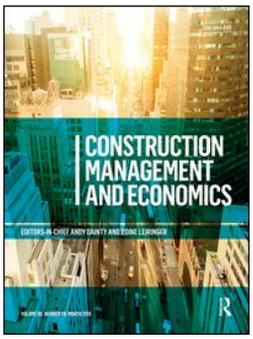

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# Managing collaborative space in multi-partner projects

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**ABSTRACT**

Collaboration across company borders in multi-partner construction projects has proven to be challenging. An increasing number of projects aim to strengthen such collaboration by collocating project members from different companies in the same physical space. Yet we know little about the management practices required for taking advantage of such a collaborative space. To begin to remedy this shortcoming, we present an in-depth case study of a hospital construction project that applied a collaborative space and focus on the management practices influencing this space. With the help of affordance theory, we identified two types of management practices and show how they transform across project phases. These management practices included designing the physical elements of the collaborative space, and creating shared collaboration practices for the space. We contribute to the construction management literature by taking the first step in conceptualizing the connections between space, management and collaboration practices in the context of multi-partner projects. We suggest managers to consider carefully what kind of collaboration practices the space is expected to enhance and plan the physical and social space to support it.

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Integrated project delivery; collaborative space; co-location; collaboration; affordance

## Introduction

Many value creation processes like large infrastructure investments are too complex for a single organization to execute by itself (Gulati *et al*. 1994). Therefore, organizations often incur temporary arrangements that transcend organizational boundaries, such as multi-partner projects (Jones and Lichtenstein 2008). The quality of collaboration between the partners typically influences the success of a project (Pauget and Wald 2013, Fulford and Standing 2014). Unfortunately, difficulties may arise when, for example, the values, interests and needs of an individual company clash with project goals (Smits and van Marrewijk 2012). Within the construction industry, some of the well-known problems in collaboration are poor communication, industry level fragmentation and adversarial relationships (Nicolini *et al*. 2001). To resolve these challenges in complex construction projects, it is quite common to apply more integrated project execution strategies with solutions such as involving key participants early in the process, developing jointly the project goals and making a multi-party agreement (Lahdenperä 2012).

Often these more integrated ways of working include the use of a shared workspace where a project's team members from different companies are physically co-located (Nicolini 2002, Henisz *et al*. 2012, Lahdenperä 2012). In this article, we call these co-locations or "big rooms" collaborative spaces (Hua *et al*. 2010). The concept of collaborative space refers not only to a physical space connecting individuals but also to informal or formal collaboration practices within the space (Hua *et al*. 2010). In this way, the concept of collaborative space helps to understand the more complicated relationship between shared physical space and collaboration practices. Co-location is expected to advance face-to-face collaboration practices between individuals (Bulte and Moenaert 1998, Cannella *et al*. 2008) as physical proximity can assist these practices by offering accessibility and by enabling the development of personal relationships (Beck and Plowman 2013). While research has suggested that space can influence collaboration practices, the literature on collaborative spaces offers little knowledge on *how* to organize the space in order to assist its potentially positive effects on project collaboration. This hinders harvesting the full potential of such shared spaces and adjusting them to the project context, leaving project managers with a trial and error strategy when they implement a collaborative space. Indeed, earlier literature has noticed a need for further studies on collaborative spaces in projects (Heerwagen *et al*. 2004, Kokkonen and Alin 2016) and in organizations (Hua *et al*. 2010; Rashid 2013).

As mentioned above, the literature on workspaces indicates that spatial solutions can influence collaboration

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practices positively (Heerwagen *et al*. 2004, Kyrö *et al*. 2016). However, there are also examples of only limited positive effects of spatial solutions (Bulte and Moenaert 1998, Hua *et al*. 2010) or even trade-offs related to interruptions in independent work (Heerwagen *et al*. 2004, Elsbach and Pratt 2007). These results suggest that the relationship between space and collaboration practices is ambiguous (Bulte and Moenaert 1998). Inspired by Lefebvre's (1991) ideas on how space is produced, we presume that management is interfering with the relationship between space and collaboration practices. Most of the existing studies on workspace and collaboration practices limit their investigations to presenting different links between spatial solutions and behaviour (Heerwagen *et al*. 2004), the collaboration practices inside the space (Fayard and Weeks 2007), the effects of the space (Scarbrough *et al*. 2004) and the space as a tool for facilitating coordination (Kahn and McDonough 1997). These studies have ignored the role of management in producing a space for the desired collaboration practices. Consequently, the relationship between management practices, workspaces and collaboration practices remains quite unexplored. Therefore, we maintain that there is a need to explore how management practices participate in producing the positive effects of a collaborative space within multi-partner, temporary collaborations.

In order to explore the relationship between management practices, workspace and multi-partner collaboration, we conducted a qualitative case study on a large construction project employing a collaborative space. The key contribution of this study is the illustration of the significance of managing collaborative spaces. In order to understand the role of management, it is important to consider the links between space, the management practices related to the given space, and the nature of the project partners' collaboration practices. After considering these links, we present a theory section on collaboration, space and management. Then the methods are presented, followed by the analysis and the findings. Finally, we discuss the implications and look at the overall picture in the conclusions.

