

# **EXPLORING THE DEVELOPMENT OF COLLABORATION IN CONSTRUCTION PROJECTS: A CASE STUDY.**

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## **ABSTRACT**

The production process in construction projects is carried out by several specialised participants. These project participants develop relationships that influence how the production process is progressing. Scholars within the construction management literature view the adversarial relationships often experienced within this industry as a root cause of inferior productivity levels.

The data used in this paper is based on case studies from two pilot construction projects in Scandinavia in which collaborative planning based in large part on Last Planner System™ was implemented. The case studies were based on 36 interviews with managers (general contractor and subcontractors) and observation in planning meetings. The hypotheses investigated in this paper are that there are functional relationships between a) the degree of familiarity and community, b) the willingness to take others' perspectives, and c) the degree of engagement in activities and the degree of collaboration in construction projects. Based on the implementation process we explore in this paper the process of developing collaboration on site, in such a way that it may lead to mutual benefits for all participants in the construction project. We use a set of collaboration indicators to identify the development process which led towards strengthened collaboration. We conclude that the various activities and processes related to collaborative planning contributed to the development of collaboration within these two construction projects.

## **KEY WORDS**

Collaborative planning, Last Planner System, Culture of collaboration.

## **INTRODUCTION**

The construction industry is assumed to be characterised by “cultures of conflicts” (Loosemore et al. 2000; Jørgensen et al. 2004). In construction projects a large number of specialized people engage in some kind of interaction and in some level of collaborative activities to bring the project forward. These interactions, however, often result in conflicts. Contract documents for construction projects are traditionally prepared to manage conflicts rather than collaboration (Grimsmo, 2010). The levels of trust between the partners are reported to be low (McDermott et al. 2004; Huemer 2004). Such adversarial relations are more common than rare and may result in a perceived understanding of the reality of this industry as ‘the way we do it’, and ‘this is the way things are in the construction industry’. There are still a limited number of empirical studies on the construction industry concerning the concept of

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collaboration. One approach, however, is Integrated Delivery Project – IPD – a relational contracting approach that integrates people, systems and practices in a collaborative process to optimize project performance (Matthews and Howell, 2005). This paper describes the processes of developing collaboration among the participants in the two projects. With reference to which collaborative activities were carried out and how, we aim to raise awareness of issues that may influence the development of a collaborative culture in such projects.

According to Zuo and Zillante (2009) and Reagle (2006), limited definitions of collaborative culture in construction are offered. Montiel-Overall (2005) offers a definition of collaboration as a “trusting, working relationship between two or more equal participants involved in shared thinking, shared planning and shared creation”. Collaborative culture in this paper refers to a working climate of joint efforts to bring the building project forward. We have used a set of collaboration indicators to describe the collaborative development process. These are

1. A feeling of familiarity and community. This indicator is based on how participants are involved, the degree of respect and trust among the participants
2. The willingness to take others’ perspectives. This indicator is based on how able and willing the participants are to put themselves in the shoes of others, both in planning meetings and in production, how they see themselves in a broader context, and the dependencies they create between them
3. The level of engagement in activities. This indicator refers to how prepared the participants are for joint progression planning meetings, and to what extent they are engaged in meetings.

Based on the three indicators for collaboration we test the following hypotheses:

- a. There is a positive functional relationship between the degree of familiarity and community and the degree of collaboration in construction projects.
- b. There is a positive functional relationship between the degree of willingness to take others’ perspectives and the degree of collaboration in construction projects.
- c. There is a positive functional relationship between the degree of engagement in activities and the degree of collaboration in construction projects.

The conclusions concerning the hypotheses above are not based on quantitative components of a range of metrics – the indicators are treated as qualitative components based on subjective judgements from the informants. As such, conclusions will be stated in terms of a weakened or strengthened view of the functional relationships hypothesised. The informants’ subjective assessment of the development of collaboration in these projects is based on the experiences within the projects and the differences between the current and previous project experiences. Past projects vary of course in terms of size, complexity, success or failure etc.

## **ABOUT THE CONSTRUCTION PROJECTS**

This paper is based on the process of implementing collaborative planning in Norway. Two office building projects were chosen as pilot projects by the Norwegian general contractor. One of the projects was a 25000m<sup>2</sup> commercial building built in the period from August 2008 to March 2010. The other was a 4300m<sup>2</sup> office building

built in the same period. Both projects were conducted by private owners. A main purpose of the pilot construction projects was to improve progress planning by involving more people in collaborative planning activities. Lean principles and collaborate planning methodologies were implemented using an adaptation of the Last Planner System™ (Ballard, 2000). In the pilot projects, involvement meant including both the general contractor's employees and subcontractors in the progression planning.

