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Did We All Just Agree? Probing Joint Decision Making In Relational Project Delivery Arrangements

Teemu Lehtinen, Aalto University, Finland

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Paul Chan, The University of Manchester and Robert Leicht, The Pennsylvania State University

DID WE ALL JUST AGREE? PROBING JOINT DECISION MAKING IN RELATIONAL PROJECT DELIVERY ARRANGEMENTS

Teemu Lehtinen[1]

ABSTRACT

Joint decision making is a central part of relational project delivery arrangements and often contractually enabled in projects. When project participants are contractually more equal, they also have a say on many issues that would be out of their influence normally. This process and dynamics of joint decision making between different companies in relational projects, resembling organized anarchy, is not well understood. We studied joint decision making in various managerial levels in a single Project Alliancing project in Finland. We tried to uncover how joint decisions are made between companies, and what elements influence the outcome of joint decision making. With a visual grounded theory approach and using the garbage can model as a framework, we analyzed over 11 hours of video data and found 18 distinct joint decision making processes with three types of decision making; rational, rule-based and mixed. Furthermore, five different roles emerged that had significant impact on the outcome of joint decisions; expert, payer, manager, impugner, and customer. The roles and types of decision making did not form any clear patterns but there was a clear link between the contract structure and having the last say on a joint decision.

KEYWORDS: Joint decision making, garbage can model, project alliancing, video analysis

INTRODUCTION

Joint decision making is a central part of relational project delivery arrangements such as Integrated Project Delivery (IPD), Project Alliancing (PA), and Project Partnering (PP). Other distinctive characteristics in these delivery arrangements include the early involvement of key parties, transparent financials, shared risk and reward schemes, and a collaborative multi-party agreement. In recent years, relational project delivery arrangements, or in other terms relationship based construction procurement, have been increasingly adopted in the construction industry to fight the challenges caused by the fragmentation of phases and participants in the construction process and especially the separation and lack of integration between design and construction. (Lahdenperä 2012; Walker & Walker 2013)

Joint decision making is often contractually enabled in relational projects. A contract defining the relationships and establishing all key project participants as equal partners supports collaboration and consensus-based decisions in projects (Kenig et al. 2010). When project participants are contractually equal, they also have a say on many issues that would be out of their influence in traditional projects. In practice, this leads to various joint decision making structures in projects with different levels of management groups including representatives of each project participant included in the contract. In addition, the relational contract usually requires unanimous decision making in projects. In reality, however, the consensus may not always be reached and project participants may have to rely on the majority vote. Nevertheless, jointly made decisions should increase accountability and commitment to the no-dispute rules and liability waivers in relational project delivery arrangements. (Lahdenperä 2012)

[1] Doctoral Candidate, Enterprise Simulation Laboratory SimLab, Department of Industrial Engineering and Management, Aalto University School of Science, Espoo, Finland, teemu.lehtinen@aalto.fi.

Regardless of the obvious benefits, the process and dynamics of joint decision making between different companies in these kinds of settings, resembling organized anarchy (Cohen et al. 1972), is not well understood. Decision making itself has been studied on individual and group levels in organizations for decades (e.g. Simon 1955; March 1991) but there is not much literature on inter-organizational joint decision making in project-based settings. Kadefors (2004) studied relational practices and co-operation in projects from trust perspective and found that team building processes and project-wide communication can help trust-based collaboration to arise and persist. In addition, systems to manage conflicts and monitor relations in projects can prevent distrust initiating from problems and misunderstandings among project participants. Still, these effects can vary substantially by project to project because processes of trust development in project relationships are dynamic, complex and sometimes even contradictory. Similarly, Bygballe et al. (2013) studied the impact of formal (such as contracts, formal meetings and incentives) and informal (such as team co-location, team building workshops and trust building) mechanisms in relational contracting on flexibility in health care projects. They argued that both formal and informal mechanisms are needed and they complement each other; through informal practices the formal mechanisms are negotiated and adjusted over the project as the participants jointly and gradually make sense of the work and relationships. Furthermore, informal practices become even more important in long and dynamic projects. But still, according to Bygballe et al (2013), little is known how relational project teams actually deal with changing demands and unforeseen events in projects. Thus, a deeper analysis of what goes on inside the “black box” of project relationships is needed to gain a better understanding of the effects of various project management measures.

This paper aims to open up that “black box” from the perspective of joint decision making. We studied joint decision making in management groups on different levels in a single Project Alliancing project in Finland. We try to shed light on two specific research questions; how are joint decisions made between companies, and what elements influence the outcome of joint decision making? Our research approach is based on qualitative video analysis with two analysis rounds; first we adopt the garbage can model (Cohen et al. 1972) to structure the decision making in our video data, and second, we use visual grounded theory (Konecki 2011) to further map the joint decision making processes in different decision situations. The findings help us understand the role of joint decision making as an integration mechanism (Lehtinen 2013) between different participants in a construction project with relational project delivery arrangements.

GROUP DECISION MAKING AND GARBAGE CAN MODEL

Decision making has been studied on individual and group levels for decades from myriad of perspectives. In this study, we concentrate on organizational decision making and more specifically, group decision making and garbage can model. In general, organizational decision making can be classified into two main theoretical streams; (1) rational choice theory or in other words logic of consequence, and (2) rule-based action theory or in other words logic of appropriateness (March 1991). **Rational choice theory** views decision making as intentional action with specific consequences and entailing four aspects:

(1) **Knowledge of alternatives**. Decision makers might ask, what are the options available to me?

