

**UNDERSTANDING ADOPTION AND USE OF ICT IN CONSTRUCTION PROJECTS
THROUGH THE LENS OF CONTEXT, ACTORS AND TECHNOLOGY**

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ABSTRACT

In the literature on construction related ICT no distinction is usually made between ICT use in the permanent organization and the temporary organization forming the building and construction projects. By drawing on the rich body of literature on organizational and managerial aspects of ICT the aim of the paper is to investigate how the interplay between contextual elements, actors' frames of reference, and the ICT influence the adoption and use of ICT in building and construction projects. This objective will be pursued by an analysis of an ongoing study of ICT use in the Swedish building and construction sector, including semi-structured interviews and an ethnographic inspired study of a partnering project worth 50 million €. It is concluded that project based mode of organizing, with the prime focus on time and costs, creates a conflict with the process of introduction and development of ICT use that is characterised by ambiguity and indefinite duration in time that goes beyond the termination of a project. Unless immediate benefits are perceived by the adoption and use of an ICT application, it will not be used. This conflict can probably not wholly be solved, instead the industry has to learn to live with it and create spaces for innovation of ICT-mediated changes.

KEYWORDS

ICT, adoption, use, organizational change, building and construction industry, temporary organizations,

1. INTRODUCTION

Today large building and construction companies use ICT to the same extent as companies in other industries in order to co-ordinate and manage their internal information flows (see e.g. Molnár et al, 2007). However, in construction projects the use of ICT for intra- and inter-organizational coordination and information exchange in the planning-, design- and production processes has been limited even if it is claimed to be a recognized potential (see e.g. Wikforss and Löfgren, 2007). Among the explanations for the limited adoption and use of ICT are: fragmentation of the industry and lack of integration between design and production process (Dainty et al, 2006); a focus on solving technical problems, at the same time as the organizational context is overlooked, as well as problems of existing ICT solutions to incorporate interests of varying professional groups (Wikforss and Löfgren, 2007); which in turn is grounded in a varying set of principals, rules, knowledge domains, etc in professional groups leading to difficulties in co-operating (Söderholm, 2006). Moreover, in the literature on construction related ICT there has been a focus on construction companies, and no distinction between ICT use in construction “parent” organization, the permanent organization, and the temporary coalition of actors forming project teams (Rowlingson, 2007). Accordingly the central issue analyzed and discussed in this paper is how an enhanced understanding of the adoption and use of ICT in building and construction projects can be gained.

By drawing on the rich body of literature on organizational and managerial aspects of ICT, the crucial point of departure is to understand adoption and use of ICT as an emergent change process embedded in an organizational and societal context (Kling, 1980; Markus and Robey, 1988; Orlikowski, 1992). In order to analyse the processual and emergent nature of ICT adoption and use, the interrelationships between contextual elements, actors’ frames of reference and the role of the ICT itself need to be analysed (Constantinides and Barrett, 2006). Given this background the aim of the paper is to investigate how the interplay between contextual elements, actors’ frames of reference, and the ICT, influences the adoption and use of ICT in building and construction projects. This objective will be pursued by an analysis of an ongoing study of ICT use in a major Swedish construction company, including semi-structured interviews and an ethnographic inspired study of a partnering project worth 50 million € over two years.

2. THE PROCESSUAL AND EMERGENT NATURE OF ICT ADOPTION AND USE

The importance of taking the organization and its context into consideration when ICT adoption and use is studied has in IS-research been recognized by for example Lucas (1975). He stated that one reason for failures of ICT implementations was a focus on the technology, whereas it was neglected that a new ICT should be integrated in an organization where people would be affected by the new technology. This view was further developed in the seminal articles by Kling (1980) and Markus and Robey (1988) who challenged the views on change, tending to overemphasize the rationality of managers directing change and the capability of ICT to create predictable changes of organizational processes. Instead they suggested that research should analyse the processual and emergent nature of ICT-mediated change. The process of ICT adoption and use can be described as social process involving a wide array of actors (see e.g. Newman and Robey, 1992; Robey and Bourdreau, 1999). This social process is linked to intra organizational and broader contexts, so called multi-layered contexts, emerging from a series of historical, organizational and economic circumstances (Walsham, 1993). The context can be understood as broader socio-political structure in which the adoption and use unfolds, including industry characteristics, political agendas and power relations (Pettigrew, 1985). Further the context is also understood as an organization’s cultural characteristics including particular formal and informal rules of behavior enacted by organizational members (Martin, 1992). When changes triggered by the adoption and use of a new ICT it is very likely that programs of action inscribed in the ICT challenge existing cultures, structures and power relations in the organization (see e.g. Orlikowski, 1992; 2000).

