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CLIENT'S PRESENCE DURING DESIGN. A STUDY ON ROLES, PRACTICE AND VISUAL MANAGEMENT.

Janni Tjell

NCC Göteborg. Janni.Tjell@ncc.se

Chalmers University of Technology, Civil and Environmental Engineering,
Construction Management, Gothenburg, Sweden. Tjell@chalmers.se

Petra M. Bosch-Sijtsema

Chalmers University of Technology, Civil and Environmental Engineering,
Construction Management, Gothenburg, Sweden. Petra.Bosch@chalmers.se

From earlier studies we know that communication between clients and the design team can be difficult and needs and wishes of the client are not always understood. Studies related to integrated design processes, cooperative work approaches and collocation support a better cooperation between the client and the design team. Furthermore, visualisation is known for being supportive of sharing information and knowledge embedded in practice. The aim of this article is to explore how the physical presence of the client and application of visual means influence practices for sharing information and collaboration toward realizing the client's needs and wishes in the final design. The research applies a multiple case study of three qualitative cases in an Integrated Design Team (IDT) setting. All three cases were followed throughout the entire design process, where the design teams were semi-located. Based on empirical data we found the following: (1) the physical presence of the client in a IDT environment influences (i) the relationship between the client and the IDT, (ii) and the client's role towards being an active member during the design process. (2) The client applies a traditional way of sharing their information in contrast to the work practice and potential for visualization within the IDT (3) There exists potential for increasing the use of visual means and possibilities of visual management to enable the understanding of the client's needs and wishes in an IDT.

Keywords: Client's role, Collaboration, Collocation, Design and Visual management.

INTRODUCTION

Construction design is a complex process with many actors and often crosses multiple disciplines and organizational boundaries (Bosch and Henriksson 2014). Information transfer and communication are often problematic during the design phase (Dainty, et al. 2006), within the design team but also between the client and design team. In project-based teams with members from multiple organizations with different priorities, embedded practices and domain knowledge, it can be difficult to share knowledge and information. However, the process of sharing information and knowledge between the client and a design team is crucial for the compliance of the final product with the needs and wishes of the client. The knowledge and information, which is important to share during the design is often specialist knowledge that is situated, embedded and situated in practice (Beth 2003; Orlikowski 2002). In a project context, sharing of embedded and practice knowledge becomes a challenge.

In project-based industries the sharing of embedded knowledge is often found problematic and many studies focus on how to support knowledge sharing of embedded and practice knowledge. Some studies focus on different work approaches in which the design team collaborates closely in a specific environment, with the use of visual and technology means and in which knowledge is shared through interaction and practice. A number of concepts have been studied and tested that emphasize the importance of working with structured and visual methods supporting joint problem-solving and concurrent collaboration, e.g., BIG Room concept (Liker 2004), extreme collaboration (Garcia et al. 2004), integrated concurrent engineering (Evbuomwan and Anumba 1998), Integrated Product Delivery methods (Cohen 2010). These approaches have been found to embrace the complexity of a construction project, eliminate misunderstanding, improve reliability in the design team and support visualization of the mutual needs and wishes of both the design team and client. Studies based on these approaches have focused on the physical location, different methods and techniques applied, and benefits and challenges of these concepts. Although, many of these studies show the benefits of increased understanding within the design team and improved interaction and joint problem-solving, few studies discuss in detail how the physical presence of the client as well as the use of visual means impact the design team in terms of sharing information and knowledge practices. In our research we apply the term Integrated Design Team (IDT), which is a combination of the earlier terms used.

The aim of this study is to explore how in particular the physical presence of the client and the use of visual means influences knowledge and collaboration practices in a collocated environment towards the realization of the client's needs and wishes. The IDT's investigated included the design team as well as the client. In this context, the client is an in-house commercial client, whose profession is to invest and sell properties - the client is not the owner of the finalized property. The contractual relationship between client and the contractor is a standard design-build contract. The paper is structured as follows; the relevant literature is discussed in the "Visualization in design" section. In the methods section we explain the qualitative comparative case study method applied for executing this research and in the findings and discussion sessions we discuss the findings and relate the findings to the literature.

