidence to the Web within most kinds of business use was mainly as a result of the familiarity with the Web through the media and for private use. Secondly, the SiB-program itself became an institutionalized arena that contributed strongly to keeping the Pilot RB-Web in place. The RB-project was organized with a SiB R&D GROUP that had its regular meetings on the RB building site once a month, where the building site manager participated. In addition the RB-project was proclaimed as a “lighthouse project” for the huge SiB-program all from the beginning in 97. In that connection there was a certain familiarity with the SiB R&D program among all the RB building site workers and thereby the high profiled status of the building project within the SiB made the workers a bit proud to participate in the RB project.

The other less visible factors for keeping the Pilot RB-Web in place, or the intangible factors, were related to the evident and important needs of integration of whole work processes across organizational company borders between participating actors that are geographically dispersed. The top management in the SiB consortium board used a strategy of alignment for having the Web to enable what they called “BPR-efforts” in projects (see Chapter 3) to create organizational change and innovation in the AEC industry. This was linked to the critical need of integration between the internal and external efficiency discussed in Chapter 3. That is, the Web was enrolled as a critical ally for their interest in increased value creation.

Nevertheless, the building site workers wanted clearly to enroll the Web as an ally for increased possibility for more proactive participation in the planning and execution of the building project as a whole. Hence, for the gangers and the building site management, the

collective practice of information sharing enabled by the Web became during the RB-project a strong symbol on broad participation and fellowship spirit in the building project.

7.7 The Aftermath of the Pilot RB-Web: The ProsjektHotell™ as a New Ally for the EM-Project?

Due to the very successful experiences of the Pilot RB-Web as described above, the RB building project got a lot of high-profiled publicity in the SiB End Report and at the SiB End Conference in Oslo, September 1999. At the finish of the RB-project the SiB consortium board and the external evaluation group of SiB viewed the experiences with the Pilot RB-Web as an unquestionable success story. As the SiB evaluation report of the RB-project was finished in October 1998 the SiB consortium board started to make plans for a commercialization of the idea of the Pilot RB-Web to become a standard Web tool supporting collaboration and execution in building projects in the Norwegian AEC industry.

The SiB consortium actors Veidekke and Interconsult in joint collaboration with the SiB R&D program were the main initiators and financial contributors in a joint venture for a successful establishment of a firm named ProsjektNett IKT Partner AS¹²³ (ProsjektNett for short) with official start-up in January 1999. Based on the successful experiences with the Pilot RB-Web, the business idea of ProsjektNett was to provide building projects in the Norwegian AEC industry with Web services related to introduction and complete operative operation of a Web tool for information sharing in projects. The tool is called ProsjektHotell™¹²⁴. As a major stockholder in ProsjektNett, Veidekke as a leading property developer committed itself to install and use the ProsjektHotell on all of its future building projects. That commitment by Veidekke was a basic precondition for the whole establishment of the joint venture.

After a natural trial and error period during most of the start-up year of 1999, practically all building projects in the second quarter in spring season 2000 in which Veidekke was a

¹²³ ProsjektNett IKT Partner AS was a joint venture between Veidekke and Interconsult as the main contributors, and with Runit AS and EDB Gruppen AS as co-founders.

¹²⁴ I will come back to a closer description of the specific Web solution called ProsjektHotell provided by ProsjektNett in the section on the case description of Bergheim Amfi in the next chapter, Chapter 8.

major actor or property developer, had installed the ProsjektHotell with some varying success.

Naturally, after the success of the Pilot RB-Web and after the crucial strategic decision to install ProsjektHotell on all of its future building projects, Veidekke became pretty focused on benefiting from their relatively heavy financial investment in ProsjektHotell during that first start-up year in 1999. The policy and the crucial point for Veidekke then that first year was that ProsjektHotell had to become a Web tool that first of all could be used by every participating actor that collaborated with Veidekke in their building projects. Here the very point was either all or nothing. For that reason and taking into account the low level of or non-existent use of IT employment in the AEC industry at that moment, Veidekke wanted to keep the Web tool as simple as possible. It was better to employ a simple standard and thereby to gain some new experiences for operative use in building projects than nothing at all. Another aspect then was that Veidekke as a result of the SiB-program was the first AEC company, at least in Norway, to employ such a Web tool on all of its building projects. This outlook made the top management of Veidekke proud of course, and the issue now was to employ and spread the ProsjektHotell around to as many building projects as possible and as fast as possible.

Due to the company strategy of Veidekke to mainly become a total contracting partner or one of the leading property developers in the Nordic AEC market, Veidekke was then in turn going to become a main driving force in deciding how to develop the ProsjektHotell as a standard Web tool for building projects at least in the Norwegian AEC industry. As one of the leading property developers in Norway and also in Scandinavia, Veidekke was the SiB-actor that really would benefit most from a tool like ProsjektHotell with a restricted functionality in the first phase¹²⁵.

Interconsult was also very eager to exploit the success of the Pilot RB-Web and thus to have influence on the premises for the shaping of what tool ProsjektHotell was going to be for the AEC industry. Consequently, Interconsult was in a sense more focused on going one step further from the experiences of the RB-project. That is, as a firm of independent and high-skilled consulting engineers and as one of the central owners of ProsjektNett, it was

¹²⁵ The first phase means “the trial and error”-phase in accumulating experiences with the tool in an initial trial period, which lasted for about a year.

more natural and obvious for Interconsult to take a more radical step by really fulfilling the very goal of SiB and lengthening SiB's EM-project. Thus, what Interconsult wanted here was to use the method of enterprise modeling as demonstrated at the Pilot enterprise modeling conference in Trondheim April 1998 (see Chapter 6) together with ProsjektHotell as a standard tool for supporting collaboration and information sharing in building projects. This was then about a standard method for performing integrated IT- and organizational development in building projects. This ambition had to be seen in relation to especially two factors. First, it was a fact that most of the competence involved in the development of the EM-project was possessed by employees in Interconsult. Second, it had to be seen in relation to the special role of Interconsult as an independent consulting engineer company. Interconsult mostly played a very minor role when seen in the perspective of a general building project as a whole and when compared to the role of a property developer like Veidekke.

Thus Veidekke and Interconsult had in a sense pretty diverging interests on behalf of the Web tool ProsjektHotell very much due to their different roles in building projects. During 1999 their interests were diverging even more and at the end of 1999 it turned into a kind of limited conflict where Interconsult decided to drop out of the joint venture of ProsjektNett with Veidekke. The obvious reason for this drop out was pretty much Veidekke's reluctance to follow the idea of Interconsult to include the Modeling conference-methodology as demonstrated in the Pilot MC in Trondheim as a central element in the use of ProsjektHotell. Thus, due to the reasons mentioned above, Veidekke was rather very keen on a *fast* spreading of ProsjektHotell in building projects within the whole AEC industry with a restricted functionality similar to the one of the Pilot RB-Web and with a simplistic "electronic project archive". Interconsult on the other hand, had obviously more to win by employing a more stepwise strategy towards increasing their own possibility to have more to say in the shaping and execution of building projects as a whole. The strategy for Interconsult was that the use of ProsjektHotell together with the Modeling Conference (as demonstrated in Chapter 6) method as a possible general "start-up gathering" in building projects. It was then assumed that using a Modeling conference as a basis for participatory development of a Web-based project tool could increase the possibilities for more equal participation among all actors and companies directly involved in the building project as a whole.

The situation at the turn of the year 1999/2000 was that Veidekke was the only remaining SiB actor left in the joint venture of ProsjektNett¹²⁶. In addition Interconsult was not interested in starting to use the ProsjektHotell as an integrated tool in their projecting tasks in building projects due to the reasons mentioned above. Interconsult experienced that ProsjektHotell as a tool similar to the Pilot RB-Web had too restricted or simplistic functionality and that it represented no useful contribution to Interconsult's role in building projects. In this situation Veidekke got a strong need to focus on consolidating the use of ProsjektHotell in own projects where they had the role of the property developer. Thus, for Veidekke it was important to focus – most for internal company purposes, on the gathering and the evaluation of experiences from the employment of the new ProsjektHotell tool in the first operative period from October 1999 until the summer of 2000. As a matter of fact, the situation was now that the strong and long-lasting industrial relationship between Veidekke and Interconsult entered a stage where it seemed to crumble away. Due to Interconsult's unwillingness for starting to use ProsjektHotell in building projects, Veidekke more and more preferred to choose others firms as their consulting engineer partner.

The experienced success of the Pilot RB-Web in 1998, the successful establishment of the joint venture of ProsjektNett in January '99, the SiB End conference in September '99 and eventually, Interconsult's withdrawal out of ProsjektNett at the end of '99, represented many important and path breaking events in a relatively short period of time for both Veidekke and Interconsult. In addition Interconsult experienced many internal challenges during most of 1999 due to the merger of the three consulting companies in 1998. Those events turned that one and a half year period from beginning of 1999 till the summer of 2000 into an intensive period of reflection and evaluation of challenges within both Veidekke and Interconsult.

From a very outspoken focus on the collaborative and external efficiency between the SiB companies in the first two years of the SiB-program period, the third program year of 1999 turned into a focus on mostly internal challenges inside the companies, trying to resolve issues like: *“What are we going to do next each of us on our own after the SiB program formally ends in 1999?”*. In a way there was a strong sense of uncertainty regarding what

¹²⁶ Now Veidekke and Runit AS were the main remaining partners in the joint venture of ProsjektNett.

was natural for them to do in the lengthening of the SiB. At least in order to maintain some continuity from the SiB, some small limited projects were decided to continue in 2000 and 2001. One of those continuation projects should emerge as a lengthening of the EM-project. This project is what I will come back to in next chapter, namely the Bergheim Amfi building project.

For Veidekke it was in a way easier to keep a focus after the SiB-program formally ended in 1999 by focusing on the effort of trying to gather and evaluate experiences from the first full operative period with ProsjektHotell from October '99 till summer 2000. At the same time Veidekke as a property developer company experienced a steady growing self-awareness of the market potential of developing the professional role as property developer in building projects. That is, Veidekke wanted to develop the actor role that takes the more superior responsibility of the building project as a whole by emphasizing more customer oriented services. In many ways there was a strong mutual reinforcement between the emerging awareness of the market potential of the property developer role and the experiences with the introduction of ProsjektHotell in building projects. One of the evident experiences was that the information sharing capacity of such a Web-based project tool like ProsjektHotell reinforces the property developer role towards becoming more visible and thereby superior when viewed in the building project as a whole from the first drawing to the finished building with a satisfied customer and owner.

From being a very low-skilled user of IT in the first years of SiB, the successful employment of the Pilot RB-Web and then the ProsjektHotell turned Veidekke during the spring and summer of 2000 into a state as one of the AEC industry's most skilful and advanced IT-user in building projects. So at that stage Veidekke had really become more mature in the sense of more naturally considering and evaluating its experiences as a skillful IT employer. Thereby, it was more natural for Veidekke to consider what efforts it should take next for developing further its use of Web-based project tools. The goals of the EM-project (see Chapter 6) was then at this moment a very likely option as emphasized by one of the Veidekke top executives in April 2000:

“ At this stage the point is that Veidekke as a property developer has benefited a lot from the experiences with ProsjektHotell and that we perceive ourselves more as an advanced and mature employer of IT for supporting operative execution of building projects. The period so far with

ProsjektHotell has been a necessary experience for us to see what is really possible and needed beyond the functionality of the Pilot RB-Web as demonstrated in the Rekkevik Brygge project and ProsjektHotell. From that point of view I see the EM-project as a much more likely alternative and thereby tool for Veidekke at this stage than I did in the beginning of the SiB-program or at the Lysebu-seminar.”

Thus the tested functionality of the Pilot RB-Web and the ProsjektHotell have functioned as obligatory passage points for the emerging understanding or interest of the Web more as a real enabler and as a communicative and strategic tool for all actors participating in building projects. Through the introduction of the information infrastructure of ProsjektHotell on most of Veidekke's projects during the spring of 2000, all actors involved in those projects were more or less enforced to use ProsjektHotell. Thus, those who had chosen to collaborate with Veidekke on its projects were effectively enforced into the use of the information sharing practice based on ProsjektHotell and thereby as defined by Veidekke. I will inquire more into this process of alignment as a process of broad participation and collective inquiry in the case description of the project Bergheim Amfi in the next chapter.

The goals of the EM-project relates not only to the What-learning focus as demonstrated with the Pilot RB-Web described above, but also to the Why-learning focus described in Chapter 6 and to the How-learning focus (see Chapter 5). The What-learning focus, or knowing what to do does not necessarily entail knowing how to do it. So this is the issue of the case building project in the next chapter, Chapter 8, namely how it can be possible to take all three learning focuses into account into one overall awareness referred to as collective reflective practice for spreading organizational change and innovation among companies in the AEC industry.

7.8 Summary

This chapter has provided the second stage of the thesis' case story embracing the collective inquiry process of the building project Rekkevik Brygge (RB). The chapter has described the development and use of a pilot Web (the Pilot RB-Web) and how parts of the building project's collective practice have changed as a consequence of the use of the Web.

The story has focused on the development of a collective practice of information sharing supported by the Pilot RB-Web. This specific information sharing practice implied an emphasis on the What-learning focus (reflecting on What to do). This has been evident as the Web enabled information-sharing practice entailed a sense of broad participation in the process especially among the workers on the building site.

Chapter 8

The Case Building Project II: The Bergheim Amfi (BA)

In this chapter I tell the third and last stage of the thesis case story and which is about the case building project called Bergheim Amfi (BA), the second building project I have followed as part of this Ph.D. project.

The concluding case chapter describes the collective inquiry process of the building project Bergheim Amfi as it unfolds over a one-year period from summer 2000 to the spring 2001.

In the present chapter, I start to introduce about the necessity to find a method to customize IT according to the local needs of the actual building project. This contrasts the practice so far described in Chapter 7 in which the ProsjektHotell has been applied according to “one size fits all”. This search process entails that Veidekke find the method of the EM-project (see Chapter 6) as relevant and useful. This entails in turn a development process of collective practice in which all the three reflection arenas come to play, namely the Why-learning focus, the What-learning focus and consequently the How-learning focus as well, creating an inquiry process called collective reflective practice.

Thus the present stage of the story documents the development process – as it actually takes place – of a *practical model* of how organizational change and innovation can be spread among companies in the AEC Industry. This includes a process that I have witnessed and been active part of as a researcher in a co-generative way as emphasized in the position of pragmatic action research discussed in Chapter 2. It describes the process towards new

useful collective practice viewed in the perspective of the building project as a whole. The participative process describes consequently the actual three reflection arenas called Startup-gathering (RA-1), the Reflection and evaluation gathering (RA-2) and Development and use of Web-based project tools (RA-3) in accordance to the model described in Chapter 5.

8.1 Introduction

When looking back to the Lysebu seminar and the Pilot Enterprise Modeling Conference in Trondheim, April 1998, (see Chapter 6) it is relevant to state that the process of finding the pilot building project for the EM-project was time demanding. But now, at the summer of 2000, the situation had changed. A main reason for the new situation was that Veidekke had gained valuable experiences from the employment of ProsjektHotell described in the previous chapter and explored a new practice of Web-based information sharing in building projects. Second, the experience among project managers of Veidekke was that the information sharing practice enabled by the Web contributed to a very great extent to reinforce Veidekke's position as a main property developer and thereby for Veidekke to take a more superior role in building projects as a whole pretty much in contrast to the role of the other three SiB consortium actors (see Chapter 3).

A success criterion in that regard was that Veidekke as the property developer was in the position to set the unconditional requirement that every sub contractor had to collaborate with Veidekke through its ProsjektHotell (see Chapter 7). That enforced other collaborating building actors to adjust its routines to the use of the ProsjektHotell and thereby for laying a good foundation for more adapted and consequently "integrated" work processes crossing organizational borders in the operative collective work practice of the building project. The actors collaborating with Veidekke on its building projects agreed on the obvious benefits of Web-based practice of information sharing and thereby for better quality of end products and thus more satisfied customers. But the ProsjektHotell had some very obvious practical weaknesses.

8.2 The Need for Adjusting and Employing ProsjektHotell According to the Actual Project's Local Needs

A majority of the sub contractors including the architects signaled that they experienced the ProsjektHotell in many ways bothersome to use and that the tool was not adjusted properly to the local needs of the actual building project's operative collective practice. Also Veidekke's own project management staff experienced these weaknesses as serious threats

against the spreading of the Web-server as a standard tool in building projects. So a key challenge for Veidekke, however, was to find a standard way or method to “customize” the ProsjektHotell more properly to the local needs in each actual project rather than employing the strategy of “*one size fits all*” that so far since the beginning in 1999 had dominated ProsjektNett’s philosophy of IT introduction in Veidekke’s projects. As the effort of developing such a standard “method of adaptation” already partially was demonstrated in the Pilot Enterprise Modeling Conference (see Chapter 6), then finding a pilot project for the EM-project eventually turned out as a possible option for Veidekke. The effort of finding that pilot project should not be that difficult now as earlier in the SiB when all SiB consortium actors should be present. Now the most important was to find a building project in which Veidekke was the leading property developer.

The employment and spreading of a Web-based project tool like ProsjektHotell had then become a strategic issue with regard to Veidekke’s ambition to become a leading property developer both in the Norwegian and the Nordic AEC market. Having underscored the importance of ProsjektHotell in its strategy formation for taking a more superior role in the execution of a building project as a whole, Veidekke was now in a position to take a step further with regard to using the Web to really strengthen its role as a leading property developer even more. In that connection, as for the reasons mentioned above, the possibility of adopting the goals of the EM-project could most likely contribute to strengthen the strategic role of Veidekke both in taking a more dominant role in building projects and the AEC industry in general. But first those ideas had to be tested out in a new pilot project, and the Bergheim Amfi (BA for short) was chosen for that mission. As the SiB-program was formally finished in 1999, the Pilot BA-project was eventually organized as an extension project of SiB.

8.3 Preparing for the Startup Process

The initial top management meeting between two of the most central SiB consortium actors was held in August 2000 in which Veidekke’s building project Bergheim Amfi was decided to be the pilot project and approved for extending the goals of the EM-project as initially stated in Figure 6-1 (see Chapter 6). The meeting was arranged as a videoconference in

which representatives of the top management from the two consortium companies Veidekke and Interconsult participated from Oslo and me and the research team from Trondheim. It was important to involve Interconsult as a resource in the planning of this pilot project as Interconsult was a central contributor to the EM-project in the early stage of the SiB program (see Chapter 6 and 7. See also Chapter 3). In order to anchor the pilot project properly among the participating project actors of Bergheim Amfi, it was then decided to arrange a Startup-meeting as soon as possible with representatives of the project management team of Bergheim Amfi.

Thus, the approval and anchoring of the Bergheim Amfi Pilot project started with the Startup-meeting¹²⁷ on Dragvoll Campus October 16 2000. At this meeting, we were 10 people in addition to us from the research staff. The ten people were executive representatives from Veidekke ASA, Interconsult ASA and the operative project management staff of Veidekke Bergheim Amfi. The Startup-meeting determined and approved after a two hours discussion the design and the goals of the Bergheim Amfi Pilot project¹²⁸ (the Pilot BA-project for short).

The goal of the Pilot BA-project was set to explore the conditions for aiming at the goals of the EM-project as stated in Figure 6-1 and, thus, with special attention to exploring the real conditions of spreading organizational change and innovation among companies in the AEC industry. That is, the more specific challenge was, then, to explore the conditions for the spreading of change among AEC companies involved in the actual building project in which a Web-based project tool had to be adapted to the project's local needs. Thus we decided to arrange a Start-Up Gathering (RA-1) for Bergheim Amfi in November 2000 organized as in accordance with the principles of the Modeling conference as described above in the Pilot MC in April 1998 (see Chapter 6). We also agreed to put most emphasis on the "process" view for exploring the conditions for process orientation as a new way of spreading organizational change and innovation in building projects across organizational borders of AEC companies involved in the project.

¹²⁷ The Start-up meeting is documented in a report.

¹²⁸ The project plan of the Pilot Project of Bergheim Amfi was described in a report that was presented for the project management from Veidekke at that Start-up meeting in October 2000.

It was decided that the Pilot BA-project should focus on finding and testing out a standard model for spreading organizational change and innovation adapted to the actual building project. In addition it was important to explore into the conditions (possibilities/constraints) for creating a process-oriented Web portal (enterprise portal) for the individual building project. In order to explore the possibilities to find a model for spreading change and innovation in the AEC industry enabled by customization of IT (or the enterprise portal) to each project, an important precondition was to arrange for broad participation in the Pilot project through a Startup Gathering for the whole project. Broad participation was understood as necessary to create the needed ownership to the development process related to the collective work processes and the construction of the following prototype of a Web-based project tool (Pilot BA-Web for short) in accordance to the second goal of the EM-project (see Figure 6-1).

But first I will describe the case building project called the Bergheim Amfi.

8.4 The Bergheim Amfi building project: An overview

The Bergheim Amfi (BA for short) is a Veidekke building project that got the permission of frame in June 2000. Startup on the building site was in mid November 2000 and the building is planned to be finished in December 2002. The project is a total contract in direction of Veidekke as the property developer or the total contractor and Veidekke also represents the role as a major owner in the project. The project is planned to build 130 apartments in a pretty classical style on Bergheim (see Figure 8-1), just up to the east of downtown Trondheim, in a nice hillside with breath-taking view over the city and the Trondheim Fjord. The total contract sum of the project is about 125 million NOK (fall 2000).



Figure 8-1 A model of the Bergheim Amfi building project: a Veidekke apartment project with 130 apartments.

Due to the fact that the project was the biggest *apartment* project in the history of Veidekke in Trondheim and because of the luxurious style of the apartments – pretty much the same as the better-known apartment project of Nedre Elvehavn in downtown Trondheim, the project got very much publicity both in local and more nation covering press. The project has a prioritized emphasis on integrating the end customer (that is the apartment owner) into the operative execution of the building project, or what Veidekke call for ‘*customer adaptation*’. For this Veidekke has employed a full time operative engineer taking care of the adaptation process and the needs of the apartment owner (see organization map in Figure 8-2).

The project management, as illustrated in Figure 8-2, has seven people from Veidekke working on full time all located in the building site offices of Bergheim Amfi. As a total contracting firm, Veidekke also has a full time operative projecting manager on the project (OPM) and the organization of the project is fairly flat.

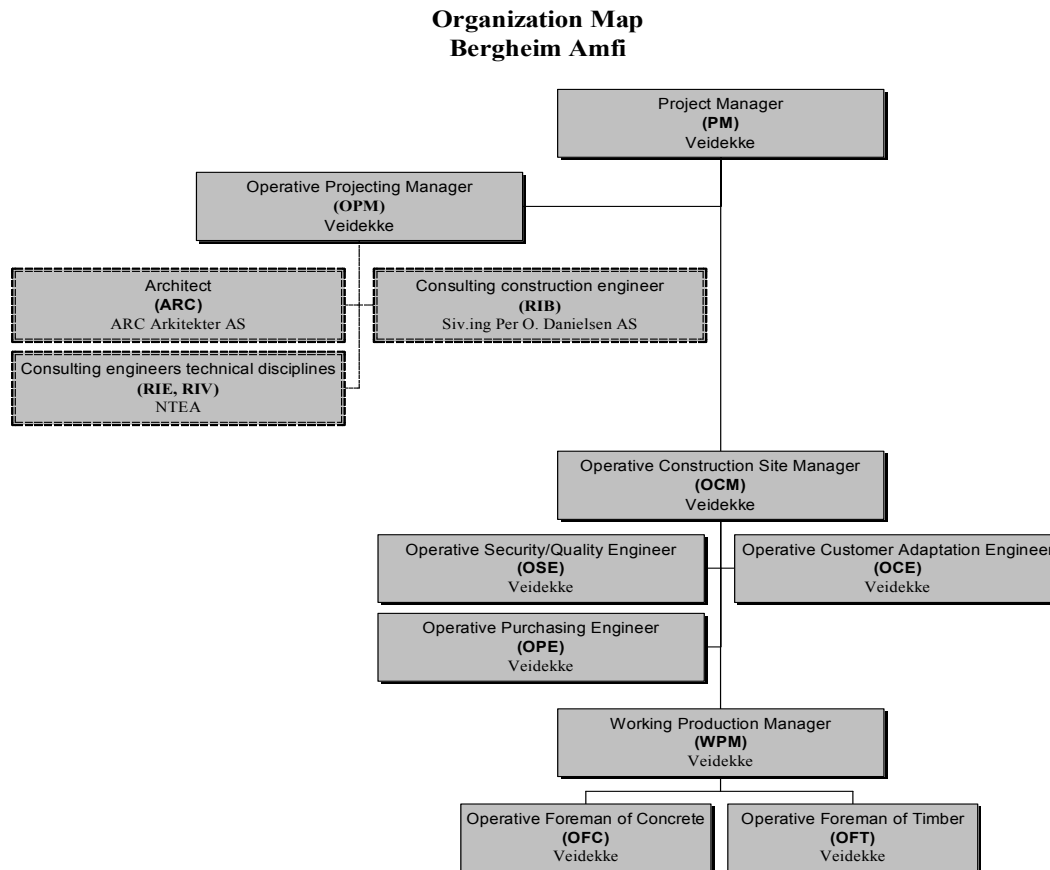


Figure 8-2 Organization map of Bergheim Amfi building project

The use of IT in the project was ambitious with regard to information sharing with an electronic room of information enabled by a Web based project server. All project related documents and drawings were accessible on an Internet server. And all actors on the project knew that the primary place to get the needed information, both meeting reports and all kinds of drawings, were on the project server, and that they expected always to find the very latest version of all kinds of documents there as well. The IT solution in use on the project was a system called ProsjektHotell™¹²⁹, which is a Web-based system that stores and handles information and drawings in a rigid static way. That is, key information is only stored in documents in which the information itself is not valid for search in any database. Thus the Web-system had no interactivity or dynamics with regard to the information stored on the project server, only to store the document or drawings, and therefore, you needed to know in advance where the documents are stored in order to find the searched information (Figure 8-3).