The contextual elements can also be seen as entities reinforcing actors’ frames of reference. By drawing on stocks of knowledge, norms, formal and informal rules constituted by the contextual elements, humans interpret and give meanings to events and behaviours to achieve meaningful interaction (see also Giddens, 1984). In this vein a new ICT is interpreted and given a meaning, but the interpretation and sense making of ICT should not be viewed as static. Even if the technology may appear to have objective forms and functions at one point in time, these can and do vary over times due to there being different contexts and different users assigning varying meanings to technology (Pinch and Bijker, 1987; Orlikowski, 1992; Linderoth and Pellegrino, 2005). Thus, actors frames of reference are continuously

constructed and refined in practice through inferences of past experience, as well as the obtainment of new knowledge emerging from for example added features to a technology, or a redefined use of a technology (op cit).

2.1 THE ICT AS SHAPER OF THE PROCESS

When studying adoption and use of ICT in organizational contexts, it is of crucial importance to include the ICT in the analysis of outcomes of the interaction between the technology and the organizational context (see e.g. Monteiro and Hanseth, 1996; Orlikowski and Iacono, 2001). However, in the analysis of interactions between ICT, social settings, and their contexts, ICT often tend to fade away, be taken for granted, or assumed to be unproblematic when it once has been designed and installed (Orlikowski and Iacono, 2001). However, in contemporary research there is a well known slippage between designers and managers intentions, and users actual deployment of technology labelled as drifting, meaning that original goals and aims with a new ICT-system often drifts away from its assigners, regardless of who defines them (see e.g. Ciborra 1996; Hanseth & Braa 1998). The drifting can be seen as a process where interactions between a not totally 'disambiguated' technology (Ciborra 2000) and multilayered contexts (Walsham 1993) trigger knowledge development and learning concerning the further deployment of a technology (see e.g. Rosenberg 1982; Andersson and Linderoth, 2008).

The heterogeneity of ICT can be seen as a result of patterns of action, or programs of actions, inscribed in technological artefacts, which originate from technology designers' assumptions about the potential user and the context for use. These inscribed programs of action delegate roles and competencies to the components of a socio-technical network, including human and non-human entities of the system (Akrish 1992, Latour 1992). When a program of action is inscribed into a piece of technology the technology could become an actor imposing its inscribed programs of action on its user (Monteiro 2000:77). However, the concept of inscriptions should not be viewed from a technology determinist perspective. Instead, inscriptions in technological artefacts can govern programs of action in strong or weak modes (Hanseth & Monteiro, 1997), and inscriptions are strengthened in a process of translation where different actor groups, indispensable for the change, need to be enrolled into a network carrying out the change (see also Latour, 1991). Depending on roles and relationships delegated to the socio-technical entities in the network carrying out the change, different challenges arise for the permanent organization when outcomes from ICT-mediated change processes would be managed and transferred (Linderoth, 2007). By taking the technology into consideration when ICT-mediated change processes are analysed, it can be concluded that the process is ambiguous, fluid and long term consequences are hard to predict (see e.g. Ciborra, 1996; 2000; Orlikowski, 1996; Orlikowski and Hofman, 1997). Taking these conditions into consideration, it can be realized that the management of an ICT mediated change process in the organizational form of a project with set boundaries, will imply a number of challenges for the permanent organization (see also Bresnen, 2006).

Accordingly, in section four, the context and actors' structures of references will be analysed from the perspective of features of ICT described in this section. In order to enhance the knowledge on adoption and use of ICT in building and construction projects, a special focus will be on to the ambiguous and indefinite duration ICT-mediated change processes.

3. DATA COLLECTION AND CASE DESCRIPTION

The data collection has been undertaken by two main methods: semi-structured interviews and participant observations, where data has been interpreted against a theoretical frame of reference. The approach chosen implies that a straight account of the respondents' answers to questions, or observations made will not bring any deeper knowledge about the process. Instead does the interpretive approach chosen enable an organizational member and/or a researcher to see his or her world with new eyes (see also DiMaggio, 1995). Therefore the results should be organized in a manner that is based on the researcher's interpretations. Interpretative case studies are a recommended method when the researcher is seeking to understand an emerging process of organizational transformation through IT (see e.g. Markus & Robey, 1988; Orlikowski & Baroudi, 1991; Orlikowski, 1992; Walsham, 1992; Robey & Azovedo, 1994).

