Thesis for the Industrial Doctor of Philosophy Degree of Engineering

Integrated Design-Build Management

- Studying Institutional Processes to Understand Project Coordination & Performance

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MT Højgaard

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&

Division of Construction Management

Department of Civil & Environmental Engineering

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Foreword

This dissertation is submitted to the Division of Construction Management at the Department of Environmental & Civil Engineering at Chalmers Technical University, SE for the degree of doctor of philosophy. The research project was conducted as an industrial Ph.D. project from June 2013 until June 2016 in collaboration between the author, Chalmers University of Technology and MT Højgaard [MTH].

MTH is a construction & civil engineering company in Denmark with over 4000 employees and an annual turnover of around 7 billion DKr. MTH carries out a range of construction and civil engineering projects, including: commercial, residential, healthcare, bridges, roads, and off-shore wind turbine foundations.

Principal supervisor: Christian Koch, Professor, Division of Construction Management at the Department of Environmental & Civil Engineering at Chalmers Technical University, Sweden.

Co-advisor: Christian Thuesen, Associate Professor, DTU Management Engineering, Technical University of Denmark.

Company supervisors: Ole Berard, Ph.D., Department Manager, MT Højgaard, Denmark & Peter Bo Olsen, Technical Director, MT Højgaard, Denmark.

Host supervisor: Professor Martin Fischer, Civil & Environmental Engineering, Stanford University, US, hosted a research stay from January 2015 to June 2015.

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Glossary & Abbreviations

'…is interpreted…' – the author's interpretation of a particular piece of empirical material.

'…is perceived…' – project team member's perceptions of, for example, their work or a particular situation or phenomenon.

'…this dissertation…' – the volume of text presenting the Ph.D. research.

'…this research project…' – the research work carried out by the author during the Ph.D. study from June 2013 – June 2016.

BIM – Building Information Modelling, digital modelling of geometry (3D), planning of construction process (4D), economy (5D) (Berard, 2012).

IDBM - Integrated Design-Build Management (concept developed as part of this research project).

Main design project – [in Danish: *hovedprojekt*] a design proposal, typically in the form of a BIM model, a set of drawings, and technical specifications, developed during the detailed design phase (Danske Ark, 2010).

MTH - MT Højgaard.

Preliminary design project – [in Danish: *forprojekt*] a preliminary design proposal developed during the basic design phase (Danske Ark, 2010).

Project delivery method – a particular collaboration form supported by a legal framework to deliver a building, for example, design-build (Ashcraft, 2006).

Project freeze – the practice of locking and no longer making changes to a particular part of a project, for example the structural design.

Project phases – temporally bracketed periods of time around which the project is organised. Project phases typically include: project conception (where the idea of the project and early effort to establish a project team are made); early design (typically where a conceptual architectural design is developed); basic design (typically where engineering and architectural design is further developed); detailed design (typically where the contractor, architect and engineer collaborate to detail the project); building phase (where the contractor constructs the building); commissioning, hand-off and occupancy (where building systems are tested and regulated, the building is officially handed-off to, and occupied, by the client) (Danske Ark, 2010).

Project team – the group of organizations collaborating over a period of time in order to purposefully develop a project together, typically, but not necessarily, including an owner, architect, engineer, contractor, sub-contractors, and suppliers.

Project team members – the individual organizations or individual representatives from each organization in the project team.

Reflective – the ability to critically consider and take account of a particular phenomenon and the conditions for what one is doing (Alvesson, 2009).

Reflexive – a particular methodological approach to conducting research.

Self-perform sub-contractor [in Danish: *egenproduktion*] – the general contractor's in-house concrete, carpentry and civil work sub-contractors.

VDC – Virtual Design & Construction. A process method emphasizing the use of digital tools and digital collaboration to develop design and construction projects (Kunz & Fischer, 2012).

Abstract

An increasing number of actors contributing with their skills to design-build projects increase the need for and complexity of coordination. The design-build project delivery method proposes to coordinate actors through collaborative interaction; however, even design-build projects result in poor coordination and building of relatively poor quality.