VISUALIZATION IN DESIGN

One of the main purposes of construction design is that the client shares their needs and wishes with the design team. The design team in turn needs to interpret these requirements and executes a set of actions to satisfy these needs and wishes to buildable documentation (Bowen & Edwards 1996).

To enable this sharing of information and knowledge between the design team, the project manager and the client are crucial (Boyd and Ezekiel 2006; Cherns and Bryant 1984). It is important that the target value plays a central role in the discussion throughout the entire process and in particular during the design. Often the client directs their needs and wishes through the formulation of a design brief, a 'mind model' of the project. The design brief functions as a medium of instruction between client and design team, a means of stimulating communication, a record of decision-making process and a tool for evaluation (Bowen and Edwards 1996). The quality of the brief is of importance for final client satisfaction, but has been described as inadequate or dependent on the client (Kamara et al. 2001; Ryd 2004). Literature

primarily discusses the briefing process from the early initiation until the concept and scheme design. However, few studies discuss how the content of the design brief from the client is shared with the design team.

From earlier studies we know that especially information transfer and communication are often problematic during the design phase (Dainty, et al. 2006). In recent years there has been more focus on collaborative and integrated work in construction to improve performance (Xue et al. 2010). Although there are a number of different types of collaborative and or integrated work approaches, we focus on integrated design teams (IDTs) in which all actors, including the client, are participating (i.e., Garcia et al. 2004; Liker 2004). Many articles study on virtual design collaboration and technology supporting this type of design. However, other studies discuss the importance of collocation of the design team - either in a hybrid form or full-time - which supports face-to-face interaction, time spent together, facilitates both formal and informal communication and increases the chances to discover problems and solutions in line with the client's requirements (Garcia et al. 2004).

However, the application of integrated design creates new challenges. In these IDTs, where the design team spends more time together, either collocated or virtual, and new relationships arise and the group dynamics change. Traditionally, the client has shared information regarding their needs and wishes through the architect and the project manager to the design team (Foley and Macmillan 2005). In the IDT environment, the client is facing the design team more strait forward and has now the responsibility for making sure that the design team has understood and received the information regarding the client's needs and wishes (Bowen and Edwards 1996). While the presence of the client together with the design team enables faster and improved sharing of information and knowledge, it is important that the design team has possibilities for sharing the members' embedded and practice knowledge as well. Especially sharing embedded and practice knowledge is supported by collocation and visualization, in which it is possible to observe actions and practices (cf. Orlikowski 2002).

Another media that supports team member's possibilities for sharing information and embedded knowledge is visual communication. From studies on visual illustrations we know that the human brain is faster in processing visual illustrations than text and spoken language, and is capable of handling more visual information than non-visual information (Greif 1991; Barry 2005). For sharing knowledge and practices, the use of visual means has been studied from different perspectives and supports learning, sharing of knowledge, as well as the development of new work practices (Boland et al. 2007; Henderson (1991; Nicolini 2007). Visual means are already applied in the construction industry in terms of visual representations as well as visual planning methods.

Visual means are often perceived as visual representations that support the visualization of a construction through 2D sketches, drawings or 3D models (Ewenstein and Whyte 2007; Henderson 2007; Nicolini 2007). Other visual means are the use of methods like visual planning or visual time scheduling, which originate from lean methods (Ballard 1999; Ballard and Koskela 2009; Santos et al. 1998).

While the construction industry applies some visual means, in other industries this has been more common. Especially in manufacturing, the term visual management is applied and is defined as a holistic system supporting visualization of information to help teams and individuals to gain a better understanding of their role and contribution

within the larger frame of a project (Liff and Posey 2004; Eppler and Burkhard 2007). Through such a system, knowledge and information can no longer be treated as an asset, but information and knowledge become available for everybody (Greif 1991; Liff and Posey 2004; Galsworth 2005). This creates transparency as well as motivation among the employees in order to understand underlying motivations for various activities.

METHOD

The carried out study was a comparative qualitative case study (Easterby-Smith et al. 2014), in order to explore the client's role in an IDT and their abilities to collaborate and share information and knowledge with the design team, both with and without the support of visual and technical means. The study was based on qualitative cases of three ongoing design projects. All three cases were in-house residential housing projects and had a design-build contract. The cases were selected based on their similarities regarding work method, size, geographical semi-collocation and physical setting for the IDT. The IDT teams worked in a collocated environment for one full-day per week and was supported by structured methods and multiple visual means to support sharing of information and improving the mutual understanding between the client and IDT.