In total 13 interviews are conducted with actors on different hierarchical levels in a major Swedish construction firm. Interviewed persons are for example the CEO of the company, the head of a regional unit, the head of a business district, site managers, one ICT-manager, one projecting manager and managers in R & D departments. The data collected by participant observation has been collected by

presence at 31 meetings, encompassing 58 hours, in a construction project worth 50 million € over two years, and run as a partnering project. The meetings participated in have been:

- Production meetings at the main contractor's production site involving the site manager, vice site managers, foremen, and representatives for construction workers.
- Projecting/design meetings with representatives for including the main contractor, the subcontractors and their consultants, and the client representatives.
- Meetings of the quality group with a responsibility for internal quality audits.
- Internal "check meetings" by the main contractor including the site manager, vice site managers, purchaser, cost accountant, projecting manager, planning manager.

Additional data has been collected by following a vice site manager during one day at the construction site, and by access to all meeting minutes from the internal meetings and accesses to the projects document database.

The main purpose of the data collection has been twofold. First we wanted to get an overview of the use of ICT in the studied company, belonging to the top three in Sweden regarding number of employees and turn over. Second, in all research on the adoption, implementation and use of ICT in an organizational context, it is of crucial importance to create an understanding of the context in which the ICT deployment unfolds (see e.g. Barley, 1986). In order to do this, interviews have focused on getting an in-depth understanding of the building and construction industry and what kind of ICT that is used, and how it is used. In order to deepen the understanding of the industry, and especially of the context of building and construction projects, an ethnology inspired study of a project is undertaken. The project studied is the rebuilding and expansion of a public multi activity arena. The existing building contains indoor swimming pools and an arena for indoor sports like basketball and handball. The expanded arena will contain an adventure pool, new swimming pool, a gym, and a bowling ground.

4. ICT ADOPTION AND USE IN THE PERMANENT AND TEMPORARY ORGANIZATION

In accordance with Molnár et al. (2007) this study confirms that large building and construction companies use ICT to a large extent in order to co-ordinate and manage their internal information flows. In the company studied there are 60 different systems with a range of users from one to four thousand. The large majority of systems are used in accordance with the common idea reinforcing IS-implementation initiatives: To integrate all information into a system in order to reduce fragmentation and increase efficiency (see e.g. Monteiro, 2003). One crucial dimension of this, in the building and construction industry, can be claimed to be monitoring and control of projects. Since this, according to a head of a region, is one of the core control issues in building and construction companies. Accordingly, the large majority of ICT can be seen as means for the permanent organization to control, monitor, and to some degree provide the temporary organization, the project teams, with ICT facilitating monitoring and control of activities in the project context. For example does a business district manager state that it is very easy for him to have an overview of the performance of the projects. Examples of these kinds of ICT applications in the studied organization are systems for: planning and control of projects, estimating costs and constructing project budgets, following up costs and consumption of resources on different levels in a project. However, ICT applications supporting the production process in a project are rarer. In the project under study the ICT-applications supporting the production process is mainly a database for sharing documents among contractor, sub-contractors and client; digitized survey; an e-commerce system linked to major suppliers; and of course e-mail and mobile phones these are the most common ICT applications. Furthermore 3D based building information models are emerging as ICT application with a potential to transform processes in building and construction projects. Nevertheless, compared to other industries, for example banking, manufacturing, or travels, the building and construction industry can still be regarded as a late adopter with regard to the use of ICT in the process of producing and delivering the products. However, what role contextual elements and actors' structure of reference plays in the interactions with ICT and the potential adoption and use of ICT in construction projects is still needed to be elaborated upon.