## **RESEARCH METHODOLOGY**

Data used in this paper are based on the two qualitative case studies in Norwegian construction pilot projects described above. The research project was conducted in a phenomenological framework using an explorative approach to increased understanding of the processes of developing collaboration within a construction project. A total of 36 semi-structured interviews were conducted on a one-to-one basis with project managers, foremen and supervisors, both from the general contractor and subcontractors. Interviews were conducted at two different points in time to capture the process development. Observation of planning meetings at different managerial levels was also conducted twice in each case study. Conclusions drawn about the hypothesis are based on the subjective experiences of the participants interviewed.

## **PRE-PROJECT SITUATION**

As pointed out by Egan (1998), this industry does need to move towards a more collaborative culture. The participants' past experience, their beliefs, values and perspectives are all important elements that they bring with them into the project and these may influence the level of collaboration in a construction project. As human beings we act upon our perception of reality and thus these form the participants' behaviour on site. In traditional construction projects, with a low level of collaboration, individuals may act accordingly and thus strengthen the understanding of this reality, and continue practising a less collaborative behaviour. The painter who comes in to do his part of the job may be so used to not being able to work as planned that he will perceive this situation as being the normal situation. The industry's overall reputation as being adversarial only strengthens this perception.

## **THREE PHASES OF THE PROJECT**

In this paper, the building project is separated into three phases: the initialising phase, reinforcement phase and sustained effects phase. The analytical rationale for using the three phases is that various activities in the course of the project may influence and strengthen the set of collaboration indicators. These phases are not to be understood as distinct phases with marked beginnings and ends. The use of phases can be seen as pointers in terms of the collaborative development stages of the project.

### **INITIALIZING PHASE**

In the initialising phase of the construction projects, two important activities took place - one was a kick-off seminar and the other was the establishment of planning procedures and routines, as well as the meeting structure to facilitate these.

#### **Kick-off seminar**

Months before (most) subcontractors commenced work on site, there was a kick-off seminar where all subcontractors (project managers and team-supervisors) who were under contract at the time participated, together with key people from the general contractor project team. The project management wanted to bring the participants together for two reasons. First, the kick-off was intended to facilitate an early involvement in the project. The project management wanted the participants to get to know each other in order to develop a sense of relationship and familiarity. Second, in one of the pilots they also invited all to participate in the planning of the first phase of the project. An overview of Lean Construction and Last Planner System was provided and lean principles and techniques were discussed. One objective of the planning process was to create greater awareness about the dependencies between the trades in the production process. A pull planning session in which all participants engaged was arranged using post-it notes. Each subcontractor (trade) was given a specific post-it colour where each independent task in the planning phase was written down. The trades then placed their notes on a piece of brown wallpaper and started to discuss the order of activities with the other trades.

### **Structures and routines for collaborative planning**

In both pilot projects, there were two main levels of progression planning. The team supervisors met on a weekly basis to coordinate their activities and the project managers met every two weeks to plan for the next few weeks. The team supervisors (general contractor and subcontractor) attended a weekly planning meeting. Prior to the meeting, they had prepared a list of activities to be carried out over the next week or two. In the meeting, the activities from each trade were coordinated. Each trade, in turn, would present their plan to the others and receive feedback on whether or not the activities would cause any problem (or opportunities for that matter) for others. The informants noted that such communications nurtured a sense of familiarity and community and the joint planning sessions resulted in an ability to take others' perspectives. The realisation of seeing themselves in a broader context made them able to put themselves in the shoes of the other participants. According to the interviews, on previous projects, their sole concern was their own progress.

Every two weeks, a planning meeting was scheduled where the project managers (general contractor and subcontractor) participated. In this meeting, based on a process plan for the actual phase they were at in the building process, they looked several weeks ahead to identify any obstacles for activities to come. This was done more or less in the same manner as the weekly meeting letting each trade present their plans followed by a discussion of how others could be affected and what would be needed from the other trades in order to enable the activities.

### **Managing the planning process**

In both pilot projects, the project managers, from the outset, clearly communicated how they wanted the planning procedures to be and what they expected from the participants in terms of preparation and engagement in the meetings. Attending the progress planning meetings was not optional, nor was it optional to prepare a list of activities or to engage in the discussions.