¹²⁹ As described in Chapter 7, the commercial Web-solution called ProsjektHotell™, was developed as a result of the research done in the SiB project area number three (see Chapter 3), see <http://samspill.interconsult.com/>. A company called ProsjektNett IKT-partner AS in which Veidekke is a major stockholder, provides the solution. See <http://www.prosjekthotell.com>



Figure 8-3. The Web-based project server, *ProsjektHotell™*, used on the Bergheim Amfi building project

All actors involved in the project, including i.e. the architect, the consulting engineers and the operative personnel on the building site, were expected to use the ProsjektHotell Web-server in their operative work for collaborative information sharing. Only the actors involved in the projecting and planning phase used the system in a more active way. But as explained by one of the technical consulting engineers in the project, they perceived the system to have many weaknesses with regard to adaptation to the project's local needs and diversity:

"I trust that I will find the latest version of the document and updated information on the ProsjektHotell, that is, the latest drawing, because we all are committed to store the drawing there as soon it is ready. But we only use the system "to store" information there, not to search for it. There is a need, though, for a project tool that supports information retrieval in a more effective way and a tool that is more adjusted to the operative needs of the actual project's operative and daily collective practice."

The ProsjektHotell as used in the BA project was developed as a result of the emphasis and development of IT in the SiB-program described in the project area number three (see Chapter 3) and also as a result of Veidekke being one of the definite leading actors in the Norwegian AEC industry related to use and development of IT. But the project server was experienced among the project actors only as “*a minimum solution*” for the handling of documents and information sharing and thus as “*just a practical place to store drawings and reports*”.

In the following I will tell the story of a process of collective inquiry for spreading organizational change and innovation among the AEC companies involved in the building project of Bergheim Amfi. The story is divided into three parts as in accordance to the practical innovation model as provided in Chapter 5. This innovation model as I will show in the following description implies for a possible practical or standard tool for how organizational change and innovation can be spread among AEC companies creating assumingly new useful collective practice in the actual building project.

8.5 The story of a spreading process of organizational change and innovation in the AEC industry

This spreading story is divided into three main sections as in accordance to the innovation model provided in Chapter 5.

8.5.1 Reflection Arena-1 (RA-1): Start-Up Gathering

The RA-1 of the model, The Start-up Gathering (the S-gathering for short) of the Pilot Bergheim Amfi project, was organized as a modeling conference (MC) according to the principles of the Pilot MC in Trondheim, April 1998, described in Chapter 6. The S-Gathering was arranged on the Norwegian Coastal Voyage of MS Nordkapp November 7 - 8 2000. The conference gathered 20 people in addition to us from the research staff¹³⁰ and the participants represented all central actors of the building project Bergheim Amfi,

¹³⁰ My supervisor, a fellow doctoral student and myself represented the research staff, or the *outsiders* on the S-Gathering for Bergheim Amfi. The discussion of this co-generative research process is provided in Appendix I: Methodology and Research process.

including architects, the project management staff from Veidekke, all consulting engineers and eventually the marketing and customer staff. The participants thus represented themselves only and that all actors involved in the project were represented was very idealistic and positive from a participatory point of view.

The focus of RA-1 was defined to be the Project Execution process of Bergheim Amfi and which included the “Design facility”, “The build facility” and “Coordinate actors” processes of the Joint enterprise image of the overall building project as illustrated in Figure 6-2 (see Chapter 6). After a discussion on the initial Start-up meeting in October as indicated above, we, the research staff, and the participants from the industry agreed on limiting the scope of the S-Gathering to those three main sub processes of the Joint enterprise image from the Pilot MC. On a preparatory meeting one week in front of the Bergheim Amfi S-Gathering, the Veidekke project manager of Bergheim Amfi put together the three homogeneous groups for the first group work. These groups were formed based on an organization form that was established by Veidekke in the very beginning of the building project called the *projecting group*, the *customer group* and the *operation group*. The operation group included the daily operative personnel located in the building site office, the customer group included the marketing personnel, while the projecting group included the projecting architects and consulting engineers (see organization map in Figure 8-2).

Mostly due to time and cost considerations, the S-gathering was limited to just one day on the Coastal Voyage on its way to Rørvik and back to Trondheim again the morning after. So there was really no time to let the participants create the visualization from the very scratch as originally intended. Thus we as the research staff had to prepare in front of the conference designing an initial model of the Project execution process of the Bergheim Amfi consisting of the three main processes as mentioned above, namely “Project facility”, “Build facility” and “Collaborate facility”. We used the detailed process visualizations of those three main processes as visualized at the Pilot MC (Chapter 6) in order to merge them into one overall process image as showed in Figure 8-4 below.

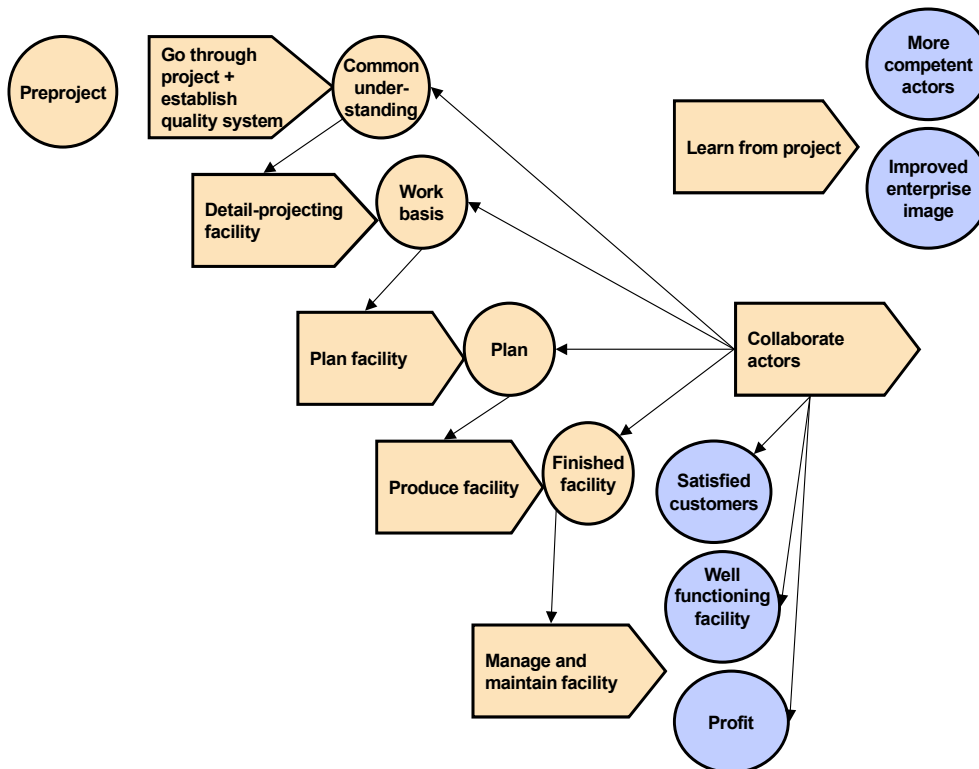


Figure 8-4 The *initial* process model for the Project Execution process of Bergheim Amfi apartment project (included in the program folder/handout that was distributed to all participants in front of the conference).

The S-gathering program as showed in Figure 8-5 below was, thus, hard and intense taking into account that we organized during one day what we expected should have taken two days to accomplish. But still, we used much time in front to design a feasible program in close collaboration with the project management staff of Veidekke so that it really should meet the basic demands and the needs of the actors and companies directly involved in Bergheim Amfi building project.

10.30	Entering MS Nordkapp, Trondheim Havn
11.00	Welcome. Opening by project manager, Veidekke The goals of the conference and the Project Execution process of Bergheim Amfi
11.15	Introduction to Method and work form of the Bergheim Amfi Modeling Conference. Presentation by the research staff <ul style="list-style-type: none"> • Enterprise images, enterprise modeling and processes • Presentation of initial model for Project Execution process of the Bergheim Amfi..
11.30	Group Work 1: Goals for the apartment project and construction of enterprise image/visualization for the Project Execution Process. 90 min. Homogeneous groups Part one: End products and goals: (40 min) Part two: Construction of enterprise visualization for the Project Execution process of Bergheim Amfi
13.00	Lunch
13.45	Plenary presentation of results
14.15	Group work 2: Construction of enterprise visualization II 60 min. Heterogeneous groups
15.15	Plenary presentation of results
15.45	Pause
16.00	Plenary: Construction of <u>joint</u> enterprise visualization for the Project Execution of Bergheim Amfi. (60 min.)
17.00	Pause
17.05	Introduction on the use of IT in the Bergheim Amfi construction project. By the IT system supplier
17.25	Group Work 3: What information and tools are needed in the main sub processes? (40 min.) Same groups as in group work 1. The groups work with their "own" sub processes of the constructed enterprise visualization from the plenary session.
18.05	Plenary presentation.
18.35	Pause
18.40	Summing up by the Research staff.
19.00	Middag Arrival Rørvik at 8:45 pm.

Figure 8-5 The hectic program agenda for the Bergheim Amfi S-Gathering November 2000 for visualization of the Project Execution process (the Joint enterprise image) of the Bergheim Amfi building project.

At the introduction of the conference we (the research staff functioned as the conference leaders or outsiders) used the initial process model (Figure 8-4), which we had prepared and designed in front of the gathering, to describe the principles of process visualizations as indicated in the story of the Pilot Enterprise modeling conference in April 1998 in Chapter 6. We also emphasized the point that their task was to evaluate and validate the initial process model in Figure 8-4 and that they could change the model completely in order to co-generate a model that fitted the way they perceived was the right way to execute the actual Project Execution process of Bergheim Amfi.

A main point in the first group work of the conference in addition to the designed enterprise visualization was that the participants had to describe the goals and the respective claims and qualities for the Project Execution process as showed in the detailed group program in Figure 8-6 below.

Group Work 1: Goals for the building project and construction of enterprise visualization for THE PROJECT EXECUTION PROCESS of Bergheim Amfi.

The Aim of the Group work

The aim of the group work is to discuss what goals and ambitions you have for how you execute the project Bergheim Amfi. Further by taking as a starting point the presented proposal for the enterprise visualization of the Project Execution with customers, end products, intermediate products and processes, discuss, change and develop the model in the way that it gives a proper image of how the processes are and how they should be.

Total time: 1 hour and 30 min

Work Procedure

- Choose a chairman, a secretary and a timekeeper.
- Read through the whole text of the task.
- Take two minutes for yourself and make some notes for each question.
- Take a quick round in the group in which every member of the group has the chance to present their own ideas and thoughts for the rest of the group.
- Concerning the enterprise image: Use the brown paper on the wall to work on. Use the delivered notes to write names on processes and products.
- Prioritize to fulfill the whole task.

Tasks

1. Take as a starting point the presented enterprise visualization, and answer the following two part questions (40 min):
 - a. What kind of end products should be the result of the building project?
Assess what end products that should be attained especially related to the customers on the one side, and your own competence development on the other side.
 - b. What claims or qualities of the end products should be demanded?
2. Take as a starting point the proposed enterprise visualization for the Project Execution process in addition to the end products and claims you have in subtask one. Discuss and perform the changes you mean are necessary in order to attain a proper enterprise visualization of the Project Execution Process of Bergheim Amfi with respect to the demanded end products and claims. (50 min)

Presentation/handing in

- Prepare a presentation for the plenary session for max 10 min, which shows end products with respect to claims and qualities, and which also explains the enterprise image that you now have on the brown paper wall.
- **Important:** Every group has got delivered a colored answer sheet. The secretary draws the enterprise model/image on the answer sheet. Remember to write down the names of the members of the group.

Figure 8-6 Detailed program for Group work 1: Construction of Enterprise visualization I of the Project Execution Process of the Bergheim Amfi.

As indicated in the description of the Pilot MC in Chapter 6, the S-Gathering of Bergheim Amfi went through the two-step process visualization of homogeneous and heterogeneous groups as indicated in the program above. Thus, by starting the group works with homogeneous groups, the program agenda of the S-gathering was designed with the purpose of having the participating actors to develop the enterprise visualizations based on their own local reality, that is, their own perception of the operative collective practice of the building project. After the first group work, then, the participants had more self-confidence about their own point of view when they entered the second group work with heterogeneous groups in which actors had more different local realities and the whole enterprise visualization started over again in the Enterprise visualization II (see Program agenda). In the group work discussions we the research staff experienced that it was a major challenge to help each group to focus on the Project Execution process as a *whole* as there was a great tendency among all groups to get caught up in detailed discussions on subjects very detached from what it meant to the process as a whole (like e.g. minor

technical aspects of drawings, construction joints on the site, etc). Due to a tight program schedule, this turned out to be a major weakness of the conference since the point of the conference was to have the participants to create a joint and shared understanding of the whole in the Project Execution process or the collective practice of the project. Because of this, we had to intervene into the discussions very often helping them to have good discussions and to sequence the sub processes in a logical order, in which we helped them in using new concepts (model language) in order to have them to articulate their own experiences in the more abstract model language of the enterprise visualization. Still in order for the participants to develop the necessary ownership to the resulting enterprise image, it was very important that they in some way could experience their own narratives or stories expressed in their “own” language were a part of or, at least, in a sense could be recognized in the enterprise image. An important mean in that regard, was the report from the conference, in which we included some of those narratives. The challenge for us, the research team, being the conference leaders was to be self-reflective enough in order to facilitate good discussions both in the groups and in the plenary sessions during the conference. Also a challenge was to have the participants to construct good work processes through the physical visualizations on the brown paper wall, and inspire them not to think in terms of the screens and user interfaces of the resulting Web-based enterprise portal for Bergheim Amfi.

The main plenary session with the joint construction of the enterprise visualization after the second group work, where the models from each of the three groups should be merged into a joint visualization (Figure 8-7), was the most demanding and difficult part of the gathering. Due to my role as a conference leader, I had to be very attentive to the logic of each of the groups’ visualizations so that the joint constructed visualization could be experienced as a coherent and consistent whole in which all participants had sufficient ownership and consensus to. In order to cope with the logic of the models in a participatory way, in which all had the sufficient possibility to contribute, we continued in the plenary session by physically moving the elements from the groups’ brown paper walls to the common brown paper model.

We expected this session of co-generating the joint visualization not to be that challenging as the groups had the initial model in Figure 8-4 to start on. But despite that initial model, there were significant differences between the three resulting visualizations after group

work 2. We started to ask the participants which one of the three had most in common with the other two. After a short initial plenary discussion, it was an easy task to pick out a starting-point model of the three. Thus we gathered all the twenty participants in front of that brown paper model. The plenary work procedure, then, was that we, by asking and discussing with the plenary, picked elements from the other two models and added or replaced elements in what should be the Joint enterprise image as showed in Figure 8-7. This session lasted for one hour and it was pretty exhausting for all participants.

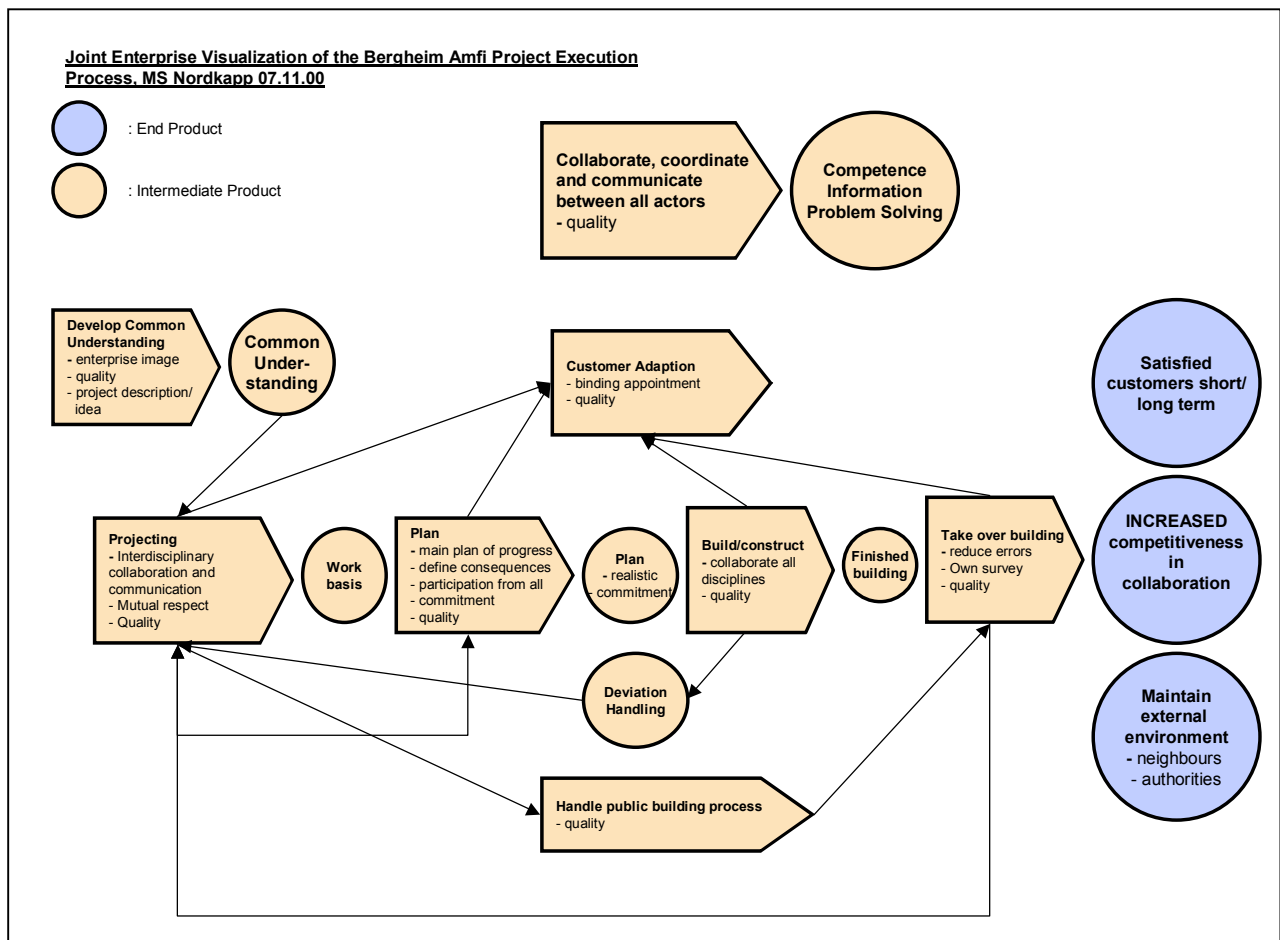


Figure 8-7 The Joint Enterprise Image of the Bergheim Amfi Project execution process constructed on the Coastal Voyage November 2000.

In the third group work (see detailed program in Figure 8-8 below), the participants went back to the same homogeneous groups as in the first group work. Here the groups had focus on what information and tools that were most needed in each of the main sub processes as visualized in the Joint enterprise image in Figure 8-7. This was an important task as the Joint enterprise image was to be used to construct and design a Web-based and process

oriented project tools or enterprise portal (RA-3). For each two of the main sub processes of the Joint enterprise image (Figure 8-7), the three Bergheim Amfi working groups mentioned above were chosen as process owners. For instance the Projecting work group had main responsibility for the two processes ‘Projecting’ and ‘Handle public building processes’ in Figure 8-7. But due to some lack of time, we decided not to use the yellow stickers attaching the required information on the brown paper model. Instead we let the groups write down the most critical information resources and efforts needed in each sub process. Despite the lack of time, this group work turned out to be very significant and a valuable one concerning the meaning and ownership each of the groups (projecting, customer and operation work group) attached to the Joint enterprise image of the Bergheim Amfi.

Group Work 3: What information and tools are needed in the main sub processes?
(40 min.)

Time: 40 min.

Aim of the Group Work:
The overall aim is to identify what is needed of information within each of the sub processes in the Project Execution process from the last plenary session. We also want to know what information is produced, and which thus are parts of the products, identify where information is important and present bottlenecks for information exchange. Further, what information needs of today are supported by IT (the web based project server) and where in the process do you see that use of IT or the Internet might be useful.

When this is done it is idealistically possible to use the joint enterprise visualization that you made earlier today as information architecture for the operative web based project server, and then connect the necessary information up to the work processes that are visualized in the enterprise image.

Work Procedure

- Choose a chairman, a secretary and a timekeeper.
- Read through the whole text of the task.
- Take two minutes for yourself and make some notes for each question.
- Take a quick round in the group in which every member of the group has the chance to present their own ideas and thoughts for the rest of the group.
- Write down the name of the type of information, tools, databases, etc. on yellow sticks, and attach them to the actual sub process or product on the brown paper wall.
- Start with the sub process the group has got responsibility for. When you are finished with that one, you may eventually do the same to the other processes.
- Prioritize to fulfill the whole task.

Tasks

- 1) What information is needed in order to execute the main sub processes of the enterprise image? Write this down on yellow sticks, and attach them to the actual sub process/product.
- 2) Identify challenges/bottlenecks for good information exchange in the Project Execution Process of Bergheim Amfi of today, and propose some efforts (at least three) that may handle these.

Presentation/handing in

- Prepare a presentation for the plenary session for max 10 min.
- **Important:** Every group has got delivered a colored answer sheet. The secretary reports the answer of the group on this sheet, which hands over to the conference leader. This sheet constitutes the basis for the report of the Bergheim Amfi Modeling Conference. Remember to write down the names of the members of the group.

Figure 8-8 Detailed program for Group work 3: Information and tools for the visualized Joint enterprise image of Project Execution process of Bergheim Amfi.

Only a few days after the S-Gathering, we finished a report documenting the whole S-Gathering on the Coastal Voyage and the outcome of it. The report was e-mailed out to all

the participants, and thus they could check and give us response on whether the input they experienced to give in the conference were properly reported.

The next major task was to organize an arena for inquiring into a prototype of a Web-based enterprise portal for the Bergheim Amfi building project (RA-3). After the S-Gathering the point was to use the Joint enterprise image in Figure 8-7 to create a consistent model of the information architecture for constructing a prototype of a Web-based enterprise portal for the Bergheim Amfi according to the goals set by the EM-project (see Chapter 6).

But as a parallel arena to the RA-3, we emphasized efforts for organizing the arena of the Reflection- and Evaluation Gatherings (RA-2). This I will describe in the next section.

8.5.2 Reflection Arena-2 (RA-2): Reflection and Evaluation Gatherings

The second arena of the model, the Reflection- and Evaluation gatherings (RE-gatherings), was going to be organized as an effort to directly follow up the results of what was gained during the S-Gathering on the Coastal Voyage. This second element of the model was organized as regular *reflection and evaluation gatherings* integrated in the operative execution or daily collective work practice of the building project. All the efforts that formed the basis for RA-2 were decided upon by the participants themselves as part of the tasks in Group Work 3 of the S-Gathering in RA-1. The RE-gatherings were organized into two main efforts that I will describe below.

The first effort of RA-2 was to use the Joint Enterprise Image from the S-Gathering as showed in Figure 8-7 as a regular point on the meeting agenda for the projecting and planning group with the consulting engineers and the architects. Also the operation group (the daily operative personnel on the building site of Bergheim Amfi) was using the image on some of their meetings. But as several members of the operation group also were members of the projecting group, including the projecting manager, it was not seen as necessary to use the image as a regular point in both groups. Therefore we in the research group concentrated to participate as regular participant observers and discussion partners in all of the meetings in the projecting group in a four months period from November 2000,

after the S-Gathering, until mid March 2001. The projecting meetings were held on regular basis each Friday from 08:00 am until 11:00 am on the building site at Bergheim Amfi.

The Joint enterprise Image was then used as a regular separate point on the meeting agenda and usually as the last point of the meeting. The projecting manager was usually pretty eager to spend enough time on that point each Friday *debating* issues and he perceived this point as a very good opportunity to inquire into issues of importance for the project which there otherwise would not be any occasion for. To each meeting we had xeroxed the Joint enterprise image as showed in Figure 8-7 in full colors in A2, A3 and A4 formats. The participants got a copy each and we had the big A2 format on the office wall. By the way, this A2-copy continued to hang on the office wall as several of the projecting group members used it pretty frequently to reflect on daily issues and reflecting on collective practice. The issues for discussion were related to how to improve collaboration generally in the project linked to the perceived challenges in the daily problem solving matters regarding both construction facility and architectural issues. The other meeting participants also perceived that those occasions with joint reflection really contributed to increase the collective understanding of the building project's collective practice as a whole. Consequently, it was a common perception that the reflection processes *on* the collective practice provided a foundation for more effective collaboration between the actors in the operative execution process, as emphasized by the architect:

“ The Gatherings and the reflection-meetings [the architect here also include the Evaluation Gathering which I describe below], have contributed to that I see more shaded on the building project, or the project's collective practice and the end products. For architects it is the physical building that is the superior End product of the building project. We are focused on that the users and the employers of the building are going to be satisfied. The Gatherings have contributed to create a joint spirit and a greater consciousness that the architect has to be more humble to the other professions on the project. We look different on how to take care for each other. Traditionally the architect's role has been perceived as running over the others in the project team, due to our traditional attitude of perceiving some professions as “unwanted” in relation to achieving good architectural solutions. [..]

*It is the **process** of creating the Joint enterprise image that has contributed to this strong focus on collaboration and which I perceive as the most valuable gain from the model. But also the presence of you as observers on the projecting meetings has contributed a lot to the process and to maintain the consciousness from the S-gatherings alive in the operative work. In relation to my own role I*

have got increased understanding of the need of the architect in the physical building phase of the project. For the quality of the end product it is of paramount importance that the architect is present at the changes and the adaptations between the different professions and contracts.”