All three projects were followed throughout the entire design process and more than 22 semi-structured interviews were held with key members of the three projects and interviews were recorded, transcribed and coded. We applied a qualitative methodology for coding derived from grounded theory (Lincoln and Guba 1985). As well as interviews and secondary data collection, we performed continuous observations of more than 100 hours of the collocated design sessions based on a structured observation guideline.

The studies were conducted at one of the largest contractor companies in the Nordic EU-countries. Case study A consisted of a design team of 6 -13 members, Case study B had a design team of 8 - 12 members and Case C had a design team of 8 –10 members. All teams had the following disciplines represented at every collocated session: client, architect, structural engineering, heating, ventilating and air conditioning (HVAC), electricity and project manager (PM). Occasionally subcontractors, Virtual Design and Construction (VDC) coordinator, fire, cost estimation, and site manager were also present. All three cases designed residential houses in the Gothenburg area in Sweden, based on design-build contracts and we followed the projects during two phases: (1) the design and (2) the detailed design phase.

Both for the design and the detailed design phase the IDT collaborates for one full day per week in a collocated environment. The team follows a structured agenda during the collocated sessions and begins with a review of the protocol followed by a review of a visual time schedule and then the "To-and-From" matrix which visualizes questions and responses within the IDT. These activities combined took usually between half an hour and a little more than an hour. After this, the team began their coordination work, where they continuously applied the decision list, A3's and the building information modelling (BIM) models (see Tjell and Bosch-Sijtsema 2015 for a detailed description). In this study the main focus was on the use of the A3 method, which is a visual tool representing e.g., parts of discussions that take place in the IDT. In two of the projects we observed that sketches of design solutions, ideas and changes were made by multiple actors to gain a common understanding in a

discussion and support the decision making process. From session to session the PM is digitalizing both the A3 and the decision list and attaches them to the protocol.

FINDINGS

The findings section is structured around three themes: 1) Impact of the client's physical presence during the design. 2) The client's way of sharing information and knowledge with the design team. 3) How the client uses and embraces the available visual means.

Physical presence of client impacts relationships and roles

We found from both the observations and interviews that the physical presence of the client plays an important part during the IDT meetings in a number of ways. The presence of the client during the IDT meetings makes the design teams focus more on the needs and wishes of the client "Using this method, there is focus on the client's needs and wishes – just for that simple reason that they (the client) are present!" (Structural engineer)

As well as creating a clearer focus on the client's needs and wishes, the clients also have the possibility to steer and direct the design process when they are physically present during the process. This was both mentioned in the interviews, but primarily observed during the design sessions. In these sessions the client could comment, ask questions and receive detailed information and sometimes clearly state that this is not what s/he wanted to obtain.

However, the client's physical presence alone is not enough, according to the interviewees. The clients' representative has to be actively engaged in the design process otherwise the presence of the client can even create some frustration among the IDT. "I mean there are some clients' representatives who are physically present in the IDT meetings, but while they are sitting there, they are doing other things not related to the project and only answer single questions, and then according to me they have totally missed the point with the IDT meetings" (Structural engineer)

On the other hand as well, when the clients' representatives are both physically and actively engaged in the design and the design process then the clients' representatives can receive a better understanding of the ongoing challenges the IDT is facing and adjust their request and demands. In several interviews the personality and behaviour of the client was mentioned as important to succeed in an IDT concept. "If it is a good client, then I think the needs and wishes are communicated very clearly. Absolutely, what is the goal, what is it that we want etc. ... But it has to be someone (client) who is active; you cannot have someone who says, "Here you go" with the design brief and then leave the rest to the project manager." (Structural engineer)

The relationship between the client and the IDT has changed from being an abstract role to a real person. "I did not know the consultants in the same way as I do now, where we even sometimes have lunch together", "Maybe I have become more visible to the other consultants and they know that it is me who is in charge in the end if they want to change anything. Earlier, I think it has been more that the PM has had to say I have to ask the client. Now when I am there, they can ask directly". (Client)

The presence and focus on the increased collaboration between the client and the IDT, also lead to a change of the clients role and IDT's expectations to the client. "I mean we are setting requirements to our client in a totally different way, you (client) have to

deliver an answer because we need it, otherwise you cannot move in, in two years. That is creating a whole new understanding but also a requirement on the client's role, which we have never had before so clearly. And this becomes very clear if you have a client, who does not understand what they have to deliver. When you are sitting in an IDT environment, it becomes very powerful when it is outspoken that "you" have to deliver something next week, it becomes very powerful – it becomes a whole new role". (PM)

The client's role is therefore changing from being secluded from the design team to be an active member of the IDT.