## Literature

### *Intensifying collaboration with the help of a collaborative space*

Collaboration between companies ideally occurs when "parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible" (Gray 1998, p. 5). Collaboration is arranged and agreed upon at the level of the organization, but the individual employees are the ones who engage in the collaboration practices. Thus, collaboration is realized when individuals from different companies work together. Typical collaboration practices include exchanging documents, like emails, designs, reports and drawings (Singh *et al*. 2011), as well as discussing (Beck and Plowman 2013) and solving tasks jointly and between organizations (Heerwagen *et al*. 2004). Collaboration between companies does not necessarily mean that collaboration practices between companies are intensive. Intensity can be increased by using, for example, collaborative spaces. Consequently, many construction projects are done in collaboration, but only some of the collaboration practices can be described as intensive.

Collaborative space intensifies collaboration by bringing individuals together. This potentially increases the possibility to engage in face-to-face collaboration with both formal practices (such as meetings) and informal practices (like spontaneous conversations) (Heerwagen *et al*. 2004). Work practices that are conducted face-to-face have been recognized as beneficial, especially for accomplishing complex tasks (Stryker *et al*. 2012, Naar *et al*. 2016) and improving interpersonal relationships (Hinds and Cramton 2014). In addition, individuals sharing a space can observe each other and overhear each others' conversations. This can lead to an increased understanding of the project and enhance engagement in the project (Heerwagen *et al*. 2004, Vaagaasar 2015). The layout of the space can also influence interaction by creating corresponding movement patterns (Backhouse and Drew 1992, Fayard and Weeks 2007). Thus, a collaboration practices that are enabled by a collaborative space includes different forms of face-to-face interaction that would not be possible without that space. However, for a space to increase the intensity of collaboration practices, the involved individuals may need to learn new ways of working (Edenius and Yakhlef 2007). An example of the latter is to learn how to deal with disturbances when performing solitary work (Heerwagen *et al*. 2004).

### *The relationship between space and collaboration practices*

While a physical space can influence collaboration practices positively (Hua *et al*. 2011), management literature has concluded that the connection between space and behaviour is neither causal nor simple (Elsbach and Pratt 2007). Because of the complicated nature of this relationship, spatial arrangements have caused both desired and undesired outcomes (Elsbach and Pratt 2007), or had no influence at all (Bulte and Moenaert 1998).

Some scholars have explored the relationship between space and collaboration practices by looking at physical proximity (e.g. Cannella *et al*. 2008, Beck and Plowman

2013, Gray *et al*. 2015). They have noted that informal interactions can be increased by bringing individuals from different departments or companies closer together (Allen 1984, Beck and Plowman 2013).

The relationship between space and work place behaviour has also been explored by investigating spatial design solutions such as workstation layouts (Värlander 2012), walls separating workstations (Heerwagen *et al*. 2004), as well as open-plan offices, and how these can be designed to increase interaction between employees (Maher and von Hippel 2005). These various spatial designs can create proximity and distance in space, but they can also influence behaviour by providing visibility or separate individuals. Other studies have connected the space-behaviour relationship to social processes that affect both the behaviour and the design of the space. These studies follow, for example, Lefebvre's (1991) theory and discuss how space can influence power relations, although space is also influenced by the experiences and practices of individuals (Taylor and Spicer 2007). These studies have not discussed collaboration practices much, but they offer an example of how the production of space relates to the ways in which the space can influence behaviour.

The relationship between social processes and physical space has also been considered within the theory of affordance (Fayard and Weeks 2007). However, the affordance theory of informal interaction differs from the previous theories because it posits that an individual has several possibilities for action to choose from within a specific environment (Gibson 1986). This can be explored by understanding how an individual perceives his or her possibilities within the space and chooses a way of behaving based on these perceptions (Fayard and Weeks 2007). Individuals' perceptions of space are embedded in the socially constructed knowledge that connects certain ways of behaving to specific spaces (Fayard and Weeks 2007). For example, in Fayard and Weeks (2007) case study, the space was used the way it was planned only after establishing norms for behaviour. Thus, spaces and objects situate in a web of cultural knowledge which includes, for example, rules and norms (Hutchby 2001). Accordingly, when studying affordance of space, the focus should be both on how the physical features of an environment enable or prevent some behaviour as well as on the socially constructed possibilities for collaboration practices within the space (Fayard and Weeks 2014). Consequently, when using this framework, we need to acknowledge the physical features of space, such as the distance between individuals and the layout of the space. In addition, we should consider the social constructions of collaboration practices within the space, for example, initiating interaction by interrupting others at their desk. In each situation, individuals choose their behaviour based on their understanding of physical and social circumstances. Overall, collaborative space is realized only when both the physical space and the collaboration practices are accomplished.

### *Managing space to intensify multi-partner collaboration*

As the relationship between collaborative space and the quality of collaboration practices across companies is complicated, we have suggested that management practices are important to achieve the potential positive effects of collocating project team members. Yet we know little about the practices that management apply to manage collaboration practices in a collaborative space. Earlier management literature has tended to treat collaboration as a relationship structure or a management strategy (Bedwell *et al*. 2012). They have not focused on how collaboration practices are realized and gained their characteristics through the interactions of the participants. Similarly, the project management literature has tended to emphasize standardized execution models rather than the evolving management practices incorporated in project execution (Cicmil and Marshall 2005, Winter *et al*. 2006). In other words, it would be beneficial to take a closer look on the management of collaboration practices as it is actively produced in projects.