### **Summary of phase one in terms of the three indicators**

Many of the informants emphasized the positive outcomes of the kick-off seminar, such as the relations building effects and a thorough process planning which enhanced plan reliability. Engaging in early project activities was reported to be of great importance for how the project evolved. The kick-off seminar created a positive climate and the informants noted, already at this stage, a growing sense of familiarity between the participants, characterised by a friendly tone and less formal behaviour. When they met again, weeks of months later, they were already familiar towards each other. The information and the activities shared at the kick-off meeting were reported to have affected the participants' interest in the totality of the project, and made them see themselves in a broader context. The kick-off seminar facilitated an early involvement, i.e. all participants took part in discussions and planning session.

As the communication around the table in the meetings focused on what each and every one needed in order to carry out their planned activities, the participants became increasingly aware of the dependencies between the various trades. As noted by several informants, the level of dependencies towards the technical trades, in particular, was new knowledge to them. The interviews revealed a new and positive experience and growing interest of other trades' activities. Thus a willingness to take others' perspectives resulted. For example, the interviewees reported that the participants' discussion of the order of activities in the meetings, made clear to them how their own work affected and was affected by others' work.

In the initialising stages of the pilot projects the project management took a leadership role in getting people involved and engaged in the planning meetings. From these two case studies it appears to be of the essence to facilitate a good start by establishing good meeting structures and procedures for early involvement and planning on site. A framework for collaboration, including, planning procedures, meeting structures and routines for the look-ahead meetings, was experienced by the informants as important to develop collaboration.

## **REINFORCEMENT PHASE**

We refer to the second phase as the reinforcement phase. In the initiating phase, new behaviour may be a result of project manager expectations towards the participant in terms of how to prepare and engage in meetings, whereas in this phase, the participants develop a self-interest and motivation to continue the new set of collaborative behaviour, thus reinforcing collaborative behaviour.

### **Weekly planning meetings and look-ahead planning**

The most fundamental change from traditional planning methodologies is the look-ahead meeting (Ballard, 2000). The subcontractors embraced the project management's focus on progress and the coordination of activities. According to subcontractor project managers, the opportunity to discuss matters related to the other trades and the developed understanding of the consequences that any changes in priorities may inflict was vital to them.

The collaborative climate in the planning meetings also positively affected the collaboration in the production. An example of such behaviour was described by one informant as the willingness to help each other clear out an area, to make it ready for the next trade. In previous projects the same situation would cause finger pointing and blaming of each other.

The informants pointed to getting to know each other better as being an important factor to the changed attitude. When the team-supervisors in their weekly meetings exchanged experiences about the production and various factors that affected their progress, they experienced a growing relationship based on trust and responsibility towards each other.

The team-supervisors described an improved understanding among the group of supervisors, and that they executed a more selfless behaviour on site. An example to illustrate this was the supervisor for the plumbing team who noted that even if his own staffing in periods was sub-optimal, resulting in short-term variations, the overall project gained from an optimal pattern of workers on site.

Half-way through one of the projects an incident happened that threatened to break down the level of collaboration that had been developed over months. A delivery of floor coverings from a supplier was much delayed which had major impact on all the trades present. As all subcontractors were depending on the floor coverings to be in place before they could continue with their own tasks, the agreed order of activities all of a sudden could not be followed, and the contractors more or less found themselves left to find work where ever they could on site. As one of the informants said, 'it was as if we were suddenly back to the old way of running projects, when we didn't know what the others were doing and only cared for ourselves'. The process stabilised after a few weeks, however, this incident demonstrates how vulnerable these relationship-building processes can be when a threat, this time an external, occurs.

#### **Example of how to facilitate daily collaboration**

In both pilot projects the 'technical trades' offices were co-located with the general contractor project management team's offices. The doors between the offices were mostly kept open, and barriers to communication were low. The co-location enhanced communications and understanding between the contractors. Similar approaches are reported in America, e.g. a "Big Room" is set up to facilitate a collaborative work environment (Khanzode, Fisher and Reed, 2007). One of the subcontractors said that "the communication was great, being in neighbouring offices improved the relationship between us. We understand each other better now and are pushed towards collaborative behaviour since we have the guy next door to answer to". A closer relationship in one area, such as joint progression planning, led to a more collaborative attitude in other areas such as the use of equipment. In contrast to the subcontractor's experience from previous projects where trades locked their own equipment in, they were more positive to lend their equipment to others. Cooperation and close interaction provided a sense of team and helped build respect between the project participants.

It is the project management's responsibility to pave the way for good cooperation and involvement by creating suitable structures and procedures for collaboration. A solid framework, however, with structured meetings, procedures, etc., may not alone ensure collaboration and involvement. Only when the participants experience for themselves that the changed behaviour and interaction yield positive outcomes to them in terms of an improved work life, plan reliability, production flow and financial benefits, will the new behaviour be cemented. The individually perceived usefulness will strengthen the new set of behaviours.