The use of the Joint enterprise image as showed in Figure 8-7 on the meetings then worked as a pretty effective device for reflection and discussion among the meeting participants. Our job as the research staff was to work as facilitators in those discussions and reflections and to assist in problem solving when needed. The project management of Veidekke emphasized the importance of the RE-gatherings in the aftermath of the S-Gathering and that a shared understanding of the end products was an important contribution to more useful collective practice or more effective execution in the project:

*“ The individual contributions are moderated for the benefits of the **whole** and the common goals of the building project as a whole that everybody works for. The model and the process focus of the Joint enterprise image in itself have contributed to view the building project in some other useful ways.”*

And a recently educated engineer in the projecting group of Bergheim Amfi emphasized the meaning of the RE-gatherings for himself:

[The recently educated engineer]: *“ For me as a recently educated I feel that the model and the arenas of the reflection gatherings have contributed especially well in increasing my understanding of the building project in general, and I emphasize the whole, and its end products.”*

One in the project management group stated the meaning of the Joint enterprise image in a very positive way due to the process of co-generating the image:

“The employment of the Joint enterprise image has been a very useful symbol for fellowship and collaboration spirit in the execution of the project as a whole.”

The second effort of RA-2 was organized as a one-day Evaluation Gathering (or E-Gathering for short). It was during one of the reflection sessions and at the detailing of one of the sub processes of the Joint enterprise image at the end of a projecting meeting in late January 2001, that the idea for an E-Gathering was launched. We, the research staff, were asked to start preparations and making the plans for the new gathering and we decided the date to be on March 29 2001. The aim of the E-Gathering was first of all to create a joint

understanding of status, challenges and bottlenecks viewed in relation to the end products, as visualized in the Joint enterprise image (Figure 8-7), and collaboration in the building project Bergheim Amfi and further to propose joint efforts of improvements in the operative execution process or collective practice of the project.

An additional goal of the E-Gathering was at the same time to follow up some of the central issues and efforts from the S-Gathering on the Coastal Voyage in November 2000 in addition to the different suggestions and experiences on the way in the project's execution process at that moment.

The E-Gathering functioned as an effort to follow up and as an extension of the S-gathering at the Coastal Voyage based on its co-created Joint enterprise image in order to discuss experiences and approaches to different problems in the project execution process of Bergheim Amfi. The aim was therefore to turn the focus on the goals or the *end products* of the whole building project Bergheim Amfi, which implied to view the project execution process based on the demands to those three visualized end products as showed in Figure 8-7. In addition it was important to keep focusing on the results that may be achieved or enabled through effective collaboration in the spirit of joint fellowship.

The way of working at the E-Gathering was in principal based on the same way as the one demonstrated at the first S-Gathering or the Pilot MC (Chapter 6) with a frequent change between regular group work and plenary sessions. The gathering lasted for about 6 hours from noon till 6 p.m. in the afternoon. That way of working enabled all the participants to co-generate a common and shared understanding of the status regarding challenges and bottlenecks creating ownership to the needed and proposed efforts of improvements and thereby creating new useful collective practice in the building project. This way of working was an important contribution to the reinforcement of the co-generated and shared understanding of the building project as a whole as visualized in the Joint enterprise image. The group works were presented in plenary for discussion and development of collective knowledge.

The E-Gathering was hence a sub element in the RA-2, and it was executed with the program as shown in Figure 8-9 below. Detailed descriptions and explanations of the group exercises were described in a specific Exercise book that was distributed to everybody the

same day in addition to that the participants received it on e-mail a day in advance. The number of participants was 17 and the participants were the same as those who participated on the S-Gathering five months earlier. Thus the participants represented all actors involved in the project; the projecting group, project manager, technical consultants, sales coordinator and one sub contractor. For the group work the participants were divided into three groups.

12:00	Lunch Grand Clarion Hotel Olav, Olavskvartalet, Trondheim
12:30	Introduction and Welcome By project manager, Veidekke
12:45	Introduction by Research Staff: Focus: Goals and End products for the project execution process of Bergheim Amfi. Where are we now?
13:00	PART I: Goal/End products Group Work: Preparatory questions for discussion: What is status in the project in regard to goals/end products and demands for the project? 1. What experiences are done in relation to what is good and what have not worked so well? 2. What are the bottlenecks in the project and where do you see possible bottlenecks in the future?
13:45	Pause
14:00	Plenary presentation from Group Work I.
14:30	PART II: COLLABORATION AND INTEGRATION IN THE BUILDING PROCESS Group Work: 1. What collaboration and communication relations are established in the project? 2. What relations have to be established/reinforced in order to gain the best possible End products? The groups here base their work upon the Joint Enterprise Image as indicated with the actors in the different sub processes.
15:15	Plenary presentation from Group Work II.
15:45	Pause
16:00	PART III: ACTIONS/MEASURES Group Work (75 min) Based upon the two earlier group works we will here work more detailed with focus on concrete actions or measures related to <i>the priorities</i> and thereby use of information and tools as needed, and thereafter describe more specific measures to fulfill the end products of the project.
17:15	Plenary presentations from Group Work III.
17:45	Summary of the day.
18:00	Dinner and social activities in the bar, Grand Clarion Hotel Olav, Olavskvartalet.

Figure 8-9 Detailed program for E-Gathering March 29 2001, Grand Clarion Hotel Olav, Trondheim.

The aftermath of the E-Gathering was very much that most of the participants managed to follow up the proposed efforts for improvement in the operative project execution process of Bergheim Amfi. This point was stated by one of the participating consulting engineers from the projecting group:

*“ The reflection gatherings based on the Joint enterprise image has very much contributed to a basis for attaining improved technical solutions and thereby to new useful collective practice in the project. It is important continuously to adjust the physical building construction in order to optimize a whole solution. So I can clearly say that based on the proposed measures from those gatherings that we on **each meeting** make plans for more concrete improvement actions as a result of our joint focus on the end products and the whole in the collaboration process. “*

Thus, the reflection gatherings, both in terms of the first and second effort as mentioned above, contributed to the continuous process of collective reflection on practice debating especially issues related to “what to do?” as in accordance to the innovation model discussed in Chapter 5. But in order to create new useful collective practice, it was necessary also to reflect *in practice* by collectively reflecting on the issue “How to do it?”. This will be the issue of the next section.

8.5.3 Reflection Arena-3 (RA-3): Development and use of Web-based project tools

The third arena of the model, the RA-3, was going to be organized as a parallel arena to the RA-2 and also to directly follow up the results of what was achieved at the RA-1, the S-Gathering. The RA-3 – the development and use of Web based project tools for collaboration and information sharing in the building project as a whole – was important to reinforce effects both from RA-1 and RA-2 more into the operative collective practice and consequently to reflect in practice in order to create a shared understanding of “How to do it?”.

As we had limited resources as researchers for creating the prototype of a Web-based Enterprise portal based on the Joint enterprise image as showed in Figure 8-7 (Pilot BA-Web for short), it was a time demanding development process to come up with a sufficient consistent prototype. This development process took place over a 5 months period after the S-Gathering from November to March where we as the research group took part as observers and active discussions partners in the regular weekly meetings each Friday with the projecting group (the architects and consulting engineers) in addition to some meetings with the operation group (the project manager, projecting manager and three other operation people of Veidekke that worked full-time on the BA site) and the customer group (the same groups as at the S-Gathering in November).

Once or twice a month in that 3 months period from December to March 2001 we (the outsiders) arranged 1-2 hours reflection meetings in the continuation of the 2 hours projecting meetings to design the structure of the Pilot BA-Web. In most of the projecting

meetings we used the Joint enterprise image from the S-Gathering to facilitate the discussions about information needs and required efforts in each of those main sub processes as showed in Figure 8-7 in order to design the more detailed sub-sub processes of the main processes of the Joint enterprise image¹³¹. To those reflection meetings we had xeroxed colored A2 copies of the Joint Enterprise Image that we hang on the wall of the project meeting room¹³² so that everybody in the meeting could see it in addition to that they all had an A4 copy of the image in front of them on which they could visualize and make notes for themselves during the meetings and discussions. In some of the reflection meetings the project participants were asked to take into account that the Joint enterprise image or the process visualizations needed to fit into a computer screen and therefore to create several levels of processes. We ended up with three principal process levels as indicated in Figure 5-2 (see Chapter 5) and a fourth level visualized as an activity list with overview over the processes' main activities, people, information resources and other links.

In the last two months of the period, from February to the end of April we had sufficient empirical data to start designing the Pilot BA-Web on the Internet together with the project participants in a co-generative way. The first process maps were written on large brown papers, or "brown-paper-sessions", at some of the projecting meetings on the building site. But as the maps became sufficiently described by the Bergheim Amfi actors on their projecting meetings, the main process maps and the sub-sub process maps were re-drawn in the ProcessWebDesigner¹³³ (PWD) as showed in Figure 8-10, a tool for visualizing and designing a process oriented enterprise portal directly available on the Internet.

¹³¹ The Joint Enterprise Image as showed in Figure 8-7 is the 1.level, or the supreme level with the main work processes of the collective practice in Bergheim Amfi and the second level constitutes the sub-sub processes (these principal levels of the Joint enterprise image are indicated in Figure 5-2 in Chapter 5).

¹³² The regular meeting room for the Bergheim Amfi project was part of the project office that was placed just in mid of the building site at Bergheim Amfi.

¹³³ The tool called ProcessWebDesigner was developed as a result of research efforts (R&D) in Statoil (the Norne-project) and as part of the research in the SiB and the EM-project described in Chapter 6. See <http://www.nukleus.no>. Nukleus AS is a small consulting firm that offers consulting services in a large specter of integrated IT- and organizational development, and that resides at the popular Nedre Elvehavn in Trondheim.

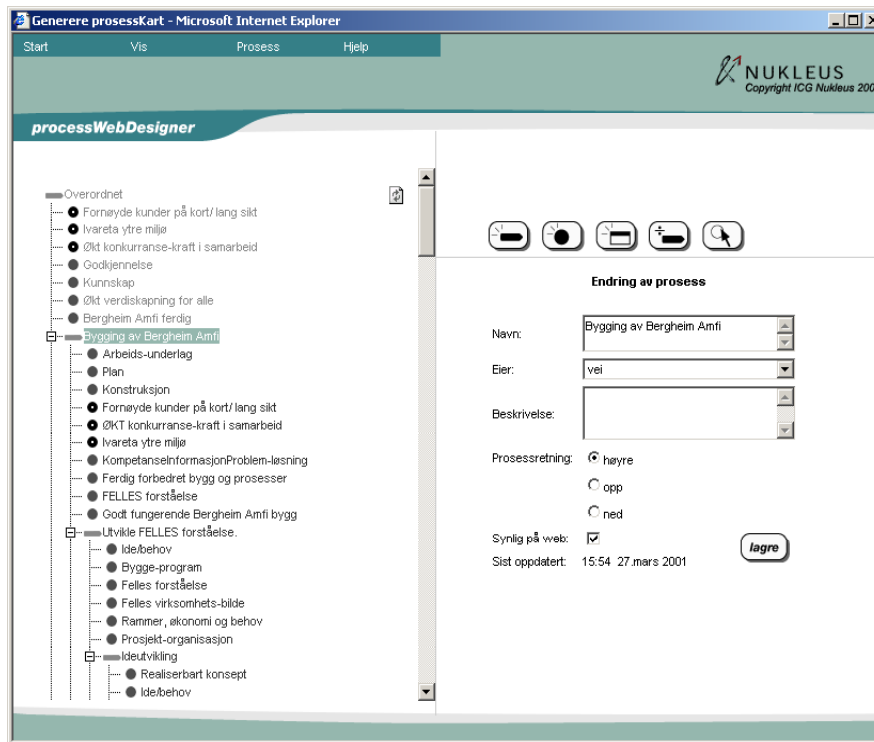


Figure 8-10 The Nukleus ProcessWebDesigner (PWD): the tool that we used for visualizing and designing the Pilot BA-Web on the Internet.

The PWD-tool is a Web application to make process maps with html-links directly available on the Internet. There is no need for moving outside the Web browser from the beginning to a finished product. The outcome is an interactive process map in several dimensions where you in the bottom find tables of activities as in line with the principal thinking showed in Figure 5-2 (see example in Figure 8-11 below) with possibilities for links to special formularies, information databases, quality documents and other relevant remedies.

The PWD was pretty easy to use in itself, and it helped us in an effective way to make the Pilot BA-Web based on the Joint enterprise image consistent and coherent. All maps for each process level should be confined within one presentation slide. The most demanding and also the most important part of the work of designing the Pilot BA-Web, was to define which of the activities of the Bergheim Amfi building project belonged to each of the sub processes of the Joint enterprise image. Consequently, it was quite a huge job and inquiry effort for us two academic researchers to create the activity tables that linked each activity to the necessary tools, that is, information regarding helpful descriptions and also routines and different procedures of the quality system of Veidekke.

navn	hjelpemidler	veiledning	krav
Lage beskjed til en eller flere aktører på prosjektet	Liste over tidligere beskjeder sortert på tema og tid. Lag og send beskjed Liste over tidligere beskjeder sortert på tema og tid	Her lager du og sender beskjed til aktører på prosjektet. Se mer	
Lede, håndtere relevant informasjon og gjennomføre prosjekteringsmøter	All informasjon blir lagret etter følgende kriterier: Saknummer: Overskrift: Beskrivelse: Ansvarlig: Informasjon til: Type: Informasjon/beslutning/oppgave Frist: Status: utført/ikke utført Prioritet: høy/lav Lage referat Se referater	Prosjekteringsmøter ledes av Håkon Storli, Veidekke. Møtene holdes hver fredag fra kl 08:00 på brakeriggen Bergheim Amfi. Prosjekteringsleder må påse at referat er lagt ut senest i løpet av samme dag.	Alle har ansvar for å hente ut siste referat som underlag for neste møte. Utdrag kap x i Kvalitetsplan
Innhente erfaringsgrunnlag fra tidligere prosjekter og oppdrag	Referansedatabasen	Ved erfaring av viktig hendelse skal det gjøres en sjekk mot tilsvarende prosjekter og hendelser	Utdrag kap x i Kvalitetsplan
Lage		Alle i prosjektering	

Figure 8-11 A detail of the sub-sub process 'Professional coordination, communication and decision', a sub process in 'Projecting', showed as tasks in an activity table as it is available on the Internet.

The activity table as showed in Figure 8-11, was part of the sub process 'Projecting' that is showed in the Figure 8-12 below in the main process visualization map based on the Joint enterprise image showed in Figure 8-7 from the Coastal Voyage. The further discussion and debate using the process maps and the Joint enterprise image as communicative and reflective devices continued in each of the three work groups in an informal way in the lengthening of their project meetings.

As when the maps and the activity tables became digitalized and available on the Internet through the PWD, it was possible for the project actors to create improvement proposals directly on the Internet to every sub process of the prototype. Thus, through the Internet each of the process owner groups could follow up each other work more easily, and due to the Internet it became easier for the groups to see duplicated work and dependencies that were created in the joint constructed process maps from the S-gathering. As the Pilot BA-Web with all its different functions was directly available on the Internet the barrier to start using the Pilot BA-Web in regular operative work was almost non-existing. One reason for this – to the contrary of case of the ProsjektHotell, it was not depended on any program

application installed on local computers, and also that most actors were pretty used to the Internet in other settings and how it works. Also, as the user interface and the structure itself were designed on the basis of the joint construction of the original Joint enterprise image at the S-gathering (RA-1), the actors were familiar to the information architecture and consequently they did not need any special pre-training in starting to use the system in full operative work. The point here is that the actors did not experience any typical “implementation process” in the sense that the implementation was fulfilled as a consequence of the joint construction process at the S-gathering.

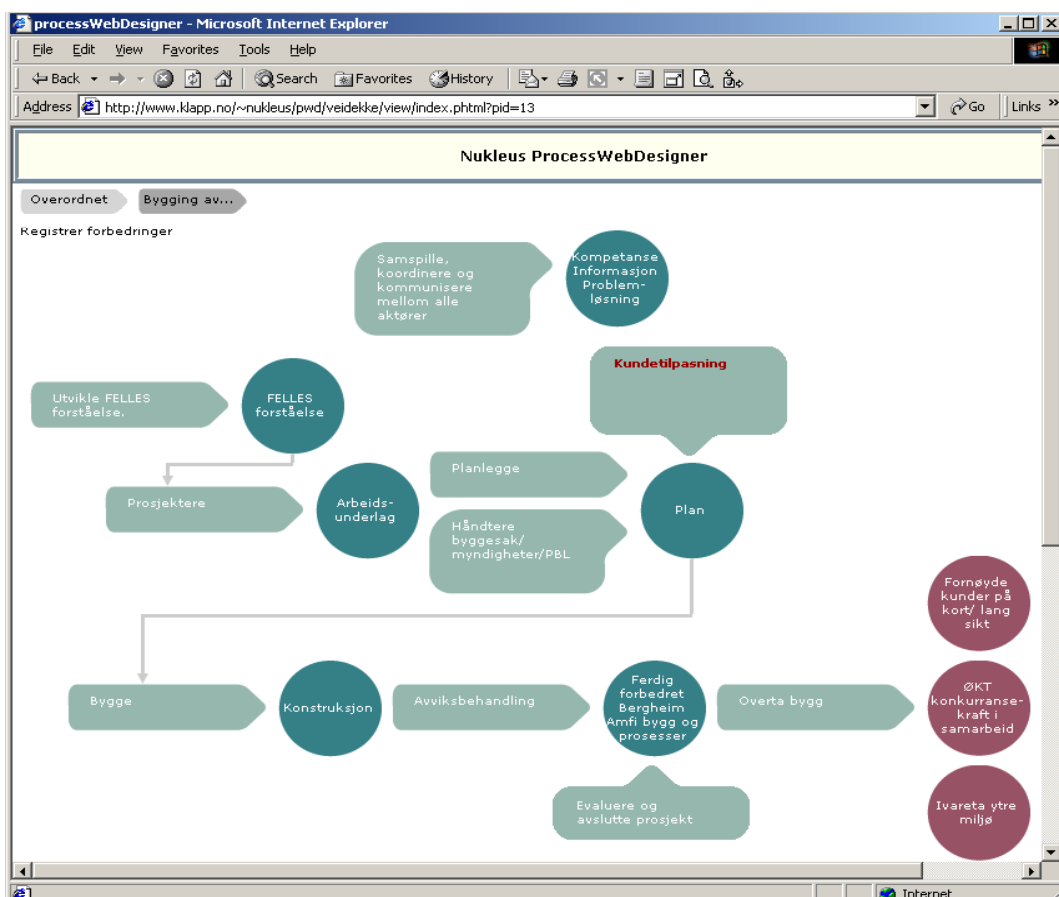


Figure 8-12 The Pilot BA-Web (portal) for Bergheim Amfi showing the project execution process based on the Joint enterprise image from the S-Gathering (see Figure 8-7).

Thus the prototype portal or the Pilot BA-Web as showed in Figure 8-12 was implemented as a result of the co-generative “design-process” at the S-Gathering on the Coastal Voyage. This portal is a process-oriented workspace with an intuitive interface enabling the actors of Bergheim Amfi not only to find the information as needed in their daily collective work. But it also supports the development of a joint and aggregated collective understanding of

the building project as it works as a dynamic common frame of reference (see Chapter 4) supporting collective reflection-in-practice. Hence, this practice emphasizes reflection on design issues based on the Joint enterprise image and its end products as visualized with the red circles (see Figure 8-12) by continuously asking “How to do it?”.

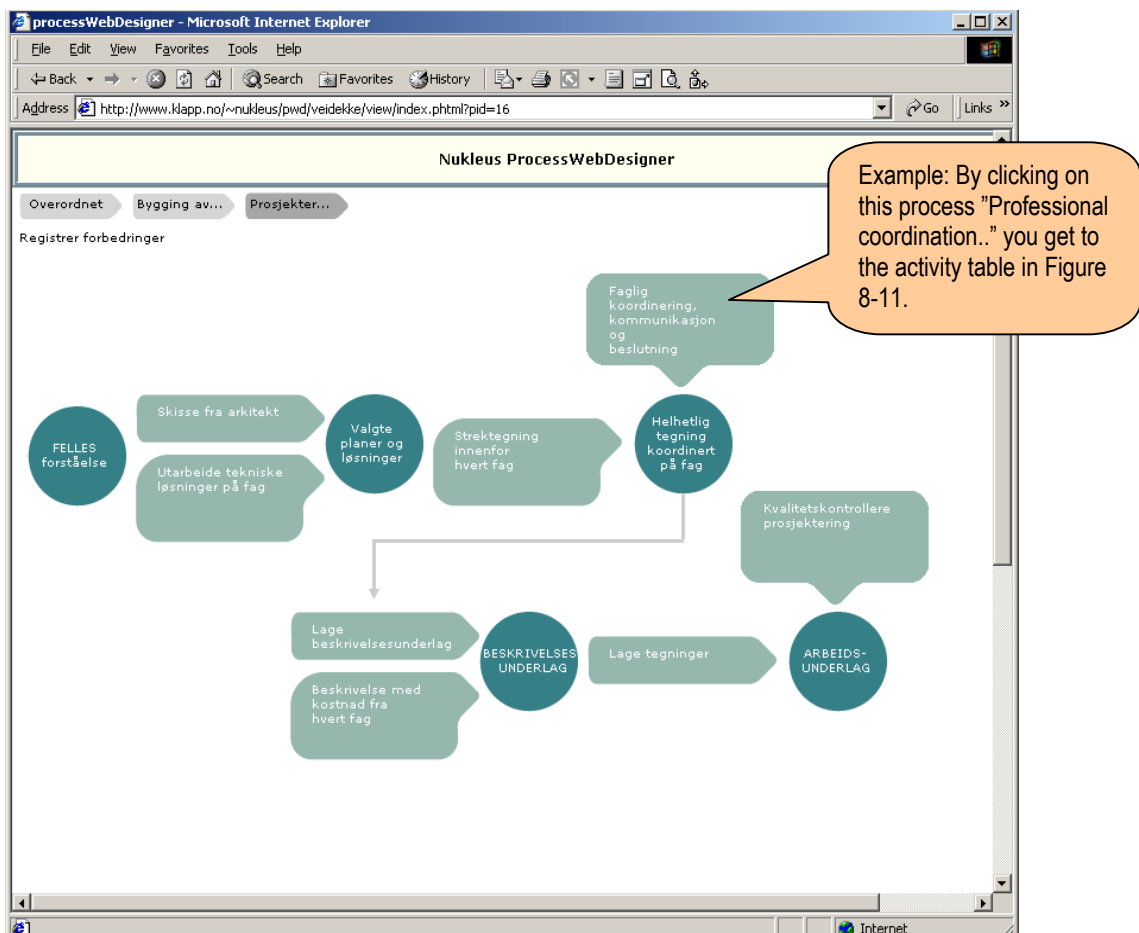


Figure 8-13 Detailed process image of the sub process 'Projecting' (process level 2).

The example of the activity table as showed in Figure 8-11 is a sub process of the “Projecting”-process as showed in Figure 8-13 above. In order to have the process view, or the screen view, as shown in Figure 8-12, as consistent and coherent as possible it was necessary to move a little bit on three processes from the original Joint enterprise image in Figure 8-7 in addition to that we had to add one process and one intermediate product. The sub process added to the “screen-view”-version of the Joint enterprise image in Figure 8-12, was the “Evaluate and finish project” and the product was “Finished improved Bergheim Amfi construction and processes”. These changes from the original Joint enterprise image as showed in Figure 8-7 were based on the suggestions from people in the projecting group at one of their meetings just after the S-Gathering.

This way, the involved actors of Bergheim Amfi turned the enterprise visualizations, or the Joint enterprise image from the Bergheim Amfi S-Gathering into the dynamic Web-version called the Pilot BA-Web, an enterprise portal on the Internet. This Web-based project tool will as a consequence enable and support collective reflection-in-practice through this arena of collective *design* of structures of and thereby continuous reconstruction of the operative collective work practice in the building project Bergheim Amfi.

The co-generated development process including the development of a Pilot BA-Web has come as a result of broad participation among all the actors involved in the S-Gathering as described above. We, the researchers, have done the technical development of the Pilot BA-Web, but most important, the premises of the design and the design of the visualized enterprise image on the Internet (the Pilot BA-Web as showed in Figure 8-12) were done by the actors themselves. Therefore, we have "simulated" a social construction process in which we have avoided the typical "implementation process" as seen in most traditional IT-introduction projects. The participative social construction process of the Joint enterprise image at the S-gathering represented the very implementation process of the Pilot BA-Web.

8.6 Summary

This chapter has provided the third and final stage of the thesis case story embracing the collective inquiry process of the building project Bergheim Amfi. It seems fair to conclude that the inquiry process of the project has taken place as a co-generative learning process in three reflection arenas creating a new useful collective practice among the AEC companies involved in the project. The three learning focuses that have come to play in each arena are the Why-, What- and How-learning as in accordance to the provided model in Chapter 5.

PART THREE:

Toward Creating Participative Innovation

In this third part of the thesis I present an overall discussion for a general conclusion of the thesis. With parts of the discussion already provided in Part One through its presentation of an innovation model in Chapter 5, I will here focus on the overall discussion by including both theory and case. The discussion will be divided into two chapters.

In Chapter 9 the discussion is divided into two sections. First, I will provide a general discussion of participative organizational change and innovation. This discussion is based on a Deweyan pragmatic inquiry perspective with a strong value commitment to participation and empowerment (see Chapter 2) by using the perspective of diversity management as outlined by Flood and Romm (1996) (see Chapter 4 and Chapter 5). Second, I provide a discussion of the case story and the use of the innovation model as a way of thinking about spreading participative processes of organizational change and innovation among companies in the AEC industry.

Eventually, in Chapter 10, I outline the thesis' general conclusion and consequently the key findings of the study.

Chapter 9

Discussion

This chapter provides the thesis' overall discussion in how to think about organizational change and innovation as participative processes. The chapter draws on the Deweyan concept of inquiry discussed in Chapter 2, rejecting the dualism of theory and praxis in which knowledge is grounded in actual praxis facilitating organizational diversity and collective learning processes.

9.1 Creating organizational diversity and participation

Experiences from the thesis case study of the two case building projects show that it is reasonable to say that the AEC industry¹³⁴ has the following two important characteristics. First, there are a large number of separate participants on any one project, each of whom has his/her own characteristics, particularly regarding information retrieval and use. Second, these participants only come together to form a unique, short-lived “team”¹³⁵ which has to learn “from scratch” to use its information in an intelligent and systematic way.