Therefore, the purpose of this research is: to gain a deeper insight into how coordination is respectively enabled and constrained; to understand how coordination relates to project performance; and, to propose methodological elements for an integrated design-build management concept.

An institutional work perspective explains how design-build projects are social phenomena characterised by structures, purposeful reflective interactions and political negotiation. Furthermore, coordination is interpreted as an institutional phenomenon and specifically coordination is defined as bringing together potentially social, temporal and spatially separated work elements. Coordination mechanisms include formal structures, relational interaction, and integrative institutional processes.

Similarly, project performance is defined as a temporary negotiated order of multiple institutions.

The research design consists of three literature studies combined with a double-qualitative empirical study of six design-build projects. The six projects are studied through a quadric-hermeneutic method enabling insight into the phenomenon of coordination.

The analysis shows that during the design process peaceful co-existence, fragmentation and occasional integration occurred. During the detailed design phase a conflict between project quality and efficient construction arose. As a result, the design process dragged on, stalled and re-circuited and the project was not fully representative of all the institutions in the project. Nevertheless, due to a combination of structure, loose coupling and informal interaction the project team was able to begin and progress the build.

Further, the analysis shows that a project's constellation of institutions is reflected in the project's performance.

Following the analysis, an integrated design-build management concept proposes new meanings and formal structures for enabling integrating constellations of institutions to improve project coordination and performance.

This research project concludes that project coordination is a process of mutating constellations of institutions where conflict, competition, blending, fragmentation and the lack of collective on-going institutional work are the primary constraints to project coordination. Similarly, integrating constellations of institutions and occasional fragmentation through temporary competition enable project coordination and increase project performance.

Keywords: coordination; institutional work, design-build; and, project performance.

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Introduction

Complexity, collaboration & coordination

> *'I know I probably sound like an old fool, but in the past, it was simpler after all. Today it is much more complicated, because you have all these people who have to participate, who have to make a contribution, whom you wait for, and you can't work on anything until they have had their say and this and that. Today, we have managed to complicate such a* [project] *process more than ever… there are so many things… people, that… …have opinions and whom… you have to take into account.'* [Engineer, Project 1].

An increasing number of the actors in the design and construction field wish to contribute with their knowledge early in the design process (Værdibyg, 2013; Gray & Hughes, 2001). This is attributed to increased regulations and owner demands, e.g. requirements for energy performance, sustainability more broadly, an increased number of building products, use of BIM, and increased technological complexity of buildings.

The more organizations that wish to contribute with knowledge in the early design processes, the more complex coordinating the project becomes. Furthermore, the complexity of coordination is not only a result of increased project knowledge, information and requirements, but also a result of potentially divergent interests, norms, values and underpinning understandings of what constitutes a '*good'* and '*legitimate'* project (Söderlund, 2010).

Also, the project team has to work towards a particular, '*but often ambiguous and negotiated'*, goal (Bresnen & Marshall, 2010, p.154). As a result, projects require extensive technical and social coordination (Kadefors, 1995).

This is reflected in the literature, where the notions of collaboration and coordination are overlapping and concern '*bringing together actors'* and both technical and social *'work elements'* (Urup & Koch, 2014). However, in this research project, collaboration is defined broadly as the bringing together of individuals and organizations, while coordination specifically concerns gradually integrating potentially spatially, socially and temporally separated work elements.

Low productivity & poor quality

The increased project complexity results in a number of specific problems: poor quality of design information (Berard, 2012); lack of coordination (Apelgren, et al., 2005); insufficient knowledge sharing (Thuesen, 2006); and collective shirking (Henisz et al., 2012). Ultimately, these problems result in rework of design work, rework of construction work, and poor quality of the final building (Apelgren et al., 2005; Schultz, 2012).

Design-build project delivery

A number of project delivery methods propose to address these problems by coordinating processes, actors and social structures. A project delivery method is defined as a framework for organising the collaboration on a project. Relatively established collaborative project delivery methods include, design-build, partnering, integrated project delivery and project alliance.

It is beyond the scope of this dissertation to elaborate on all the project delivery methods. However, there are several overlaps between the collaborative project delivery methods (Lahdenperä, 2012).