To understand management practices of collaboration we follow Bresnen (2009) and recognize management as an actively produced practice in the course of a project. Here, the daily managerial interventions that are not necessarily visible in management models are important for successful collaboration (Suprapto *et al*. 2015). The practice approach implies exploring management as fostering collaboration practices while situated in context, formed in time, related to others and connected to socio-materiality (see Korica *et al*. 2015). In accordance with a practice approach, we presume that the management of multi-partner project collaborations is an evolving process embedded in local practices and negotiated through interaction between management and project members across companies. Thus, besides making decisions, management practices can include activities such as negotiations and sense-making through interaction (Korica *et al*. 2015). Based on these observations, managing a collaborative space would mean project management practices aiming at influencing the physical features and social constructions of the space to intensify collaboration practices between individuals across companies over the course of project. These management practices consider how management aims to influence space, instead of considering only management by decisions.

To understand in more detail how management relate to collaborative space we explore management practices creating both social and physical affordance to increase

the potential positive impact of space. The social and physical affordances are interwoven, but management can address them separately (e.g. design the layout and influence the use of the space) while considering the connection between them. Hence, our research question is: "what management practices are used to influence both the physical features and socially constructed practices of collaborative space to enhance multi-partner collaboration in a construction project?" These management practices are not pre-existing or fixed, but rather they are produced throughout project execution and create evolving affordance of space for the individual employees.

## Methods

To explore the management of collaborative space, we conducted an in-depth qualitative case study within the construction industry. We chose this design, as it enabled exploring the phenomenon of interest in a real-life context instead of in isolation (Yin 2003). Moreover, a single case study allows for elaborating on more details of a particular case than is possible in multi-case studies. These details facilitate exploring the complex relationship between space and behaviour. While a single case study might not offer possibilities to generalize findings, it provides opportunities to develop theories by creating new understanding (Siggelkow 2007). Furthermore, a single case may offer possibilities to create theories that are more complicated, because a single case can fit a theory to the details of a case (Eisenhardt and Graebner 2007). Also, a single case study is useful for gaining new insights from complex projects (Buvik and Rolfsen 2015) because it enables the complexity to be considered.

### *The case project*

The case project was conducted in the U.S.A. from 2007 until 2015. At the beginning of the project, it represented a rare example of a construction project with a collaborative space, and therefore, most of the participants experienced it for the first time. The project completed two hospital buildings with 289 beds and an energy centre. Altogether 29 partners were involved in the execution. These included a building owner who had contracts with an architect, a general contractor, designers and a construction management consultancy. Subcontractors were bound to the general contractor. The case project was large and complicated, which can be challenging for collaboration. Besides the size, the complexity of the project was derived from the requirement for higher supervision for hospital buildings as well as the fast development of medical equipment and services while the project lasted. To meet these challenges, project management decided to promote collaboration between the companies. The decision was supported by the emergence of new technology for design and planning which also opened possibilities to develop more collaboration practices.

An experienced director of the owner's organization decided to implement a modified version of the integrated project delivery (IPD) method that is based on the idea of enhancing collaboration between companies in construction projects. IPD includes principles such as the "early involvement of key participants, transparent financials, shared risk and reward, joint-decision-making, and a collaborative multiparty agreement" (Lahdenperä 2012, p. 57). In the case project, the integrated delivery model included earlier construction design presence than in traditional projects (the mechanical, electrical, plumbing and structural designs were partly done at the same time as the architectural designs), a collaborative space, separate contracts, monetary incentives and collaborative processes for decision-making. The intensified collaboration began in March 2009 with a workshop for planning collaboration practices and building trust between participants. During the workshop, the participants (around 40) planned together common goals, processes, decision structures, clusters and information processes.

### *Data collection and analysis*

The first author visited the case project for three weeks in autumn 2012, at the time the construction work was conducted. At first, the researcher attended the collaborative space and the meetings held within the space in order to be acknowledged among the project employees. Then, the researcher engaged in informal discussions to learn about the project, paid visits to the construction field and engaged in meeting observations. During the observation period, field notes were made and photographs were taken. Also, project documentation was examined – such as organization charts, meeting minutes, communication process plans, cost and scheduling plans, quality control plans, project presentations and layouts of the collaborative space. The interviews were conducted at first with the identified key employees such as project managers of separate companies and then the rest of the interviewees were reached with a snowball sampling (Biernacki and Waldorf 1981). The collaborative space included at that point around 200 project members. The main data composed of 41 semi-structured interviews that were recorded and transcribed. Multiple data sources support the validity of the findings (Yin 1989). The interviews were performed with the following interviewees (with the number of interviewees in brackets): building owners (7), architects (5), construction management consultancies (4), an inspector (1), general contractors (19) and subcontractors (5). The interviewees possessed the following roles:

project manager, project engineer, project executive, chief engineer, superintendent, detailer, quality manager and coordinator. The average interview lasted approximately 40 min. The questions concerned the interviewee's work role and work practices, and her or his experiences of collaboration, project management, collaboration practices and collaborative space.

