

# WHEN WE DEVELOP COLLABORATION, WHAT EXACTLY DO WE DEVELOP?

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## ABSTRACT

In this paper we will expand further on the literature focusing on collaborations within the construction industry. In the articles that are concerned with collaborative efforts, the authors present definitions. Often a common denominator is that collaboration is carried out by two or more parties to reach a goal. Little operationalization is offered in terms of understanding collaboration contextually. What are we actually talking about when we are concerned with collaboration, and in particular how to develop collaboration between actors in the construction industry?

This paper aims to discuss the term collaboration from the collective viewpoints of actors at a construction site, who consist of skilled workers and apprentices, supervisors, foremen and site management. The basis for this discussion is a previous review of collaboration in the literature, as well as previous research undertaken by the (first) author, which operationalizes collaboration in terms of six underlying dimensions.

The argument posed in this paper is that if correct measures were to be identified and taken to improve and develop constructive collaborative relationships between interorganizational actors on the construction site, we would need to address the term collaboration in greater depth. Rather than operating with an overarching and insufficient definition of “collaboration”, we need to operationalize and sufficiently understand how actors themselves understand collaboration within a specific context.

## KEYWORDS

Collaboration, interorganizational relationship, trust, communication, perspective-taking, motivation, the Last Planner System

## INTRODUCTION

Collaboration happens when two or more people perform a set of actions that enables them to achieve a goal. Appley and Winder (1977) defined interorganizational collaboration as a process in which two or more firms work closely together to achieve mutually beneficial results. Jacobsen (2004) stressed the fact that entering a collaboration was a voluntary act in which interdependent contractors sought each other to fulfil the quest of achieving the desired results. Collaboration optimally takes place when actors enter a relationship where they display commitment towards each other, and where they value the team relationship as much as they value their own self-interest (Appley & Winder, 1977). Wood and Gray (1991) offered the following definition: “Collaboration occurs when a group of autonomous stakeholders of a

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problem domain engage in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain”.

In terms of collaboration taking place at a construction site, the stakeholders, in question, are the contractors who participate in the project. They represent independent decision-making firms, they act voluntarily, and they are normally expected to follow a set of industry norms and rules for this type of collaboration. An underlying premise is that the contractors together engage in, and form, a voluntary change-oriented relationship, in which they produce the result, e.g., a building, together. Although industry rules, norms and structures may be implicit in the collaboration, contractors may still explicitly agree on rules and guidelines that will govern the collaboration in the specific construction project.

The above initial descriptive take on what constitutes collaboration, as often found in the literature, is in line with what the readers would have expected. From these initial definitions of collaboration, readers often perceive they have sufficient knowledge of the concept to start tackling any problems thereof, and to follow the author’s argument towards a solution to improve collaboration. But is it necessary so? How can the industry know how to develop and strengthen collaboration without more in-depth understanding of what the concept implies? The argument put forward in this paper is that there is a need to develop knowledge as to what constitutes collaboration in the context of the construction industry generally, and specifically the collaboration taking place at the construction site, to initiate the correct measures to develop a collaborative effort. Because, as stated by Howell et al. (2004), “[p]eople are at the beginning, end, and center of projects”. Thus, in this paper we offer an in-depth analysis of what constitutes *collaboration*, as viewed by the actors themselves at a construction site.

Researchers have been concerned with collaboration from different perspectives over the last decades. Alves et al. (2021) investigated how the language used in contracts might influence collaboration, specifically in terms of developing and implementing schedules. They found that contract clauses mainly focused on the compliance, and they found overall a limited mentioning about collaborative efforts beyond expectations in the clauses (Alves et al., 2021). Willis and Alves (2020) investigated the language used in construction contracts with the purpose of identifying the keywords commonly associated with collaboration. Interestingly, they found that in traditional contracts, such as design-bid-build contracts (DBB), there was a lack of language to support collaboration. In integrated-project-delivery projects (IPD), on the other hand, keywords associated with collaboration were employed in the contract clauses to promote collaborative behaviors and processes.