Hence, the case study of the various steps in the processes of building design, manufacture and construction show that these processes are essentially composed of a sequence of decisions, implying that information has to be appropriately available to support making decisions which match the objectives (see discussion in Chapter 3 regarding linear project management perspectives in building projects). This, in itself, hardly seems surprising; since modern well-managed industrial processes are generally based on decisions that are only made on the basis of the best available information. However, in the building sector, this is not generally the case nor, indeed, can it easily be so. This is much due to the way work is actually organized, namely in a project-by-project environment. Information falls then into two categories.

One category of information is specific project-related information and the second is general information. The former grows with the project and is 'lost' in the final end product¹³⁶, whereas the latter, general information constitutes an ever-increasing, publicly available stock of knowledge (access to and immediate use of this stock by the industry practitioners presents difficulties).

¹³⁴ The term 'AEC industry' (Architects, Engineering and Construction) is used broadly here; it is intended to cover all the actors involved in the building project, both professional and commercial enterprises, ranging from architects' and engineers' offices through to sub-contractors and manufacturers; it also includes approvals agencies, trade associations etc

¹³⁵ In management jargon, this team is called a 'temporary multi-organization'; each one is formed by selection from within a 'multi-industry' (the AEC industry).

¹³⁶ This refers to the final or end product of the building project, which includes the physical construction or building.

The experiences from case story have shown that despite the importance of information sharing in the context of the execution of building projects, many of the participants have a ‘casual’ attitude to its exploitation and management. For example, when confronted by a problem in the design process, architects usually give up their search for information before contacting external documentation services or research centers, while engineers may only do so after exhausting internal and informal sources. Searching for information was not seen as a productive activity, even as told by respondents in the case study, for example, that when, in the design and design-development phases of a project, a task has to be redone (with consequent loss of time and, presumably loss of profit too), it is usually because insufficient information led to faulty decisions having been made in the first place, and consequently constructions faults in the building project that has to be redone.

A very striking characteristic of the prevailing collective practice in the AEC industry, as documented by this case story (Part Two), was the steadfast focus on “minimum cost” and the importance of professional specialization leading to a hostile fragmentation of the organization of the building project. That is to say that “minimum cost” paradigm in itself too often was seen as the main aim of the building project in which specialization is the only or at least dominant way for practice. The case study of Rekkevik Brygge in Chapter 7 showed that what was possible to learn in terms of reflecting on doing the right things not only doing things as right as possible, is at best secondary, but usually non-existing in the daily operational work in the project. The practice on the building site was dominated by short deadlines entailing the practice of “come on, hurry up”, and then at best focusing on “doing things right” or How-learning. The efficiency and quality of individual separate tasks increases by specialization, but the potential of collaboration between those tasks decreases because a high degree of specialization reduces the ability to learn in second or third loop level as in line with Flood and Romm (1996) and thereby acquire new skills and consequently new useful collective practice.

Specialization also is an obstacle for coping with rapid changes in the ever-changing business environment and then to act in a proactive way according to Deweyan collective inquiry (see Chapter 5). The principle of inquiry and collective reflection in the Deweyan sense contradicts the practice of profession-based specialization as in the way it is traditionally emphasized in the AEC companies (see Chapter 3).

In contrast to the strong conservative-minded and profession-based tradition of the AEC industry, the case story has shown that the collective practice in the two building projects has undergone a process of organizational change with regard to collaboration, learning and visualization. This change process was in the first stage, as described in the RB-project (Chapter 7) and the Pilot RB-Web, basically related to a new practice of information sharing. Redundancy of information and knowledge and consequently increased degree of participation were thus made possible or enabled through that kind of Web supported information sharing.

Redundancy in terms of information sharing is hence important for enabling frequent dialogue and processes of collective reflection. A shared practice of information sharing helps to create the needed common frames of reference among all actors involved in the building project. Thus, this helps to facilitate the explication of tacit knowledge or exchange of knowledge between design and production in building projects¹³⁷. This I will come back to later in the discussion.

9.1.1 Understanding the collective practice in AEC companies as a continuous process of Deweyan inquiry

The experiences of the SiB R&D program (as described in brief in Chapter 3) in addition to own case study experiences (see PART TWO) showed that the building actors are distinguished to produce knowledge intensive services, not only single mass products. The response from people interviewed was pointing to a possible shared or joint understanding that could unite all the different participants with their different roles and contributions, including the building site shop floor worker, equipment contractor to project management, as in accordance to roles as signed in the project contract. One alternative is to view the building project as a “knowledge-intensive service” in which the produced building is seen as arrangement for optimal support for the end customer’s enterprise that is supposed to use the finished constructed facility from the building project. The aim is then to let all the

¹³⁷ Husemoen (1997) distinguishes between design and production as two communities-of-practice. By design I mean the projecting group involving basically the work processes of the architect and the consulting engineers that represent one community-of-practice, while production refers to the collective work practice on the building site mainly executed by the joiners and concrete workers represent a second community-of-practice.

actors reach a joint understanding of what is supposed to be the service referred to as a common frame of reference. This means that the end customer of the building project works or gets the role as a facilitator for the collaboration between all the actors involved in the building project.

In that connection the case study showed that information technology (IT) or Web technology in the case of the BA building project in Chapter 8 is a key enabler or tool for visualizing the common frame of reference for continuous reflection-in-practice during the operative execution of the building project. This constitutes a basis for in the next turn integrating and facilitating work processes across organizational borders of the AEC companies involved in the project.

The case study, both the RB and the BA case project, showed that the total behavior and operative collective work practice in the AEC companies involved was strongly conditioned by the routines of communication and the ability to interpret the information of the drawings effectively in the actual problem solving situation on the building site (see Chapter 7). This was especially observed to be the case in the relation between the ganger and the daily site foreman and also between the building site management and architects or engineering consultants outside the building site. As one of the shop floor workers on the building site said:

“Communication between daily building site management, property developer and architect is very critical for the effectiveness of the production on the building site. Especially in the case of the architect that always seems to be in arrears in relation to solving and to understand what we perceive as the real practical problems on the building site. When the drawings do not seem to apply to what we the shop floor workers perceive as reasonable solutions, then it too often takes too much time before revised drawings from the architect are available.”

The effort of meeting this perceived problem with communicating and understanding the information provided by the architect drawings relate to the need of achieving a collective understanding of the project's end product and consequently the collective practice. The case study has showed that broad participation through collective reflection on and in practice in addition to visualizing a common frame of reference are necessary conditions to spread organizational change and innovation in AEC companies in creating new useful collective practice. Consequently, it was showed that one way to accommodate these

conditions is by participative visualization of the organizational work processes of the total building project in a holistic system perspective¹³⁸ supported by Web-based enterprise visualization as discussed in Chapter 4. The central point here is the participative development of the common frame of reference as a Joint enterprise image as showed in Chapter 6 through a Model conference (Emery and Purser 1996, Gjersvik 2000). In the next section of this discussion chapter I will discuss more about constructing and using common enterprise visualizations as a method for creating a common frame of reference for the participants involved in the building project.

The case story showed the organization of the Pilot MC in Trondheim, April 1998 (see Chapter 6), aimed at creating a common and co-generated Joint enterprise image of a “general” building project as a whole. The idea of enterprise visualization then is that this Joint enterprise image has to be used to develop and visualize a common frame of reference and thereby letting the image work as an active reflection object and as an information architecture for retrieving the needed project-specific information in each work process, and not only the general building information. The shared enterprise image is then visualized as a “living” model in a Web-based project tool. The aim of that common and co-constructed model is thus to create a common and collective understanding in order to act in concert on the basis of a shared understanding. One crucial point in that connection is the primacy of the whole or the collective knowledge as in line with my discussion of Deweyan inquiry in Chapter 2 as a guiding idea for developing together the collective practice in building projects.

Thus, the purpose of visualizing the work processes and its relationships of the building project in a total system perspective, like in a Joint enterprise image, is to develop joint collective understanding of what is perceived as an increasing dynamic complexity of organizational processes, relations and interrelations (Christiansen 1994, Levitt and Kunz 1998). In that way enterprise models, or the Web-based enterprise image as described in Chapter 5 (Figure 5-2), may be used as an *arena* to act, communicate and to reflect both *on* and *in* these total organizational work processes (Schön 1983). This is parallel to the five knowledge conditions of Nonaka and Takeuchi (1995) discussed in Chapter 2. This development and use of Web-based enterprise image as a common reflection arena enable

¹³⁸ The *holistic* system perspective builds on the pragmatic AR approach as outlined by Greenwood and Levin (1998), p. 70. See Chapter 2.

the externalization or conversion of tacit knowledge into explicit knowledge creating the Nonakian “knowledge creation spiral” throughout the execution of the building project¹³⁹.

I argue, then, following the pragmatic argument of Deweyan inquiry as discussed and concluded in Chapter 2 that the Web becomes a necessary tool in constituting a possibility for spreading change and innovation and thereby creating new useful collective practice in building projects. A Web-based enterprise image constructed and used in RA-1 and RA-2 as showed in Chapter 8 represents a shared image of the building project as a whole. Thus, the Web represents an important *arena* for enabling real *collective* learning and reflection *continuously* throughout the operative execution of the building project across and beyond the organizational borders of the participating AEC companies. This means that development and the use of Web-based project tools becomes an integrated part of the every-day collective practice, and not as a practice in addition to the “real” work processes of the building project.

The necessary condition for this is thus showed to be the common frame of reference created as a Joint enterprise image supported by the Web. Hence, the Web-based enterprise image makes it possible to visualize in a dynamic way a shared collective understanding of all the important work processes, roles and dynamic dependencies between roles and organizational specific activities in a total and holistic perspective. This means enabling all the involved actors in the project – from the gang foreman on the building site to the consulting engineers and architects – to easily see and understand the relation between ones own contribution, role and the building project as a whole.

Thus, the operative use of the Web-based enterprise image, as emphasized in Chapter 5, aims at creating that necessary collective understanding through collective reflection in and on that visualized common frame of reference. A participative process among all involved actors, companies as well as individuals, presupposes as discussed in Chapter 4 the condition of the visualization of a common frame of reference.

My experiences from the case study entail, then, a particular focus on the interplay and the conversion between the design process (work processes related to the programming,

¹³⁹ The argument of Nonaka and Takeuchi (1995) on organizational change and innovation is reviewed and criticized in Chapter 2. I relate to the Nonakian argument in order to shed light on the present discussion.

architectural and engineering activities) and the production process (work processes related to the physical construction on the building site). This means integrating total work processes in and between the design and the production process aiming at collective understanding for useful collective practice in operative execution of the building project as a whole. According to the empirical findings from the Rekkevik Brygge-project in Chapter 7, much of the problem regarding collaboration and development in building projects seems to be that there is too little mutual transfer and spread of knowledge and experience between those two communities-of-practice (Brown and Duguid 1991, Husemoen 1997). That is, between the architects and engineers with their theoretical oriented knowledge (explicit, that is, encoded and embrained (Blackler 1995)) on the one hand, the *design* community-of-practice, and the building site workers with their more practical oriented knowledge (tacit, embodied) on the other, the *production* community-of-practice. The lacking interplay between the two sides have entailed many misunderstandings on both sides, e.g. construction faults due to incorrect drawings, and problems for the construction workers to interpret the drawings and find the best practical solutions for constructing. More interactions and interplay between those two knowledge milieus or communities-of-practice are important. In that connection the argument of Levin (1997) and Ehn (1992) – regarding the need for broad participation, claim that it seems very relevant to introduce larger extent of job rotation between the shop floor workers on the building site. For instance one effort may be to introduce more systematic rotation between the joiner workers and the concrete workers. In following the argument of Levin (1997), the involved actors like the project manager and the shop floor workers would have benefited from developing larger extent of responsibility, identity and shared understanding regarding the building project as a whole. In that connection it would be very relevant to involve building workers and their practical competence together with the architects and engineers early in the planning process of the building project. And also the opposite way, to arrange for involving architects and engineers more in the processes of the building site. These efforts were taken into account by the modeling process of the S-gathering (RA-1, Chapter 8) of Bergheim Amfi. That is, the RA-1 of BA described in Chapter 8 showed to lay the very foundation for and took into account the necessary interplay between the design and production communities-of-practice.

Consequently, the RA-1, RA-2 and RA-3 of BA in Chapter 8 describes the necessary arenas for dialogue between those two communities-of-practice during the actual project

execution or collective practice of the building project as a whole. This was then supported by the Web-based enterprise image (the Pilot BA-Web) as a way of integrating total knowledge and work processes in and between design and production. This participatory effort of developing and using a common frame of reference as a Web-based enterprise image constituted the requirements with regard to job rotation and the demand for more holistic and shared understanding of collective practice. Thus the collective practice that was co-generated on the Bergheim Amfi functioned very much in accordance to the collective reflective practice as emphasized in Figure 5-1 in Chapter 5. This discussion I will come back to later in Section 9.2.

The *production* community-of-practice had emphasis on tacit knowledge (embodied and embedded)¹⁴⁰, like skills of practical use of building equipments, admission and maintenance of the building being constructed. The architects and engineers in the *design* community-of-practice on the other hand were more concerned about the more explicit knowledge (embrained and encoded) concerning cost, time, acreage, weight and so on, which all of it also had to be documented in reports. The case study showed from interviews and observations, both from the RB and the BA projects described in the Chapter 7 and 8, that especially the architects had far too little experience with practical solutions regarding production and too much emphasis on theoretical understanding or embrained knowledge. On the other hand, the shop floor workers on the building site had too little experience with and knowledge about organization and the planning process of the building project. Hence, the effort to connect these two communities-of-practice creating a shared understanding or what Blackler (1995) called *encultured knowledge* is thus a necessary condition for rethinking the meaning of changing the collective practice in the building project as a whole. In following the argument of Deweyan inquiry, this has to do with the importance of practicing collective reflection through arranging for processes of continuous inquiry for learning how to do things right (How-learning), doing the right things (What-learning) and reflecting on power-knowledge dynamics (Why-learning).

Thus by integrating the reflection processes of design and the reflection processes of production in accordance to the three arenas of the innovation model provided in Chapter 5, there is huge potential for spreading organizational change and innovation in the AEC

¹⁴⁰ Blackler (1995)

companies involved in the building project. That is, there is a potential for spreading collective reflective practice creating new useful collective practice in projects. Brown and Duguid (1991) looks at how abstract knowledge as in the case of design are given more emphasis than the practical knowledge of production in understanding learning between or learning in the conflict between different communities-of-practice. This echoes the argument of pragmatic AR (see Chapter 2) regarding the need for diversity and consequently broad participation in order to achieve learning and consequently collective learning in actual practice for real organizational change.

Brown and Duguid (1991) emphasize the collective aspect of learning as in line with Dewey's argument of inquiry discussed in Chapter 2. Learning is intrinsically connected to the collective reflection process on and in actual practice in a community of practice. Creation of new collective knowledge for how to act together changing collective practice is primarily socially constructed and shared, and thereby learning is intrinsically connected to the practice in being a part of communities-of-practice by learning its language and frames of understanding. This practice is not mainly explicit knowledge, but primarily the kind of tacit embodied and embedded knowledge on how to work inside these communities-of-practice. This argument on facilitating the learning regarding the dynamic of the politics between different communities-of-practice is in concert with Greenwood and Levin (1998)'s emphasis on the necessity of dialogues in facilitating diversity and democracy for creating real change. That is, learning as a continuous process of Deweyan collective inquiry for keeping the conversation going, not towards something "new". The creation and spreading of new knowledge for new useful collective practice are conditioned by facilitating and appreciating diversity of the existing viewpoints and experiences across different communities-of-practice. This entails to put the political dimension of organizations as a real starting point for change through the reflection arena emphasizing a Why-learning focus as discussed in Chapter 5.

Creating new collective knowledge for new useful collective practice conditions arenas for dialogue and collective reflection between the different communities-of-practice by arranging for informal meeting places between production and design. As stated above, the role of the Web is to support reflection and communication in such arenas enhancing reflection across organizational work processes and professional dividing lines. Conducting building projects according to these participative principles is pretty far from the existing

practice of the AEC sector as indicated in Chapter 3. But one possible way is to evaluate possible candidates for project collaboration in building projects not only on the basis of price, but also primarily in relation to competence being involved in the actual project.

9.1.2 Three arenas for collective reflection

In the previous section I emphasized the necessity to learn through collective reflection on total work processes of the building project in a holistic system perspective for creating a common frame of reference. That is, the point is to arrange arenas of dialogue for a process of Deweyan inquiry both facilitating organizational diversity and aiming at a shared image or common understanding of daily collective work practice. The central point in this is to organize *arenas*¹⁴¹ of dialogue for communicative action in which the most important is the collective inquiry (see Chapter 2) that takes place in the interaction between the different communities-of-practice of the actual building project.

Thus an important condition for the collective learning process as Deweyan inquiry in building projects is the interaction between the two communities-of-practice called design and production. That is, there is an emphasis on arranging *arenas* of dialogue in and between the two different communities-of-practice entailing collective reflections on the work processes of the building project as a whole for continuous inquiry into how to operate together. In the following I discuss the three principal arenas of reflection viewed as necessary in creating a collective reflective practice in which each arena has its specific learning focus (see Chapter 5).

First, the reflection process on actual collective practice, as emphasized in our discussion of pragmatic AR in Chapter 2, is primarily about What-learning, or, “Are we doing the right things?”, or to put it in line with Flood and Romm (1996), *debate* issues are at the center of this reflection arena. Thus, the quality of the processes of debate is at stake, as discussing in a participatory way the actual collective practice of the building project as in line with the workability principle of Greenwood and Levin (1998). The learning model of Argyris and Schön (1996) (single and double-loop learning) and Senge (1990)’ five dimensions, to a

¹⁴¹ My concept of *arena* parallels the notion “the enabling context” as outlined by von Krogh, Ichijo and Nonaka (2000)

large extent follows the argument of Flood and Romm's debate management. Nevertheless, as far as concerning our discussion of Argyris and Schön (1996)'s model in Chapter 2, there is still the interventionist that "knows" that the participants will debate sooner or later towards what the outsiders know is the only "existing and right" consensus of common terms. This is the hidden positivist argument of Argyris and Schön that I in a thorough way in Chapter 2 have opposed by building on the Deweyan argument of collective inquiry.

I oppose the argument of Argyris & Schön (1996) because they disregard the reflection concerning questions about How-learning (design) and Why-learning (might/right). According to Flood and Romm (1996) the practice of debate management has a focus on facilitating work processes and collective reflection in actual collective work practice where the aim is to "forget" about the established truths of so-called "best practice". Arranging for arenas of collective reflection – referring to an *enabling* context (von Krogh, Ichijo and Nonaka 2000) – through broad participation as in line with the pragmatic knowledge argument of Dewey (see Chapter 2) is what Flood and Romm view as *debate management*. Also the argument of Brown and Duguid (1991) does not take into account the design and might-right learning loops in their iron grip on the reflection issues related to debate-management only.

Second, Flood and Romm (1996)'s How-learning arena or design management is learning about doing things the right way, and which fundamentally goes in concert with Schön (1983)'s concept of *reflection-in-action*. As Flood and Romm puts it How-learning is about learning to address processes of designing collective practice and consequently design of organizational structure. Thus, the point is to learn through using the common frame of reference for reflecting in actual practice about how to do things during operative project execution. The use of Web-based enterprise models in process modeling like in BPR and TQM (see Chapter 2), turns out as an example of design management. The approach of actor-network theory (ANT) and Latour (1987) discussed in Chapter 2 is clearly consistent with the argument of design management because the only matter of concern in ANT is to learn how to transform and how to enroll others. Thus, the How-learning loop is also consistent with the perspective of Nelson and Winter (1985) (see Chapter 2).

Despite my critique of Nonaka and Takeuchi (1995)'s model of "knowledge creation" in Chapter 2, the promising point in their model, however, is that they provide a thorough

argument of the importance of the tacit dimension by providing five central conditions for the purpose of creating an “enabling context” or arena for design management (von Krogh, Ichijo and Nonaka 2000). The Nonakian emphasis on tacit knowledge is consistent to Flood and Romm’s concept of design management or How-learning focus in reflecting in practice. This entails having a discourse on activities, products, roles and the relationships between them in designing the very structure of the actual collective work practice of the building project. I therefore argue for the importance of Nonaka and Takeuchi’s argument of autonomy or seeing wholes for acting in a “proactive way” (Nonaka and Takeuchi 1995).

On the other hand, the very weak point of the argument of Nonaka and Takeuchi (1995), as emphasized in my discussion in Chapter 2, is that they have a striking harmony perspective on learning and knowledge, mostly inherited from American management-tradition¹⁴², having left out or rejected the meaning of power in the actual processes of organizational change and innovation. There is no emphasis on reflection addressing the quality premises of the knowledge being “created” through the “implementation” of the model. And to mention that yet again, therefore I used Chapter 2 to explore into the “detour” of the pragmatic epistemology of Dewey (1938) in order to find a knowledge concept constituting a sufficient basis for understanding the conditions necessary for creating organizational change, and which fully takes into account the meaning of power and broad participation.

Third, the Why-management arena or might-right management is just what according to Flood and Romm (1996) reflects concern with the power-knowledge dynamics of the actual collective practice. This is the issue of concern in pragmatic AR discussed in Chapter 2 addressing conditions of broad participation in order to cope with power and thereby to ask for the premises of the framework of participation and premises of the quality of knowledge consistent with the Levinian premise of workability (Greenwood and Levin 1998). That is to reflect on what is considered right is controlled by who has the power to set the premises in the project, and thereby to question structures and relationships as forms of dominance. In my pragmatic knowledge conception of inquiry as inspired from Dewey and Greenwood & Levin, I stated the intrinsic link between fact and value, and hence, between knowledge and action. In that regard the Why-learning arena often turns out to be the most difficult

¹⁴² This harmony perspective on knowledge is still present in his newest co-authored book by von Krogh, Ichijo and Nonaka (2000). This book ventures further from Nonaka and Takeuchi (1995) focusing more on the enabling potential of organizational “knowledge creation” in practice.

one, due to the emphasis on learning about values and appreciation of diversity of viewpoints. This minimum presence of diversity is an important condition for continuous development and learning, as emphasized in the argument of co-generative learning and principle of pragmatic knowledge creation as emphasized in our review of pragmatic AR in Chapter 2.

Consequently, the type of learning that constitutes a fruitful basis for organizational change and innovation is according to Flood and Romm (1996) called *diversity management*. The reflective practice of diversity management or triple loop learning seeks to emphasize the meaning of all the three arenas of learning, or focuses of development, and the meaning of the *diversity* between them. It does this by bringing into consideration all the three questions at any one time as a basis for deciding what actions to take. The point is to loop between the three questions or reflection arenas helping to maintain a collective reflective practice as a discourse in each of the three reflection arenas. Diversity management tries, then, to manage the diversity of the arenas of learning that in turn enhances the joint organizational capability of collective reflection towards joint responsible choice making. Hence, triple loop learning links into a triple loop the three arenas of learning and the consciousness of triple loop learners becomes more than the sum of its parts. As Flood and Romm (1996) point out:

“Triple loop learning wants to establish tolerance between all three centers of learning and preserve the diversity therein. It does this by bringing together the three questions from the three loops into one overall awareness.”¹⁴³

In an effort to develop the requirements of Flood and Romm’s diversity management model, I was involved in a co-generative process at the Trondheim Pilot Modeling conference (MC), April 1998 (see Chapter 6) where relevant actors from all parts of the AEC industry participated. Just to recap, the Pilot MC was based on a collective and communicative face-to-face interaction for participatory construction of a Joint enterprise image. The aim was to co-generate a common frame of reference or a shared understanding of the most important work processes in building projects in general. The advantages of the Pilot MC turned out to be that it enabled the participants to visualize a co-generated common frame of reference through a discourse-based practice of collective reflection

¹⁴³ Flood and Romm (1996), p. 228-9.

entailing a common and shared understanding (encultured knowledge) among the participants. The face-to-face interaction process took place over two days and it was performed as an alternation between group work and plenum work in one single room. It was emphasized that the participants themselves were jointly responsible for the content of the process and we, the professional staff or the outsiders, were of course responsible for the method and the organization of the conference. The method had emphasis on being simple in order for the participants to focus on the content and not the method itself. The product from this effort was a Joint enterprise image with name on the main work processes and its products. A fundamental condition for the conference to develop further continuous learning and development, was the participatory aspect in letting all involved participants have a chance to experience participation in a social process and as a consequence develop ownership to the co-generated common frame of reference represented as a Joint enterprise image (see Chapter 6 for a detailed description of the process).

The basic argument is that this Pilot Trondheim MC, which ended up in a general and generic Joint enterprise image of a “general” building project as showed in Figure 6-2, demonstrated how to address a main emphasis on the Why-learning focus or might/right-management as outlined by Flood and Romm (1996). Nevertheless, the Pilot MC also provided learning with regard to the other two reflection arenas as the social construction process of the Joint enterprise image included reflection with regard to both debate and design issues of actual collective work practice. I argue, then, that such a collective face-to-face interaction is a way of facilitating all the three reflection arenas with a special emphasis on the Why-learning focus as a social constructivist process underpinning the process of Deweyan inquiry. But the conference in itself, though, is only one event in a continuous organizational change process (Gjersvik 2000). The result of such a triple loop learning process is new collective knowledge with regard to an intrinsically shared and common understanding of operative and collaborative work practice in building projects.

The next step according to the goal of the EM-project as stated in Figure 6-1 (see Chapter 6), in achieving an organizational change and innovation process integral to the actual building project, is to use the end product from the Modeling conference, the Joint enterprise image, in a Web-based project tool (Enterprise portal) supporting the work processes and its associated practice of information sharing. Thus, the assumption was that the use of such a Web-based project tool based on the Joint enterprise image from the MC

entails new useful collective practice integrating the operative work processes both in design and in production (see assumption in Chapter 5, Figure 5-6). The Web structure based on the Joint enterprise image operates then as a possible arena for collective reflection-in-practice creating an artifactual common frame of reference functioning as a communicative and reflective device. The overall assumption, then, was that this generic Joint enterprise image could be used and adjusted to the actual building project through a Modeling conference – as demonstrated at the Pilot Trondheim conference, as a start-up gathering for building projects in general in the Norwegian AEC industry.