We investigated the data in an interpretative manner to understand the management of a collaborative space that is situated in its context (see Yanow and Schwartz-Shea 2006). In the end of analysis, we consulted affordance theory to conceptualize the findings. Our unit of analysis is management practices that consists of activities aiming to influence space performed by the individuals from one or more companies. The procedures for thematic qualitative analysis were applied to search the data for central themes in order to tease out the essential empirical patterns (Braun and Clarke 2008). The analytic work started with us reviewing the project documents, the field notes and the interview transcripts as well as the photographs. The collaborative space began to seem different regarding the design and construction phases. Second, we generated initial codes to identify the basic elements of the data. These codes included titles such as "the client's culture is different from the contractor's – more rigid"; "the need to remind people not to use emails"; and "team building". Then we collated these codes into themes related to space. The ensuing themes included titles such as "the results of participating in space"; "the experience of participating in space"; "managing participation"; and "the practices of participation". In the fourth phase, we reviewed the themes and formed thematic maps that indicated the central themes. Finally, after multiple iterations, support from documents and consulting the literature on affordance, we defined and named the eventual themes that we present in the next section.

## Findings

From the case project, we found management practices influencing both physical and social affordance (see Table 1). These management practices and the collaborative space that management formed were reshaped over time. The project encountered several changes, but these two phases included the most significant differences concerning the collaborative space that can be compared.

In the design phase, the reason for choosing a collaborative space for the project derived from the client organization and its project executive's aim for collaborative project delivery methods in order to ensure that such a challenging project would succeed. The implementation of the idea came from the client organization who had the power to define the project. The space was compatible with the general project delivery method. Additionally, bringing the general contractor and some of the main subcontractors into the project early gave an opportunity to take more advantage of the space.

The collaborative space was reformed at the beginning of the construction phase because the work tasks changed, which required changes in personnel. The work shifted from creating design solutions for the space towards executing the designs and supporting the construction. Along with these changes, the number of the employees performing office work increased from around 100 to 200. The management – including the client organization, the general contractors and the architects – decided to continue to have a common space for the project and thus created a new space in order to offer room for all the employees.

### *Management practices related to the physical features of collaborative space*

#### *The design phase*

Following the idea that the design of a workspace can potentially influence the collaboration practices between employees, a large common space was created for the project. This collaborative space was composed of one large room that was built as an open office including workstations with visibility to others and seven meeting rooms of different sizes. It was built from the rented trailer components commonly used on construction sites and was located next to the construction site. The collaborative

**Table 1.** Management practices to enhance informal practices within the collaborative space.

| Management practices related to | At the design phase | At the construction phase |
|---|---|---|
| Physical features of collaborative space | Deciding the form of the space (size and style) | Deciding the form of the space (size and style) |
| | Designing together the layout for workstations | Designing separately the layout for workstations |
| Social constructions of collaboration practices | Reflective management of collaboration with separate companies, overcoming resistance by persuading employees to work in the space | Reflective management of collaboration with separate companies, managing less attentively by relying on employees' earlier experiences of space |
| | Promoting a common understanding of collaboration for the project with an emphasis on intensive communication | Gathering insights from the employees with surveys and discussions |
| | Promoting separate periods for collaboration practices and individual work | Reminding others of the desired collaboration practices while performing daily work |

space enabled a connection between individuals that the project executive from the general contractor described in the following way: "In [the collaborative space] we all used to sit under one roof, I mean literally. … Everybody was in there". That also included management. As the space enabled connecting easily with others, a substantial amount of inter-organizational meetings was held. Furthermore, after these meetings the employees could easily consult each other or management. This availability, accessibility and emerging practice of inter-organizational consulting also assisted more collaborative decision-making, which the project engineer for the general contractor describes below:

> The pros [advantages] would definitely be having both the design team and management accessible. If you feel that you are not confident in making a decision on something on your own, having the resources there to help you when you have questions is undoubtedly very valuable.

The involved companies had differentiated needs regarding type and amount of workspace. Therefore, initiation also included organizing the joint management of space, including the separate companies taking care of the multiple needs related to space. The following quotation is from a project engineer for the general contractor who was involved in space planning. He describes the difficulties of planning the space for the needs of several companies; they only understood after finishing the space that detailers needed a larger workspace than the others did. To include the larger tables required by detailers, they had to rearrange the space plan for everybody.

> It is a lot easier for one person to plan for their company. But when you are trying to plan for 13, 14, 15 companies' needs, you end up fighting a lot of things that you would not think of, like the detailers would start complaining that they did not have planning space that they could not work just off their computers … we realized that the initial trailer setup we did not have enough square footage. So then, we went into a reconfiguration and shrank everybody's desk size. And then detailers got one specific desk and the coordinators got one size desk, detailers needed bigger desks.

The involved companies were able to influence how the space was formed which eases considering the different companies while organizing the space. A project executive from the general contractor noted that "it takes buy-in from the 20 companies that have people here full time" in order for them to get to "really agreeing and wanting to be like one big family". Involving companies can assist in creating a willingness to work in the space.