Sharing of information between client and the design team

The official communication between the client and the IDT is formulated by the client in a design brief. The brief is a written document and, according to the client, is written before the design and detailed design "I write (client) the design brief to the architect, we do that already in the programming phase. The design brief is a detailed program that very clearly describes the overall business case. So we are really trying to communicate that this is what we want them to design for us". (Client)

Even though the client has the impression that this design brief is very detailed and clearly communicated, this is however not the case according to the IDT members. Many interviewees mentioned that they either do not know about the content of the design brief, or they have not read it. Several interviewees state: "I cannot say that anyone in particular goes through the design brief", "I do not even look at it, sorry but honestly I do not look at it.... I think that it is the client's responsibility – it does not really interest me!" (PM)

The client's sharing of information with the IDT through a written design brief corresponds to conventional ways of sharing information in a conventional design setting. The IDT setting however offers a variety of ways to share information and knowledge, particularly orally or visually. This is also discussed during the interviews as well as supported by observations.

"It (the design brief) is the overall information regarding the specific project, but I think with the application of the IDT concept the need for reading the design brief is declining, at least for me who receives information through the spoken language easier than the written. ... It is easier for me to gain a deeper understanding of the design brief when the PM is going through thoughts and ideas when the client is present, the PM and client have discussions and then parts of information are shared earlier, and not only towards the end of a project, which was the case earlier in a conventional project when the team gathered a lot less frequently" (Structural engineer).

The client's sharing of information through a written design brief is therefore not reaping the full potential of IDT setting.

The use of visual means to share the client's needs and wishes.

During the design the IDT as well as the client apply a number of visual means to support and facilitate their mutual sharing of information and knowledge. The application of visual means is enabled by the physical setting of the IDT and impacts how people work. "I think when you have a room like X (the room where all the three observed cases have taken place) where you have all these visual tools; you become more focused on this specific project than in a conventional project. And obviously if

you are in such a room you are using the tools on the walls, so it does influence how you work.”(Client)

Based on our observations, the IDT members are applying a number of visual means, where some of the most frequently applied are the visual time schedule, “to and from matrix, decision list and the A3’s.

It is a combination of all the visual means that facilitate the visual environment which influences the IDT work processes. “So the fact that we in the IDT are working so much with the visual aspect not only in terms of the model and the time schedule, makes it much easier to discuss things, because it becomes visible what we are discussing. So it becomes better because everybody talks about the same thing,”(PM)

One of these visual means has facilitated the client’s abilities to communicate their needs and wishes more clearly to the IDT, this is the A3’s. “I do remember something regarding “door-automatics” where we wanted to regulate something regarding the electrical installations. Then we did that on an A3, we sketched and explained how we were thinking, to show that it was not a huge change. Because as soon as we from housing (internal client) change anything then it costs a lot because we are working with a design-build approach.”(Client)

Through the observations and interviews it is perceived that the vision and management of the project is hardly visualised or discussed. One aspect is the lack of sharing information from the design brief, but also the unexplored possibilities that an IDT setting can provide. “Today it (vision) is not really communicated, it would be better if we had more drawings and visualization of the vision or something similar. It is obvious that we could put more effort into those parts, so that everybody is on the same page.” (Client)

“It would have been nice if there would have been something on the walls here in the IDT from the design brief. Because as it is now, it is only something that we quickly go through in the beginning.” (Structural engineer)

DISCUSSION

The paper studied how the presence of the client in an IDT setting is affecting the relationship between the client and the IDT. Both in terms of knowledge and information sharing regarding the client’s needs and wishes as well as how this is supported by visual means. Based on three comparative case studies we contribute with the following: (1) the physical presence of the client in an IDT environment influences (i) the relationship between the client and the IDT, and (ii) the client’s role towards being an active member during the design development. (2) The client applies a traditional way of sharing their information through a design brief to the IDT, which is not embracing the opportunities of the visual setting of the IDT. (3) There exists potential for increasing the use of the available visual means and possibilities for visual management to share their needs and wishes between client and IDT. These contributions are discussed in more detail below.