At that moment, after the Pilot MC in April 1998, the understanding both among the participants and the outsiders was that the Pilot conference is a powerful and promising method in facilitating the three reflection arenas necessary for organizational change and innovation to emerge among the networking AEC companies involved in the building project. But still the experience was that the Pilot MC was only an experiment not linked to any real building projects entailing no change with regard to operative collective practice. In order for the gained knowledge about participative process modeling to have any meaning for action and practice in projects, it was decisive to find a pilot building project willing to be the first in trying out a model for change and collaboration. But as described in the thesis case story (see Chapter 6 and Chapter 7) the effort of finding that building project was going to be very time-consuming indeed. The experiences gained through the development and use of the Pilot RB-Web, the Rekkevik Brygge building project and the ProsjektHotell Web tool, was for Veidekke an important and necessary learning process in coming to terms with how organizational change and innovation can be spread among AEC companies participating in building projects.

The employment of ProsjektHotell in Veidekke's building projects after the Pilot RB-Web (see Chapter 7) was in a limited but important sense a partial success. Veidekke as a property developer gained useful experiences regarding information sharing and basic use of IT among networking actors involved in the building projects that used ProsjektHotell. But the problem as described in Chapter 7 was that the operative use of ProsjektHotell in those building projects provided minimal support for collective learning (e.g. experience transfer). Also, it provided no support regarding facilitating a shared understanding or common frame of reference (Blackler 1995). That is, the use of ProsjektHotell was not an integral part of operative collective practice in projects to the extent of supporting any

processes of learning and spreading of a common frame of reference for reflection. As showed in the case description of Rekkevik Brygge in Chapter 7, the strength of the inscribed patterns of use with regard to the ProsjektHotell as an actor-network (Monteiro 2000) had not accumulated the degree of robust strength sufficient for any irreversibility. Most of the actors involved in Bergheim Amfi perceived the ProsjektHotell still as a tool for “additional work”, and not integral to collective work practice for any “real productive work”. The common perception was rather that ProsjektHotell mostly was a tool for “storing things” only, and also there was a common routine to have a local paper copy of the documents in addition to the one stored on the actual Web server. But the use of ProsjektHotell provided the participating building actors valuable experiences in itself regarding the employment of IT for supporting a practice of collaboration and information sharing in projects. It was a common understanding that there was a need for IT tools more adjusted in meeting the real needs to the actual building project, and that ProsjektHotell could not meet those demands properly. As stated by the Veidekke project management staff in Bergheim Amfi:

“A useful Web-based project tool is necessary for effective management and collaboration in building projects today. There is a continuous increasing demand to coordination and communication in the operative execution of projects. [...] There is an increasing need for good tools supporting the way we collaborate together on projects, not only the routine administrative works. [...] ProsjektHotell doesn't provide any support for progress reporting. Also deviation handling is very unsatisfactory supported today and there is no support for the actual coordination needs between projecting and production (design and production). The consequence today is too many deviations in the projecting process. Here I see a basic need for a Web tool supporting the actual coordination in a much better way.”

At the summer of 2001 – after nearly two years of operative experience with ProsjektHotell in addition to the one-year experience with the Pilot RB-Web (see Chapter 7) and midway in the Bergheim Amfi project, Veidekke, as a property developer, could conclude that ProsjektHotell was not the optimal solution in supporting collaboration and communication between the actors involved in a building project. But in lack of any better options, it was the only IT-based alternative commercially available at that time, and for Veidekke the common perception was from the beginning of 1999 that “*ProsjektHotell is in a way better than nothing*”. ProsjektHotell was at that moment a temporary solution to support primarily the project management, which was possessed by people from Veidekke, in their basic

handling of information and administrative routines in building projects. During fall of 2001 Veidekke actually decided to leave out any further use of ProsjektHotell on new or future building projects due to those experienced weaknesses as indicated in Chapter 7. As this was a strategic decision made by Veidekke as a leading actor in the Norwegian AEC industry, I will not dwell into the specific company based reasons Veidekke had for this action. But viewing it in the light of an actor-network perspective (see discussion of ANT in Chapter 2), the inscribed patterns of use into ProsjektHotell were not that strong (Monteiro 2000). That is, ProsjektHotell was not going to constitute an irreversible aligned actor-network. Nevertheless, the widespread spreading of the Internet has entailed Web-based project supporting tools in reaching a pretty robust level of irreversibility in general. Thus for most modern project-based enterprises the Web has become the primary tool supporting not only information sharing, but also knowledge sharing (experience transfer) both within companies and across organizational company borders supporting the development of encultured knowledge (Blackler 1995, Krogh, Ichijo and Nonaka 2000).

9.2 Using the innovation model in spreading organizational change and innovation among AEC companies

The Bergheim Amfi case in Chapter 8 describes the process of the development and the use of the innovation model as outlined in Chapter 5 (see Figure 5-4). The crucial element in this co-generated development process between the insiders and the outsiders¹⁴⁴ is the construction and use of a common frame of reference created as a Joint enterprise image in three different reflection arenas. During the actual use of the model it turned out that the three arenas (RA-1, RA-2 and RA-3) each represented one specific focus of collective learning as a process of Deweyan inquiry. First, in the Startup-gathering (RA-1) there was a specific emphasis on the *Might/right-focus* of development, or the For-whom or Why-learning loop. Second, the Reflections- and evaluation gatherings (RA-2) provided emphasis on the *debate-focus* of development or the What-learning loop. Third, while the third arena, development and use of Web-based project tools (RA-3), provided the emphasis on the *design-focus* of development or the How-learning loop. Thus the result was that the three reflection arenas with each different subsequent learning focus addressed

¹⁴⁴ A research colleague and I represented the outsiders from Dragvoll Gård, where we represented a professional research team as outsiders (see discussion of research process in Appendix 1).

all the three learning centers creating what Flood & Romm (1996) call is a triple-loop learning process in constituting the collective reflective practice of diversity management as discussed above.

The development and the use of the common frame of reference as a Joint enterprise image in those three reflection arenas in accordance with the outlined innovation model is what kept the process of triple loop learning alive during the operative execution of the Bergheim Amfi building project. That is, the triple loop learning process implied a form of Deweyan collective inquiry based on the outlined principles of collective reflective practice discussed in Chapter 5. This collective inquiry called for good processes of learning by preparing in a participatory way for the development and use of a joint constructed enterprise images of actual collective practice in the BA building project. That is, the enterprise image-based inquiry process called for keeping the collective reflection process alive throughout the building project as a whole. This actual reflective practice entailed for using the Joint enterprise image from the S-gathering in designing an information infrastructure, a Web-based enterprise portal providing active work process support as integrated in daily collective work practice. This way, all relevant information related to total work processes of the actual building project was organized and linked up to the right visualized work process in the Pilot BA-Web (see Chapter 8).

The social aspect in the construction process of the Joint enterprise image, or the aspect of people having the experience of coming together with other people to learn and develop together as showed in RA-1, RA-2 and RA-3 in Chapter 8, is more important than what the actors actually reflected on or the actual Joint enterprise image in itself. Theoretically, this is based on the assumption that people have a basic need of developing their own identity empowering themselves through the process of Deweyan inquiry. This Deweyan inquiry is consistent with the argument of Habermas (1996) in his theory of communicative rationality and his discourse principle (see Chapter 2). The Bergheim Amfi case in Chapter 8 showed that the innovation model outlined in Chapter 5 takes into account all the three learning focuses for actually creating collective reflective practice as emphasized by Flood and Romm (1996) in the actual collective practice of the project. All participating actors in Bergheim Amfi emphasized the importance of using the model as a standard tool in AEC building projects:

[Project management (PM):] *“By using the innovation model as a way of supporting execution of projects the primacy of the whole gets into focus and to my experience things have went easier, I don’t have to perform so much control any more, if you see what I mean. More people have started to take more responsibility or what I will call a joint responsibility for the building process and the end products as visualized in the Joint enterprise image”.*¹⁴⁵

The project management (PM) of BA turned out to be very harmonized in the view that the use of the model described in Chapter 5 and use of the Joint enterprise image (see Figure 8-7) had contributed to remove traditional barriers and create increased fellow feeling among participating actors. It was also emphasized that the social processes that took place in the three arenas had functioned pretty much as constructive “team-building” gatherings for the project as a whole. The effect of this was emphasized to be improved “customer adaptation” due to shared understanding, improved collaboration between actors in design and production. Consequently, it was emphasized by the project management of BA that the use of the Joint enterprise image in those three arenas effectively supported the process that is needed in order to stay in continuous development during operative project execution:

[PM]: *“The use of the Joint enterprise image has contributed to that actors have been involved earlier in problem-solving at stake and that the relations as a consequence have been a lot easier to establish. This has contributed to increased competitiveness and thus a possibility to develop both competence and relations between the involved actors in the project.”*

All the people in PM of Bergheim Amfi pointed out that the actual social processes taking place in the three reflection arenas in the model have contributed to create increased joint ownership and responsibility to the building project as a whole. Several of the participating actors made the comment that earlier experience has been that it very often feel very difficult to achieve an ownership to your own work in projects. All participating actors in BA made also the outspoken comment that the consciousness about own role as a small part of a complex whole had increased as a direct consequence of the participation in the three reflection arenas (RA-1, RA-2 and RA-3):

“A direct consequence of participation in the three reflection arenas has been that you get together with all the other actors and get to know each other through tasks that have to be solved in joint

¹⁴⁵ The Joint enterprise image in the context of Bergheim Amfi refers to the image as showed in Figure 8-7 in Chapter 8.

fellowship. Especially the interdisciplinary work is positive, where the reflection gatherings of the three arenas is a good occasion to get to know each others needs and preconditions in the work that has to be done. Actually I experience as a consequence that it is easier to take contact with the other actors. I experience that there are good discussions on those different arenas as provided by the model, and that nobody is reluctant to contribute to solutions, there is room for most ideas and proposals to discuss. And every proposal are actually taken serious and discussed. I also feel that my own confidence has increased as a result of the participation in the three reflection arenas.”

One of the more experienced operative building site managers, who also worked as a gang foreman, emphasized the importance of co-creating a shared understanding of the whole of the project as a direct result of participation in the model’s three reflection arenas:

“For my self the participation in the three reflection arenas have had an important contribution, where it is first and foremost the whole in the building project that the use and the development of the Joint enterprise image has helped me to understand. The focus on the whole has obviously contributed to that I see with new eyes on the project as a whole. The evidence for this is that I have experienced that things go more smoothly both here on the building site and between the actors. [...]Today there are many processes that go on in parallel, like here on the site of Bergheim Amfi. The processes of programming, projecting (design) and production take place to an increasing extent in parallel, and just this “parallel processing” is what puts continuous increasing demands to coordination and communication, that is, the collaboration process in building projects. This continuous increasing parallel processing makes it more demanding than ever, even for experienced construction managers on traditionally “easy” projects like apartments projects. Especially I think that participation in the three arenas of the model will be of great benefit for the new employees.”

One of the actors in the projecting consulting group stated that one of the most important aspects regarding the use of the model has been the participative aspect of the reflection arenas. Broad participation in the operative execution of the project has taken place due to the social participatory processes of the three reflection arenas (RA-1, RA-2 and RA-3). Important events in the social processes of the arenas were the joint construction of the enterprise image with its overall focus on the whole and the end products as visualized in the Joint enterprise image of BA (Figure 8-7):

“Participation in the three reflection arenas have contributed to increased consciousness and a more whole understanding, which again have contributed to better and more competent collaboration [...]This has contributed to increased competitiveness in collaboration, and thus provided room for finding better solution on the way in the process. I think that we have learned from each other and to find new creative solutions in fellowship. I also feel that those joint reflection

processes in the three arenas (RA-1-2-3) have provided better and strengthened collaboration with architect, and as a result that architect act more on the basis of equality with the other projecting actors.”

Several people in the project management group of Bergheim Amfi stated that the participation in the model’s three reflection arenas during the BA project contributed to a very useful connection between operative building site management and the projecting group of the project. This entailed increased consciousness about the importance of involving technical shop floor workers (e.g. joiners and gangers) earlier in the planning process together with the architect. Further it was emphasized by several respondents that the use of the model has contributed to increased ownership and good collaboration climate that in turn entailed that the participating actors are more focused on finding the good solution for the whole. Consequently, the actual and enthusiastic broad participation in the three reflection arenas entailed that all actors of BA created a robust collective will to act more for the whole of the project than the traditional profession based interests:

[Project manager]: *” Through the active participation in the reflection arenas supported by the Joint enterprise image we have developed a foundation for improved technical solutions. Concrete improvements measures in daily operation have been discussed as a direct consequence of the participation in the reflection arenas and the focus on the whole of the project.”*

[Projecting engineer]: *“The collective focus on the whole, as a consequence of the participation in all the three reflection arenas, has influenced the project solutions that are chosen. It is easy to get lost into the details if you are not focused on the whole. I experience that everybody are more willing to adjust to each other and to the whole more smoothly in order to get to the project’s common goal in a best possible way. This fellowship spirit has contributed to that we push ourselves harder to be more creative together. At the same time many are contributing to find good and creative solutions across the borders of the professional disciplines and through those improved relations the collaboration goes a lot better. Especially interesting and positive have the discussions with the architects been. The real challenge then, which the broad and active participation in the arenas have contributed to, is to be creative together, not only alone.”*

[Architect]: *“The participation in the reflection arenas using the Joint enterprise image and the focus on the whole and joint collaboration have contributed to that you do more! The actors work more together to find improved joint solutions rather than acting more on the basis of the traditional profession interests. Based on a understanding of the whole, I see the need for being involved*

stronger in the production phase of the building project through for instance participation in the building meetings on the site in order to have the best quality on the project's end products."

[Consulting engineer]: *"Clearly, participation in the model's reflection arenas have contributed to more improved collaboration based on the whole of the project, and I experience that it is a lot more motivating to find solutions that is achieved on the basis of joint efforts and which consequently is optimal for all."*

One of the operative building site managers of BA commented more specifically on the co-generated Pilot BA-Web (RA-3) (see Section 8.5.3):

[Operative building site manager/gang foreman]: *"Such a Web tool with an information architecture made on the basis of the Joint enterprise image from the S-gathering, ensures that we are going to use a tool that really supports the real needs in the project. Consequently, the users will be familiar with the principles of the tools before they start using it. That in itself I experience as a great resource for the project as a whole."*

The responses from all the involved actors of the Bergheim Amfi based on direct presentation of the main assumption as showed in Figure 5-5 and 5-6 in Chapter 5, revealed that the actors experienced the active participation in the three reflection arenas of innovation model described in Chapter 5 as useful for the actual operative collective practice. That is, the active and broad participation in the three arenas entailed that the actors of BA created a new useful collective practice and thereby it contributed to increase the very competitiveness and the total value creation in the AEC companies involved in the BA building project. Several project actors of BA emphasized the need to use the practical innovation model in Figure 5-4 (see Chapter 5) as a standard tool in projects for facilitating collaboration and collective learning:

[Project manager]: *"Yes, I have experienced that the assumption (see Figure 5-5) of the innovation model has been more than right. This perspective on collaboration in building projects I experience is very important in order to create a good end result and consequently to contribute to increased value creation for all AEC companies involved in the project. We need these reflection arenas (RA-1-2-3) as a general model for learning to think and reflect together about collaboration and execution in projects. It is important to have arenas in which the participating actors of the project can combine the professional with the social. Increased joint understanding of the whole in projects is an important aim. Today there is too little resources being used on experience transfer, and such a model will clearly contribute to that aim. We really need such a tool that is so simple that everybody*

on the building project can participate, but which at the same time supports information sharing and the exchange of experiences with everybody on the project as effective as possible. The model will to my experience provide a very important contribution here.”

[Operative building site manager/gang foreman]: *“This is not only a model that we possibly should use, but primarily one that we **need** to use right now as a standard tool in every building project!”*

[Architect]: *“To my experience as an architect the model is a very well suitable tool on general basis in building projects. I conclude that the model would be especially useful as a tool in shared contracts because it is more difficult to create good collaboration in such projects.”*

[Consulting construction engineer]: *“Very positive. To my experience as a consulting construction engineer in building projects, it is important to change focus from a narrow “earn-money-attitude” to a focus on the process as a whole and the end products of the project. I experience that the model is really wanted as a standard tool for improving collaboration and learning in AEC companies involved in building projects. It is very useful to have an arena where you can combine the professional and the social in such an effective manner as I have experienced the use of this model in Bergheim Amfi.”*

These responses show that redundancy in terms of a shared understanding or encultured knowledge based on the broad participation in the three arenas of the model has been facilitated. The model has in this way helped to create a common frame of reference for communication and collective reflection in those three reflection arenas respectively. Together the three reflection arenas, then, imply a broad participatory process that preserves the necessary organizational diversity of local realities creating the collective inquiry process for real change and innovation. The discourses of collective reflection facilitated on the basis of the Joint enterprise image has in turn reinforced the conversion – that is, the externalization and the internalization process – of tacit knowledge (embodied and embedded) into encultured knowledge. This conversion process between forms of collective knowledge constitutes then the collective reflective practice as showed in Figure 5-1 (see Chapter 5).

Consequently, the responses above show that the provided *model of change* (Figure 5-4) represents a possible *standard tool* supporting and developing the spreading of participative organizational change and innovation among companies of the AEC industry. I am very eager to emphasize the point that the model does *not* imply for any standard or universal

recipe of organizing projects or to conclude anything about “best practice” for spreading innovation in building projects. On the contrary, the model represents some practical guidelines for how to develop and maintain the *arenas* facilitating the necessary kind of broad participation in creating real organizational change and innovation in AEC companies involved aiming at new useful *collective* practice in building projects.

Collective knowledge in AEC companies is thus about how to collaborate and learn together for operative and joint execution of building projects. The development and use of the Joint enterprise image along the three learning centers each provided a good arena respectively for AEC companies to debate and design the actual collective practice with regard to language, relationships of the actors, structures and common routines in a natural way *integrated* as part of daily collective work practice during the project. The organization of the reflection arena of RA-1 in BA showed then a participatory process in which the political dimension and might/right-issues was taken as a real starting point for the change process. Consequently, the use of the model as a practical tool in the BA project showed to facilitate broad participation and the Deweyan inquiry process necessary to achieve new useful collective practice and which all actors involved in the project, companies as well as individuals consequently share.

Development and use of the Joint constructed enterprise image (as showed in Figure 8-7) constituted a central and decisive part of the thesis’ argument on organizational change and innovation in AEC companies. The Joint enterprise image is, then, constituted by jointly constructed process visualizations of enterprise work processes of the actual building project (see Section 5.1, Figure 5.2). Thus, the case story in Part Two showed that the Joint enterprise image constituting a common and shared frame of reference was a necessary element for developing the actual collective practice along three reflection arenas underpinning a *collective reflective practice* in the BA project.

Hence, the RA-2 in the Bergheim Amfi-project provided the actors a good *arena* for collective reflection-*on*-practice as natural part of operative collective practice emphasizing the What-learning focus. In the arena of RA-2 the joint constructed process visualizations from RA-1 enabled the building actors to collectively reflect on the joint collective work practice. Thus, the Joint enterprise image provided a joint communication platform that represented a good basis for collaboration and coordination through collective practice of

information sharing and knowledge conversion both within and between the AEC companies involved in the project.

Consequently, the Joint enterprise image (see Figure 8-7) showed that it provided a *common frame of reference* for all participating actors involved in the BA building project. Especially the newcomers in BA (staff that was newly educated, both engineers and joiners) learned to appreciate the Joint enterprise image due to its possibilities for improved overview and learning more about the building project as a whole. But also senior staff appreciated highly the image or visualization with regard to the possibilities it provided for *collective reflection* on “old” or “stuck” practice and also the possibility it provided to find more joint and collaborative solutions together. Also, it was emphasized that broad participation through the use of joint constructed enterprise image in the three arenas entailed a possibility for seeing wholes with regard to processes, interrelationships and patterns of change rather than the typical “discipline based” ways of doing *things*. This traditional focus on things rather than processes entailed the traditional “sub-optimization” at the expense of the whole of the project.

All the participating actors of BA emphasized the necessity of seeing *wholes* for joint responsibility aiming at more coordinated and joint action across profession based interests and organizational borders among all the actors involved in the project. The broad participation in the three reflection arenas of the model (RA-1-2-3) supported by the use of a common frame of reference as a Joint enterprise image entailed that the participating building actors generated an improved ability for seeing *wholes*. This led consequently to an increasing collective will in taking more joint responsibility for the building project as a whole. Both people in production¹⁴⁶ and design¹⁴⁷ appreciated the use of the Joint enterprise image in all the three arenas as a possibility to co-create a joint and shared understanding of wholes of intangible *processes* and *relationships* rather than tangible *things*. This entailed more interdisciplinary communication between the two communities-of-practice contributing to a joint practice of collective reflection aiming at new useful collective practice of the BA-project as a whole. Especially projecting people in design, i.e. the architects and the consulting engineers, learned to appreciate the use of the Joint enterprise

¹⁴⁶ Production means here people participating in the operative work processes related to the physical production on the building site, e.g. joiners, operative building site management, constituting an production community-of-practice (Husemoen 1997).

¹⁴⁷ Design means people participating in the initial and operative planning processes (projecting) of the building project, like basically architects and consulting engineers, constituting a design community-of-practice to the difference from the production community-of-practice (Husemoen 1997).

image as a good possibility for improved collaboration and communication between different design personnel in the projecting phase (between e.g. architects and engineers) and also between production and design personnel.

The provided innovation model constitutes, then, a basic argument for the importance of seeing organization and technology development as intrinsically linked. The Joint enterprise image needs to be *integrated* in operative collective practice in order to achieve collaborative support for all building actors involved in the project. Thus the effort of spreading organizational change and innovation aiming at new useful collective practice requires collective reflection also to focus on the organizational design, structures and the technology of the building project. Thus, RA-3 of BA provided a good *arena* for collective reflection-*in-practice* as naturally *integrated* in operative collective practice. The Web-based process visualizations of the Pilot BA-Web implied a broad participatory process of collective reflection-*in-practice* on the issues of organizational design, structures and technology in which the How-learning loop was emphasized. Through broad participation in the arena of RA-3 the building actors of BA used the process visualizations of the Joint constructed enterprise image as a way to structure, access and aggregate the needed information in the Pilot BA-Web. Thus, the Web-based project tool based upon the Joint enterprise image from the arena of RA-1 provided a powerful tool for the involved AEC companies to develop a useful practice of information sharing and consequently knowledge conversion both within and between building projects.

The use of the Web technology based on the Joint enterprise image enabled the building actors both in design and production to consequently *integrate* the practice of collective reflection as a natural part of operative and daily collective work practice in the BA project. That is, Web technology in the arena of RA-3 implied the transformation of the Joint enterprise image from being a conceptual model in RA-1 to become an operative artifact, or, artifactual device for communicative and reflective action throughout the project. Thus, the Joint enterprise image operating as a Web-based operative artifact in the RA-3 entailed in the last instance the spreading of a *collective reflective practice* focusing on design issues among the AEC companies directly involved in the BA-project.

The case story as told in the Chapter 6 and 7 show that the SiB basically was an R&D program constituted by a top management group (the SiB consortium board, see Chapter 3 for overview of SiB) representing four AEC companies, that stated *IT* as the most basic

lever for changing and improving the collective practice of projects in the AEC industry. This top management group thus formed the SiB as a program that had its main focus on means and efforts for “starting to use” IT in building projects as a general tool. The consortium viewed IT as the key “thing” that by its *use* in itself in building projects could contribute in spreading the necessary processes of organizational change and innovation among companies in the AEC industry.

The story of the Pilot project Rekkevik Brygge (RB) and ProsjektHotell in Chapter 7 shows how the SiB consortium board (see also Chapter 3) treated change purely as a matter of a “thing” related to IT, in statements like “*starting to use IT as the thing it is*”¹⁴⁸. The point was that if the participating actors of RB started to use IT in building projects anyhow, the proclaimed assumption in the SiB consortium board was that “processes of organizational development” would spread among AEC companies as a “strict consequence” of project based IT-use in itself¹⁴⁹. This was basically the assumption behind the Pilot RB-Web and ProsjektHotell case (see Chapter 7). The case story shows how the Pilot Conference in Trondheim as told in Chapter 6 basically was viewed by the SiB consortium as “*an academic and theoretical exercise*” without any clear practical purposes and especially not in regard to IT.

The case story documents, then, that there was basically *no* innovation that took place with regard to the collective practice until the Bergheim Amfi project described in Chapter 8 (see discussion above). The SiB during its main R&D program period from 1996 to 1999 (exemplified by the case story of the Pilot project Rekkevik Brygge in Chapter 7) was strictly speaking a faulty “IT-project” that showed to have no integrating link between the development of actual organizational or collective practice and introduction of the Pilot RB-Web. Consequently, there was really no innovation taking place – that is, change in actual collective practice, with regard to the use of neither the Pilot RB-Web nor the ProsjektHotell in the Veidekke building projects in the period 1999 – 2001. That is, the described change processes with regard to the enterprise portals the Pilot RB-Web and ProsjektHotell in Part Two were not integrated with any participatory processes of Deweyian inquiry. Also the demonstrated learning process at the Trondheim Pilot

¹⁴⁸ This is my interpretation of how the SiB consortium actors during the RB pilot project implicitly thought about IT as simply as a “practical *thing* to use”.

¹⁴⁹ See statement given by CEO of Veidekke in Chapter 6.

Conference in Chapter 6 was not linked to any actual processes of change in any actual building project.

Taking into account the discussion earlier in the chapter, I conclude that the Bergheim Amfi case in Chapter 8 was a success story of a real participative process on using a Web-based project tool (the Pilot BA-Web) for spreading organizational change and innovation among the AEC companies involved aiming at new useful collective practice in the actual building project. I conclude that the Bergheim Amfi case documents how it was possible to spread a process of organizational change based on a kind of *collective reflective practice* naturally integrated in the project's daily collective work practice. That is, the case shows how it is possible by the aid of a Web-based project tool based on the Joint enterprise image to successfully spread a process of integrated organization and technology (Web) development (innovation) among the AEC companies involved in the project aiming at new useful collective practice.