Salazar et al. (2019) pointed to the need to teach actors on the project how to make reliable promises. They built on the previous work by Salazar et al. (2019) on how to generate reliable commitments and proposed an updated version of indicators to measure and control the management of commitments in construction projects. Retamal et al. (2021) presented the results from a case study about construction projects in Colombia that demonstrated the importance of enhanced understanding with the linguistic action process. This resonates well with the argument in this paper, that a conscious and practical approach to the use of language is needed to establish a reliable commitment.

Davoudabadi et al. (2022) described a research project in the UK in which a Lean-BIM joint implementation effort at an engineering design firm was evaluated. They found several barriers to effective collaboration between Lean-BIM teams as well as a lack of motivation and desire to engage in the collaboration. This was explained by a lack of awareness of the mutual gains from such a collaboration. Other barriers reported were that Lean and BIM experts exerted different work mentalities and lacked a common approach to accomplish their joint task, hence; group think biases were detected.

Research has pointed to various measures that need to be considered to develop collaborative relationships. Salam et al. (2019) proposed that designers and contractors need to

align their knowledge and views about the actual interactive processes to which they engage. In their paper, they emphasized a concern about the lack of knowledge about what participants did in the active collaboration process. Schöttle and Tillmann (2018) discussed the development of shared goals as a means to support collaboration. They found evidence that there was a positive functional relationship between goal-setting activities and a) increased communication and coordination, b) a guide for team action, and c) enhanced team motivation. Gomes et al. (2016) specifically studied collaboration in the context of the early design phases and discussed how shared understanding can serve as a basis for collaboration. In their paper, they developed a model about the process of building a shared understanding, in which the key features are: a) division of labor, (as a condition for collaborative actions), b) coordinated perception and situational awareness, i.e. understanding co-workers' situations, and c) mediated coupling and boundary objects. Garcia and Murguia (2021), stressed the need to understand collaboration not only in theory but also in practice. In their study, they aimed to investigate which factors influenced collaboration and they set out to develop a model for inter-organizational collaboration. They concluded that collaboration can be nurtured by improved operational capacity, taking measures to reduce uncertainty, promote trust and to apply a longer-term view in developing fruitful partnerships.

The above review shows that research on collaboration in the construction industry varies not only in terms of the specific topic of interest, but also in terms of which phase (design or making) in the collaboration process is being assessed and which actors are the focal point.

## **METHOD**

The present paper builds on a recently published curriculum book written for master students in Norway, which summarized the findings of research that had been carried out over the past two decades. This research explored the crucial question: "What is good collaboration to you?", and this same question was directed to various actors at a construction site. Thus, the scope was to discuss the term collaboration from the collective viewpoints of actors at a construction site.

This paper further builds on previous research and practice by the authors as well as a review of recent IGLC papers. Firstly, the collective data gathered from observations, interviews, and surveys for the doctoral thesis of Skinnarland (2013) served as a starting point for the conceptual discussion on collaborative relationships in the construction industry. In her doctoral thesis, collaborative relationships were the focal point of the research. The author established six dimensions for the term collaboration, based on a literature review and research on the collaborative practices on and among the actors at a construction site. These six dimensions are described in detail from page 5 onwards. Secondly, we build the paper on a review of the authors' collected research on construction site production and management, in which collaboration is viewed more implicitly. And, thirdly, a review of recent IGLC conference papers containing *collaboration* in the title, was conducted for the sole purpose of establishing a knowledge base for writing this paper.

## **DIMENSIONS OF COLLABORATION**

Much like the type of collaboration that takes place in a surgical suite, where different professionals collectively prepare for the actual surgery as well as post-surgery activities so that the surgical process does not result in an unsuccessful outcome for the patient, so can a similar collaboration process take place in certain situations at a construction site. For example, two carpenters can help each other lifting beams, one holding while the other carries out the work. The crane operator collaborates with the carpenters to lift materials to a specific area on the construction site.