4.1 CONTEXTUAL ELEMENTS ROLE OF SHAPING USE OF ICT

In contemporary research a number of factors have been identified as explanations for the adoption and use of ICT in the building and construction industry. For example competitive advantages, external and internal forces, management support, user's individual characteristics (see Mitropoulos and Tatum, 2000; Peansupap and Walker, 2006; Rowlingson, 2007). We agree that these factors can explain the adoption

and use of ICT, but we want to bring the analyses further by highlighting one of the most distinguishable industry characteristic, namely the way building and construction activities are organized: by projects. The building and construction industry used to be mentioned as one of the industries with the longest tradition of organizing the activities by projects. With regard to the often individual and unique character of the outcomes of the production processes, the project has been the most appropriate form for organizing activities. But on the other hand, the project as organizational form for organizing activities can be claimed to be a factor constraining the adoption and use of ICT in building and construction projects. It can be argued that the focus on time and costs in projects are direct counterproductive for the adoption and use of ICT, if it is taken into consideration that positive outcomes from ICT implementations emerge through processes of knowledge development and learning these require a time span that often goes far beyond the termination of a project. I.e. the indefinite duration of ICT mediated change processes (Orlikowski, 1996), stands in sharp contrast to the well defined duration of a construction project. Furthermore Bresnen (2006) points at a number of inherent conflicts, or key differences, between the underlying logics of project management on one side, and on the other side the underlying logics of organizational change and learning. Thus, unless immediate benefits from an ICT-implementation can be showed with regard to the central dimensions of time and cost, it will be hard to convince project actors to adopt a technology. If the realizing of benefits from an ICT-implementation requires changes of work structures and a process requiring knowledge development and learning, which most often is the case in ICT implementations, project stakeholders incentives for adopting a new technology would probably be rather low.

One argument for adopting ICT is that a company can remain, or be more competitive, by for example reducing costs, or improving the perceived quality of goods and services delivered. However, the question is raised if the characteristics of the “competitive landscape” in the industry has reinforced the use of ICT in order to improve competitiveness? It can be claimed that the immobility of the products, implying a local situatedness of production processes and actors involved in construction projects, has not reinforced the use of ICT in order to stay competitive. Even if the major Swedish building and construction companies are active on an international market, for small and medium sized projects they operate on local markets competing with locally based competitors. This picture is confirmed when the CEO of the company studied is interviewed. He refers to an internal survey with 85 managers of local business districts, 54 % of them pointed out a locally based company as the hardest competitor. This condition implies that a locally based company can compete successfully with the three major companies when it comes to small and medium sized projects. It can be claimed that the limitation of the competition to local markets has held back a competitive pressure reinforcing innovation of the organizing of production processes, and implicitly an adoption and use of ICT as a mean for renewal and development of production processes. This condition can be compared with the situation in the manufacturing industry, where we have get in touch with small companies, with around 100 employees, who compete on international markets (see e.g. Andersson and Linderoth, 2008). For these companies the competitive pressure is harder and all means, including ICT, are needed to be taken into consideration in order to remain competitive.

Another contextual element that partly can constrain the adoption and use of ICT in the production process is the lack of standardization. In an interview with a R & D manager, working on standardization issues linked to the introduction and use of 3D-based building information models, states, for example, that it exists more than 3000 types of windows on the Swedish market. Maybe 300 would be enough for satisfying the need in the market, he rhetorically asks. A site manager also mentions windows as an example when lacks of standards are discussed. He states that on each and every construction site there is always a search for special solutions when it should be made watertight between windows and other building components. He adds that this is just one example of maybe hundreds. This lack of standardization of building components can also be to the origin of the lack of standardized working procedures. This problem is highlighted in an interview with a head of a business district, when he mentions the commonly used abbreviation “LPA” that can be translated to “to be solved at construction site”. When ICT is used as a support in production process there is an unconditionally need for varying degrees of prescribed components and activities. Just consider a fully automatized production line in manufacturing, or when a package travel is booked on the Internet. Thus, the lack of standardized procedures in the industry can be claimed to be another factor restricting the potential use of ICT in the production process. However, a gradual change might evolve. The need for standards is highly visible in the launch of 3D-based building information models. The managers concerned with the development and use of these models state that there is a heavy workload of inscribing standardized components and work methods into these models. However, some of the sub-contractors’ consultants, in the project studied,

already work with 3D-based tools. For example, the ventilation consultant stated that he draws everything in 3D, and about 90 % of components needed are available in 3D and supplied by material suppliers. Furthermore, he also stated that the material suppliers have realized that they do not have a future if they cannot deliver components in 3D for computerized models. However, he finally concludes that the use of 3D-technologies in a project is an issue of client's and contractors' possibilities to use the technology.