Consequently, the case story documents that SiB, as an R&D program, basically was a “top-down” program focusing on innovating “models” to increase managerial control. That is, IT was viewed as a tool for increasing “*managerial top-down control*” (see also Chapter 3). Thus, the *SiB* basically was an R&D program conducted by a top management group viewing change in the AEC industry as a *top-down* matter for developing “models” to enhance and extend managerial project *control* of operative collective practice in projects. The program goal of “10-20 % productivity improvement” (see Chapter 3) emphasized the issue of control by developing so-called “BPR-models” for change and “integrated process development” in building projects. This point was underlined in the consortium statement “*Without control there will be a terrible cost crack [in projects]*”¹⁵⁰. The deployment of IT was then emphasized as the tool that should both enable and reinforce “the productivity effects” of managerial-biased control as obtained through “the application” of the “expert biased” BPR-models.

I conclude that this top-down based view for development and governance of R&D programs in the context of the fragmented and knowledge-intensive AEC industry was too narrow-minded (see Rekkevik Brygge case in Chapter 7) in order to spread organizational change aiming at new useful collective practice in building projects. The case story of a development process in Part Two documents that an R&D process aiming at spreading

¹⁵⁰ SiB End Report, 1999 (www.samspill.interconsult.com), p. 5 and Eikeland (1998)

organizational change and innovation rather is a product of a co-generative and *participative* inquiry process requiring *broad participation* across the production and design communities-of-practice in building projects as demonstrated in the Bergheim Amfi case in Chapter 8.

9.3 Summary

In summing up this chapter I will argue that the two case building projects provide enough information in order to consider the BA-project as described in Chapter 8 as an example of a participative process of spreading organizational change and innovation among the AEC companies involved in the project. In contrast to the BA-project, the actual collective practice of the RB project in Chapter 7 provides an example of the more traditional and prevailing “linear-control” oriented project management perspective discussed in Chapter 3. Further, I will argue that the three reflection arenas from the case interpretations provide sufficient information in order to suggest a model for thinking about spreading organizational change and innovation in the AEC industry. Thus, the thesis’ conclusion as well as the general findings will be provided in the next chapter.

Chapter 10

Conclusion

This concluding chapter is divided into five parts. First, I make a recapitulation of the starting point of this study in a short introduction. Second, I draw the general conclusion of the thesis. Third, I provide the central findings according to the thesis' research questions. Fourth, I provide some statements regarding the validity of the study. Finally, based on the provided general conclusion, I make some suggestions for further research in the area of organizational change and innovation.

10.1 Introduction

This thesis has discussed and studied the conditions viewed as necessary for creating organizational change and innovation. My point of departure has been the SiB R&D program and how change and innovation were facilitated in the AEC companies that were directly involved in two building projects. The two case building projects were Rekkevik Brygge (RB) and Bergheim Amfi (BA).

The main argument was that organizational change and innovation must be understood and studied as continuous Deweyan inquiry or collective learning processes. This is underpinned by a pragmatist approach to knowledge and organizations emphasizing the primacy of collective meaning construction of language and identification as a social, collective process. Thus organizations are viewed to be a continuous collective learning process in which individuals construct and reconstruct the collective knowledge (embedded and encultured) constituting that collective work practice of the organization (see Chapter 2).

In reviewing the status of the AEC industry today, the main argument was that companies suffer from an inability for joint organization and collaboration in building projects. Consequently there is a lack of will to take a joint responsibility for the quality of the end products as handed over to different customer groups. A main problem is thus a striking tendency to sub-optimize the smaller parts over which they have control. Hence the focus on cost and time leads to a continuous focus on doing only what is necessary according to the role as specified in the contract. This tendency has for many years turned into a strong self-reinforcing mechanism and which has entailed a situation of extreme fragmentation and hostile conflict orientation. Consequently, the AEC companies are hardly practicing any common routines for knowledge conversion¹⁵¹ and information sharing either within or between building projects (see Chapter 3).

¹⁵¹ In traditional terms knowledge conversion is referred to as “experience transfer”.

This grim looking status of the AEC industry motivated four AEC companies to start the SiB R&D program aiming at “a more competitive AEC industry”. I argued that the only way to achieve that aim was to throw a new light on the collective practice in building projects in which traditional “contract based cooperation” was replaced by a participative and dynamic practice of collective reflection across organizational borders. The emerging argument was that collective forms of knowledge could be visualized into one *common frame of reference* emphasizing a shared collective understanding of the whole. This collective frame of reference contains then knowledge regarding how to act together as a whole in daily collective practice. This means that organizational design, relationships, routines and technology are linked with language and models into one common frame of reference (see Chapter 4). Consequently, I argued that the joint visualized common frame of reference would constitute a basis for changing the collective practice in projects. This required that the common frame of reference have to be truly collective or shared. Hence, it must be constructed through a broad participatory process in which three focuses of learning come to play each referring to a distinct *arena* for continuous collective reflection.

Thus I stated in Chapter 1 that the objective of the thesis is to contribute to how organizational change and innovation in AEC companies can be created through broad participatory-based efforts of learning and developing together in projects.

The thesis’ two major research questions were then posed as follows (Chapter 1):

- 1) ***What are the conditions necessary to achieve organizational change and innovation in AEC companies?***
- 2) ***How can organizational change and innovation be spread among the companies in the Norwegian AEC industry?***

The discussion in Chapter 9 shows that the thesis’ case story (Part Two) provides a sufficient basis for answering the research questions.

10.2 Collective Reflective Practice

The thesis' main conclusion is that organizational change and innovation is a collective reflective practice of the three reflection arenas (RAs) called visualizing a common frame of reference (RA-1), collective reflection-on-practice (RA-2) and collective reflection-in-practice (RA-3)¹⁵². The knowledge content of the arenas are dynamically and interdependently linked on a continuous basis. The development and use of a Joint enterprise image as a common frame of reference in each of these arenas ensures an interdependent and dynamic relationship between them. Figure 10-1 shows organizational change and innovation as collective reflective practice.

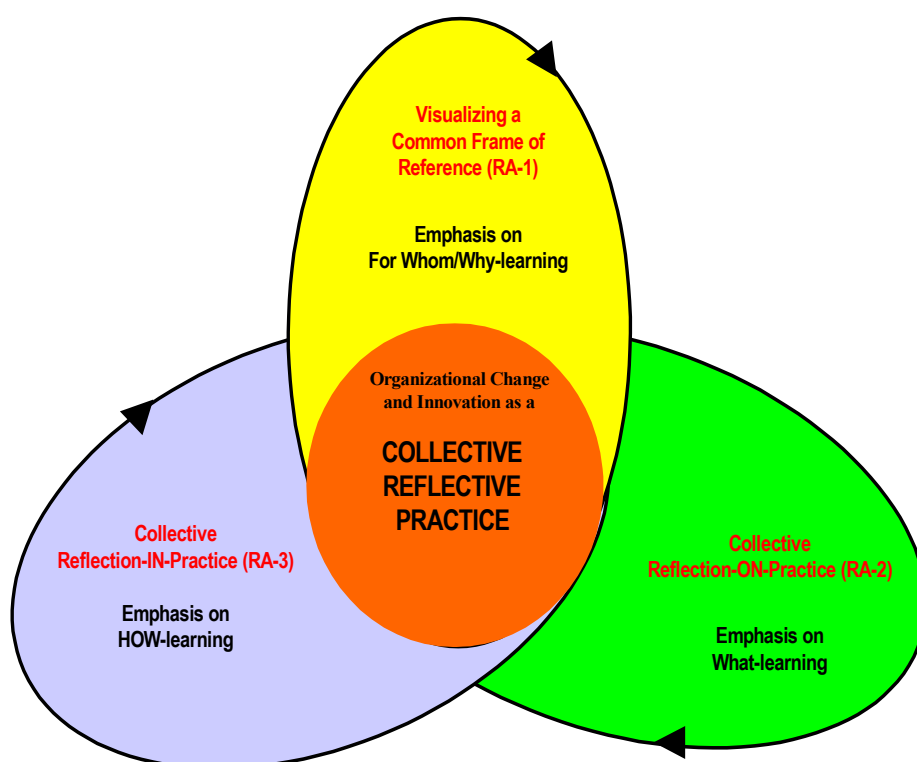


Figure 10-1 Collective reflective practice

Collective reflective practice means that *all* the three reflection arenas must be implemented based on the Joint enterprise image functioning as a common frame of

¹⁵² RA-1, RA-2 and RA-3 (Reflection Arena) are closer described in Section 5.2 and concluded in Section 10.3.2

reference in order to spread organizational change and innovation among AEC companies involved in building projects. The interdependent relation means that usefulness of the knowledge in one arena depends on the implementation of the others. The dynamic dimension means that the knowledge content of each arena as visualized in the Joint enterprise image relate to each other on a continuous basis from project to project across companies in the AEC industry. The result of the collective reflection in those three arenas is new useful collective practice for operative execution of the actual building project.

For each of the three reflection arenas, there is a corresponding learning focus with the Joint enterprise image functioning as a common frame of reference. Thus each arena emphasizes different reflection processes with regard to *focus* of collective learning. In the first arena (RA-1) the Joint enterprise image is initially visualized in a participatory construction process providing emphasis on the Why-learning loop. In the second arena (RA-2) the Joint enterprise image is used as a reflective and communicative device continuously debating interrelationships of collective practice by emphasizing the What-learning loop. Finally, in the third arena (RA-3) the Joint enterprise image functions as an artifactual common frame of reference through Web technology continuously designing structures of collective practice by emphasizing the How-learning loop.

In sum, the provided model for creating organizational change and innovation in the AEC industry consists then of three reflection arenas. These arenas represent three different ways of using the Joint enterprise image as a common frame of reference each having its specific collective learning focus (see Figure 10-1):

- Visualizing a common frame of reference through *participatory visualization* of collective practice focusing on the *power-knowledge dynamics* in collective practice by asking: **Why to do it?** (RA-1)
- Collective reflection-*on*-practice focusing on continuously *debating* interrelationships in collective practice by asking: **What to do?** (RA-2)
- Collective reflection-*in*-practice focusing on continuously *designing* process structures in collective practice by asking: **How to do it?** (RA-3)

Hence, all three reflection arenas as indicated in Figure 10-1 must be implemented in an interdependent and dynamic relationship in order to achieve and spread organizational change and innovation among the AEC companies that are directly involved in projects. The described development and use of the common frame of reference as a Joint enterprise image – as in accordance to the innovation model described in Section 5.2, is the tool that ensures this dynamic relationship for changing collective practice in AEC companies involved in the actual building project. I will now summarize my central findings and the answers provided to the thesis' research questions in Chapter 9.

10.3 Central findings

In this section I summarize the findings and the answers provided to the two research questions.

10.3.1 *WHAT are the conditions necessary to achieve organizational change and innovation in AEC companies?*

The conditions necessary for creating organizational change and innovation are proposed in Section 5.1 and discussed in Chapter 9. Three conditions are found necessary to achieve change in AEC companies. These are visualizing a common frame of reference, collective reflection-on-practice and collective reflection-in-practice. Each of these conditions refers to a specific reflection arena with a corresponding learning focus as showed in Figure 10-1.

In Chapter 9 the collective practice of the two case projects Rekkevik Brygge (RB) and Bergheim Amfi (BA) are compared with these conditions. I find many differences in the collective practice of the two projects. I summarize the findings discussed in Chapter 9 under each condition:

- I. ***Visualizing a common frame of reference:*** Both case projects view a common frame of reference as important for project execution. The qualitative difference is that the common frame of reference in the RB project is static in terms of a

management focused organization map emphasizing traditional managerial control in accordance to traditional contract defined roles rather than broad participation among all actors involved. Thus, such a frame of reference focuses on contract-based roles rather than activities, processes and relations in the project. Consequently the participating actors in RB developed neither any common ownership nor shared identity to the project. Hence the RB project showed no change in collective practice with minimum degree of learning and reflection. Traditional project management practice in AEC companies as found in the RB project disregards the importance of the political dimension and diversity in organizations. Consequently, the collective practice of RB emphasized managerial project control in which organizational change required even more “control to control” change.

On the other hand, in BA the common frame of reference is participatory visualized as a Joint enterprise image entailing a shared identity and common ownership to the project. The collective practice of BA is visualized with focus on processes and activities of the *whole* of the project. The visualization of a common frame of reference entailed collective reflection on premises of quality of knowledge related to goals, end products and interrelationships in the whole of the project. The issues for reflection included then who and whether interrelationships involved forms of power control what is considered right. Through this the actors of BA – individuals as well as companies, learned to appreciate the diversity of viewpoints that is so crucial for continuous organizational change and innovation.

- II. *Collective Reflection-ON-Practice:*** In RB (Chapter 7) there was to a certain extent an arena for collective reflection-on-practice debating collective practice through the Web-based information sharing practice. But the debate was static, not dynamic (it was not related to the other two reflection arenas). Individuals and AEC companies involved in RB were focused on defined static roles according to prescribed contract and managerial project control, not debating the processes and interrelationships as a whole regarding doing the right things or asking what to do during the operative project execution.

On the contrary, in BA there was a continuous process debating and discussing collective practice during actual project execution. Individuals as well as companies involved in BA used the Joint enterprise image for communication and conversations around on the building site and in projecting meetings. Thus the image was used as a reflective and communicative device for continuous collective reflection about *what* to do. The question was “Are we doing the right *things?*” in which *interrelationships* and the *whole* of processes of collective practice were the issues put into focus of collective reflection. Through this the involved actors – across as well as inside communities-of-practice – of BA changed the quality of how they communicated and related to each other in the daily actual operative execution of the project. Thus project managers, architects, engineers and joiners representing different AEC companies involved in the project gradually developed a shared language, mutual trust and understanding for a new useful collective practice in the project as a whole.

III. *Collective Reflection-IN-Practice:* In RB there was to a certain extent an arena for collective reflection-in-practice due to an emerging Web supported practice of information sharing with the Pilot RB-Web portal. It was especially the workers on the building site that experienced the information sharing practice as a possibility to reflect on doing things the right way. But this reflection did not change collective practice because there was no arena for debating it (collective reflection-on-practice) together with actors from other communities-of-practice.

In BA the use of the Joint enterprise image as a Web-based artifactual common frame of reference (the Pilot BA-Web) entailed continuous collective reflection-in-practice regarding *how* to do things. Based on the practice of collective reflection regarding debating *what* to do in the second arena (II), actors collectively *designed* new process structures by continuously reflecting-in-practice *how* to execute the new collective practice by using the Joint enterprise image as Web-based information architecture.

I found that the actual visualization of the common frame of reference in BA as a Joint enterprise image contained collective knowledge consisting of a shared understanding and language that has produced two main results. First, workers on the building site and the project management have developed a shared understanding across communities-of-practice and organizational borders of AEC companies involved in the project through broad participation in the three reflection arenas respectively. Second, the knowledge content of those three arenas constitutes a dynamic and interdependent relationship enabled through the development and use of the Joint enterprise image as a common frame of reference.

In sum, the case story in Part Two provides a fairly complete example of organizational change and innovation as a collective reflective practice in accordance with the three conditions and that eventually resulted in a new useful collective practice in the Bergheim Amfi building project.

Thus, this concludes the answer to the first research question of “What are the conditions necessary to achieve organizational change and innovation in AEC companies?”. Based on the provided conditions I will now summarize the findings and answers provided to the second research question.

10.3.2 *How can organizational change and innovation be spread among the companies in the Norwegian AEC industry?*

The next major research question was how to spread organizational change and innovation among companies in the AEC industry. In Section 5.2 a practical innovation model is introduced together with important assumptions and questions pertaining to each of the conditions above. The model consists of three elements in which each element refers to a specific reflection arena. First, there is a Startup Gathering referred to as Reflection Arena 1 (RA-1). Second, there is Reflection and Evaluation Gatherings that is referred to as Reflection Arena 2 (RA-2). Third, there is Development and use of Web-based project tools that is referred to as Reflection Arena 3 (RA-3). Thus, each reflection arena corresponds to each of the three conditions as they are described above respectively and in Section 5.1.

Based on the empirical case description in Part Two it is now possible to summarize a general answer for how to think about spreading participative processes of organizational change and innovation among companies in the Norwegian AEC industry creating *collective reflective practice*:

- 1) **Startup Gathering (RA-1): Arena** for participative visualization of a common frame of reference of the actual collective practice in building projects. This common frame of reference is referred to as a Joint enterprise image and it contains visualized collective knowledge of the actual project's encultured and embedded knowledge. The main question for reflection here is: ***Why to do it?*** That is, the main issue is the social processes related to creating a shared understanding about the *whole* of the project with its *interrelationships* and end products in order to develop joint ownership and identity. All actors directly involved in the project, companies as well as single individuals, must participate in the S-Gathering. This Joint enterprise image visualizes the collective knowledge regarding the main work processes constituting the collective practice of the building project. The S-Gathering must be organized as a Modeling Conference (MC) (in accordance to the principles described in Section 5.2 and Section 6.3) in the beginning of each building project. The participants ask Why- (For Whom) questions related to the whole of the project of roles, interrelationships, processes, technology, end products and goals of the project as visualized in the Joint enterprise image¹⁵³.

- 2) **Reflection- and Evaluation Gatherings (RA-2): Arena** for using the Joint enterprise image from RA-1 as device for collective reflection on practice debating the collective practice of the actual project. The main question for reflection here is: ***What to do?*** (Or: doing the right *things*). This arena is organized in two parallel efforts. First, use the image as an active reflective and communicative device in all kind of meetings in the project as well as for informal communication and conversations around on the building site with joiners and gangers debating knowledge of collective practice. Second, organize an Evaluation Gathering

¹⁵³ In the case story of BA in Chapter 8 the conference leaders of the S-gathering (RA-1) are the outsiders or the professional action researchers. This role has to be taken over by one of the insiders (see discussion in Chapter 2). The actors involved in the actual building project have to decide by themselves who can be an adequate conference leader.

midway in the project depending on the duration of the total project. The gathering is organized as a MC in the same way as for the S-Gathering. The main question on the E-gathering is still about what to do using the Joint enterprise image from RA-1 as a communicative device (as described in Section 8.3) enabling participative conversations about collective practice. This way the common frame of reference from RA-1 is used for continuously debating operative collective work practice of the project.

- 3) Development and use of Web based project tools (RA-3): Arena** for using the Joint enterprise image from RA-1 in parallel with RA-2 as an artifactual common frame of reference through Web technology. The issue in this arena is to use the Joint enterprise image as information architecture in a Web-based project server *designing* the structure of collective practice in projects through continuously reflecting-in-practice. The main question for reflection here is: ***How to do it?*** (Or: doing things *right*). The debate and conversations about the collective knowledge in RA-2 enables then to use the Web for collective reflection-*in-practice* regarding how to do things. This way, the use of the Web-based and artifactual common frame of reference entails continuous collective reflection-*in-practice* during operative project execution regarding design issues of collective work practice.

This summarizes the findings regarding the reflection arenas necessary for thinking about how to spread organizational change and innovation in AEC companies as a Deweyan inquiry process for “keeping the conversation going”. It is emphasized that the model is not a traditional “management-recipe” for organizing building project, but rather as a framework for thinking about participative change and innovation. The three arenas relate to each other in a dynamic and interdependent way. Thus organizational change and innovation requires that all of the three reflection arenas must be interdependently implemented on a continuous basis from project to project in order for the AEC companies involved to change its actual collective work practice. The dynamic and interdependent relationship means that the content of the reflection arenas including the common frame of reference must change on a continuous basis. This way the workers on the building site learn to develop together with project management and consulting engineers and architects across the different communities-of-practice and across organizational borders of the AEC

companies involved in the project. Thus change and innovation turns out as a continuous *collective reflective practice* based on three distinct *arenas* for collective reflection facilitating organizational diversity and democratic participation in the process.

According to the discussion in Chapter 9, I have found that the innovation model entails creation of new useful, collective practice and thus a process of sustained growth in value creation of the AEC companies involved in the building project. This finding is in accordance to the provided assumption of spreading of change in Section 5.2. Thus I have found that the use of the innovation model is a competitive advantage for the AEC companies involved in the actual building project.

Finally, I have found that the three reflection arenas are all based on a collective learning form constituted by a continuous internalization and externalization process between two types of collective knowledge forms. That is, between externalized collective knowledge (encultured knowledge) on the one hand and internalized collective knowledge (embedded knowledge) on the other. First, the explicit collective knowledge is constituted by the Joint enterprise image functioning as a *conceptual* common frame of reference. The enterprise image functions in turn as a conceptual object for collective reflection and communication on collective practice developing encultured knowledge. That is, the development of a shared collective understanding with regards to might/right (Why?), debate (What?) and design (How?) in all the three arenas respectively (RA-1, RA-2 and RA-3). Second, the embedded knowledge is then constituted by the Joint enterprise image functioning as an *artifactual* common frame of reference in collective practice. This means that it is based on the process of collective reflection-in-practice through the transformation of the Joint enterprise image to a Web-based operative artifact in collective practice. This way new collective knowledge in the Joint enterprise image from RA-1 is internalized as embedded in collective routines, collaborative structures, relations and technology designing new process structures in RA-3.

10.4 Validity of the innovation model

I conclude that this study and the provided innovation model with its three constituting reflection arenas have validity. I do so because the individuals and the AEC companies directly involved in the Bergheim Amfi project fully agree that the use of the model has

contributed to enhance their own understanding of collective practice in the project. Consequently the use of the model has contributed to new useful collective practice and to enhance the actors' ability to collaborate and learn together in daily collective work practice in the project. After every reflection gatherings (as part of RA-2) during the one-year project period I made a report that was e-mailed to all the participating actors. In that way they could easily give me response on my way of seeing it. Given this co-generative process of learning between the local stakeholders and myself as an outsider they could easily agree on my presented version in the e-mailed reports. Nevertheless, in my final conversation round I could document that all the insiders of BA fully agreed that my way of interpreting the data was a reasonable understanding.

The whole research process behind the entire model and its results where at the end in the June of 2001 documented in a final End Report and presented at a Veidekke internal seminar. Representatives both from Veidekke's top management together with operative project staff from BA attended at the seminar. The presentation of this End Report was presented with a PowerPoint-presentation that is attached to this thesis in Appendix 2. This way all participating actors in addition to key actors in the AEC industry have read a "draft" of the thesis' most central chapters, which means especially Chapter 5. I argue that this is the strongest possible quality test concerning the central content of the thesis. See also Appendix 1 where I discuss research quality with regard to the trustworthiness criteria of Lincoln and Guba (1985).

10.5 Further research

The thesis discusses many areas in the field of organizational change and innovation that would be very interesting for further research. The practical innovation model as described in Chapter 5 includes three major research areas in which neither is fully understood in the context of the AEC industry¹⁵⁴.

¹⁵⁴ It would be very interesting for further inquiry into how the conditions of visualizing a common frame of reference, collective reflection-on-practice and collective reflection-in-practice apply to other companies and sectors beyond the AEC industry.

The area of visualizing a common frame of reference in an arena for dialogue emphasizing a Why-learning focus and power-knowledge dynamics is probably the most disregarded issue in the field. There are some contributions referring to knowledge as “mental models”, “building a shared vision” or “instill a knowledge vision” for innovation within single companies, but fairly little is known of innovation being *participatory* built together across organizational borders. The value of organizational diversity of viewpoints as emphasized in this thesis is in many ways disregarded due to the “problematic issues” of power¹⁵⁵. Consequently, most contributions in the field presuppose a rationalist approach to knowledge and organizations aiming at “consensus making” for equalizing and harmonizing viewpoints of the single individuals¹⁵⁶. This individualistic perspective – emphasizing individual forms of knowledge (embodied/ embrained/encoded), conditions then premises for managerial control of change and harmony of viewpoints – not diversity, that ultimately inhibit the ability for learning and change. The thesis has strongly opposed this rationalist approach by emphasizing development of collective forms of knowledge (encultured/embedded) as the basis for change in which diversity of individual viewpoints are strongly appreciated as a basic condition for collective learning and change. Through this diversity – not equalizing of viewpoints, the visualization of a common frame of reference turns out meaningful for continuous construction and reconstruction of collective knowledge and consequently learning for intrinsic appreciation of organizational diversity.

A challenge for further research is, then, related to understanding conditions for the development and sharing of *collective* knowledge. Here I see much unplowed research fields especially related to how development and use of new Web services may underpin collective reflective practice as a basis for creativity, innovation and strategy formation in project based enterprises in general. Here I would suggest inquiring more into how the involved ones may experience the innovation efforts as fully integral to daily collective practice, not as efforts that works “in addition” to the daily work practice. Thus a central issue for further research is then to explore more into *participative* ways of developing and creating a common frame of reference visualized as an enterprise image of the whole of the organization’s collective practice. This enterprise image may then function as a

¹⁵⁵ The work of Lysgaard (1985) is probably the one that most strikingly shows the importance of how collective knowledge is socially constructed within communities-of-practice and how this collective knowledge constitutes a power relation that governs the collective practice of the organization. See Chapter 2.

¹⁵⁶ The most striking contribution within the field of organizational learning that presupposes this positivistic premise regarding interventionist-conditioned consensus making is the one by Argyris and Schön (1996). I strongly oppose and criticize this rationalist stance in Chapter 2.

communicative and reflective device in different connections. One issue – as developed in this thesis, is to explore more into conditions for using the joint constructed enterprise image as information architecture in Web-based project tools and thereby for transforming the conceptual common frame of reference into an operative artifact providing intrinsic process support in daily collective work practice. A valuable contribution will then be to find out more whether this facilitates the involved actors' – individuals as well as companies – collective understanding (encultured knowledge) and reflection on and in collective practice.

Another valuable contribution for further research is documenting how organizations in a co-generative learning process with the external outsider or researcher may achieve organizational change and innovation based on genuine respect for the organization's understanding and experience of own situation and status. Co-generative learning through action research is not only a methodological principle to change and innovation but also a central democratic value. Consequently, it is of paramount importance that new theory and knowledge is experienced as a *tool* for increasing awareness, reflection and understanding regarding the actual mechanisms and relations in the context in which the single organization itself experience to be a part of.