While partnering has been used in projects in Denmark, no records of IDP and project alliance projects have been found. The lack of diffusion of these three methods in the Danish construction field may be due to the project delivery methods' lack of ability to place the economic risk with the contractor (Licitation, 2013). Research from other countries suggests that selective adaptation determined by organizational norms, perceptions and values (Phua, 2006) may also explain the limited diffusion.

Of the collaborative methods, the design-build method is the most common in Denmark making up around 33% of all projects (Jørgensen, 2012). In Denmark, design-build projects are characterized by collaboration among typically the architect and owner (and potentially the engineer) during the early design phase, while the contractor engages in and leads the detailed design and construction phase. Also, characteristically, there is a temporal overlap between the design phase and the construction phase, where detailed design is being developed alongside the build progressing. Furthermore, design-build projects develop through a number of standardized phases (Danske Ark, 2010). These phases typically include: project conception (where the idea of the project and early efforts to establish a project team are made); early design (typically where a conceptual architectural design is developed); basic design (typically where engineering and architectural design is further developed); detailed design (typically where the contractor, architect and engineer collaborate to detail the project); building phase (where the contractor constructs the building); commissioning, hand-off and occupancy (where building systems are tested and regulated, the building is officially handed-off to and occupied by the client).

The design-build method was established in Denmark during the early 1970's (Dansk Byggeri, 2005). In 1972 the first set of guidelines for design-build execution was published by Dansk Byggeri. Design-build project delivery gradually became diffused in the Danish construction industry and in 1984 and 2005 the guidelines were revised to reflect current legislation and best-practice based on the extensive experience that the field had gained with design-build projects since 1972.

In Denmark design-build projects are becoming increasingly popular for three reasons: they are perceived to place the financial risk with the contractor, which is desirable to many owners (Licitationen, 2013); the owners perceive to be more in control of the project (Licitationen, 2013); and increased collaboration between contractor, owner, architects and engineers during the design process results in better management of project time and budget and buildings of higher quality compared to projects delivered as design-bid-build or individual trade contracts (Jørgensen, 2012).

According to an analysis from MTH's Customer & Marked department, design-build projects make up 51% of the total fiscal amount bid for in 2016, an increase

from 44% in 2013, when this research project was begun. This reflects, not only the field's shift towards increased collaboration as a whole, but also, according to MTH's sales director, a purposeful effort on behalf of MTH to pursue design-build projects. Design-build projects are pursued because they increase contractor's control over project cost and profits, and they are perceived to enable the contractor to gain a deeper insight into the project before the building process begins.

Design-build – an institutionalized phenomenon

The design and build of projects is a social phenomenon: a number of organizations interact over a period of time, typically months or years (Thuesen, 2006) in order to design and build a building. Once the project is completed the interaction and the temporary organization gradually disperse as the aftermath of the project settles. When a new project begins, particular patterns of interactions among organizations (potentially previous collaborators) are resumed again.

Each project concerns a new building on a new site, with a new project team and in that respect each project is unique, in that no two projects are perfectly identical (Morris, 2010). As a result, much literature on building projects have emphasised the uniqueness and temporality of projects (e.g. Lundin & Söderholm, 1995) and that uncertainty and novelty are the most significant challenges for project teams to manage (Morris, 2010). And while no two projects are perfectly identical (due to geographical, technical, functional, social and temporal variation), design-build projects vary little in terms of process and outcome, which indicates that design-build projects adhere to well-established social structures (Kadefors, 1995; Dille & Söderlund, 2011).

According to Kadefors (1995) similarities across project process and outcomes indicate a heavily institutionalised social phenomenon. Specifically, Kadefors (1995) points out that building codes, regulations regarding work environment and worker's protection, design-build contract template, consultants' agreement template, tendering systems, standardized roles, standardized skills and knowledge, and repetition in task content, are all regulative and normative work elements with a homogenising effect on design-build processes and project outcome.

Furthermore, for building projects, not only design-build ones, roles are also supported by cultural-cognitive understandings that provide knowledge about hierarchal order and decision-making authority (Jones & Lichtenstein, 2008; Gray & Hughes, 2001). Also, event-based and chronological pacing, e.g. coordinating building projects with the use of deadlines, timelines, and milestones (Jones & Lichtenstein, 2008), are also structures adding to homogenised project processes.