The use of 3D-based building information models in the production process is, however, an application with a potential to transform the production process (see e.g. Jongerling, 2006; Robertsson et al, 2007, Boland and Lyytinen, 2007). In the company studied 3D-based building information models are already used in some project's projecting phase and the company recently decided that 3D-based building information models should be used in all projects under own management. The R & D managers interviewed, states that some sub-contractors involved in these projects were highly sceptical at the outset, but after the implementation of the projects, parties involved have had rather positive attitudes towards use of the 3D-based models.

4.2 ICT USE AND THE ROLE OF FRAMES OF REFERENCES

When the actors' frames of reference are analyzed, the frames can be claimed to be reinforced by the contextual elements and especially the project based mode of organizing construction processes. In this mode of organizing there is a special focus on time and cost, two factors always present on the agenda in construction projects. As already discussed, for managers on different levels the monitoring and control of time and costs in projects is the ultimate task. However, even for the workers the focus on time is of crucial importance, which the following episode illustrates:

At a weekly production meeting, held each Monday morning, a carpenter is suddenly coming into the meeting room, furious because there are no lifts available and the vice site manager has to fix one NOW. The manager calls the local outlet of the machinery and equipment rental firm. 45 minutes later the lift is delivered. After the incident the manager says that he thinks that it is good that people are engaged in their work and always want the process to move forward. However, when we just after the delivery discover another lift on the floor below where the lift was needed, he adds that people sometimes need to spend some extra minutes and communicate with each other in order to find out if the missing equipment is somewhere else at the site.

This episode could be seen as an expression for engagement in the project's progression, but also as an expression for how the structure of wages shapes the sense making of events and reinforce certain behavior. In the Swedish construction sector, piece wages are dominating, which implies that all occurrences and activities these not are included in the piecework can be regarded as real or potential threats to the achievement of high wages. This implies that the potential adoption and use of ICT-applications among workers will be heavily affected by the wage structure. I.e. if the ICT is perceived to bring immediate benefits regarding time consumption or not.

A controversy caused by the use of a new ICT-application and related to the time dimension, was digitized survey. Early in the project it was decided that there would be no measures on the drawings. Instead should all measures for the components in the building be surveyed by the digitized system. This implies that the surveyor downloads the measures from the subcontractors computerized models into his digital device, and then survey them at the right places on the site. The advantage with this system, as stated by the site manager and the projecting manager, is that all measures are surveyed correctly from the beginning, instead of that drawings are interpreted and measures are surveyed with a folding rule or measuring tape, implying that errors occur and are transferred. However, not all parties affected agreed on the benefits. This was mainly caused by the surveyor's from time to time heavy workload, depending on delays in the projecting stage. For example did the construction workers representative complain at a number of production meetings, that the workers needed measures surveyed for the progress of the work. At one occasion the digitized survey was even blamed as a reason that workers did not get enough drawings, but this depended on heavy delays by the architect firm. One of the vice site managers emphasized, however, that the construction workers needed to think in advance and communicate where they wanted the measures surveyed, in order to ease for the surveyor to prioritize what to do. Another vice site manager did also from time to time complain that survey risked delaying his part of the building and he wanted to use the folding rule and the measuring tape. But the projecting manager stated that this would not be the case, because of the risks of transferring measure errors.

There is however one group in the project context that has been heavily influenced by ICT, the site managers. The site managers interviewed confirms that they are more tied to the computer today than a decade ago. Also other interviewed confirm this picture and states that the role of the site manger has changed during the last decades. From a focus on building, to someone who has the responsibility for production, logistics, planning, economy and staff issues. These responsibilities can be seen as the force that has tied the site managers closer to the computer. However does the head a region say that there is a process going on where more competence is moved out to the construction sites in order to provide more support to site managers. Regarding the ICT used by site managers, applications these are perceived to cutting time are appreciated, and vice versa. For example did a head of a business district state that many site managers were sceptical to the introduction of electronic invoices, but after the implementation the opinions were positive. On the other side are site managers sometimes sceptical towards the web-based purchasing system, because it can be hard find the right items and information. When it comes to the voluntary adoption and use of ICT, applications perceived cutting lead times are adopted. For example, digital cameras are used for taking pictures of building components and attached to e-mails when a quick answer on a question is needed from a subcontractors or other actors concerned. Or when some information is needed about for example assembly an instruction, Google is often used in order to fast find the information needed.