The levels of trust between the project participants reportedly did increase. According to the informants, effects of cooperation in the progress planning also

affected the feeling of unity and well-being. As an example of a unity-building activity the project management in one of the projects, every Friday, invited all participants on site, managers and workers, to join in on a barbecue lunch outside the office buildings. This was a very much appreciated initiative since it expressed gratitude towards every one's efforts.

Attitudes towards each other changed, which again influenced on people's expectations towards each other. Managers at all levels as well as the workers worked towards global optimization as opposed to local optimization (see i.e. Elfving, Tommelein and Ballard, 2003).

### **Summary of phase two in terms of the three indicators**

In this phase of the project the indicators were more easily identified as the participants experienced for themselves the first few positive effects of their new involvement and collaborative behaviour. The participants experienced for themselves the pay-off from their committing to the collaborative behaviours, in terms of positive experiences of increased plan reliability, and more predictable and less stressful days. The feeling of familiarity on site strengthened, expressed by the informants in terms of a growing feeling of 'we' instead of 'us' and 'them'.

### **SUSTAINED EFFECTS PHASE**

The reason why we call this last phase the sustained effects phase is that, in this phase of the project, the effects of the changed behaviour started to manifest themselves "as the way we do this". The first few effects of the collaborative activities experienced in the second phase made the participants start to believe that "we may be on to something here". In the third phase these experiences were more substantial in the sense that more project participants shared the same positive experiences and effects and that the effects were consistent. Collaborative behaviour was evident, both in the planning progression meetings and elsewhere on the building site. The levels of trust that had been built were based on the confidence that the different contractors would keep their promises to their part of the building process, which increasingly resulted in an expectation that such collaborative behaviour would continue. The informants reported that they had developed a willingness to commit to the totality of the project in contrast to previous projects. In this phase it may be important to create an arena for reflection and sharing the positive experiences, since reflection may further strengthen the new behaviour. One of the informants said "There is no turning back to the traditional way after this project".

### **The three phases in a loop**

The dynamic nature of a construction project means that the project evolves in a loop more than it develops through a straight line. First, the separate stages in the building project may call for new pull planning sessions and new kick-off seminars, since new challenges are faced. Secondly, the composition of people on site will change as some subcontractors finish their job and new ones enter the project. This creates a loop situation that necessitates a focus on the three phases simultaneously. This may be particularly difficult towards the end of the project since this stage demands a special focus on delivery planning at the same time as small scale subcontractors, with perhaps limited resources to use on collaborative planning, need to be involved in and

commit to the planning routines. Indeed in both projects, they did experience challenges with involving new subcontractors towards the end of the project.

### **Summary of phase three in terms of the three indicators**

In this phase we have not introduced new activities to develop collaboration. However, in our view, the crucial point is that the participants' collaborative behaviour which earlier, to a greater extent, resulted from project manager expectations, and eventually from experiencing the first few effects that reinforced their behaviour, in this phase was described by the informants more in terms of a pattern, as a sustained form of collaboration. The interviews revealed a growing sense of familiarity among the participants, exemplified by the subcontractors' expressed wish to work for the general contractor on future projects. A sign of willingness to take the other participants perspectives was the ongoing problem solving that took place on site. In previous projects, the participants would, according to themselves, distance themselves from the problem and say, 'It's not my problem, and you fix it yourself'. Now they were willing to collaboratively solve the problem for mutual gains. The informants explained that in traditional projects they would have done their work without considering what consequences this would have for other trades. In these two projects frequent problem solving, and the willingness to find solutions in the best interest of the whole project, led to a low conflict-level. Instead of writing extra checks or issuing fines for non-compliance, the participants willingly sat down to discuss how to best deal with the situations. From the observation of collaborative behaviour in planning meetings it was evidently a high level of engagement. When asked to comment on this, the informants said that in previous project 'only half of the men would show up and just a couple would actually say something'.

### **CONCLUSIONS**

The informants expressed overall positive outcomes with the development of the collaboration during the project, in terms of the level of well-being, higher plan reliability and improved production flow. Even if financial benefits were not measured, several subcontractors stated that they 'made good money on this project'. Particularly the early effects of the involvement in planning helped reinforce the new collaborative behaviour. As these effects proved to be sustained, informants said that going back to the traditional way of carrying out projects was not an option. The case studies clearly identified the need to focus on involvement throughout the project as new participants enter and need to be involved in the new collaborative behaviour. In terms of the three indicators of collaboration, we have described a development process within these two pilot projects and the way that collaboration process developed from initialising new collaborative behaviour, to early experiences of positive effects to a sustained pattern of behaviour of collaboration. In terms of the hypotheses in this paper, we cannot test these for statistical significance. Based on the subjective views of the informants, however, there are strong indications that the hypotheses are strengthened within these projects. As such, these offer valuable insight into the project internal development process of collaboration.