However, the homogenising mechanisms highlighted by the contributions of Kadefors (1995), Gray and Hughes (2001) and Jones and Lichtenstein (2008) do not lead to institutional determinism. Hansen (2013) show that there are at least four variants of the design-build delivery method. Furthermore, the introduction of new project delivery and process methods indicate that there is room for agency, potential for change, and efforts towards disruption of current design and build institutions – even if these project delivery and process methods have not become prevalent institutions themselves.

Despite the recognition that projects, not only design-build ones, are significantly institutionalised, relatively little research has studied how collaboration developed in a multi-organizational context of complex projects from an institutional perspective

(Bresnen & Marshall, 2010, p, 155.). Exemptions include Viking and Lidelöw (2013) who studied institutional logics in home builders in Sweden, Rowlinson and Jia (2015) who studied health and safety on construction sites in China, and, Bresnen and Marshall (2010) who studied multiple institutional logics in relation to the diffusion of partnering in the UK.

The high performance project

Due to the perception that projects are unique and uncertain, much literature on project management has developed, and still is developing, an understanding of project performance as execution-oriented (Morris et al., 2010), e.g. concerned with how to deliver buildings on time and on budget (e.g., Flyvbjerg, 2010) and managing risk and uncertainties (e.g., Winch & Maytorena, 2010). In sustainability literature, high performance buildings typically refer to buildings with low energy consumption and user comfort (Gylling et al., 2011). However, other contributions refer to buildings as 'facilities of new value' (Winch, 2009) and define project performance as a matter of creating or adding value to the project as well as the organizations involved in the project (Ashcraft, 2006; Værdibyg, 2013).

Accepting that project performance follows certain social structures then high performance projects depend less on managed uncertainty, but rather on managed shared meanings, perceptions, and norms for what constitutes value. However, no studies were found that shed light on a potential relationship between institutions and project performance.

Contribution & Research Questions

Accepting that the construction field in general, with its current organization, so far has been unable to leverage the increased complexity to increase productivity, this research project assumes that the construction field wishes to be able leverage complexity to increase productivity.

Therefore, the first purpose of this research project is to provide practitioners as well as the academic community with a deeper understanding of the phenomenon of coordination on design-build projects.

The second purpose of this research project is to understand potential relationships between coordination and project performance.

The third purpose is to propose how coordination may be enabled in design-build projects.

In order to make this contribution, a set of specific research question have guided the research:

RQ #1: What theoretical and methodological framework would enable a systematic development of insight and understanding of the coordination of design-build projects?

RQ #2: How and why is coordination, interpreted as an institutional concept, respectively enabled and constrained in design-build projects?

RQ #3: How does coordination or the lack of coordination relate to project performance?

RQ #3.1: What constitutes a high performance project?

RQ #4: What would a design-build management concept that enables coordination and high project performance consist of?

Theory

To gain a deep understanding of coordination of design-build projects, this research project is informed by institutional theory, in particular current streams of institutional work (Lawrence et al., 2009). The following sections elaborate institutional theory, specifically institutional work, and how it can inform coordination of design-build projects. In the following sections I will introduce, build-on, and extend the notion of institutional work. In an attempt to overcome the conundrum of presenting nonlinear arguments in the linear format of this dissertation, I here offer the reader some guidance.

First, the notion of an institution is defined. Second, the co-existence of multiple institutions is developed followed by an introduction to the concept of institutional work, with a particular focus on the relationship between agency and structure. Third, potential relationships between multiple institutions are presented. Fourth, enabling and constraining mechanisms of multiple institutions are elaborated and lead to a discussion concerning temporary stability and incremental change. Fifth, institutional work processes concerning the creating, maintaining and disrupting of institutions are presented. Subsequently, project performance and coordination are defined in the context of institutional theory. Finally, a summary of the theory chapter is provided.