5. DISCUSSION

By the analysis of the interaction between contextual elements, actors' structures of reference and the ICT itself it is possible to draw some conclusions regarding adoption and use of ICT and distinguish the permanent organization and the temporary organization. By taking the ICT into consideration, it is obvious that the introduction and development of ICT use in an organization in order to achieve renewal and change, requires a process of knowledge development and learning that goes beyond the termination of a project. By including the context into the analysis, the project organization with a prime focus on time, reinforced by for example contractual regulations and incentives encouraging a reduction of time consumption, a conflict between the mode of organizing and the features of ICT-mediated change has clearly come up to the surface. Furthermore is the focus on time reflected in actors' frames of reference which is expressed when an event or a new phenomenon is interpreted and made sense of. This focus on time makes it hard to find the slack necessary for experimenting with new ICT, unless the ICT-application brings immediate benefits for the actors concerned. Usually a project is used as an organizational form when ICT mediated changes are implemented in organizations. The project is an occasion for reflecting over how the ICT and the organization can be adapted to each other and to develop knowledge of how organizational process can be renewed. At the same time, the projects definite duration in time makes it necessary to find organizational arrangements these facilitate the transfer of ideas from the project to the permanent organization (Linderoth, 2007). But when operations in it self are organized by projects it will be a challenge to find the slack necessary developing the ICT use. This argument can furthermore be supported when the rather encompassing use of ICT in the permanent organization is taken into consideration. In the permanent organization slack resources for the development of ICT is easier to find. Consider for example that a number of people in the organization studied working on issues connected to the development of ICT use. Furthermore the adoption and use of ICT in the permanent organization is reinforced by the priority of monitoring and controlling projects. Accordingly, since ICT-applications are to be developed by R & D departments, a deep knowledge is needed regarding context specific conditions in projects, facilitating and constraining the adoption and use of ICT.

Despite the problems caused by the organizing of operations by projects, ICT-applications are indeed adopted and used in building and construction projects. As stated, perceived immediate benefits are one condition that facilitates adoption and use. But another important condition, if actor group have various perceptions of the benefits, is the possibility to make the ICT into an obligatory passage point (OPP) (Callon, 1986, Linderoth, 2007). I.e. actors concerned by the change should not have any alternative than passing the ICT-application on their ways to their goals. One such example is the digitized survey. The removing of measures from the drawings is a conscious or unconscious attempt by the management to force actors to await the digitized survey. But it is also important to bear in mind that organizational routines are to be adapted in order to facilitate the use of the new technology (Linde and Linderoth, 2000; Linderoth, 2002). Furthermore is actors' possession of power another key to whether ICT is adopted and used. This means that one actor in the project need to have power enough to force other actors indispensable for accomplishing a task to adopt and use an ICT-application. The use 3D based building information models in projects under own management, can be seen as one such example. In this case the contractor has full control over which actors should be included or excluded from a project. For example

can use of 3D based building information models be stipulated if a subcontractor wants to be included in the project. Furthermore, projects under own management can be a good opportunity to test new technologies and organizational arrangements, since contractors themselves on one hand take the whole risk, but on the other hand are they freer to innovate.

Even if the organizing by projects is claimed to be one the main sources for the relative low rate of adoption and use of ICT in building and construction projects, this organizational form would probably not be replaced in the nearest future, or probably not at all. Therefore the industry has to learn to live with the disadvantages of the organizational form and create alternative spaces for innovation where for example new ICT can be tested and experimented with. By some occasions ICT can be implemented into a project setting if it is possible making it into an obligatory passage point and developing organizational routines supporting technology use. By other occasions, where it is necessary to experiment with processes of operation due to the use of new ICT, projects under own management, might be the best forum. However, important to keep in mind in that case, is that actors engaged in these projects should not draw on their old frames of references regarding how a project would be organized and managed.

6. CONCLUSIONS

By taking the context, actor's frames of references and the ICT itself into consideration when adoption and use of ICT in the building and construction sectors is analysed, it can be concluded that the project based mode of organizing, with the prime focus on time and costs, creates a conflict with the process of introduction and development of ICT use that is characterised by ambiguity and indefinite duration in time that goes beyond the termination of a project. The focus on time in projects, reinforced by for example contractual agreements including fees for delays and structures of wages, creates a basic conflict with the ambiguous and indefinite duration of ICT-mediated change processes. Unless immediate benefits are perceived by the adoption and use of an ICT application, it will not be used. This conflict can probably not wholly be solved, instead the industry has to learn to live with it and create spaces for innovation of ICT-mediated changes.

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