(2) **Knowledge of consequences**. Decision makers might assess, what happens if I take each option?
(3) **Consistent preference ordering**. Decision makers would weigh the value gained or lost by taking each option.
(4) **Decision rule**. Decision makers would use a rule to select a single option based on its consequences for the preferences. (ibid.)

In an ideally rational world, decision makers would know all of their alternatives, understand all consequences of each option, and would be able to weigh precisely the value gained or lost for each option in order to make the best possible decision. In practice, however, there are limits on the number of alternatives considered and also the amount and accuracy of available information. Simon (1955) introduced this idea as **bounded rationality** which arises from uncertainty and ambiguity related to the four aspects of rational decision making. Thus, a boundedly rational person makes rational decisions based on the available knowledge of alternatives and consequences.

Rule-based action theory, on the other hand, views decision making as a routine in which decision makers do what they are supposed to do in a specific situation. Instead of evaluating alternatives in terms of their consequences, they follow organizational rules stemming from standard operating procedures, professional standards, cultural norms, and institutional structures (March 1991). Three aspects are involved in this kind of rule following that characterizes the logic of appropriateness:

(1) **Situations are categorized**. Decision makers may ask, what kind of situation this is?
(2) **Decision makers have identities**. Decision makers may ask, what kind of person am I and who would be appropriate to handle this?
(3) **Rules and identities are matched to situations**. Decision makers may ask, what is appropriate for a person like me in a situation like this? (ibid.)

In practice, this kind of rule-based action can be seen in organizations when people traditions, hunches, cultural norms, advice of others, standard procedures and manuals, and rules of thumb. Both rational choice and rule-based action are intentional forms of behavior, but rule-based action can be less conscious and often taken for granted. (ibid.)

As organizations comprise multiple actors with often conflicting preferences and identities, these logics of decision making become further complicated. For the **group decision making**, March (1991) argues that the widely adopted two-staged model is in fact iterative and intertwined. In the first stage, individuals negotiate and come to an agreement and in the second stage, they execute the agreement. In practice, there are many decision moments and the consensus fluctuates, and thus, the group decision making is not precise and formal but rather informal with loose understandings and expectations. (ibid.)

Furthermore, Fisher (1993) studied the group decision making with grounded theory approach and identified the **interact system model for group decision making** with four stages:

(1) **Orientation**. Members start to get to know each other, involves a great amount of clarification and agreement.
(2) **Conflict**. As members become familiar, ambiguity decreases and both positive and negative reactions increase which leads to conflicts.

(3) **Emergence**. Members start to understand which way the group is heading through conflicts and slowly approach consensus through discussion.
(4) **Reinforcement**. Members justify the final decision.

Fisher (1993) acknowledges that is not for all groups and it essentially works with groups that need to reach a consensus on issues of major importance to members. In addition, the process is not always linear in practice as some members may shift from phase to phase in discussion and a group may get stuck in a phase because one member is unable to adjust to changing conditions or has a hidden agenda. Nevertheless, both Fisher (1993) and March (1991) illustrate the dynamic and even chaotic nature of group decision making.

To further describe the chaotic nature of organizational decision making, Cohen et al. (1972) developed the **garbage can model** of decision making in organized anarchies. Organized anarchies itself are characterized by three properties:

(1) **Problematic preferences**. Preferences are inconsistent and ill-defined to satisfy rational decision making.
(2) **Unclear technology**. Technologies, tasks and processes are uncertain and poorly understood.
(3) **Fluid participation**. Participants vary and change over time and as a result the boundaries of the organization are uncertain and changing. (ibid.)

According to Cohen et al. (1972), these can be characteristic of any organization in part or part of the time, but they are particularly present in public, illegitimate, and educational organizations such as universities. From this perspective, an organization is "*a collection of choices looking for problems, issues and feelings looking for decision situations in which they might be aired, solutions looking for issues to which they might be the answer, and decision makers looking for work*". And furthermore, according to garbage can model, one can view *a choice opportunity as a garbage can into which various kinds of problems and solutions are dumped by participants as they are generated*. (ibid. p. 2) Figure 1 illustrates a decision situation according to the garbage can model.