The above examples, whether in a surgical unit or the loading of materials at the construction site, demonstrate a *simultaneous* collaboration, a slightly different type of collaboration than the collaboration on the construction site that most frequently takes place, which is more *sequential* in form (Kalsaas & Ose, 2017). In sequential collaboration, each trade carries out their tasks in a given order, up until a finished result is handed over to the client. For a more thorough understanding of this, we may view collaboration within the concepts of work flow and coordination. When studying organizations, we cannot escape the very basic premise that all organizations need coordination (Van de Ven et al., 1976). We can borrow insight from Thompson (1967) who proposed a theory of a hierarchical relationship in which the nature of workflow is determined by an increased level of task interdependence. According to Thompson (1967), workflow is either a) *independent* (or pooled), b) *sequential* or c) *reciprocal* in form. These are additive linkages as work flow interdependence increases (Van de Ven et al., 1976). Independent, or pooled, activities (Thompson, 1967), are activities which are carried out simultaneously but they are not linked to each other. An example would be a worker who installs windows on the first floor while another installs windows on the second floor. Sequential and reciprocal work flows are both mutually dependent. A sequential work flow is e.g. the first worker who installs the window, then the second worker installs the moldings. In a reciprocal work flow the activities will flow both directions as two or more workers rely on each other to accomplish the task, such as with the loading of materials.

Flow may be discussed in a psychological sense, as *intuitive qualities* (Bølviken & Kalsaas, 2011) as well as *production* (a physical sense). These two are different concepts, yet related. In the psychological sense, flow is the experience of an ultimate balance between task demands and perceived skills (Csikszentmihalyi, 1990). In production, flow is a physical reality. Kalsaas and Bølviken (2010) review the term flow in production conceptually and Kalsaas (2012; 2013) in later works develops the operationalizing of workflow. In measuring these two conceptual terms of flow, the authors found indications that for the skilled workers the measurement of perceived flow corresponds well with physical flow.

The point of departure in this paper is primarily sequential workflow and collaboration, where, for the work to be coordinated and carried out in an agile manner, with efficiency, good quality, and be performed only once, a *sequence* is required. All work activities carried out by the various trades on the construction site are part of a production where the result depends on everyone's input that is collectively given in a correct order. This brings us to the very core of collaboration in construction site production, dependence, in agreement with Thompson (1967). To complete the construction project, all trades depend on each other and each other's input.

It is the question of *dependency* which urges the question of "What is good collaboration on the construction site?". "What are the characteristics of interdisciplinary collaboration being perceived as good?" Researchers have been concerned with interdisciplinary collaboration, not only within the construction industry, but in all industries in which the project constitutes a form of work. A review of the literature (Skinnarland, 2013), that focused on collaborations at construction sites, suggested that characteristics of (good or bad) collaboration could be summarized into six dimensions of collaboration. In several Norwegian studies, skilled workers and apprentices, supervisors, foremen and site managers had been asked; "When do you experience good collaboration on the construction site?". "What goes on between you and the other project participants when you perceive the collaboration to be good?" The answers to such questions revolved around: 1) the feeling of knowing each other, a sense of community and that they worked towards a common and known goal (dimension 1). Many interviewees described good collaboration as good involvement, good communication and a good flow of information (dimension 2). Others described collaboration as good when there was a large degree of trust between all trades and a lack of conflict (dimension 3). Still others reflected upon good collaboration as a feeling of being motivated, a feeling of being comfortable with

each other and a feeling of having a good day at work (dimension 4). Others described further good collaboration in terms of experiencing a high degree of understanding, mutual respect, taking each other's perspectives and acknowledging each other's needs (dimension 5). When asking skilled workers, many reflected upon the experience of production predictability as proof of good collaboration (dimension 6). Skilled workers are concerned with the production flow and predictable work processes. When they experienced that, this was often to them perceived as good collaboration. In the coming section of the paper we will discuss each of the above six dimensions of collaboration and how they are intertwined to form good collaboration at a construction site.

### **A SENSE OF COMMUNITY AND FAMILIARITY**

In inter-organisational collaboration, where trades are so dependent on each other's deliveries and efforts for the overall project to make good progress, many experience that the familiarity and common ground that develops, becomes a guarantee that the trades, to a larger degree, can work according to plan. Getting to know the people in the project gives the participants a sense of unity and a community. Experiencing community and togetherness affects well-being and the desire to help others.