Institutional theory

Institutions

Sociological institutional theory is concerned with grasping the social human world that generates perceived universal laws (Zilber, 2008, p.163). Central to the concept of institutional theory is the understanding that there are structuring social elements – institutions – that affect human interaction (Lawrence & Suddaby, 2006). Scott (2008, p.48) defines institutions as *'social structures that have attained a high degree of resilience'* and consist of *'regulative, normative and cultural-cognitive elements'* and *'provide stability and meaning to social life'*.

According to Scott (2008, p.51) the regulative pillar is associated with rules, laws and sanctions following a logic of instrumentality. The normative pillar is associated with social and moral obligation, and guided by a logic of appropriateness. The cultural-cognitive pillar is associated with common beliefs, taken-for-grantedness and orthodoxy.

Once rules and norms have become well-established and their inherent meaning has become taken-for-granted '*explicit social control and justification'* becomes superfluous (Zilber, 2002, p.235) and the institution has the ability to reproduce itself (Scott, 2004). While such an understanding of institutions explains why project process and outcome are stabilized, it is unable to inform how variation across projects and time occurs.

Other scholars, who seek a less deterministic view of institutions, have proposed to define institutions as '*organized, established procedures that reflect a set of standardized interaction sequences*' and '*product of purposive action*' (Lawrence & Suddaby, 2006, p.4). While this definition of institutions implies that an institution is part of a larger and temporary negotiated order (Yu, 2013). Lawrence and Suddaby's

(2006) definition raises two issues. First, while agency is interpreted to be reflective, agency is interpreted to be less empowered in projects than suggested by '*product of purposeful action'* due to the constraint that institutions afford on agency. These constraints are considered to be a result of partly overarching structures (Scott, 2008), and partly a result of ambiguity, potential paralysis caused by, and necessary negotiation among, multiple co-existing institutions in the project. The co-existence of multiple institutions shall be elaborated on later in the following sections.

Second, while '*established procedures*' are clearly less deterministic than taken-for-granted cultural-cognitive structures, reducing structure to *procedures* implies that institutions and institutional change can be measured through change in procedures, action and practices alone (Zilber, 2002). Reducing manifestations of institutions to procedures, action and practices alone means it is only possible to capture the more-or-less visible conduct of institutions and, on the other hand, accept to neglect the 'content' or meaning of the institution. Meaning is central to the foundation of institutional theory: Berger and Luckmann (1966, p.54) defined an institution as *'a reciprocal typification of habitualized action…'*. Reciprocal typification is understood as *'the development of shared definitions or meaning that are linked'* to the habitualised actions (Zilber, 2002, p.235). Berger and Luckmann (1966) also stated: *institutionalism is the notion of institutionalization as a process in which… ephemeral interactions become objectified patterns, and meaning… becomes part of the social-historical a priori* (Meyer, R., 2008). Thus, in order to understand the efforts and motivations of institutional workers on design-build projects, understanding not only normative conduct, but also the shared meanings, is important.

In studies on institutional change, Suddaby and Greenwood (2009) propose the following definition of an institution: '*an institution may take the form of juridical regulations, informal rules or codified social arrangements, norms of conduct, or cognitive structures that provide understanding and give meaning to social arrangements'* (Suddaby & Greenwood, 2009, p.176). This definition offers a balanced view of structure and agency that is useful for understanding coordination on design-build projects.

However, in order to emphasize the importance of meaning and the temporary negotiated order of multiple institutions that characterizes the design-build project, I specifically define an institution as a more-or-less taken-for-granted shared meaning, underpinned by normative understandings and conducts, and potentially rules, that guide and provide meaning to social interaction.

Institutional work

While institutions constitute more-or-less taken-for-granted social structures, institutional work, on the other hand, is specifically concerned with understanding how purposeful efforts can be made towards creating, disrupting and maintaining institutions at the organizational (or field) level (Lawrence et al., 2009; Kraatz, 2009).

The concept of institutional work was conceived by Lawrence and Suddaby (2006) in an attempt to connect, bridge and extend work on institutional entrepreneurship, institutional change and deinstitutionalisation.