Management also participated in designing the layout of the room, in terms of where each of the employees were seated in order to augment interaction between them. The design was implemented by placing the employees close to each other that were assigned to one of the building teams combining different companies. This meant that they seated the detailers of the subcontractor companies and general contractor close to each other. The detailers benefited from working close to each other by easily overhearing and asking questions from the members of the building team. Meanwhile, some of the project partners were placed among their company members. The architects, the client's employees and construction management consultants worked close to the members of their company, which enabled them to consult the members of their company more easily, while requiring them to walk to the other part of the space to consult the members of the other companies. The project executive of the general contractor described the layout in the following way:

> I would be sitting here, and the person sitting next to me may be from a different company and across from me would be someone from another company. We were broken up. We mixed it up a little bit as well so we could have mechanical detailers sitting next to a plumbing detailer sitting next to a fire protection detailer, but all working on the hospital team.

She described how they planned the layout for the different companies to work close to each other within the same building team: here she describes them as hospital team. The layout fine-tuned the collaboration practices according to the teams. However, it required consideration of the relation of the individuals' work tasks and then deciding which of these relations should be prioritized in the layout. The physical dimensions of the collaborative space supported intensified face-to-face interaction and communication aligned with project goals. The face-to-face interaction also allowed communication to be more dialogical. A superintendent of the general contractor describes this dialogical process enabled by the collaborative space in the next quotation: "At first, it was a little difficult to get used to because of all the different disciplines that were in the room. But it really worked out, because you could see the benefit of a guy having a question, getting up and walking over to somebody else who may have the answer, and working back and forth". Thus, the space enabled easily asking for comments and explaining more than through normal project practices of using emails. This would mean more dialogical conversation between individuals instead of giving the necessary work results to others.

### *The construction phase*

Due to the doubling of the number of employees in the construction phase, it was impossible to fit everybody's workstation within the old collaborative space, and therefore the space had to be modified and a new, smaller spaces was added besides the larger space. In this phase,

the collaborative space consisted of one larger trailer and five smaller trailers beside it. The large space followed the form of an L. It offered workstations for employees in the client organization, the construction management consultancy, the architects, the general contractor and an inspector. The smaller trailers were built next to the large space and offered meeting rooms and workspaces for the subcontractors. This meant that the project participants could no longer see the employees of other companies from their workstation. As the chief engineer of the client says in the following quotation, the project participants now saw the collaborative space as a village:

> At the construction phase things changed, it is now more of a village, there is more distance between people and it is not easy to reach out to people. … a trailer village evolved. But the change was not detrimental.

Previously the space was described for example as a co-location, while "co-village" represented the extended distance between individuals. Some interviewees argued that due to the nature of work, the construction phase requires less intense interaction than the design phase. Nevertheless, the managers had made efforts to provide a shared space but, due to practical issues, they did not manage to get everyone into one building. As a project executive from the general contractor described it: "We added more room but we could not get an large enough space to get all the subcontractors connected at the same time … we even looked into adding a covered walkway but then there are fire sprinkler systems, and it does not work well". In other words, practical restrictions also influenced the actual design of the collaborative space. Despite the reduced proximity in the new space, the collaborative space could still offer access to individuals from separate companies and the interviewees described this resulting to reduced latency in solving issues.

The layout of the large space was designed as an open-plan office and no walls were raised between the workstations. Each company organized their part of the space themselves, and grouped their employees together. The employees of various companies were no longer blended with other companies, but rather each company occupied a separate part of the space. The divided space allowed the separate companies to coordinate their part of the space alone. For example, during the observation period the general contractor rearranged the layout in their part of the space while the other companies continued with the same layout as before. The following quotation describes how the office coordinator of the general contractor considered organizing their part of the space.

> We have gone into trailers and torn down the walls so that we can have an open environment. It just seems to work for us. We are all very vocal, and we interact a lot. There is nobody that sits in a little shell, and we don't want to be in boxes. And we find that being able to bounce ideas off each other, being able to hear what is going on, you might have an idea that they have not thought about, and you will hear people pop off and say something, and they kind of go whoa! … All of our jobs, all of our offices have this floor plan. We do not believe in the private office thing. We have the big open space … all of our offices, including corporate, is like this.

The quotation shows how the office culture of the individual company was reproduced in the collaborative space. Furthermore, the companies that had the most employees in the project, and therefore occupied more space, also had more influence on the collaborative space as a whole than the smaller companies did.

The separate trailers for subcontractors were substantially smaller than the larger space and one or two companies occupied each trailer. The companies working in trailers decided the type of the layout in their trailer. The subcontractors who worked in separate trailers experienced the most significant difference in the collaborative space between the design and the construction phases. A senior project manager of the client describes how the different space influenced his relations to the subcontractors in the next quotation.

> I wish I had more direct visual of the [subcontractor]. The general contractor is a little bit further [than before] but still you can still see what is going on and you just walk over there if you want to talk to someone. That little bit of distance is not a problem … The [subcontractors] used to be in the same trailers at the design phase. So, we knew each other really well and now I do not know them.

While the space's design in the first phase enabled the manager to know the subcontractors, he lost their acquaintance in the construction phase due to the placement of the project members in different trailers. In other words, the idea of using space to overcome organizational boundaries seemed to work better when the space was designed so that all the members were in the same physical room. Furthermore, the change in design shows how project phases can influence the form of collaborative space.