It is, however, not sufficient for developing collaborative relationships, that project participants get to know each other on a social level. They also need to develop a familiarity professionally. "What is important to us to achieve trustworthy production flow?". Trades that communicate and articulate how dependencies between them affect production flow, invest in a type of professional conversation, which complements and strengthens the social relations and bonds between the project participants.

Early kick-off meetings *may* provide opportunities to develop relationships as project participants spend time together. As such, kick-off meetings, is a strategy to increase chances of success (Cooke & Hilton, 2015). Often participants report several positive experiences from kick-off meetings. They receive sufficient knowledge of the overall project, of the client's desires and ambitions, and what goals they will work on together to achieve success with the project. Project participants report a satisfaction with having met and gotten to know the other co-workers they will work with on the project (Skinnarland, 2012; Skinnarland, 2015). Such an early *sense of community*, a *we-in-this-project-feeling* and a *sense of familiarity* with both the project (and goals) and the participants from the various contractors, is often described as providing a sense of good collaboration. It may be possible to collaborate even without the tight social relationship; however, collaboration will gain from such familiarity (Skinnarland, 2013).

### **FEELING INVOLVED, GOOD COMMUNICATION AND FLOW OF INFORMATION**

The second dimension of collaboration is *involvement* and *communication*. The basic idea of involving even the skilled workers and apprentices is twofold. One is that plan reliability increases as more informed input is provided, and another is that the more people take ownership and commit to following the plans, the greater the chances are that the work processes will flow well, and everyone will collaborate towards reaching the project goal. This last point addresses the giving and receiving of reliable promises.

Being involved increases understanding of the process and a feeling of knowing what one is a part of, what one's efforts contribute towards. Furthermore, the dependency between project participants calls for sufficient information sharing and a multi-trade approach to communication. Being involved and the way that project participants communicate within the project organization mutually influences and reinforces each other's strengths and weaknesses. Many of the actors interviewed in construction projects highlighted the driving force they experienced when they felt fully involved, which explained the association to involvement and communication.

Involvement and communication matter at the individual level, as it enhances well-being, and provides meaning to both the work itself and collaborative relationships. However, involvement also matters at the project level, as involvement strengthens the trade's will to help each other (the project community), to take more responsibility, and to be more committed. Coffey (2000) therefore emphasizes the importance of involvement and communication and states that involvement is an active manifestation of commitment.

## **PERCEIVED TRUST BETWEEN ACTORS**

The third dimension of collaboration revolves around *trust issues*. Many researchers who have studied interpersonal relationships and interactions have been particularly concerned with trust, and the importance of trust in these relationships. Trust is built and torn down in a social and interactive process, in which the actors' interactions change the nature of the trust (Swärd, 2017). Social psychologists have studied what kind of behaviours between individuals creates or destroys trust whether at the individual or group levels. Trust understood at the interpersonal level can be defined as "the expectation of the other party in an interaction, the risk associated with believing them, and the acting on such expectations as well as the contextual factors, which either enhances or inhibits the development and maintenance of trust" (Lewicki & Bunker, 1996).

Given the great dependence, which exists between the actors at a construction site, there is a need to trust each other to experience a positive flow in their work production. Again, dependency requires that activities in an area are completed in a planned sequence as promised. Joint multi-trade planning makes apparent which trades will work on what, where and when. If performance (or quality thereof), or the timeframe is not in accordance with what was promised, there will be consequences for the trades who come later in the production process.

When promises are broken, project participants who take subsequent action based on the expectations of these promises will be disappointed. They become annoyed and frustrated. An occasional broken promise will most likely not significantly change the character of the trust. However, a pattern of broken promises can lead to broken trust. Thus, a high level of trust makes it easier to avoid conflicts in a project and easier to create a good collaborative climate. Again, the dependency on others to produce their project inputs demonstrates the sense of the participants' trust as a way to describe good collaboration.

## **FEELING OF BEING MOTIVATED AND HAVING A GOOD DAY AT WORK**

The fourth dimension of collaboration is *motivation and well-being*. Many, when challenged to dwell upon the notion of good collaboration, express opinions in lines of; "to me good collaboration is feeling motivated and having a good day at work".