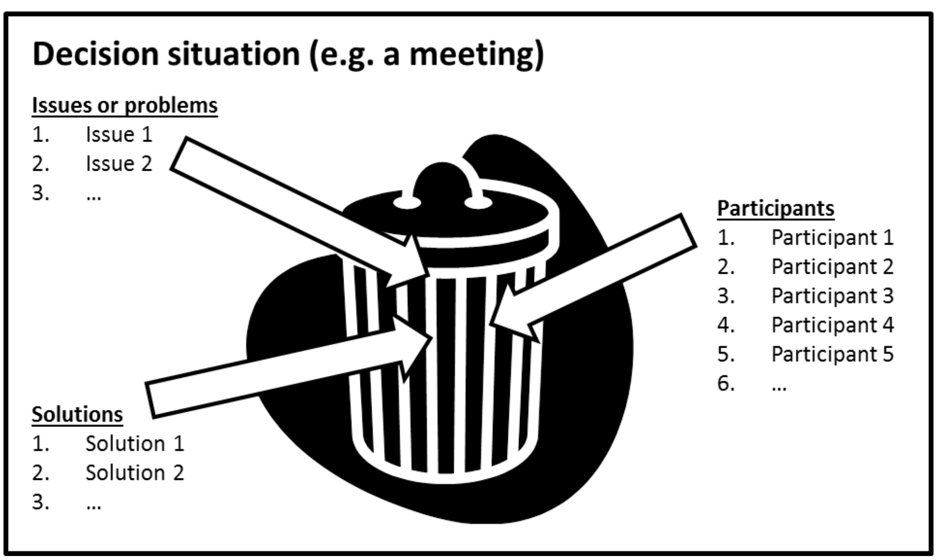


Figure 1: Garbage can model of organizational decision making

Even though introduced already in the 1970's, the garbage can model still endures in organization theory and keeps attracting new research (Cohen et al. 2012). For example, Lomi et al. (2012) applied the model to understand the network dynamics of decision opportunities between contributors and software bugs in an open source software project. In the context of the construction industry, Kreiner (2012) adopted the model to make sense of the observed counterintuitive decision making in an architectural competition.

METHODOLOGY AND DATA

For this exploratory study of joint decision making, we chose a qualitative single case study approach based on video analysis. In order to understand how joint decisions are made in a relational project delivery arrangement, we chose one Project Alliancing project in Finland where we got access to attend and video-record meetings on different levels. This kind of case study strategy allows investigating a contemporary phenomenon that is difficult to separate from its context (Yin 1989).

The project under study, Case Alliance Office, is roughly a $15 million, 65,000 square foot, 6-story office building being built on a tight lot in the middle of operational campus area in Southern Finland. The project started in 2012 and will be finished in 2015. The construction phase started in fall 2013. The Project Alliancing contract was made between the owner and general contractor but the architect and engineers joined the project Alliance with cost-reimbursable contracts later on. The owner also had the end user organization and a construction manager firm as its representatives on the project.

The consensus-based joint decision making structure was defined in the contract (see Figure 2, the decision ladder in the case project). There were three levels of formal meetings; (1) Alliance Executive Group meeting (AEG), (2) Alliance Project Group meeting (APG), and (3) Design meeting. AEG was a strategic-level meeting held quarterly and led by the owner. The participants consisted of executives from the owner, end user and

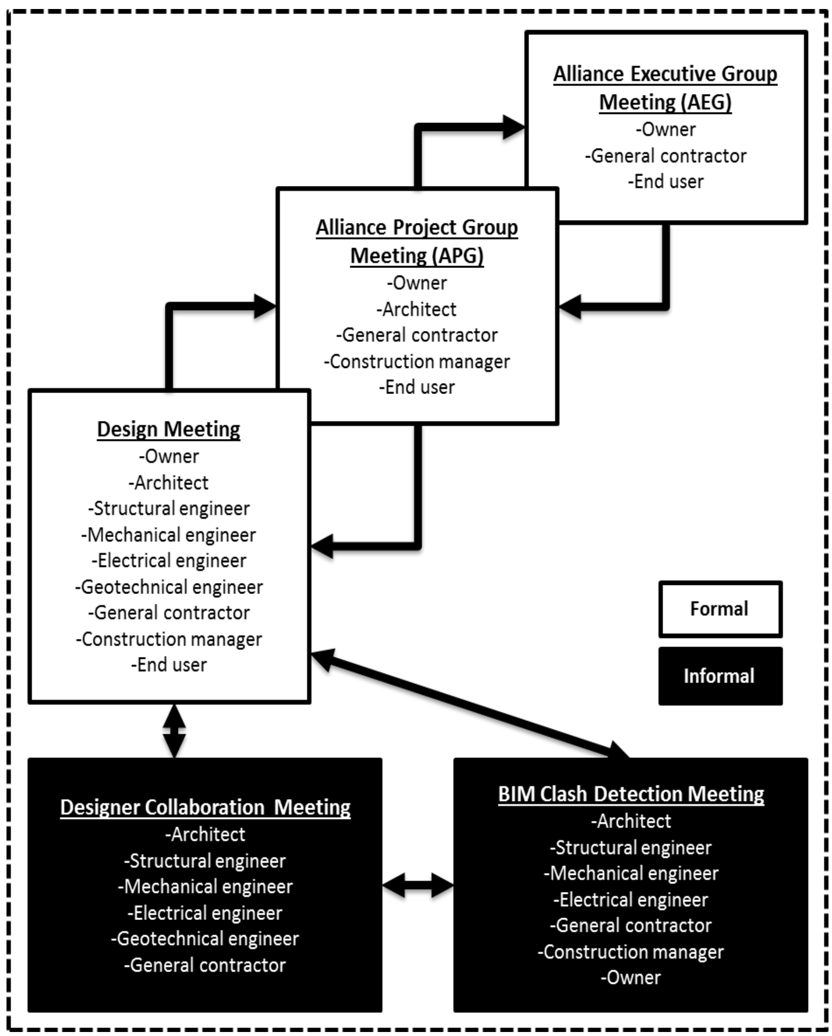


Figure 2: Decision ladder in the case project

general contractor. APG was an operative-level project management meeting held monthly and led by the general contractor. The project managers from the owner, architect, general contractor, construction manager and end user participated in the APG meeting. Design meeting was a general project management meeting held bi-weekly, led by the general contractor and open for all project participants. In addition to these formal meetings, the project team had two informal meetings; (1) Designer collaboration meeting and (2) BIM clash detection meeting. Designer collaboration meetings were co-working sessions held on an as-needed basis between the designers. The meeting was, however, led by the general contractor and often held at the premises of the general contractor. BIM clash detection meetings were co-working sessions for detecting and fixing clashes in design models and held on an as-needed basis and led by the general contractor. The session was intended mainly for the designers but open for all project participants.