In the 1980's neo-institutionalists became increasingly interested in institutional change resulting from exogenous pressure (Suddaby & Greenwood, 2009) and as a result emphasised a deterministic view of agency. As scholars became increasingly interested in endogenous institutional change, neo-institutionalism was increasingly

criticized for over-emphasizing the regulative and cognitive framing element of institutions (e.g rules and shared meanings) (Lawrence & Suddaby, 2006) and depicting an over-socialised view of agency (Lawrence et al., 2009).

Institutional entrepreneurship (Battilana et al., 2009) took stance to neo-institutionalism's deterministic view of agency and allowed for a reflexive, self-directed and empowered understanding of agency. Studies of institutional entrepreneurship often concerned actors who mobilised resources to create new or transform existing institutions (Lawrence et al., 2009). However, institutional entrepreneurship came under increasing criticism for depicting actors as super-rational and heroic, neglecting to describe the institutional arrangements that constitute the context in which these entrepreneurs operate (Lawrence et al., 2009).

As a reaction to the voluntaristic view of institutional entrepreneurs, scholars became interested in understanding how actors affect institutions while also being affected by institutions: '*How can actors change institutions if their actions, intentions, and rationality are all conditioned by the very institution they wish to change?'* (Holm, 1995, p.398).

Lawrence and Suddaby (2006) developed the concept of institutional work in an attempt to avoid depicting actors either as '*cultural dopes*' trapped in institutional arrangements or as hyper muscular institutional entrepreneurs (Lawrence et al., 2009, p.1).

Thus, institutional work proposes a balanced view of the relationship between agency and structure (Lawrence et al., 2009) by considering institutions a product '*of human action and reaction'* (Lawrence et al., 2009, p.6). Institutional work is characterised by politically savvy (Yu, 2013) and reflexive agency driven by interests and motivations, engaging in negotiations and making deliberate efforts to contribute to institutional change (Lawrence et al., 2009). More precisely, institutional work is the '*purposive action of individuals and organizations aimed at creating, maintaining and disrupting institutions*' (Lawrence and Suddaby, 2006, p.215). The key concern of institutional work is to understand the paradox of how actors can change the institutions that they are simultaneously conditioned by. This paradox was named '*the paradox of embedded agency'* by Seo and Creed (2002).

Scholars have attempted to resolve the paradox of embedded agency by building on different ontological foundations. For example, Battilana and D'Aunno (2009) build on psychological models (Emirbayer & Mische, 1998) to explain how individual actors consciously draw on past experience, contextualise current lived situations and hypothesizing future schemas. The psychological models are used to account for how actors at the individual level become aware of the cultural-cognitive institutions that they have come to take for granted, in order to initiate institutional change (Lawrence et al. 2009). This relates to the ontological foundations of institutional work, Berger and Luckmann (1966) who understand institutions to be '*embodied in routines that rely on automatic cognition and uncritical processing of existing schemata'* (Lawrence et al. 2009, p.11).

However, a psychological model is problematic in the context of design-build projects. As shall be elaborated in the following sections, a design-build project where multiple organizations collaborate can be characterised as a constellation of multiple institutions. If projects are characterised as complex constellations of multiple institutions, then multiple actors are dependent on each other and institutional agents themselves are multiply constituted, sociological entities adapting to and changing their institutional environment (Kraatz, 2009). As a result, institutional work is less a matter of individual cognitive process. Rather, institutional change is interpreted to be

a sociological phenomenon and a matter of collective efforts (Zietsma & McKnight, 2009) and political processes (Pettigrew, 1986; Lawrence et al., 2009; Kraatz, 2009; Yu, 2013). This will be elaborated shortly.

Multiple institutions

While institutional work recognises the importance of understanding agency and action in a context of structure, institutional work is explicitly (Lawrence et al., 2009) not concerned with explaining how structures affect agency and action.

While not explaining how institutions affect action is useful in order to clearly define the contribution of institutional work, it nevertheless is a limitation of institutional work. Institutional work, as an isolated concept, doesn't explain the on-going process of institutions and agency interacting. In relation to understanding how coordination is respectively constrained and enabled in design-build projects recognising that institutions affect action alone is insufficient.