## *Management practices related to socially constructed collaboration practices*

### *The design phase*

Management practices that related to socially constructing common collaboration practices aimed to motivate and influence individuals to perform their daily work through engaging with each other. For most of the project partners, it was their first experience with a collaborative space and some of them resisted it at first. In the following quotation, a senior project manager for the client described how they persuaded the architects to attend the space.

> When we set up the trailer, the architects didn't want to come. Most architects at this point were pretty resistant to moving out of their home office and having a crew here. Finally, my boss said: "If you do not come, we are going to get another firm." They finally decided to move here. Now they are marketing for their business, we are co-located, we are an integrated project team. I think they probably see the benefits now.

The quotation indicates that the client organization managed to assure the architects to work in the shared space and that the architects themselves recognized the benefits of the space after experiencing it for a while. Some of the dissatisfied individuals in the collaborative space were transferred to other projects to avoid the possibility of them influencing the atmosphere negatively. As an architect described it: "if somebody was genuinely unhappy … there is no benefit in keeping somebody who is bringing the morale down on the project if they really don't want to be here".

In the case project, management continuously facilitated the collaboration, which realized in the discussions of how to form and improve collaboration practices, how to assist the decision-making between companies and how to improve the processes between companies. A senior project manager from the construction management consultancy described how the reflection on collaboration practices was part of management and how it continued during the project:

> It's been a part of our process since it started. We talked about: "How are we going to be dealing with issues? How are we going to be organizing ourselves? Who's going to be doing what?" It was a part of that, but it's obviously a continuous growth out here for people to understand what it is … You've got to continue to work on it. It's something that we have been discussing openly within the [co-location] with everybody, not just with [the client] and general contractor but with sub-contractors.

Through the continuous reflection, management could develop its methods for assisting project collaboration for this specific project and adapting to project changes. They also promoted collaboration practices through working on a common understanding of why the collaborative execution model had been chosen in this project. A project engineer of the general contractor described the idea of forming one project company to make the partners enact the idea of collaboration:

> What we had to realize is that we were forming a new company here, no longer did everybody work for their electric engineering company or work for plumbing company. We all worked for [client] … And trying to get that mentality into people. I think after a while some people did really feel that. Because if you still feel like you are working for your own company and you are only looking out for yourself, then there is no benefit in doing this and a lot of it becomes just a show.

Furthermore, management was controlling the time for collaboration practices and individual work within the space. A need to manage time came from the general culture of collaboration practices in the collaborative space that a project architect described as an "open door policy". This culture meant that anybody could walk up to another person's desk at any time and ask him/her to collaborate. This caused disturbance from time to time when individuals needed to concentrate on their tasks. To manage the disturbance of individuals' work, an initiative was made to divide the work time into two sections: one for collaboration practices and the other for individual work. A principal in charge of the architecture company described promoting a specific time for collaboration practices in the following quotation:

> We tried for a while instituting what was called office hours; there was a period of time at the beginning of every day where you were kind of open and available and people could come up for whatever need there was. And the flip side of non-office hours was that there was an expectation that there was some structure in the other hours that somehow you couldn't be interrupted. Well, that never happened.

The interviewee described promotion of two different periods for collaborative and individual work, but also how the divide was never realized in the collaborative space. The employees preferred to use the availability of others when they needed instead of coordinating the collaboration practices to specific periods. The individuals controlled their work from constant interruptions by sometimes declining to answer questions if they worked on tasks that were more urgent. After the management had promoted collaboration practices to employees, the management could no longer fine-tune the time for performing these collaboration practices in the space. These management practices within the design phase included ways to boost the collaboration practices enabled by space as well as an attempt to control the collaboration.

### *The construction phase*

In this phase, the initiation required less negotiation to get individuals to work in the shared space because some of the employees were already used to it. While some tasks required new employees in the construction phase, some of the old employees continued and some left for new projects. A senior project manager for the general contractor described the situation this way: "Some of us have been around since the design phase, it is kind of part of our language now". The new employees in the construction phase were not introduced extensively to the existing practices of the space, but were expected to integrate at some level. Working in the trailer was neither that new for the employees who normally work beside the construction

site. Management was less attentive on integrating individuals while the physical space also offered different possibilities than in the design phase. Management ended up to relying on employees earlier experiences of the space when the new employees were not introduced that well to the collaborative space.

The management continued to reflect on and discuss collaboration practices during the construction phase. A project architect from the architecture company described how the managers discussed the collaboration: "Every so often, maybe every quarter, these guys will have meetings. The leadership had meetings about how we make these relationships between the teams more cohesive; make the process flow a little bit better". In addition to the continuous attention to collaboration practices, the representatives of the general contractor conducted two surveys in order to understand better the employees' perspectives on the challenges of collaboration. The first survey included questions on evaluating the current collaboration, the collaboration desired by each major company and subcontractor, and trust in others. A senior project manager of the general contractor described how the survey was a possibility for the individuals to express their frustrations:

> We found that even though we were co-located, we had frustration among the team members about working together. And we were trying to see what some of the frustrations are. Let people be able to have a format they could honestly and openly be critical and state their concerns … So the first survey we did, basically, just tried to establish. "Do you trust some of your teammates, some of your partners, or not? What are the concerns that you've had?" And people had some strong concerns.