The video data was collected during the design phase in spring and summer 2013. We attended and video-recorded altogether six different meetings; (1) Design meeting on January 8th 2013, (2) Designer collaboration meeting on January 8th 2013, (3) Alliance Project Group meeting on March 14th 2013, (4) Design meeting on March 19th 2013, (5) Alliance Executive Group meeting on May 22nd 2013, and (6) BIM clash detection meeting on June 13th 2013. The video recordings totaled altogether 11 hours and 10 minutes of video. In addition to video recordings, we took altogether 31 pages of detailed notes on the discussion in the meetings.

The data analysis proceeded in two phases. First, we did a preliminary analysis by watching all the videos and making overall notes with rough time stamps on what is happening in the video. In addition, we mapped roughly different joint decisions in the data using the garbage can model (Cohen et al. 1972) as a framework (issues, participants and solutions). In the second phase, we dug deeper on different joint decisions and used visual grounded theory (Konecki 2011) to map the processes leading to those decisions. We used ELAN video analysis software to specify fragments and add transcripts in video.

FINDINGS

The findings are presented in two parts. The first part – decision situations with issues, solutions and participants for joint decision making – structures each observed meeting through the lens of the garbage can model (Cohen et al. 1972) and answers the question how joint decisions are made between companies. The second part – joint decision making processes and key elements – summarizes the findings of these joint decision making processes and answers the question what elements influence the outcome of joint decision making.

1. Decision situations with issues, solutions and participants for joint decision making

In the following, the joint decisions in each of the six observed meetings are presented by using the garbage can model (Cohen et al. 1972) as a framework.

1. Design meeting on January 8th 2013

Design meetings were formal bi-weekly meeting for the project administration with the widest coverage of participation and led by the general contractor. The meeting on January 8th 2013 lasted for two hours and ten minutes and the participants consisted of the architect, structural engineer, mechanical engineer, electrical engineer, geotechnical engineer, two representatives from the general contractor, three representatives from the construction manager, two representatives from the end user, and the owner. The nature of the discussion in the design meeting was more expressive rather than conversational; participants went through their own status on the project and key points were documented. Two issues were further discussed together; (1) the material of the facade, and (2) the method of excavation when the construction starts. Regarding the material of the facade, titanium zinc plate and traditional plastering were discussed as possible solutions. The original plans and target cost included the plastering but the architect felt that the titanium zinc plate would be better aesthetically and life-cycle-wise. The decision was not made in the meeting as the participants needed more information on the cost difference and possible impact on the building permit process. Regarding the method of excavation, sawing and drilling were discussed as possible solutions. Here, the decision was not made either as more information was needed on the cost difference and schedule impacts. All the issues, participants and solutions in the design meeting on January 8th 2013 are summarized in Figure 3.

1. Design meeting (Jan 8th 2013)

Issues for joint decision making
1. Material of the facade (cost, permit, aesthetics, life-cycle costs)
2. Method of excavation (cost, schedule)

Participants
1. Architect
2. Structural engineer
3. Mechanical engineer
4. Electrical engineer
5. Geotechnical engineer
6. General contractor 1
7. General contractor 2
8. Construction manager 1
9. Construction manager 2
10. Construction manager 3
11. End user 1
12. End user 2
13. Owner

Solutions
1. Titanium zink plate vs. plastering (decision not made, cost difference needed)
2. Sawing vs. drilling (decision not made, cost difference needed)

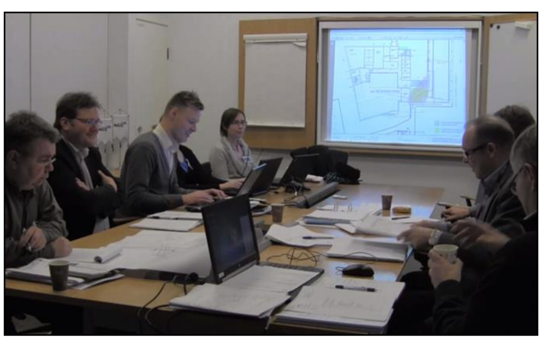
Figure 3: Summary of the design meeting on January 8th 2013

2. Designer collaboration meeting on January 8th 2013

The designer collaboration meeting was an informal meeting for designers on an as-needed basis and led by the general contractor. The meeting on January 8th 2013 was right after the formal design meeting and lasted for an hour and 30 minutes. The architect, structural engineer, mechanical engineer, electrical engineer, geotechnical engineer, and the general contractor participated in the meeting. The nature of the discussion in the designer collaboration meeting was casual and interactive; the participants could bring any issues to the table and 2D drawings and 3D models were often used as visual boundary objects in discussion. On January 8th 2013, three issues were discussed jointly; (1) the renovation of the tunnel, (2) the method of excavation,