## RECOMMENDATIONS TO FURTHER RESEARCH

This paper is based on a qualitative research project, with an explorative approach to learn about the collaborative development process. Conclusions only hold within the two cases studied and cannot be generalised. Further research is needed in order to develop knowledge of how increased collaboration eventually may replace the adversarial relationships reported industry-wide. Future research may include quantitative indicators of collaboration in order to measure and compare different projects and companies and their levels of collaboration.

H1: Subcontractors will be more engaged in planning meetings on a project in which a general contractor facilitates collaborative planning methodologies (e.g. the use of Last Planner System) in comparison to a project in which a general contractor makes use of collaborative planning methodologies optional.

H2: Subcontractors will be more prepared for planning meetings on a project in which a general contractor facilitates collaborative planning methodologies (e.g. the use of Last Planner System) in comparison to a project in which a general contractor makes use of collaborative planning methodologies optional.

## REFERENCES

- Andersen B., Bølviken T., Dammerud H., and Skinnarland S. (2008). Approaching Construction as a Logistical, Economical and a Social Process. Presented at the 16th annual conference in the International Group for Lean Construction. Manchester, UK, July 2008.
- Ballard, G. (2000). "The Last Planner™ System of Production Control". PhD Dissertation, The University of Birmingham, Birmingham, UK.
- Egan, J. (1998). Rethinking Construction. Department of the Environment, Transport and the Regions. (Available at <http://construction.detr.gov.uk>).
- Elfving, J. A., Tommelein, I. D. and Ballard, G. (2002). An International Comparison of the Delivery Process of Power Distribution Equipment. Proceedings of the 11th Conference of the International Group for Lean Construction, Blacksburg, USA.
- Falkum, E. (2008). Makt og opposisjon i norsk arbeidsliv. Avhandling for dr.philos.-grad. Fafo.
- Grimsmo, E. (2010). Hvordan unngå prosjekteringsfeil. Byggekostnadsprogrammet, 2010.
- Huemer, L. (2004). Activating trust: The redefinition of roles and relationships in an international construction project. *International Marketing Review*, 21(2): 187-201.
- Jørgensen, B., Emmitt, S., and Bonke, S. (2004). Revealing Cultures and Sub-Cultures During the Implementation of Lean Construction. Proceedings of the 12th Conference of the International Group for Lean Construction, Copenhagen, Denmark.
- Khanzode, A., Fisher, M., and Reed D. (2007) "Challenges and benefits of implementing virtual design and construction technologies for coordination of mechanical, electrical, and plumbing systems on large healthcare project", CIB 24th W78 Conference, Maribor, Slovenia, 2007, pp. 205-212.
- Loosemore, M. Nguyen, B. T. and Denis, N. (2000). An investigation into the merits of encouraging conflict in the construction industry. *Construction Management and Economics*, 18(4), pp 447 - 456

- Matthews, O., and Howell, G. A. (2005). "Integrated project delivery: an example of relational contracting." *Lean Construction Journal*, 2 (1), 46–61.
- McDermott, P., Khalfan, M. M. A., and Swan, W. (2005), 'Trust' in Construction Projects, *Journal of Financial Management of Property and Construction*, Volume 10, Number 1, pp19 – 31, March 2005
- Miller, C., Packham, G., and Thomas, B. (2002). "Harmonisation between Main Contractors and Subcontractors; A Pre-requisite for Lean Construction?" *Journal of Construction Research*, 3(1), 67-82.
- Montiel-Overall, P. (2005). "Toward a Model of Collaboration for Teachers and Educators" In *Proceedings of the 12th International Learning Conference*, Granada, Spain.
- Reagle J. (2006). Is the Wikipedia neutral? In *Proceedings of Wikimania 2006*. URL [http://wikimania2006.wikimedia.org/wiki/Presenters/Joseph\\_Reagle](http://wikimania2006.wikimedia.org/wiki/Presenters/Joseph_Reagle)
- Zuo, J., and Zillante, G. (2009). Project Culture within Construction Projects: a Literature Review. *Proceedings of the 17th Conference of the International Group for Lean Construction*, Taipei, Taiwan.