To explain how institutions afford discretion on agency, it is useful to review work that concerns multiple (more than two) institutions. Early work on institutional change was concerned with explaining how a single dominant institution can guide actors within a field (Greenwood et al., 2002). Similarly, early contributions on institutional work (Lawrence & Suddaby, 2006; Lawrence et al., 2009) remain vague about the number of institutions that actors aim to change or maintain.

However, it is widely recognized that organizations operate within a societal sphere of multiple institutional logics (Thornton et al., 2012); have to adhere to pluralistic institutional demands at the organizational level (Kraatz & Block, 2008); are faced with institutional complexity arising from the existence of multiple institutions (Greenwood et al., 2011); and, that multiple institutions can coexist in organizational fields (e.g., Zietsma & McKnight, 2009; Greenwood et al., 2010; Lounsbury, 2007; Reay & Hinings, 2009).

Also, institutional work's emphasis on '*politics brings to the fore the multiplicity of the institutional order. We have multiple meaning systems, multiple actors who hold multiple interests and who work in relation to multiple contexts. They may or may not share the same understandings, and they instill institutional structures and practices with meanings, at least part of the time, to further their own interests'* (Zilber 2008, p.159). Thus, institutional work lends itself to an understanding that multiple institutions coexist.

While many studies have focused on the co-existence of two institutions (see Waldorff et al., 2013 for a review), Goodrick and Reay (2011) developed the term *constellations* (e.g. *'a set of logics in a recognizable pattern'* (p.403)) to draw attention to the co-existence of multiple institutions and that the multiple institutions are arranged in particular relationships.

Relationships between multiple institutions

By recognising that organizations (and projects) represent constellations of multiple institutions, understanding what characterises the relationship between these multiple institutions becomes relevant (Waldorff & Greenwood, 2013).

Many contributions have shown how a single institution can come to dominate another institution (e.g. Suddaby & Greenwood, 2005), while others have shown how two, potentially conflicting, institutions compete for dominance (e.g. Greenwood et

al., 2011). Research on multiple institutions has proposed that relationships among institutions can be characterized as: conflicting or contradicting (Jarzabkowski et al., 2013-B; Smets & Jarzabkowski, 2013); one institution can be dominant over other institutions (Gestel & Hillebrand, 2011); multiple established institutions and institutions in the making compete for legitimacy and dominance (Zietsma & McKnight, 2009); institutions can be competing (Waldorff et al., 2013; Goodrick & Reay, 2011, p.372); institutions can exercise relative equal influence (Gestel & Hillebrand, 2011); institutions can co-exist in a neutral or peaceful manner (Gestel & Hillebrand, 2011; Koch & Buser, 2014); institutions can be cooperative (facilitative), complementary and mutually re-enforcing (additive) by amplify each other's effects (Waldorff et el., 2013; Goodrick & Reay, 2011; Greenwood et al. 2010; Jarzabkowski et al., 2013-B; Smets & Jarzabkowski, 2013); and finally, (proto-)institutions can blend, recombine, assimilate and coalesce to form one dominant institution (Zietsma & McKnight, 2009; Thornton et al., 2012).

Finally, and perhaps most importantly, institutions can relate in multiple ways to each other and thus for example, cooperative and competitive relationships among institutions can occur simultaneously (Waldorff et al., 2013; Goodrick & Reay, 2011).

Enabling & constraining mechanisms of multiple institutions

By proposing the image of a constellation of multiple institutions, Goodrick and Reay (2011) extended the research on how multiple institutions can simultaneously constrain and enable organizations, and thus give way to a new understanding of the relationship between agency and structure (Waldorff et al., 2013). Waldorff et al. (2013) use the terms reacting and enacting institutions, to signify, that actors are both required to respond to the multiple institutions that affect their work, as well as, make efforts towards institutional change.

Constraining action

Relatively few pieces of literature on multiple institutions have offered an understanding of how multiple institutions constrain organizations.