2. Designer collaboration meeting (Jan 8th 2013)

Issues for joint decision making
1. Renovation of the tunnel (low height, cables need to be moved)
2. Method of excavation
3. Possible cables in the area



Participants
1. Architect
2. Structural engineer
3. Mechanical engineer
4. Electrical engineer
5. Geotechnical engineer
6. General contractor

Solutions
1. Increasing height in the tunnel by digging the floor (decision not made, more information)
2. Excavation with explosion breaking (final decision will be made with the sub)
3. The area will be scanned for possible cables, the owner will order the job (decision made)

Figure 4: Summary of the designer collaboration meeting on January 8th 2013

and (3) possible cables in the area. Regarding the renovation of the existing tunnel between the buildings, the low height of the tunnel was considered a problem and existing cables needed to be moved from one side to another. Increasing height by digging the floor was suggested as a solution by the structural engineer but the decision was not made as more information was needed about the floor and it was not included in the target cost. The team however decided to study this option further and offer it as an optional extra work for the owner. Regarding the method of excavation, another method with explosion breaking was brought to the table by the geotechnical engineer and the pros and cons were discussed from the cost, schedule and risk perspectives. The decision was not made as more information was needed about the environment and risks. The team decided to make the final decision later with the subcontractor when it is selected. Regarding the possible cables in the area, the electrical engineer reminded that not all existing cables are necessarily shown in the as-built drawings. The team decided that the area needs to be scanned before the groundbreaking and the owner will order the job. All the issues, participants and solutions in the designer collaboration meeting on January 8th 2013 are summarized in Figure 4.

3. Alliance Project Group meeting on March 14th 2013

Alliance Project Group meeting was a monthly formal meeting for operative-level project management with key project members (owner, architect and general contractor) and their representatives (construction manager and end user) and led by the general contractor. The meeting on March 14th 2013 lasted for two hours and the participants consisted of the architect, four representatives from the general contractor, construction manager, two representatives from the end user, and the owner. The nature of the discussion in the Alliance Project Group meeting was conversational but formal; the participants could bring any issues to the table but the general contractor facilitated the discussion and formally gave the floor to participants. On March 14th 2013, five issues were brought into the joint decision making; (1) unclear target price calculations, (2) need for quantity take offs, (3) design for flexibility, (4) possibility of increasing the number of parking spots, and (5) schedule for laying the cornerstone. Regarding the target price calculations, the construction manager felt that the documents were unclear and not available for all project participants. The general contractor suggested that all documents related to the target price calculations would be made openly available to the shared project information repository and there would be clear links to specific documents in meeting

3. Alliance Project Group meeting (Mar 14th 2013)

Issues for joint decision making
1. Target price calculations are unclear
2. Quantity take offs needed (BIM vs. traditional)
3. Design for flexibility (interior wall mounts, extra cost)
4. Increasing parking spots (cost)
5. Schedule for laying the cornerstone need to be decided

Participants
1. Architect
2. General contractor 1
3. General contractor 2
4. General contractor 3
5. General contractor 4
6. Construction manager
7. End user 1
8. End user 2
9. Owner

Solutions
1. Target price calculations will be shared with in project information system (decision made)
2. Alliance will order traditional quantities, BIM not sufficient (decision made)
3. Interior wall mounts will be built for future flexibility (decision made, impact to target price)
4. Possibilities for increasing parking spots will be investigated with cost impacts (decision made)
5. Laying the cornerstone can be in November, not earlier (decision made)

Figure 5: Summary of the Alliance Project Group meeting on March 14th 2013

minutes when target price related issues are discussed. All the participants agreed and the decision was made. Regarding the quantity take offs, the general contractor wanted to hire an estimator to do quantity take offs for procurement and the owner asked if they could get the quantities straight from the building information models. The architect felt that the quantities could be taken from BIM but the modeling process is still in progress. The participants decided that the Alliance will order traditional quantity take offs from an estimator as BIM is not sufficient yet for that. Regarding the design for flexibility, the end user wanted interior wall mounts that would allow an easy re-layout of interior walls in the future. The architect had designed them but they were not taken into account in the target cost. It was agreed that the general contractor will investigate the accurate impact on target cost but they will be built nevertheless. Regarding the parking spots, there was a need to increase the number of parking spots in the area. The decision was made that the architect will investigate two possible areas with cost and permit impacts. Regarding the schedule for laying the cornerstone, the end user reminded that they will be inviting high-ranking people to the event and need to send invitations well in advance. The participants discussed realistic possibilities for the schedule and agreed that it can be in November but not earlier. All the issues, participants and solutions in the Alliance Project Group meeting on March 14th 2013 are summarized in Figure 5.