Many are highly motivated to take responsibility, to contribute to a joint project, and to work as a team and with other trades, to enhance production flow. Work motivation can be defined as "a set of energetic forces that originate both within as well as beyond an individual's being, to initiate work-related behavior and to determine its form, direction, intensity, and duration" (Pinder, 1998, p. 11). So, what is it that motivates those actors at a construction site? What motivates the site management is not necessarily the same as what motivates the middle management, which in turn may differ from what motivates the workers (Skinnarland, 2013). While the foremen are most concerned with daily production control and an overview of what is happening on the construction site, the site management is most concerned with organizational and structural conditions that facilitate optimal project implementation. By looking at what respectively middle managers (who are closer to production) and site managers (who take care of the administrative responsibility around project implementation) report in terms of what issues are of concern to them, we may deduce what it is that motivates them at work, and what they emphasize most in the collaboration.

In terms of worker motivation, Midtdal (2017) found that: a) piecework as a pay system is a motivational factor, alongside b) the working environment; and c) the feeling of self-efficacy. However, there is a need to voice caution regarding piecework. An incentive system based on piecework may be perceived as a motivator as long as production is flowing according to plan. If not, the pay system may result in decreased motivation, as lower pay becomes the central issue. Skinnarland (2013) also found that workers are motivated by being informed about the project, and by a sense of pride in their contribution to the project. All in all, it is useful for management to be conscious about what motivates the various participants in a construction project.

### **EXPERIENCING UNDERSTANDING, MUTUAL RESPECT AND PERSPECTIVE-TAKING**

The fifth dimension of collaboration is *taking each other's perspective*. Therein lies a fundamental respect for the fact that what one's own trade produces affects what other trades can do. Respect is the core of understanding each other's needs and being able to understand each other's situation. Showing respect for others' finished work and showing a positive attitude towards finding solutions for each other are core values in communication between the trades. When, for example, supervisors get involved and discuss dependencies between trades and familiarize themselves with the needs of other trades, they may be able to help themselves too. When the trades communicate with a view to what others need and what is in the projects' best interest, they also consider their own needs. Thus, taking each other's perspective concerns two things. Firstly, it is drawing attention to the interdependence between the trades in order to achieve an optimal production flow. This is done by ensuring that the work is carried out in a way that meets the needs of all trades. Above all, the overarching point is doing work in the right order (sequence). Secondly, taking each other's perspective demonstrates positive attitudes. When project participants experience others consideration, and that others show interest in one's own trades' production and needs, this reinforces one's own willingness to meet the needs of others, and to show interest in other trades' production. Thus, one aspect of taking each other's perspective is purely result oriented, in that the trades collectively achieve a better construction process through finding optimal production solutions. Another aspect is the purely relational one, an interpersonal relationship in which the trades show each other respect and the ability to understand each other's point of view.

### **EXPERIENCING PRODUCTION PREDICTABILITY**

The sixth dimension of collaboration concerns experiences of *predictability in work processes*. Particularly among skilled workers, there was an almost unanimous response to the question of what characterizes good collaboration, which concerned predictability. Predictability means that workers can bring materials and tools to a work zone and can start and finish work without disruptions or obstacles, and in line with what the plan dictates. Predictability is linked to the notion of flow. As explained with reference to Csikszentmihalyi (1990) one way of understanding flow is the positive psychological experience of devoting oneself entirely to work, free from distractions, and where the employee simultaneously experiences a good balance between professional challenges and own professional competences. Another way of approaching the concept of flow is by directing attention to the prerequisites that must be present to achieve production flow, where work processes proceed without distractions or stops. In line with the Last Planner System (Ballard, 2000) attention to the prerequisites for creating optimal flow takes place at several planning levels in the project organisation. Participants with roles and responsibilities further away from the actual production direct their attention to activities with a longer time perspective, typically two or three months in the future. For example, this could include planning the right staffing, or making sure to order deliveries with

a long delivery time. Other types of prerequisites take place closer in time to the actual production, by other roles, such as supervisors and foremen. By working systematically with involvement at all levels of a project organization in the planning and preparation of upcoming activities, the total work and attention towards removing obstacles contributes to creating predictability. When skilled workers experience work predictability, they report well-being and a lower degree of stress in the work situation as positive consequences.