Appendix 1

Methodology and Research Process

The aim of this appendix is to discuss the methodology and the research approach that I have used in the study of organizational change and innovation in the Norwegian AEC (Architects, Engineering, Construction) industry. I first and foremost rely upon a set of different qualitative methods in which parts of the case study are performed as *pragmatic action research* drawing upon Greenwood and Levin (1998). In the first section I discuss the methodology of action research in addition to the case study design and the theory building approach. In the second section I provide an overview of the fieldwork carried out in the Norwegian AEC industry and in the two case building projects called Rekkevik Brygge and Bergheim Amfi. Finally, in the third section I draw upon Lincoln and Guba (1985)'s criteria of trustworthiness discussing the quality and validity of the study.

A I. Research role, methodology and theory building

Action Research

The pilot projects in the SiB R&D program was emphasized to be executed as discourse-based and action-oriented research. In addition the program had a series of case study projects in which the researchers just observed without participating in the action-oriented way. The pilot projects thus had a research model in which there were two equal research partners. That is, the local experts, or the insiders that means the industry actors, and the external experts, or the outsiders, which are the researchers from the HSK. The principal aim of this research process as defined by the SiB program was to create an arena for *co-generative learning* as illustrated in Figure 1 below, i.e. forms of debate in which the parties through a continuous and democratic dialogue develop new knowledge about collective practice in building projects (Gustavsen 1992).

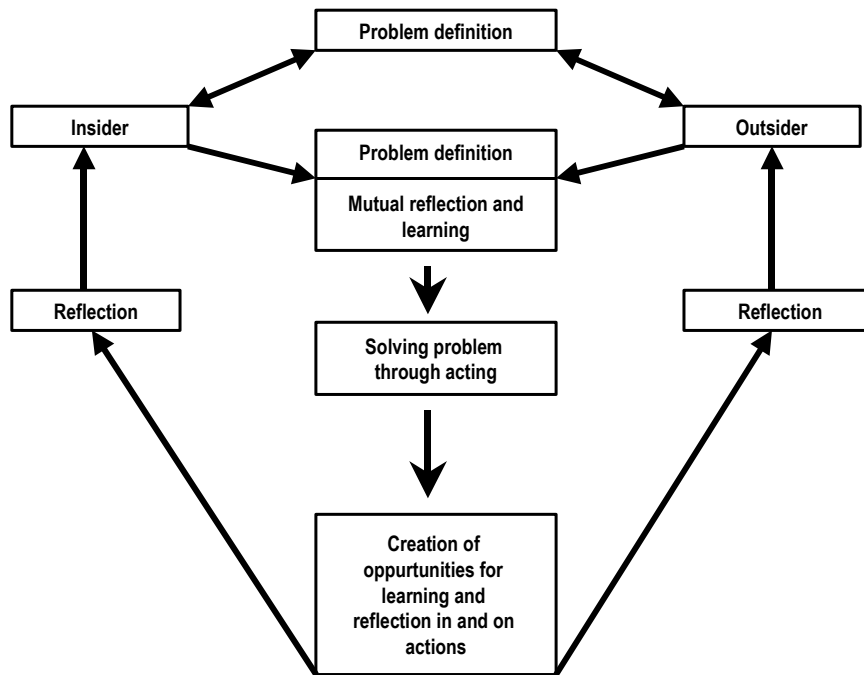


Figure 1 Co-generative learning model as practiced in SiB's pilot projects (Greenwood and Levin 1998: 116)

This entailed that the participating SiB consortium actors had the main responsibility for the execution of the development process, while we as the researchers in the HSK group had the main responsibility for the data gathering, evaluation and documentation, and that both parties had joint responsibility for the content and the outcome of the research process. This argument regarding the research activities in the SiB R&D program was explicitly stated in all SiB project plans describing the SiB program and its pilot projects.

As a research member of the HSK research forum, I was then to actively participate in the building projects defined as pilot projects by the SiB consortium to contribute and provide influence for a co-generated understanding of collective practice in building projects. I have to admit that it was my genuine interest for experiencing integrated organizational and IT development and action research in practice that got me to pursue an academic research career. This was also related to my conviction that it is necessary to be part of the development process itself in order to understand the organizational change and innovation

process. This places me in the mid of the social constructivist paradigm¹⁵⁷. Also, what intrigued me by the RCN sponsored SiB program was that it combined far-reaching fieldwork in one of the largest and most important industries in Norway with a challenging academic study. Both have been fulfilled during this study. I have participated in several industry related conferences and seminars where I have had the opportunity to contribute my view and knowledge to the best for the AEC industry as a whole. I have performed a challenging Ph.D. program at NTNU, customized to the real needs of the Norwegian AEC industry. In addition, the 6 months stay as a visiting research scholar at SCANCOR¹⁵⁸, Stanford University, California, USA, autumn 1999, has in a significant way contributed to my own process in becoming a more mature researcher and thereby increased my contributions to the AEC industry.

Taking into account the case story of the Bergheim Amfi building project (in thesis' Part Two, see Table 1 below next section) parts of the study has clearly been 'action' oriented, but how to judge to what extent the study has been 'research' oriented as well? Eden and Huxham (1999) asserts action research in the following way:

*Action research involves the researcher in working with the members of an organization over a matter which is of genuine concern to them and in which there is an intent by the organization members to take action based on the intervention.*¹⁵⁹

This stated care for the immediate practical concern of those involved goes in concert with Greenwood and Levin (2000) stating:

Action research aims to solve pertinent problems in given contexts through democratic inquiry in which professional researchers collaborate with local stakeholders to seek and enact solutions to

¹⁵⁷ In Chapter 2 I discuss the belief system of the constructivist paradigm building on the pragmatist approach of Dewey. In the last section of this appendix I re-emphasize in line with Guba and Lincoln (1994) the importance of explicating the belief system or worldview that guides the investigator not only in regard to methodology but also regarding epistemology and ontology consistent with my discussion in Chapter 2.

¹⁵⁸ Scandinavian Consortium for Organizational Research (SCANCOR) at Stanford University, <http://www.scancor.uib.no/>. The basic idea behind the SCANCOR, which is centrally located on the Stanford Campus, is beside to provide Scandinavian researchers the facilities to work in an international research environment, to internationalizing research and education in organization and leadership. Through cooperation among Scandinavian business schools and universities SCANCOR's goal is to promote an international perspective in research and education, as well as to strengthen ties among Scandinavian researchers and encourage joint research projects. The SCANCOR milieu provided excellent facilities for me as a Ph.D.-student to work on my research topic.

¹⁵⁹ Eden and Huxham (1999), p. 273

*problems of major importance to the stakeholders. We refer to this as **co-generative inquiry** because it is built on professional researcher-stakeholder collaboration. [..]*¹⁶⁰

Then Greenwood and Levin describes action research in four statements in which the first one sounds:

1. *Action research is inquiry in which participants and researchers cogenerate knowledge through collaborative communicative processes in which all participants' contributions are taken seriously. The meanings constructed in the inquiry process lead to social action, or these reflections on action lead to the construction of new meanings.*¹⁶¹

Since the first identification of action research by Lewin in the 1940s (Lewin 1951), then further developed by the socio-technical system (STS) tradition of the Tavistock Institute (Trist 1981, Trist and Bamforth 1951) and then the Scandinavian model (Herbst 1976, Elden and Levin 1991, Greenwood and Levin 1998) the main trust of action research in recent times has probably become more difficult to identify (Eden and Huxham 1999). But the extension of action research (AR) that constitutes a basis for my thesis work is an approach called pragmatic AR. I have therefore been arguing in line with what Greenwood and Levin (2000) refer to as 'co-generative inquiry' as a basis for developing a model of organizational change and innovation in the AEC industry. In my research role as a co-researcher I have come to adopt the ethical imperative of viewing the insiders or the practitioners as co-learners in democratizing the organizational change and innovation process. This imperative is so precisely emphasized by Elden and Levin (1991) when they argue: "*They are not "subjects", or "clients", or "data-sources", they are "co-learners".*"¹⁶². This co-generative learning perspective entails the view that producing new general theory is defined as equally important as generating new local theory or the empowerment of participants. This is to say that an action research initiative is valid or successful if both the practitioners and the external researchers learn and create new knowledge, as stated by Greenwood and Levin (2000) in their next three statements about action research:

- "2. *Action research treats the diversity of experience and capacities within the local group as an opportunity for the enrichment of the research/action process.*

¹⁶⁰ Greenwood and Levin (2000), p. 96

¹⁶¹ Greenwood and Levin (2000), p. 96

¹⁶² Elden and Levin (1991), p. 128

3. *Action research produces valid research results.*
4. *Action research is context centered; it aims to solve real-life problems in context.*¹⁶³

The second statement is related to the premise that the diversity of viewpoints – not consensus making, is a central condition to learning and change as emphasized in Chapter 2. Consequently, this is linked to the first statement regarding the importance of co-generating knowledge between the professional and the local knowledge. The aspects of validity and context I will come back to later in the section in connection with the discussion of theory building and case study design in the below section.

Research role

The data is explored primarily through qualitative methods of conversations and reflection meetings in addition to more regular participant observation, document studies and open-ended interviews (Yin 1994: 93) (see Table 1 below). I like to use the term “conversation” instead of interviews in emphasizing the aspect of exploring the research data rather than collecting them. This also links to my approach of co-generative inquiry (Elden and Levin, 1991) and Deweyan “holistic treatment of phenomena” (Schwandt 1994) during the fieldwork¹⁶⁴. I have argued for a holistic approach building on the Deweyan pragmatic epistemology as emphasized in the Thesis Chapter 2. The conversations have ranged from semi-structured conversations to informal chats and I always arrived the conversation-meetings with a short list of issue-oriented questions (Stake 1995). I called the list a *conversation-guide* and I always e-mailed the respondent a copy a couple of days beforehand where I emphasized that the guide was to be perceived as issue-oriented and not to be followed strictly during conversation in addition to that I indicated a concern for completing a research agenda. I also recommended the respondent to prepare for the conversation by reading through the guide in advance and write down some reflections regarding the issues in the guide. I did not ask exactly the same questions of each respondent. Instead, I expected each respondent to have unique experiences and special

¹⁶³ Greenwood and Levin (2000), p.96

¹⁶⁴ This is not to say that I disregard the usefulness of quantitative methods. To the contrary, quantitative and qualitative methods may be used appropriately and interchangeably depending on the research issue at stake as in line with Denzin and Lincoln (1994) and Greenwood and Levin (1998). See Section A.III below.

stories to tell regarding “description of an episode, an explanation, a linkage” (Stake 1995:65). In order to evoke good responses and co-generated reflections I spent quite some time to work out formulations and questions in the conversation guide. All conversations (listed in Table 1 below in next section) lasted from two to three hours. Most of them were taped and some were transcribed as indicated in Table 1. For those conversations that I did not tape, I prepared a written field note in order to reconstruct the main points of the local insider.

The reflection meetings as listed in Table 1 (below, next section) have functioned as mutual reflection arenas and been conducted in order to co-generate the inquiry and development process consistent with the co-generative learning model in Figure 1 regarding collective practice in building projects. Through this learning, the reflection meetings became a way to fulfill the ambition of empowering the involved actors speaking their points of view in addition to create genuine respect for diversity in viewpoints (Elden and Levin, 1991). Throughout the thesis this point is discussed as a central condition for knowledge creation, meaning construction and learning. As a researcher, then, I have provided influence as an individual factor being consistent with the participant-observer role described by Yin (1994). A central point is that I have provided close contact with the field over an extended period of time. This was achieved through the process of democratic inquiry in which I as an outsider or professional researcher collaborated with the local stakeholders of the AEC industry based on genuine respect of what the stakeholders themselves perceived as problems and challenges for further development (Greenwood and Levin, 2000).

Another participant-observer role (Yin 1994) I had was in my fieldwork period in March 1998 where I “worked” as regular “building site worker” on the Rekkevik Brygge project. I was then walking about together with joiners and concrete workers on the site from 07:00 am to 03:00 pm every day during two weeks. I was dressed as a regular joiner and during the two weeks I had rotated through all the work teams on the site. The work rotation on the site enabled me to have small informal chats with all the workers on the site including the operative building site management. It was especially during the regular breakfast and lunch breaks that I could have some very interesting and enjoyable chats. This site stay was important in the sense that I could learn and get familiar with the physical execution work on the building site. Through participating in their regular work they could easily tell me about their work, experiences and what they cared for during a day. After each day on the

site I spent an hour writing down my experiences and observations during the day in a diary. In addition I had a small notebook with me on the site where I wrote down immediate and spontaneous reflections and thoughts. It was interesting, though, to experience the total absence of skepticism to have a Ph.D.-student walking around on the site. In many ways I really felt that they treated me as an equal and I really felt that I got a confident and close relationship to most of the site workers during my stay bringing me valuable research experiences.

I have emphasized to maintain contact with employees at all levels of the companies involved in the two case building projects. But due to the reason mentioned earlier regarding the dominant position and role of Veidekke in building projects, it was natural that most of the contacts were from Veidekke.

Case study design and theory building approach

The case study design I have used in my study then follows the characteristics of a multiple-embedded case study as in line with Yin (1994). There are two major cases, namely the Rekkevik Brygge and the Bergheim Amfi building projects, which describes multiple units of analysis, different change processes and different activities I have followed and participated in. These processes have been within the building projects that are units organized across organizational company borders. Criteria for interpreting the findings are provided within the model described in Chapter 5 indicating important questions and assumptions that the cases are subsequently compared to. This case study design has enabled a search for cross-case patterns. This is in a way similar to Yin (1994: 45-50)'s argument of replication. The two cases were chosen as the SiB consortium companies themselves decided them to be the central "lighthouse" pilot projects of SiB. Despite their differences in size, they were comparable as Veidekke were the main property developer in both. Moreover, I have used multiple sources of evidence in this study. Using Yin (1994: 93)'s six categories, I have used company documentation, company archival records, interviews, direct observation and participant observation. Eventually, I have tried to "maintain a chain of evidence" in order to increase the reliability of the study (Yin 1994: 98-99). Through this I allow the external reader to follow the development of the model for creating organizational change and innovation in the AEC industry. From the initial

research questions (Chapter 1), through the theoretical framework (PART ONE), the case story (PART TWO), case discussion and concluding discussion (PART THREE).

I have relied upon a co-generative inquiry approach to theory building consistent with the co-generative learning model in Figure 1 (Greenwood and Levin, 1998). This entails that the theory being developed has been grounded in action creating context-centered knowledge consistent with the claim of the Deweyian pragmatism (Thesis Chapter 2) in linking theory and praxis. This position implies a full rejection of the dualism between theory and praxis that still is hold as valid in much conventional social research despite the outspoken rejection of the logical positivism paradigm. This co-generative approach contrasts the grounded theory approach of Glaser and Strauss (1967) and Strauss and Corbin (1998) claiming theory to be coded and grounded in data. According to this grounded theory view it is the professional researcher that in the last instance decides what is valid or not contradicting the Deweyan constructivist paradigm as emphasized in this thesis. Thus the crucial validity criterion of research and case study as practiced in this thesis is underpinned by “whether or not the actual solution to a problem arrived at solves the problem” (Greenwood and Levin 2000: 97). This pragmatically grounded workability criterion has been used to decide the validity of the thesis’ research results. That is, the validity and the reliability of the research results have been rooted in “*a discursive process* where participants and researchers negotiate the meanings created by their experiences during the research process” (Greenwood and Levin 1998: 114)¹⁶⁵. Thus the co-generative approach to theory building and exploration of data has relied upon a continuous cyclic process of reflection in and on action between me as an external professional researcher and the local insiders (see Thesis chapters 6 to 8). These discourses between the insiders and me as an outsider have taken place on adequate reflection arenas as described in the case story. Hence, with parts of the case study performed as pragmatic AR¹⁶⁶ on the subject of organizational change and innovation demonstrates the point that is so precisely put by Eden and Huxham (1999):

One of the most persuasive reasons for using action research is that when subjects do not have to commit to real action and to creating a future which they will inhabit, any data gained from them are inherently unreliable. This is because it is impossible to test whether what people say they would do

¹⁶⁵ My *italics*.

¹⁶⁶ The part of the case study performed as pragmatic AR is restricted to the Bergheim Amfi building project. See Table 1 in the section below considering the field activities.

is what they actually do if it 'came to the crunch'. [...] Reliable data, and hence theories, about both past and future aspects that influence the way in which people change a situation are much more likely to emerge from a research process which is geared to action than from more traditional approaches (Eden and Huxham 1999:281).

The last point is viewed as intuitively true because what participants actually say and do in circumstances that really matter to them is intrinsically more reliable compared with what they might say hypothetically, or do in controlled circumstances based on conventional social science approaches. My role as a professional researcher has been defined by the ethics of taking an outspoken and clear role as outsider and not to pretend as an insider. This has privileged the diversity of meaning construction constituting a ground for new learning and empowerment in the process for all concerned. That is, a process in which the goal is to bridge local and scientific knowledge that in the last instance creates both new local and scientific knowledge.

A II. Field activities

My first contact with the field was at a 2-days SiB seminar at Lysebu in April 1997 where also my co-supervisor from NTNU participated. Together with my co-supervisor and three other research members from the HSK research forum we constituted a consulting research team for the participating representatives of the top management group (CEOs and vice-CEOs) from each of the four SiB consortium companies. My co-supervisor participated as an active researcher in the SiB and at the Lysebu seminar as an active member of the HSK forum. The HSK had been in operation including a pre-project for SiB since early 1995. At the time when I entered the field the SiB had operated for more than one year since the start-up in January 1996. Both the HSK and the SiB program were then going on very well and the SiB consortium actors were at that time on the Lysebu seminar in a pretty optimistic mode and also expressed very ambitious goals on behalf of the outcome of the R&D program. The four SiB consortium actors were then pretty familiar with my co-supervisor's consulting research role in the SiB R&D program and therefore it was not necessary to have an explicit meeting with the SiB actors discussing my role with the program and the four companies. But still I introduced myself for the first time at the Lysebu seminar, in front of all these top CEOs from leading AEC companies in Norway, as

a Ph.D.-student from NTNU that was going to focus on practical conditions for creating organizational change and innovation in companies of the Norwegian AEC industry. It was also emphasized that my research was especially going to focus on integrated organizational change and IT supported process modeling. Due to the SiB consortium board's familiarity with my co-supervisor research role in the program and the HSK research forum, it was mutually understood that I should not only study the operative practice of building projects, but also contribute to a development process, as documented in Chapter 8, with my accumulating knowledge throughout the study. Thus my introduction was open and my research role was fairly well defined (Stake 1995)¹⁶⁷. Nevertheless, the research process and the activities that I was going to take part in showed over the years of the case study to be much more wide-ranging than a typical "IT-introduction project"¹⁶⁸.

The field activities spanned the time period from spring of 1997 to the summer of 2001 in which I more or less actively participated within building projects executed and organized by the four SiB consortium companies. The major field activities then are concentrated with relation to two building projects, namely the Rekkevik Brygge project in 1998 and the Bergheim Amfi project in 2000/2001, both in which Veidekke was the main property developer. Due to the dominant position of Veidekke, both because of its leading position in the AEC industry in general and its central role as a property developer in building projects, I had naturally much more contact with Veidekke than the other three SiB companies. During the time before and in between the two concentrated field periods, the field activities were restricted to formal and informal conversations mostly with people on the project management and top management level in the four SiB companies. As shown below field notes and transcript of conversations (both informal and semiformal talks in one-to-one and in groups) from different kind of meetings have been the most frequent sources for exploring information and empirical data. The reflection meetings during the Bergheim Amfi project (see Thesis Chapter 8) were all reported and e-mailed back the participating actors. According to my discussion above regarding action research, the Bergheim Amfi is the part of the study that is fully action research oriented.

In the table below I provide an overview of the field activities more or less in chronological order. In the table I have diversified between *Conversation round*, indicating a round of

¹⁶⁷ See Thesis Chapter 1.

¹⁶⁸ The IT-introduction was emphasized as the most important part of SiB. See Thesis Chapter 3.

conversations with actors in a specific building project or AEC actors in general, and *Reflection meeting*, indicating a meeting with collective reflection for co-generative learning on a specific topic with the AEC actors involved in the project:

Time Period	Description (Conversations round/Reflection meeting)	# of conversations	# taped	# transcribed	# of transcribed A4 pages	Type of data
1997: March - September	<u>CONVERSATIONS round no 1:</u> Conversations with the top managers, including CEO and vice CEO, in each of the four SiB consortium companies indicating top priorities for the strategic development of the building process. Conversation guide sent beforehand to all respondents. A majority of the respondents were e-mailed the transcribed conversation for control.	9	9	9	155	Transcript
01 – 02 April 1997	<u>REFLECTION meeting no 1:</u> the SiB seminar at Lysebu, April 1997 (The Lysebu seminar), two days, with all the top managers of the consortium companies present. The meeting is documented in a report. Reflection topic: enterprise modeling. Reflection Report e-mailed to the participants. (Chapter 6)					Field notes
December 1997	<u>Conference:</u> Observations and informal conversations with professionals at AEC-conference in Oslo (1 day).	Informal conversations with AEC professionals				Field notes
January 1998	<u>Conference:</u> Observations and informal conversations with AEC professionals at a NIF conference and presentation of SiB (1 day)	Informal conversations with AEC professionals				Field notes
February 12 1998	<u>REFLECTION meeting no 2:</u> One day, R&D group of the Rekkevik Brygge Pilot project had a meeting with project management of RB at the building site office of RB, Larvik.					Field notes
March 25 1998	<u>REFLECTION meeting no 3</u> one day: a HSK-meeting with invited AEC professionals and SiB consortium members discussing an outline for common theory of the building process at a main proposal from Eikeland (Eikeland 1998)					Field notes

Time Period	Description (Conversations round/Reflection meeting)	# of conver- sations	# taped	# tran- scribed	# of trans- cribed A4 pages	Type of data	
03 – 17 March 1998	<u>CONVERSATIONS round no 2:</u> combined with two weeks of fieldwork at a Veidekke building site, Rekkevik Brygge, Larvik. SiB pilot project. Conversations with all construction personnel on the site (joiners, gangers), RB building site management. Field diary. I “worked” as regular “building site worker” together with joiners and concrete workers on the site from 07:00 am to 03:00 pm every day during the two weeks. (Chapter 7)	24	1			Field notes + Taped	
1-2 April 1998	<u>REFLECTION meeting no 4: The SiB Pilot Modeling Conference,</u> Lilleorget Trondheim Report e-mailed to participants (Chapter 6).					Field notes	
May and June 1998	<u>CONVERSATIONS round no 3:</u> conversations with project management staff including the consulting engineers, architects and technical consultants on the building project Rekkevik Brygge (RB) where Veidekke was the property developer. (Chapter 7)	9	9	9	190	Transcript	
July 26 – August 16 1998	<u>The USA journey I:</u> San Francisco, San Diego and Boston: AEC conference with AEC professionals and academics at Stanford University, one week (CIFE Summer Program http://www.stanford.edu/group/CIFE/index.html), After that I was a participant at the Academy of Management 1998: “What matters most?” in San Diego http://www.aom.pace.edu/ Finally I visited Society of Organizational Learning (SoL) http://www.solonline.org/ , Boston. Travel report published as SiB report (ISBN 82-91860-21-1)					Informal conversations with US based AEC professionals and AEC academics (Stanford University).	Field notes
April 1999	<u>Modeling Conference:</u> observations on a one-day Modeling Conference as part of the intranet development project at SiB consortium actor, Interconsult ASA, Trondheim.					Informal conversations and observations with employees from Interconsult ASA.	Field notes

Time Period	Description (Conversations round/Reflection meeting)	# of conver- - sations	# taped	# tran- scribed	# of trans- cribed A4 pages	Type of data
September 1999.	The SiB End Conference: observations and informal conversation with AEC professionals about the need for process modeling in the building process. A presentation by my co-supervisor (Chapter 7). Two days.					Field notes
July 1999 – January 2000	The USA Journey II: Research stay at SCANCOR, Stanford University, California, USA. 100% sponsored by the Research Council of Norway (RCN)					Literature studies.
February – June 2000	Pilot project planning: Planning and literature studies for a pilot building project on “ <i>Enterprise modeling, learning and knowledge development in the building process</i> ” based on the experiences from the SiB Trondheim Pilot Modeling Conference April 1998.					Pilot Project planning. The planning process is documented in 3 different documents (Plan1.doc, Plan2.doc and Plan3.doc)
May – November 2000	CONVERSATIONS round no 4: A conversations round with top management people in Veidekke, Interconsult, and ProsjektNett AS; including planning meeting with Veidekke and Interconsult for the Pilot project Bergheim Amfi . Aim: To anchor the Pilot project in participating companies. Conversations guide (chapters 7 and 8).	10				Field notes + Taped
October 16 2000	REFLECTION meeting no 5: Start-up meeting for the Pilot Bergheim Amfi project 10 people from Veidekke, Interconsult and ProsjektNett, 2 hours (Chapter 8)					Field notes
November 07 2000	REFLECTION meeting no 6: Start-up Gathering (RA-1) 20 people from Bergheim Amfi, Hurtigruta, 8 hours. (Chapter 8). All participants were e-mailed beforehand a detailed program description of the S-gathering.					Field notes
November 2000 - February 2001	COLLECTIVE REFLECTION meetings ROUND no 7-20: Participatory observation and collective reflection activities as integrated part of the Projecting meeting group every Friday weekday during a period of 4 months on the Bergheim Amfi building site office (RA-2 and RA-3 in Chapter 8). Meeting diary					Field notes

Time Period	Description (Conversations round/Reflection meeting)	# of conver- - sations	# taped	# tran- scribed	# of trans- cribed A4 pages	Type of data
March 29 2001	Reflection meeting no 21: E-gathering (RA-2) , 18 people from Veidekke and Bergheim Amfi, 6 hours, Olavskvartalet Trondheim. All participants were e-mailed beforehand a detailed program description. (Chapter 8)					Field notes
April and May 2001	CONVERSATIONS round no 5: Conversations with all participating projecting actors in Bergheim Amfi (each conversation lasted 2 hours). Conversation guide were e-mailed beforehand to the respondents. (Chapter 8)	15	15			Taped
June 22 2001	Reflection meeting no 22: Presentation of Bergheim Amfi Pilot Project End Report. The End Report (40 pages) was e-mailed beforehand to the participants, the Veidekke Bergheim Amfi project management staff. The meeting was held at Veidekke head office in Trondheim. 2 hours. The ppt-presentation is enclosed in Appendix 2 of the Thesis.					Field notes
Total		67	37	18	345	

Table 1 Overview of field activities

The overview in Table 1 shows a total of 22 reflection meetings and 67 conversations. Together with the case story told in the chapters 6, 7 and 8, this section provides a sufficient overview then of my fieldwork in and among companies in the Norwegian AEC industry involved in the building projects Rekkevik Brygge and Bergheim Amfi when it comes to the major activities and time spent.