4. Design meeting on March 19th 2013

The design meeting on March 19th 2013 lasted for one hour and 30 minutes and the participants consisted of the architect, structural engineer, mechanical engineer, electrical engineer, two representatives from the general contractor, two representatives from the construction manager, two representatives from the end user, and the owner. Two issues were discussed jointly in the meeting; (1) technical systems in the courtyard and (2) sound masking system in open offices. Regarding the technical systems in the courtyard, the end user was worried how the courtyard will be designed to accommodate all the technical systems as there will be different permanent and temporary distribution substations for cooling, electricity and steam. Participants made the decision that the architect will design a sketch how all permanent and temporary technical system substations could be located in the courtyard. Regarding the sound masking system, the end user wants to keep the option open to have a sound masking system in open offices. The participants agreed that the electrical engineer will take it into account in electrical design and investigates the cost impact including the needed cabling. All the issues, participants and solutions in the design meeting on March 19th 2013 are summarized in Figure 6.

4. Design meeting (Mar 19th 2013)

Issues for joint decision making
1. Technical systems in the courtyard (cooling container, distribution substation)
2. Sound masking system (cost, impact for design)

Participants
1. Architect
2. Structural engineer
3. Mechanical engineer
4. Electrical engineer
5. General contractor 1
6. General contractor 2
7. Construction manager 1
8. Construction manager 2
9. End user 1
10. End user 2
11. Owner

Solutions
1. Architect will design a sketch how technical systems are located (decision made)
2. Electrical engineer takes sound masking system into account, cabling included (decision made)

Figure 6: Summary of the design meeting on March 19th 2013

5. Alliance Executive Group meeting on May 22nd 2013

Alliance Executive Group meeting was a quarterly formal meeting for strategic-level project management with key Alliance members (the owner, end user and general contractor) and led by the owner. The meeting on May 22nd 2013 lasted for two hours and the participants consisted of two representatives from the general contractor, two representatives from the owner, and the end user. The nature of the discussion in the Alliance Executive Group meeting was conversational but quite formal; the participants could bring any issues to the table but the owner executive facilitated the discussion and formally gave the floor to participants. The major procurement decisions (over 500 000 euros) were also made on the Alliance Executive Group level. On May 22nd 2013, five issues were brought to the joint decision making; (1) objectives and documentation of the upcoming team building workshop, (2) selection of the excavation subcontractor, (3) selection of the precast concrete supplier, (4) selection of the elevator supplier, and (5) selection of the step-ladder unit supplier.

Regarding the team building workshop, the owner wanted to document the discussion and decisions in a form of game book that would guide the collaboration in the construction phase. The general contractor suggested that they would assign a person to document the important issues and everybody agreed to that. Regarding the selection of the excavation subcontractor, the general contractor had made a proposal based on the price and competence and this proposal was approved unanimously in the meeting. Similarly, the general contractor had made proposals for the selection of precast concrete supplier, elevator supplier, and step-ladder unit supplier. These proposals were also approved unanimously in the meeting. The price-level and nationality were discussed when selecting the precast concrete supplier but it did not affect the decision. Price, earlier experiences and warranty and service terms were discussed when selecting the elevator supplier, and the decision was made conditionally mostly based on price. The owner wanted to investigate further whether the service is worthwhile to include in the contract or not. Cost and installation was discussed when selecting the step-ladder supplier but it did not affect the decision making and the original proposal was approved. All the issues, participants and solutions in the Alliance Executive Group meeting on May 22nd 2013 are summarized in Figure 7.

5. Alliance Executive Group meeting (May 22nd 2013)

Issues for joint decision making

1. Documentation of the team building workshop
2. Selection of the excavation subcontractor (price, competence)
3. Selection of the precast concrete supplier (price, nationality)
4. Selection of the elevator supplier (price, earlier experience, warranty, service)
5. Selection of the step-ladder unit supplier (cost, installation)

Participants

1. General contractor 1
2. General contractor 2
3. End user
4. Owner 1
5. Owner 2

Solutions

1. General contractor will assign a person to document the important issues (decision made)
2. GC's proposal on excavation subcontractor approved (decision made)
3. GC's proposal on precast concrete supplier approved (decision made)
4. GC's proposal on elevator supplier approved conditionally (decision made, more information)
5. GC's proposal on step-ladder unit supplier is approved (decision made)

Figure 7: Summary of the Alliance Executive Group meeting on May 22nd 2013

6. BIM clash detection meeting on June 13th 2013

BIM clash detection meeting was an informal meeting mainly for designers and general contractor on an as-needed basis and led by the general contractor. Any project participant was however allowed to participate in the meeting. The meeting on June 13th 2013 lasted for two hours and the participants consisted of the architect, structural engineer, mechanical engineer, electrical engineer, two representatives from the general contractor, three representatives from the construction manager, and the owner. The nature of the discussion in BIM clash detection meeting was casual and interactive; a merged 3D model was used to guide the discussion and the participants could bring any issues to the table. On June 13th 2013, the discussion was mostly straightforward clash-related change requests and only one issue was brought to the joint decision making; the suspended ceilings in the locker rooms. The ceiling height was relatively low in the locker rooms and the owner suggested that there could be open ceilings to allow more room for MEP systems. The architect did not like the idea and reminded that it would be more difficult to clean. The decision was not made in the meeting. All the issues, participants and solutions in the BIM clash detection meeting on June 13th 2013 are summarized in Figure 8.