The survey was partly chosen to offer a format for individuals to provide anonymous feedback and partly to enable all the participants of a large project to express themselves. The results of the survey were used to improve collaboration practices. The companies together formed a poster to describe the ideas of working together and establishing some rules for collaboration practices in meetings such as being respectful. Another survey with the theme of team alignment was conducted later. The surveys enabled understanding the perspective of the individuals from different companies and identifying issues that required attention.

As previously mentioned, the collaboration practices changed in the construction phase when the project context reformed and the physical circumstances of the space changed. Nonetheless, the idea of intense collaboration practices in the daily work was not abandoned. In the following quotation, a project executive of the general contractor described how they promoted face-to-face interaction: "We are trying to teach everybody involved that when you need to send an email, it is really to confirm the direction we agreed to and not use that as a starting point. Do not initiate a conversation with an email". The quotation shows how conversations were valued as the required format for collaboration practices. Some individuals described how they promoted face-to-face practices for individuals, such as this project manager from construction consultancy company:

> There was an issue on Friday – the architect's plan looked different than the [mechanical subcontractor]'s plan for a diffuser and so I grabbed the architect and I grabbed the designer, the architect, the MEP designer and took them over the [plumbing company]'s trailer. I said "Let's talk about this: What are the impacts if you would go with the linear versus the diffuser? What are the architectural impacts?" and so on. I think they would have run e-mails for another day and it blows my mind and, like, why don't you just get out then talk to somebody – that's the whole point. So I still have to go through and just say "talk and talk".

The quotation describes how an individual asked others to have a conversation face-to-face and considered that as the best way to handle the task. This can be considered reminding of the desired collaboration practices at the same time as reasserting the collaboration aims of the project. Management could not fully control the collaboration practices in the collaborative space, but without promoting collaboration practices in the space, the potential benefits of the space for facilitating collaboration practices would have been less.

## Discussion

Our aim has been to explore the role of management practice in a collaborative space in a multi-partner construction project. We found these management practices to influence both physical features and social constructions of collaboration practices (see Table 1). Our findings on the management practices related to the physical features of collaborative space in the case the project included designing the space and its layout either together with different companies or separately. Previous research on workspaces has explored the principles of a physical workspace layout that increases collaboration practices, but it has mostly been done within an intra-organizational context. Within an inter-organizational context, the inhabitants of the collaborative space belong to different companies that have their own cultures and routines that often make collaboration practices challenging (Jones and Lichtenstein 2008). To overcome some of the differences among company-specific ways of doing, and to form collaboration practices that cross these boundaries, the spatial layout can be planned in accordance with the interdependencies between project tasks instead of according to the companies.

In the case project, our findings on the management practices related to social constructions of collaboration practices contained overcoming resistance, managing it continuously by reflecting the functionality of space,

gathering insights from the employees, promoting a common reason for collaboration, guiding collaboration practices for specific periods and reminding others of the desired collaboration practices. Earlier literature has recognized the need for reflectivity in general (Lalonde *et al*. 2012), here we recognize the need to apply reflectivity to managing space through different phases of a project. As the research literature has not previously connected collaboration practices performed in a space to management, it has not indicated how shared understanding can influence the nature of the collaboration enabled by space. Furthermore, to motivate collaboration the interests of the participating companies can be reconstructed (Leufkens and Noorderhaven 2011), and this was made in the case reported here by defining the idea of *one* project company. Both of these management practices related to social and physical affordance of space were performed at different levels of management. General decisions were made at the project executive level, while the lower level of management, including project managers from different companies, implemented these decisions. Sometimes the individual companies had their project management performing independently related to space. Additionally, some individuals also acted as managers of collaboration practices in order to influence others. These different levels indicate the complexity of managing space within an inter-organizational context.

By linking space with the affordances created by management practices, we can consider how to nurture and "nudge" the collaboration practices of individuals. Affordance theory accentuates the role of individuals' active perception of their environment and how it shapes their behaviour. Management can influence these elements, for instance, by narrowing down some of the possibilities, proposing some specific possibilities as more desired or bring out possibilities individuals do not acknowledge themselves. The social and physical affordances described in the research literature and the how management constructed affordance in the case project reported here can be found in Table 2.

The table enables separating the physical and social elements of collaborative space as creating affordance and, in addition, it enables the identification of related management practices. In addition, the table provides a separation between the two sides of affordance that are constructed differently and thus follow different logics. Management can create physical possibilities for collaboration with designating a space for collaboration practices and with designing a layout of this space. Management can also shape the social understanding of possibilities for collaboration practices through creating common knowledge of the practices among the participants. Physical space can be designed to foster collaboration practices, but it can also enable practices that are not ideal for the project. Therefore, management must also work to reassert the functional practices through actively constructing a common understanding of them. Management concerning physical affordance includes considering physical forms and designs. Managing social affordance, on the other hand, requires influencing individuals' understanding of their own behaviour, which can include challenges, such as resistance. The social affordance is related to individuals' earlier experiences and wider cultural knowledge. It is less tangible and implies limitations which are less clear than physical elements.