A III. The trustworthiness of the study

In order to decide what is meaningful regarding quality of research, I argue in line with Guba and Lincoln (1994) that there is a need to be clear about the competing set of basic beliefs at a paradigmatic or philosophic level that in the last instance have important practical implications (see Thesis Chapter 2). The point according to Guba and Lincoln is

that the underpinning paradigm or worldview is essential to be clear about because it guides the investigator not only along the questions of methodology, but also regarding ontology and epistemology. In Chapter 2 I have argued in favor of a pragmatic knowledge approach relying on the pragmatism of Dewey that deals with all the three aspects of worldview. This approach to understanding knowledge and organizations I have showed builds fundamentally on the paradigm of social constructivism (Berger and Luckmann 1967, Lincoln and Guba 1985, Guba and Lincoln 1989).

Hence, building on the Deweyan pragmatist approach to knowledge, I have in the above section argued in line with Greenwood and Levin (1998) for using the criteria of workability as a fundamental basis for judging the validity and reliability of research results. Consequently, building on the Deweyan pragmatist approach the trustworthiness of this study is viewed to rely on two major forms of credibility. First, there is the workability criterion that parallels the challenge of internal validity. Second, there is the criterion of transcontextuality that parallels the challenge of external validity. Regarding the internal validity, I argue that the action research approach as applied in the case of Bergheim Amfi shows in a thorough way that the criterion of workability is satisfied.

Relying on Lincoln and Guba (1985)¹⁶⁹, the trustworthiness is viewed to rely on credibility (parallel to internal validity), transferability (parallel to external validity), dependability (parallel to reliability) and eventually confirmability (parallel to objectivity). The credibility criterion is defined in terms of internal validity, which is achieved through the following techniques:

- (1) *Prolonged engagement*: This regards whether the researcher has provided substantial involvement in order to learn the actual collective practice of the context. I have been involved in the Norwegian AEC industry for a period of almost five years, and based on the description of the table (Table 1) in the section above, I claim that the study satisfies this criterion.
- (2) *Persistent observation*: The co-generative learning approach applied in this study (see above sections) implies an aim to democratize the research process letting the research objectives develop and unfold in cooperation with the companies involved in the SiB program and in the two case building projects. This has been the case in

¹⁶⁹ This section also partly relies on Knutstad (1998: 139 – 146).

this case study as the area of creating organizational change and innovation was at best limited or unclear at the initiation of the study. Thus it has been developed in a constant interaction between theory and praxis during the whole study.

- (3) *Triangulation*: Triangulation of data mostly implies to the use of multiple methods and sources of data. Multiple sources of evidence have been discussed in the sections above in which interviews, conversations and written material are the main sources. Regarding multiple methods, it has been the case that interviews have been added by participant observation (e.g. both in Rekkevik and Bergheim), regular observation (e.g. in the Rekkevik Brygge), and presentations of concepts and interpretations of explored data in different reflection meetings, regular meetings, conferences and seminars. As shown in the previous section (Table 1), there has been a range of activities, organizational settings and number of people involved. During the study there has been an excellent opportunity to test my understandings and assumptions with several informants in a broad specter of settings. Nevertheless, the pragmatic AR approach applied in the Bergheim Amfi case project has really provided an opportunity to have a real discourse on questions and issues in a context in which they are actually generated.
- (4) *Peer debriefing*: This regards the technique of exposing one's own understanding to peers, preferably not doing research in the same area. As indicated in the previous sections of this appendix, I have had substantial interaction with fellow researchers in basically four arenas. First, there are meetings and seminars together with fellow Ph.D. students in the HSK forum over a period of almost three years. Second, there are interactions and discussions I have had with other research fellows at the Research community of Dragvoll Gård/Studio Apertura, Norwegian University of Science and Technology (NTNU – Norges teknisk-naturvitenskapelige universitet). Third, there are meetings, seminars and talks with research fellows and associates during my 6-months research stay the fall 1999 at Center for Integrated Facility Engineering (CIFE) and SCANCOR at Stanford University, California, USA. Fourth, but not least, I worked together with a fellow Ph.D. student in a pragmatic action research process in the Bergheim Amfi case in which we worked as a research team according to the co-generative learning model (see Figure 1 above) over a period of almost two years.
- (5) *Negative case analysis*: This technique regards the effort of constantly testing ones understanding, concepts and assumptions against new data. As my overall approach

to exploring data in which thought and action are united as in accordance to the process of Deweyan inquiry and the criterion of workability as argued above, I have not used this technique in my inquiry.

- (6) *Unbiased representation*: This technique regards the value of displaying the “raw” data that is gathered either by using audio or video recording equipment. Due to the trustful and confidential relationship with the case companies, it has never been considered as relevant using this technique.
- (7) *Member checking*: This technique regards to what extent the findings and relationships are tested out in the field and with the practitioners (insiders) from which they originated. This activity I have tried to satisfy in several ways. It has first of all taken place through ongoing discourses in the field throughout the whole study (see previous section). Second, I have provided presentations in different meetings and seminars discussing it with the insiders. The End Report of Bergheim Amfi project was presented at an End seminar (June 2001, see Appendix 2) with all the participating actors present. Also my sessions in the HSK activities have provided a member check as when case company representatives have been present at the meetings.

Based on the discussion in those seven paragraphs, I conclude, then, that the study fully satisfies the credibility criterion.

When it comes to transcontextual credibility, I argue in line with Lincoln and Guba (1985) that due to the context-centered and constructivistic aspects of knowledge external validity cannot be specified other than by ‘thick’ descriptions. I will argue that I have provided thick descriptions that show how transferability might be possible. In the last instance the reader is the one who decides this question.

In accordance to the trustworthiness criterion of dependability, it should be pretty obvious that the thesis conclusions depend upon my own models and research experience. However, the feedback from the actors involved in the case projects show appreciation and acknowledgements of my research results in the sense that they so far have showed eagerness in building on the innovation model and using the model in future building projects.

The final trustworthiness criterion of confirmability regards to what extent it is possible for other researchers based on access to the “same data” to draw the same conclusions. Taking into account the stated context-centeredness of knowledge as socially constructed, the co-generated inquiry process over a period of almost 5 years makes it at best highly unlikely, in practice impossible, to replicate the research process and then make the same interpretations and conclusions. Indeed, it would be totally unethical to expose my confidential “raw” data for the aim of confirmability.

In sum, then, I claim that this study has proven a sufficient degree of trustworthiness. I view the credibility as high, that transferability is likely, though, it is not demonstrated, dependability is a logical implication taking into account the design of the study and at last that confirmability is very questionable in ethical terms being more a contradiction in terms taking into account that knowledge is socially constructed in a collective inquiry process.

A IV. Summary

This appendix has discussed the methodology and research process that form the basis of my study for the Ph.D. thesis. I have described the SiB research program and its research activities. Then the research and theory building approach and my research role have been discussed.

Finally, the quality of the research results and the exploration of data have been assessed with regard to the trustworthiness based on a pragmatist research position. I have concluded that the study provides a sufficiently thick case story in acknowledging the conclusion of the thesis. I emphasize in accordance to the stated context-centeredness of the study that transferability is likely, and consequently that external credibility is not claimed.

Appendix 2

Bergheim Amfi End Report

In this second appendix I present the PowerPoint-slides that I used when I presented the End Report of the Bergheim Amfi Evaluation Project (see Chapter 8) for the Veidekke staff at Veidekke's head office in Trondheim, June 22 2001.

Slide 1

Sluttrapport Følgeprosjektet Bergheim Amfi
Praktisk Metode for Samhandling og Læring i Veidekkes BA-prosjekter

NTNU

Presentasjon av Sluttrapport for Følgeprosjektet
Bergheim Amfi

**"Bruken av virksomhetsbildet har blitt et veldig nyttig symbol
for fellesskap og samarbeidsånd i prosjektet."**
(Prosjektledelsen)

22.06.01 Torbjørn Korsvold Flerfaglighet og samarbeid for bedre organisasjoner:
StudioApertura 1

Slide 2

Sluttrapport Følgeprosjektet Bergheim Amfi
Praktisk Metode for Samhandling og Læring i Veidekkes BA-prosjekter

NTNU

KONKLUSJON

Vi har funnet at **Metode for samhandling og læring i byggeprosjekter**
er nyttig for å bidra til:

- I. FELLES FORSTÅELSE:**
Bidrar til felles forståelse av helhet og sluttprodukter i byggeprosjekter
- II. ØKT VERDISKAPING:**
Skaper godt grunnlag for økt verdiskaping gjennom å tilrettelegge for god samhandling utfra en delt forståelse av helhet i byggeprosessen.
(ref. Veidekke årsrapport 2000: Nyskaping, Samskaping og Verdiskaping)
- III. MÅLRETTING:**
Tilrettelegger for målrettet arbeid med å skape sluttprodukter ut fra klart uttrykte mål/sluttprodukter.

Gjennom Følgeprosjektet Bergheim Amfi har vi fått anledning til å teste ut effekten av Metodens to første deler. Vi har utviklet en pilotmodell (prototyp) for en prosjektweb basert på metodens delement 3, som Veidekke vil vurdere eventuelt å teste ut på et senere byggeprosjekt.

22.06.01 Torbjørn Korsvold 2

Slide 3

Sluttrapport Følgeprosjektet Bergheim Amfi
Praktisk Metode for Samhandling og Læring i Veidekkes BA-prosjekter

NTNU

Byggeprosjektet omfatter:

- samhandlingsprosessen;** utvikling av aktørenes samhandling på byggeprosjektet
- byggeprosessen;** utviklingen av bygninger som skal skape optimale forhold for kunden/byggherren i fremtiden: her inngår problemløsning innen de spesifikke fagprosesser (arkitekt, RIB, RIV, osv).
- sluttprodukter;** byggeprosjektets sluttprodukter som inkluderer alt fra ferdig bygg til fornøyde kunder til økt verdiskaping i samarbeid

22.06.01 Torbjørn Korsvold

Plerfaglighet og samarbeid for bedre organisasjoner:
StudioApertura

Bergheim Amfi

Slide 4

Sluttrapport Følgeprosjektet Bergheim Amfi
Praktisk Metode for Samhandling og Læring i Veidekkes BA-prosjekter

NTNU

Byggeprosjektet i verdiskapingsperspektiv:

YTRE RAMMEFAKTORER

SAMHANDLINGSPROSESSEN

BYGGEPROSESSEN

Fornøyde kunder

Økt konkurransekraft i samhandling

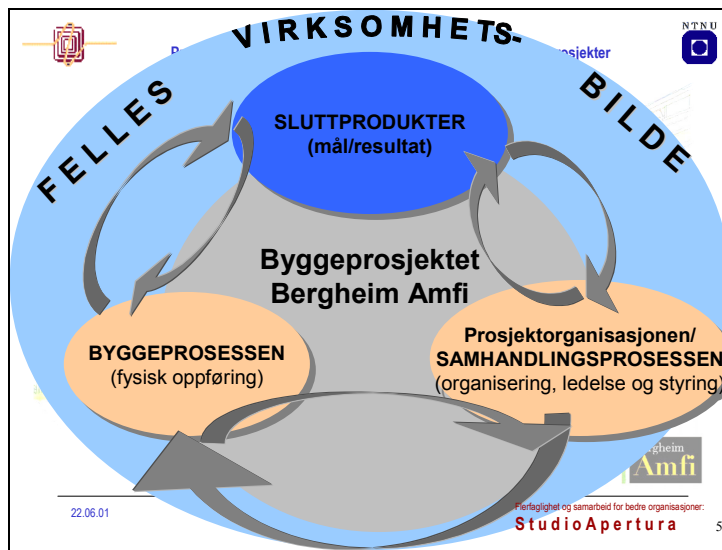
Ivareta ytre miljø

→ Et mellom samhandlingsprosessen (1), byggeprosessen (2) og sluttprodukter (3)

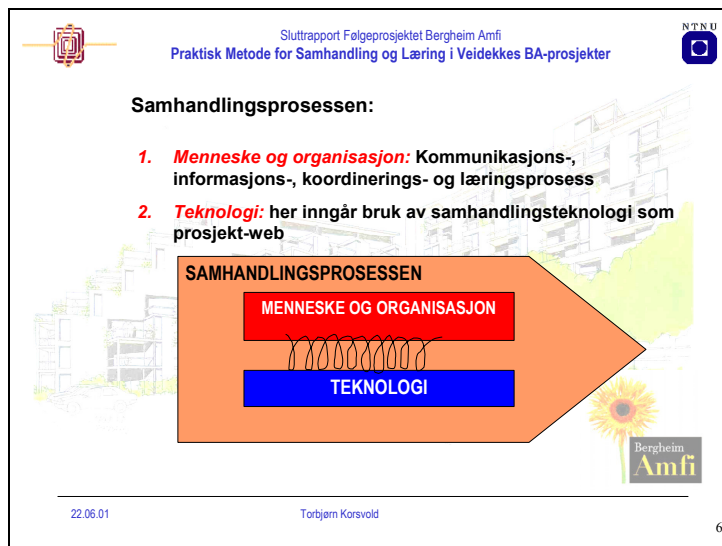
22.06.01 Torbjørn Korsvold

Bergheim Amfi

Slide 5



Slide 6



Slide 7

Sluttrapport Følgeprosjektet Bergheim Amfi
Praktisk Metode for Samhandling og Læring i Veidekkes BA-prosjekter

NTNU

Hva går metoden ut på?

DEL 1: Oppstartssamling med utvikling av felles virksomhetsbilde

DEL 2: Oppfølging med refleksjons- og evalueringssamling

DEL 3: Bruk av verktøy (IT) for effektiv samhandling i operativ prosjektgjennomføring

Bergheim Amfi

22.06.01 Torbjørn Korsvold Flerfaglighet og samarbeid for bedre organisasjoner: StudioApertura 7

Slide 8

Sluttrapport Følgeprosjektet Bergheim Amfi
Praktisk Metode for Samhandling og Læring i Veidekkes BA-prosjekter

NTNU

De tre delene i Metoden inngår som en naturlig og integret del av byggeprosessen:

BYGGEPROSESSEN

DEL 1
Oppstartssamling
Felles Virksomhetsbilde

DEL 2
Oppfølging med refleksjons- og Evalueringssamling

DEL 3
Bruk av verktøy (IT) for effektiv samhandling

Bergheim Amfi

22.06.01 Torbjørn Korsvold 8

Slide 9

Sluttrapport Følgeprosjektet Bergheim Amfi
Praktisk Metode for Samhandling og Læring i Veidekkes BA-prosjekter

Hva går metoden ut på? (forts.)

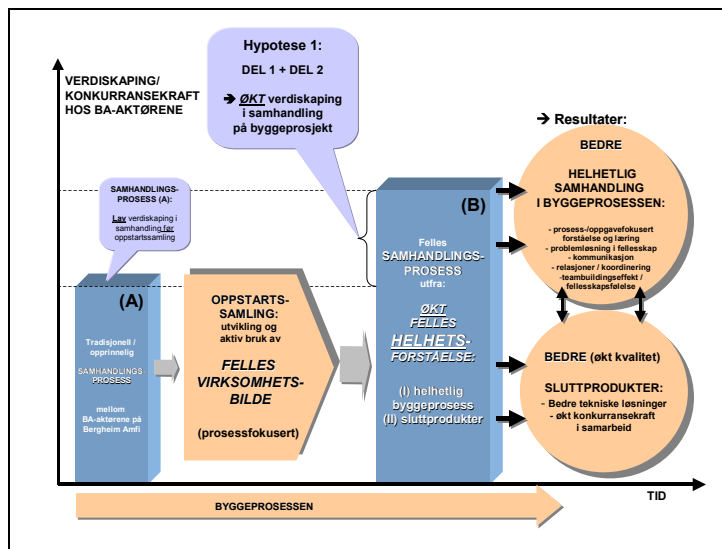
1. **Verksted:**
krever aktiv deltaging fra alle
2. **Deltakerbasert:**
basert på bred medvirkning
3. **Visualisering:**
 - enkle teknikker for å lage felles bilder av aktivitetene i prosjektet
 - støtte for samhandling og kommunikasjon
4. **Læring:**
læring gjennom fokus på helhet

22.06.01

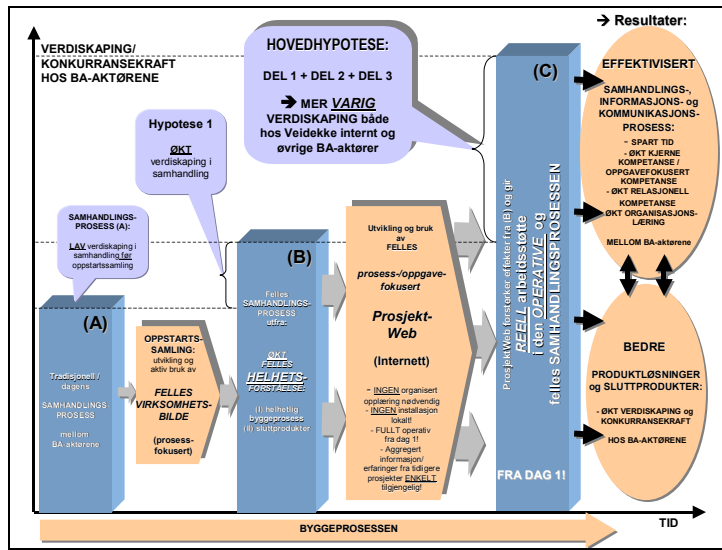
Torbjørn Korsvold

Flerfaglighet og samarbeid for bedre organisasjoner.
Studio Apertura

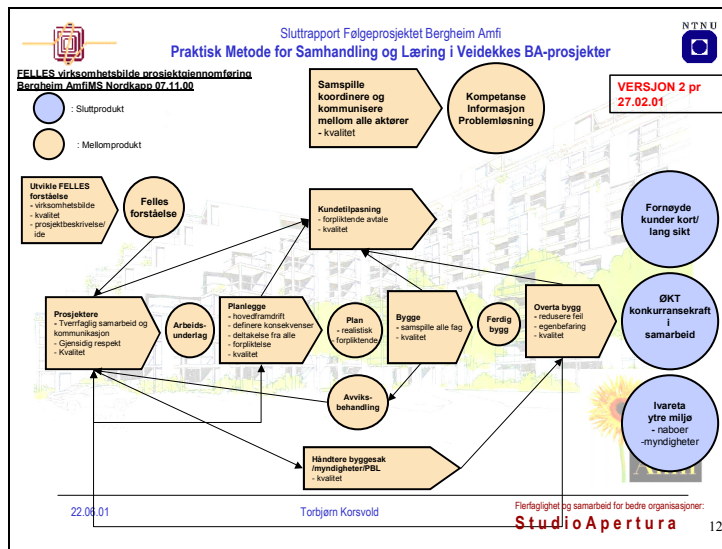
Slide 10



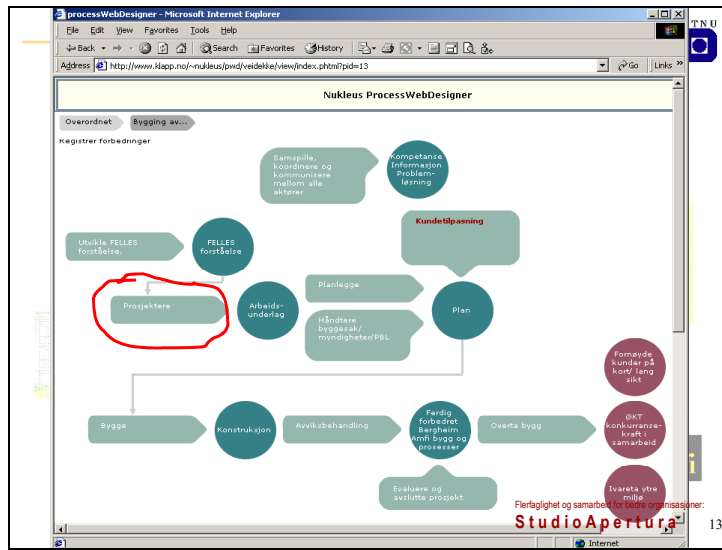
Slide 11



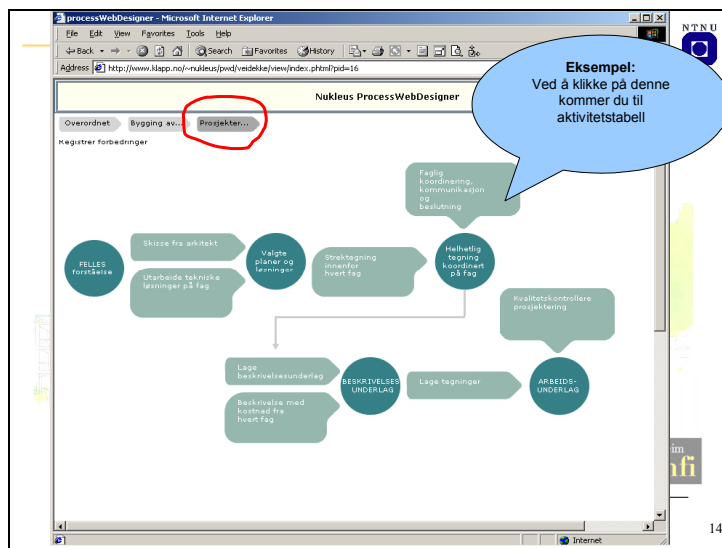
Slide 12



Slide 13



Slide 14



Slide 15

The screenshot shows a web browser window displaying the 'Nukleus ProcessWebDesigner' interface. The main content is a table with the following structure:

navn	hjelpessider	veiledning	krav
Lage beskjed til en eller flere aktører på prosjektet	Liste over tidligere beskjeder sortert på tema og tid: Lag og send beskjed Liste over tidligere beskjeder sortert på tema og tid	Her lager du og sender beskjed til aktører på prosjektet. Se mer	
Lede, håndtere relevant informasjon og gjennomføre prosjekteringsmøter	All informasjon blir lagret etter følgende kriterier: Saksnummer: Overskrift: Beskrivelse: Ansvarlig: Informasjon til: Type: Informasjon/beslutning/oppgave Frist: Status: utført/ikke utført Prioritet: høy/lav Lag referat Se referater	Prosjekteringsmøter ledes av Vidcon Storli, Veidekke. Møtene holdes hver fredag fra kl 08:00 på brakkeengen Bergheim Ant. Prosjekteringsleder må påse at referat er lagt ut senest i løpet av samme dag.	Alle har ansvar for å hente ut liste referat som underlag for neste møte. Utdrag kap Kvalitetsplan
Innhente erfaringsgrunnlag fra tidligere prosjekter og oppdrag	Referansedatabasen	Ved erfaring av viktig hendelse skal det gjøres en sjekk mot eksisterende prosjekter og hendelser	Utdrag kap Kvalitetsplan
Lage		Alle i prosjektering	

At the bottom of the browser window, there is a logo for 'Studio Apertora' and the text 'Flerfaglighet og samarbeid for bedre organisasjoner.' The page number '15' is visible in the bottom right corner.

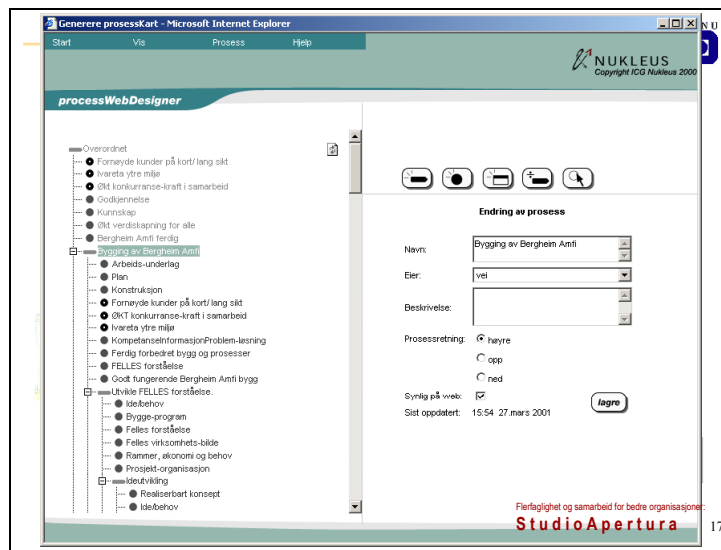
Slide 16

The screenshot shows the 'Nukleus ProcessWebDesigner' interface with a process flow diagram. The diagram consists of several steps in rounded rectangular boxes:

- Ideutvikling** (Idea development)
- Idé/behov** (Idea/need)
- Behovsanalyse** (Need analysis)
- Byggeprogram** (Build program)
- Skissering av konsept, prosjektbeskrivelse og ramme** (Sketching of concept, project description and framework)
- Ramme, økonomi og behov** (Framework, economics and needs)
- Bestille prosjektgruppe** (Order project group)
- Prosjektorganisasjon** (Project organization)
- Oppstartssamling / konstruksjon av felles virksomhetsbilde (1-2 dager)** (Kick-off meeting / construction of common corporate image (1-2 days))
- Felles virksomhetsbilde** (Common corporate image)
- Konstruksjon og design av prosjekt-web/portal** (Construction and design of project web/portal)
- Felles forståelse** (Common understanding)

The 'Utvikle FE...' button in the top navigation bar is highlighted with a red circle. The page number '16' is visible in the bottom right corner.

Slide 17



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