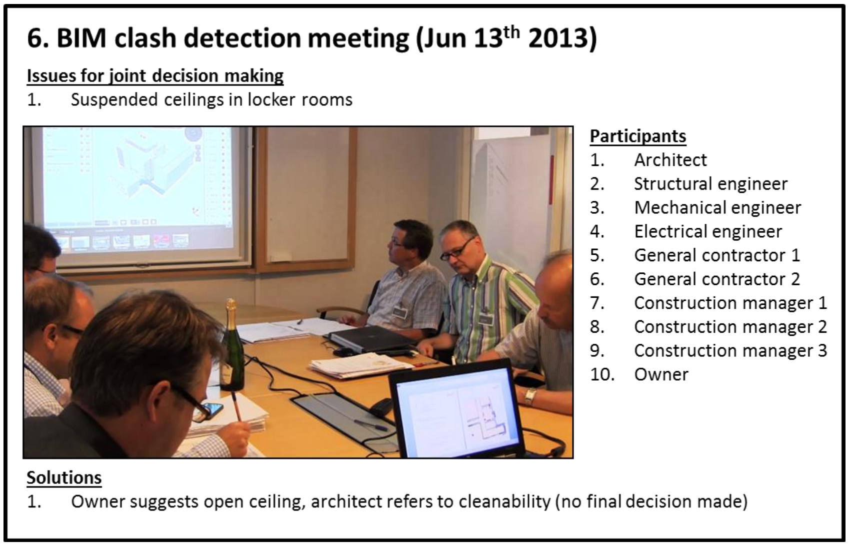


Figure 8: Summary of the BIM clash detection meeting on June 13th 2013

2. Joint decision making processes and key elements.

From the different decision situations in the case project, we found altogether 18 issues that were jointly discussed and from which 13 joint decisions were made in the situation and five were left undecided. Two of these issues were also related (method of excavation discussed in both design meeting and designer collaboration meeting on January 8th 2013). Table 1 summarizes the joint decision making processes found in the case study.

In Table 1, key elements of each decision making processes are presented. The initiator column presents the project participant that initiated the process. The issue was initiated either as part of the agenda or emerged in the discussion. Nine following columns represent each project participant in the design phase of the case project. The X with a number represents how many turns each participant took in discussing the issue. A dash means that the project participant did not attend the meeting. If the cell is empty, it means that the project participant was present at the meeting but did not participate in the discussion. The Final decision column states whether a joint decision was made (Yes/No) and which participant said the final word. The type column describes the type of the decision making. Reflecting to the two main theoretical streams, rational choice theory and rule-based action theory (March 1991), we found three types of joint decision making processes; (1) Rational decision processes (altogether nine joint decisions), (2) Rule-based decision processes (altogether three joint decisions), and (3) Mixed decision processes (altogether six joint decisions). In rational decision processes, different alternatives were carefully discussed jointly and final decision was made unanimously based on the best possible alternative. This resembled more innovative decision making where the group utilized the competence and experiences of its members. For example, in the issue of scheduling the laying of the cornerstone, the realistic time window was defined based on the perspectives of all participants. The general contractor also shared their previous experiences (both positive and negative) on the same issue in order to reach the shared understanding on the goals and meaning of the issue. The end user and the owner, however, wanted to play it safe and well as they were expecting high-ranking guests to the event. Finally, the time window was further specified and agreed unanimously. In rule-based decision processes, it was more important to follow agenda and have the decisions made rather that assess the different alternatives in the issue. This resembled more routine decision making where the group members acted in a way they are used to act in a similar situation. For example, in the issue of selecting the step-ladder unit supplier, the participants did not discuss different alternatives but rather just made the quick decision based on the general contractor's original proposal. Finally, the mixed decision processes had elements from both rational and rule-based decision making. For example, in the issue of quantity take offs, the project participants decided to hire an external estimator to calculate the quantities as it is always done that way. Still, they discussed the possibility of getting some quantities more efficiently from building information models and agreed to offer BIMs to the external estimator as well.