A large amount of earlier workspace literature has concentrated on describing the physical characteristics of space and the actions performed in space (e.g. Heerwagen *et al*. 2004). The present study combines the theory of affordance and the workspace literature to show how management can influence the way in which individuals use the space. This means that management can be part of the effect of space on behaviour by influencing both the space and the use of space. Thus, management can be relevant also in studies of more permanent workspaces. In addition, by connecting affordance theory (Fayard and Weeks 2007) to management we extend the understanding of how affordance can be structured actively by management.

Previous literature on collaborative space or co-location has rarely described how it is organized or what it requires

**Table 2.** Managing elements affording a collaborative space.

| Elements affording a collaborative space | Physical possibilities for using a space for collaboration | Social understanding of collaboration possibilities within a space |
|---|---|---|
| Examples of affording elements from collaboration literature | The space's design related to proximity (Cannella *et al*. 2008, Beck and Plowman 2013), open office layout (Maher and von Hippel 2005, Värlander 2012); walls (Heerwagen *et al*. 2004), co-working rooms (Heerwagen *et al*. 2004), a shared service area (Hua *et al*. 2011) | Awareness of what happens in the space, brief interactions (max 1 min), individuals working together over time (Heerwagen *et al*. 2004), consulting, verifying (Sapsed *et al*. 2005) |
| Managing the affording elements within a collaborative space | Choosing a design for a space | Defining collaboration practices for a space |
| Examples of managing affording elements based on the results of this study | Designing the building and layout together with separate companies or separately, considering the needs of various companies | Spreading a common understanding of collaboration, directing practices for specific time, reminding of desired collaboration practices |

to function (e.g. Lahdenperä 2012, Beck and Plowman 2013). We open this discussion in order to increase the understanding of collaborative spaces as complex phenomena that benefit of managing it also after their implementation. We also note that the collaborative space is actively functioning to intensify collaboration mainly when collaboration practices are present in the space. The physical space might need management to introduce the collaborative practices. These practices can be defined by management as collaboration can potentially include many different practices. The different phases of the case project suggest that it would be beneficial for the project if the characteristics of the collaborative space would fit the needs of each project phase. With the help of affordance theory, we can consider how the management of collaborative space can also implement the idea of how to use the space. This may require organizing co-management between companies.

Our findings enable practitioners in construction management to reflect on the challenges and opportunities of a collaborative space, and to what extent it could be useful for a given project. The case project had a full time collaborative space, but some smaller construction projects have also applied it part of the time. Furthermore, the findings point to the importance of considering who and which companies are involved in the decisions regarding and execution of the different activities because this seems to influence the organization of space. The findings also indicate that management should keep an eye on the organizing of space throughout the project in order for the management to be able to support collaboration practices, as work activities, roles and decision patterns change over time. For management to understand how to create a suitable space, it is important to recognize the different needs of companies and which individuals are required in the space. Furthermore, creating a common understanding of the desired style of collaboration practices among management and employees is likely to advance the influence of the collaborative space. Thus, the nature of collaboration practices can be defined and supported by management.

## Conclusions

Our study illustrates the importance of actively managing space in order for this space to become an efficient means to intensify multi-partner project collaboration. Few studies have delved into this before, although it is widely accepted that management matters to projects (Turner and Müller 2005), that one can use space to enable organizational change (Kornberger and Clegg 2004), and that spatial solutions like the co-location of project members can increase collaboration practices (Beck and Plowman 2013). Based on the case study, we found management practices influencing both the physical features and the social constructions of collaboration practices. The physical features were managed with deciding the form of the space and designing the workstation layout together or separately. The social constructions were managed with practices of reflectively managing between separate companies over the project course, overcoming resistance, managing less attentively by relying on employees' earlier experiences, gathering insights from the employees, promoting common understanding, promoting separate time for collaboration practices and reminding others of the desired collaboration practices.

Our theoretical contribution combines the theory of affordance and the workspace literature to show how management can influence the way in which individuals use the space by influencing both the physical and the social aspects of space. This means that management can be part of the effects of space on behaviour by influencing both the space and the use of space. By connecting affordance theory to management, we extend the understanding of how affordance of space can be actively structured by management. The idea of management creating social and physical affordance of the space can also be applied to the workspace literature. In addition, we open the discussion of understanding collaborative space as a rather complex phenomenon that can benefit of management within the course of a project.

Our practical contributions suggest carefully considering how to manage collaborative space in the different phases of a project. When a space integrates different companies, it is useful to consider how the companies participate in management, how the space integrates individuals and what is the desired form of collaboration practices in space.

One case is not enough to generalize the results, but our study is useful for taking the first step in creating a framework for managing a collaborative space which acknowledges the complex social processes involved. Future research might propose changes to our framework, as the management practices presented here are connected to the particularities of the case project, such as its size and complexity. For this reason, these practices may vary, for example, in smaller and less complex projects.

Furthermore, future research could investigate how organizational structures, such as project teams and clusters, relate to the designing a collaborative space. As the literature is scarce on how the relationships between different partners in collaborations influence the management of a collaborative space, this is another topic for further investigation. For example, our data points to a contingency between a partner's ability to influence how a space is formed and the number of project members represented

by this company in the project. Furthermore, future studies on collaborative space and co-location should consider the existing knowledge in the workspace literature such as the challenges of disturbance in an open-plan office.

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