## THOUGHTS ON CONCEPTS, DRIVERS AND CONSEQUENCES

As demonstrated, the concept of collaboration is multidimensional. Although researchers initially define collaboration, both in its simplicity as well as in its more complex and theoretical terms, we may summarize that there are multiple ways to understand collaboration. When these six dimensions of collaboration are highlighted in this paper, it follows from reviewing empirical studies of collaboration (Skinnarland, 2013). At the same time, reflections concerning what constitutes good collaboration, inevitably also conveys what the drivers are such as the conditions and premises under which good collaboration unfolds, and what the results are from this optimal collaboration. These are three ways of talking about collaboration which during reflection overlaps somewhat.

As an example, consider the trust dimension. We can summarize findings by saying that "Well, collaboration to me means that we have trust in each other" and reflects a consideration of what collaboration *is*. We can also summarize by saying that "Well, in order to experience good collaboration, we are dependent on creating trust in each other" as a reasoning around trust as a *driver* for, or a foundation for good collaboration. We can also summarize by saying that "Well, when we collaborate well with each other, we increase trust in each other", meaning that trust arises as a *consequence* of good collaboration. This is in line with Swärd (2017) who postulates that trust can be both the dependent and independent variables, as good collaboration conditions support trust and trust provides conditions for good collaboration. In similar manners, we can also reflect upon the other five dimensions of the concept of collaboration. Collaboration per se can be expressed by each of the dimensions. At the same time, all these dimensions are necessary conditions, or premises for creating and strengthening optimal collaboration, and also consequences of good collaboration.

Thus, to develop good inter-organisational collaboration at a construction site, we argue that it will be useful to gain more in-depth knowledge of what the dimensions of collaboration entail in the specific context of construction site production. What are we really talking about when we are concerned with involvement and communication? What does communication mean? How can we understand the communication process that takes place at the construction site? What do we really mean by the term involvement? How can we link the understanding of involvement to commitment? And how can we understand involvement and communication in terms of structural and systematic aspects on the one hand, and relational aspects on the other? And when we talk about trust, how can project participants use their language actively to articulate the network of commitments? (Slivon et al., 2010). How can motivation be linked to one's own interests and what is of value to oneself? What do we really mean when we talk about taking each other's perspectives? What importance do we attach to the mutual interdisciplinary dependence when we talk about taking each other's perspectives? And how can we understand predictable work processes by linking the discussion to prerequisites for healthy activities (Ballard & Howell, 1994), as stated by the Last Planner System? How can we reflect upon the concept of flow in a way that we gain a deeper understanding of what it really means when the project participants experience flow? By engaging in conversations concerning these and similar questions concerning collaboration, we argue that clarifying and understanding more in-depth the terms used daily may in fact constitute the best preparation for optimal collaboration processes.

## **MUTUAL IMPACT ON COLLABORATION**

Following each of the dimensions in isolation, we may gain understanding of different ways to talk about collaboration. The argument so far is that taking collaboration as a concept apart, as demonstrated above, enables practitioners to direct discussion and attention to the aspects that really matter to enhance collaboration and collaborative efforts.

We have argued that one dimension of collaboration can form the basis for good collaboration and at the same time constitute a consequence of good collaboration. However, we may develop our argument further by stating that the dimensions of collaboration also may mutually influence each other. Meaning, we need to consider the dimensions of collaboration as interweaving aspects of each other. The dimensions influence and reinforce each other in both positive and negative ways. When elements in one of the dimensions falters, this can affect others, and conversely, when collaboration feels good in terms of one dimension, it also affects and strengthens other dimensions positively. A few examples may illustrate this point. Getting to know each other both professionally and socially is shown to affect the relationships of trust in the project. Involvement leads to greater commitment and well-being, which leads to more control both for the individual participant and for the overall project. In addition, greater commitment to produce according to planned activities leads to more predictable work processes. The degree of trust affects the willingness to share information, and involvement already from the outset of the project can contribute to establishing a good project culture founded on trust. Involvement and communication are prerequisites for developing trust. Another prerequisite is that commitments are kept, and that each trade delivers results according to the plan. Thus, a high degree of trust, and communication and information sharing, lead to more predictable work processes. This complexity may help explain the lack of an unambiguous "best practice" and why good production results are so difficult to reproduce from project to project; the results follow a number of complex intertwined factors that cannot be reproduced in exactly the same way.