Table 1: Summary of joint decision making processes and key roles

Issue	Initiator	Arch.	Struct.	Mech.	Elect.	Geo	GC	CM	User	Owner	Final decision	Type	Roles
1.1 Facade	Arch.	X (7)					X (1)	X (3)		X (6)	No	Rational	Expert (Arch.), Payer (Owner)
1.2 Excavation	GC		X (1)			X (3)	X (3)	X (1)	X (1)	X (1)	No	Rational	Expert (Geo), Manager (GC)
2.1 Tunnel	Struct.	X (1)	X (3)	X (2)	X (1)		X (2)	-	-	-	No	Mixed	Manager (GC), Impugner (Mech.)
2.2 Excavation	Geo	X (1)	X (2)	X (1)		X (6)	X (5)	-	-	-	No	Rational	Expert (Geo), Manager (GC)
2.3 Cables	Elect.			X (1)	X (5)	X (2)	X (4)	-	-	-	Yes (GC)	Rational	Expert (Elect.), Manager (GC)
3.1 Target price	GC	X (1)	-	-	-	-	X (5)	X (3)		X (2)	Yes (GC)	Rule-based	Payer (Owner), Manager (GC)
3.2 Quantities	GC	X (2)	-	-	-	-	X (4)	X (2)		X (4)	Yes (Owner)	Mixed	Payer (Owner), Manager (GC)
3.3 Flexibility	GC	X (3)	-	-	-	-	X (9)	X (5)	X (3)	X (5)	Yes (Owner)	Rational	Customer (User), Payer (Owner)
3.4 Parking	Arch.	X (3)	-	-	-	-	X (6)	X (1)	X (2)	X (5)	Yes (Owner)	Rational	Payer (Owner), Manager (GC)
3.5 Cornerstone	User		-	-	-	-	X (8)	X (2)	X (3)	X (6)	Yes (Owner)	Rational	Customer (User), Expert (GC)
4.1 Systems	Arch.	X (8)			X (4)	-	X (7)		X (4)		Yes (GC)	Rational	Customer (User), Manager (GC)
4.2 Sound	GC				X (5)	-	X (5)				Yes (GC)	Rule-based	Expert (Elect.), Manager (GC)
5.1 Workshop	Owner	-	-	-	-	-	X (2)	-	X (1)	X (4)	Yes (GC)	Rational	Payer (Owner), Impugner (GC)
5.2 Excavation sub	Owner	-	-	-	-	-	X (6)	-		X (10)	Yes (Owner)	Mixed	Payer (Owner), Manager (GC)
5.3 Precast	Owner	-	-	-	-	-	X (9)	-	X (2)	X (13)	Yes (Owner)	Mixed	Payer (Owner), Manager (GC)
5.4 Elevator	Owner	-	-	-	-	-	X (2)	-	X (6)	X (12)	Yes (Owner)	Mixed	Payer (Owner), Manager (GC)
5.5 Step-ladder	Owner	-	-	-	-	-	X (1)	-		X (3)	Yes (Owner)	Rule-based	Payer (Owner), Expert (GC)
6.1 Ceiling	Owner	X (1)				-	X (1)	X (1)	-	X (3)	No	Mixed	Expert (Arch.), Payer (Owner)

From the power perspective, or based on which participants had most impact on joint decisions, five different roles emerged; (1) expert, (2) payer, (3) manager, (4) impugner, and (5) customer. In eight of the observed joint decisions, there was an expert role that provided valuable expertise input to the discussion and had strong impact on the outcome. Most often this was the architect or one of the engineers but once also the general contractor. The owner adopted the payer role in many decisions and was able to influence the decisions largely because it is paying for the project. The general contractor adopted the manager role who facilitated decision making largely from the project management perspective and was seemingly legitimated to influence decisions to get things forward. In two instances, there emerged also an impugner role that questioned others and tried to change the course of the discussion. In both cases, however, the impugner was not able to influence the outcome, but rather others gained more influence and were able get their suggestion adopted. Finally, the end user adopted a customer role and was able to strongly influence the decision making by being the entity for which the building was being built.

Unfortunately, the emerged roles and types of decision making processes did not form any clear patterns. Interestingly, all final decisions were made by either the owner or the general contractor. This reflects highly the contract structure, as the Alliance contract was signed between the owner and general contractor and logically they make the major decisions. The decision making processes followed loosely the phases of group decision making by Fisher (1993); orientation, conflict, emergence, and reinforcement. The orientation and conflict phases were easiest to identify but the phases rarely followed linear order as Fisher (1993) acknowledges. The magnitude and number of participants in a conflict varied a lot; sometimes it was quick between two parties and sometime long between all parties.

DISCUSSION AND CONCLUSIONS

We studied joint decision making in various managerial levels in a Project Alliancing project in order to uncover how joint decisions are made between companies, and what elements influence the outcome of joint decision making. With a visual grounded theory approach and using the garbage can model as a framework, we analyzed over 11 hours of video data and found 18 distinct joint decision making processes with three types of decision making; rational, rule-based and mixed. Rational decision making resembled more innovative decision making where competence and experience were utilized and different alternatives carefully discussed. Rule-based decision making resembled more routine decision making where it was more important to follow the agenda and act how it is expected to act in a given situation. The mixed decision making had elements from both of these.

Furthermore, five different roles emerged that had significant impact on the outcome of joint decisions; expert, payer, manager, impugner, and customer. The roles and types of decision making did not form any clear patterns but there was a clear link between the contract structure and having the last say on a joint decision. Even though relational project delivery arrangements try to break the established mindset and institutional forces in order to achieve best-for-the-project thinking, the contract structure seems to strongly influence the final decision making power. In order to understand whether this final decision making power and best-for-the-project thinking are aligned, further longitudinal research would be needed. In addition to the contractual incentives, trust seems to play a central role in achieving best-for-the-project decisions, and therefore, the role of trust and developing inter-organizational trust in joined decision making would make important future research (Lau & Rowlingson 2009).

The garbage can model seemed to apply well in making sense of organized anarchy in construction project decision making. The characteristics of an organized anarchy seemed to be more or less present in the context of the case project. Were there problematic preferences that were inconsistent and ill-defined to satisfy rational decision making? Maybe more in issues with mixed decision making. Were there uncertain and poorly understood technologies, tasks and processes? Most certainly with high specialization and developing technology. Were there fluid participation? Participants did change and for most meetings every project participant was welcome to attend but there were also regular attendees and stable roles in the meetings. These all would deserve further analysis and research.

There were some limitations with this study. The video data contained only partial coverage of all the meetings and decision making situations in the case project. In addition, the joint decision making processes come and go further than just a single meeting. More extensive data could bring additional perspectives and more comprehensive view on each joint decision process. However, the labor-intensive video analysis approach sets some limits to increasing the amount of data.

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