Presence influences the client’s role and relationship with the IDT.

According to Boyd and Ezekiel (2006); Cherns and Bryant (1984) understanding of the clients wishes and needs and involving the client during the design is crucial for the success of a project. Based on the data from our three comparative case studies we found that the physical presence of the client in a collocated IDT setting improves the clients understanding of the IDT work processes and challenges during the design.

Furthermore, it affects the relationship between the client and the design team positively as the client becomes visible to the design team.

We also found that the client's role is changing in IDT projects. Traditionally, the client has been almost secluded from the design team, allowing the client to pursue the role of giving demands. In the IDT context, the client becomes an active member of the design team. The physical presence is however not enough. The engagement of the client is a cornerstone in the development of this new way of working and role of the client in an IDT setting. Since this role is not well defined, it becomes important that the client understands that their role is changing in an IDT setting. From the findings the task of a client in an IDT context is to be an active member of the design team, sharing their needs and wishes with the team, as well as continuous contributions in the decision making process. Literature concerning integrated project work and design discuss the importance of the integration of the client (Bowen and Edwards 1996; Kamara et al. 2001), but does not highlight the impact of the physical presence of the client in terms of relationship and role. Especially, how the role of the client is changing in these new contexts would be beneficial to study in future work.

Clients' communication practices require change

An IDT environment provides the client with new ways of sharing their needs and wishes with the design team. We found that in the studied cases, that on the one hand the client still applies conventional practices to share information regarding the design requirements. While on the other hand the design team does not follow this traditional practice. In the IDT setting the client shares their information regarding their needs and wishes with the IDT through a design brief, which is accessible on a common server for the project. The design brief is hardly communicated either orally or visually at any given point in time during the design process. The client's communication practice concerning the requirements is still following the conventional communication patterns through the architect and the project manager to the design team (cf. Foley and Macmillan 2005). The client's way of sharing information is in contrast to the way of working of the IDT in which various possibilities for sharing knowledge and information orally and visually are possible. The interaction in our cases during the design phase is therefore still critical (Dainty, et al. 2006) and more engagement from both the client and the design team is needed in order to improve the mutual understanding and interest for sharing and receiving knowledge and information regarding the client's needs and wishes.

Use of visual means for sharing information

The collocated setting of the IDT supports visualization through multiple visual means. One tool in particular has enabled the client to share and transfer information regarding the design progression more clearly and straight forward to the design team, i.e., the A3 method. Through this visual method, the client has been able to share ideas regarding possible changes within the team and make decisions based on the visual representation. The application of visual means supports the sharing of information and knowledge between the client and the design team (Boland et al 2007; Henderson 1991) and the visual means have enabled the client and design team to gain a shared understanding (Greif 1991; Liff and Posey 2004; Galsworth 2005). The visual environment of IDT is opening up for new ways of sharing information particularly regarding the coordination of the progression of the product, but also for visually managing the project. It would therefore be of interest for further research to explore the possibilities of visual management (Liff and Posey 2004; Eppler and Burkhard

2007) and guidance of the design through the design process, in order to enable the IDT to have an ongoing focus on the client's needs and wishes. Visual management combined with the available visual means supports the knowledge and information sharing process between the client and design team to deliver the right quality at the right time.

CONCLUSION

Through a multiple case study design we have studied the impact of the physical presence of the client and use of visual means in a collaborative collocated design team. Based on our findings, we contribute with the following: (1) the physical presence of the client in an IDT environment influences (i) the relationship between the client and the IDT, (ii) and the client's role towards being an active member during the design process. (2) The client applies a traditional way of sharing their information in contrast to the work practice and potential for visualization within the IDT (3) There exists potential for increasing the use of visual means and possibilities of visual management to enable the understanding of the client's needs and wishes in a IDT. The study focuses only on clients working from a design-build contract and it would be relevant for future studies to explore the interaction between clients and IDTs in other contractual relationships as well as in more hybrid and virtual environments.

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