## **LPS; COLLABORATION INTO A SYSTEM**

Ballard et al. (2009) argued that a framework is needed to explore principles, functions, and methods for production control. The Last Planner System (LPS) principles "guide thinking and action, the functions it enables to be performed, and the methods or tools used to apply those principles and perform those functions" (Ballard et al., 2009). We argue that the in-depth knowledge of the multifaceted term *collaboration* as presented in this paper will benefit from being operationalized and put into collaborative practice within e.g., the LPS framework.

The Last Planner System (LPS) is a methodology for production control based on the idea of a need to actively coordinate human and material resources during the construction process. Ballard (2000) introduced the LPS as a critique of the traditional way of approaching planning, which commonly involved a centralized and detailed plan already from the outset of the construction project. The plan was produced by actors further away from the actual site production, thus separated from the production phase. LPS in large is concerned with involvement in interdisciplinary planning and continuous preparation for future production, through systematically removing obstacles to future work activities. LPS also has an inherent principle that the project participants, by getting involved and communicating with each other, commit to keeping promises made about production (Ballard et al., 2009). LPS is ultimately a methodology specifically for planning and managing the flow of construction site production. According to Bertelsen (2005), the Last Planner System thus provides for better collaboration across professional boundaries in the construction project.

Lookahead plans are central to LPS and the understanding of flow, discussed above. These plans fill the gap between master plans for the entire project and weekly work plans (Ballard, 1997). The main task in lookahead planning is to create healthy activities. That is, to remove

any obstacles to the execution of the activities, so that the activities, when they have been transferred to a weekly work plan, can actually be carried out. Traditional weekly work schedules have been shown to be unreliable (Ballard & Howell 1994), and downstream production therefore traditionally is inherently unstable and unreliable. The idea of lookahead planning is to create predictable workflow. According to Ballard (2000), LPS increases reliability in three ways: 1) through lookahead planning and the preparation process, 2) through controlling for any previously planned work that needs to be completed; and 3) through involving and committing managers and employees. Ballard's description of the purpose and how to utilize lookahead planning is empirically supported (Fiallo & Revelo, 2002; Skinnarland, 2010; Skinnarland, 2013).

## CONCLUSION

LPS has proven to be constructive, (see e.g., Salazar et al., 2019; Retamal et al., 2021), and contractors worldwide are currently carrying out construction projects within the framework of this methodology. However, implementing LPS has proven to be far more demanding than what one would have expected from a theoretical perspective. We argue that our discussion noted in this paper may reveal rationale for this observed experience that LPS promotes collaboration, but LPS is also dependent on collaboration itself.

Again, returning to the dimensions of collaboration, we need to pay attention to how project participants communicate. Do they understand each other's contributions and needs? Do they communicate with each other or is communication more in form of one-way information? Equally crucial is how the project participants behave towards each other. Do they act towards each other in a respectful manner despite professional disparity and different needs? The way that participants in the project talk to each other and behave towards each other may greatly impact how collaboration develops (Skinnarland, 2022). Previous research emphasizes the need for the project participants to focus their attention on structures and systematic aspects on the one hand, and the relational aspects on the other. These two perspectives need to be seen in parallel to enable strengthened collaboration (Skinnarland, 2013). Stated alternatively, the project collaboration needs to stand on two legs to be able to stand firmly. Thus, if research and practise are to succeed in developing good collaboration in project-based production, a necessary starting point must be to understand what we are really talking about when we talk about collaboration.

Every construction project consists of a plurality of roles, trades and various personalities, and although all participants should put in an effort to make sure collaboration works at its best, the management's role, for a fact, is prominent and absolutely decisive, in creating the best conditions for developing good collaboration. Research should particularly emphasise the manager role in attending to the multifaceted contents of collaboration. We also advise that future publications further develop in-depth knowledge of the term collaboration provided by the current paper. Future work should build on these findings and develop knowledge of how to improve collaboration in practice. One such framework to study collaboration in practice, however not limited to, is within the Last Planner System for production planning and control.

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