Without theorizing the relationship between multiple institutions Kraatz and Block (2008) highlight how the demand to adhere to multiple institutions causes organizational confusion, conflict and ambiguity. More specifically, multiple institutions means that organizations have to establish legitimacy with multiple institutions and social groups; have to reflect *'the values, beliefs, and practices'* of more than one institution; are faced with ambiguity in decision-making processes due to incompatible prescriptions for organizational action (Greenwood et al., 2011); and have to balance maintaining old institutions and introducing new institutions in order to preserve legitimacy (Kraatz & Block, 2008). Also, institutional pluralism can generate competition among groups that profess allegiances to different institutions (Kraatz & Block, 2008, Marquis & Lounsbury, 2007).

Furthermore, constellations of multiple institutions impose ambiguity for organizations (Greenwood et al, 2011) and, potentially, paralysis in organizations (Pache & Santos, 2010). Pache and Santos (2010), although only considering two institutions, warned that organizational paralysis might be the outcome of having to adhere to conflicting institutional demands. Furthermore, Pache and Santos (2010, p.2) showed that '*when no institutional constituent clearly dominated'* organization

may strike a balance between competing institutions by adopting a combination of intact practices from both (only two) institutions.

In the context of constellations of institutions Waldorff et al. (2013) propose that one institution dominating other institutions constrains organizational action aimed at changing the constellation of institutions because legitimizing a proto-institution becomes difficult.

Enabling action

While little is known about how constellations of multiple institutions constrain agency, an even fewer number of scholars have shed light on how constellations of multiple institutions enable action. Thornton et al. (2012) propose that multiple institutions offer potential avenues for '*partial autonomy of actors'* by offering a repertoire of different meanings that actors can adhere to and act by, as well as, opportunities for blending institutions. Also, Thornton et al. (2012) further point to loose coupling and decoupling as mechanisms through which organizations can symbolically adapt practices, without taking their meanings for granted and thus enable actors to act according to other meanings. Also, Waldorff et al. (2013) propose that strengthening an alternative institution enables action because it enables organizations to legitimately engage in activities that are alternative to the norm, yet activities that correspond with their own values. Also, a facilitative relationship among institutions can enable action because adhering to one institution automatically results in the strengthening of another institution (Waldorff et al., 2013). Furthermore, much literature on institutional change has assumed that a conflict, contradiction or competition among institutions had to be resolved by one institution dominating or replacing the other for the sake of regaining stability (Greenwood et al., 2002; Hargrave & Van de Ven, 2009). However, Waldorff et al. (2013) show that a competitive or conflicting relationship between institutions that would otherwise constrain action, can be resolved by partitioning work and thus enable the co-existence of multiple institutions. Thus, action is enabled without resolving the inherent conflict or competition.

Similarly, Gestel and Hillebrand (2011) showed how multiple conflicting or competing institutions can co-exist without necessarily resolving the inherent conflict or competition and that coexistence of contrasting logics can be enduring (Yu, 2013). Gestel and Hillebrand (2011) specifically developed the notion '*mechanisms for co-existence'* to account for ways in which actors can react to conflicting or competing institutions when an obvious resolution is not possible. Gestel and Hillebrand (2011) identify *negative choice* and *deliberate ambiguity* as two mechanisms for co-existence. Negative choice refers to how actors, when faced with conflicting or competing institutions that don't completely satisfy the logic of the actor, can choose to adhere to one of the institutions – *the lesser of the two evils.* Deliberate ambiguity refers to actors deliberately using wide rhetoric to encompass the meaning of all institutions represented and thus blur the actors' perception of a conflict or competition.

Negative choice and deliberate ambiguity temporarily enable action by either allowing actor to proceed by adhering to one institution or by making the conflicting or competitive relationship more or less invisible. In that respect, mechanisms of co-existence constitute defensive responses to handling multiple institutions (Jarzabkowski et al., 2013-B). Defensive responses to institutional paradox offer short-term relief (as shall be elaborated shortly), but no deeper understanding of the institutional problem at hand. According to Jarzabkowski et al. (2013-B, p.248) defensive response mechanisms include: splitting, regression, projection, reaction,

formation and ambivalence. As opposed to defensive response mechanisms, active response mechanisms offer long-term relief because the paradox is accepted as an inherent part of the organization. Active response mechanisms include: acceptance, confrontation, and transcendence (Jarzabkowski et al., 2013-B, p.248). Similarly, Seo and Creed (2002) propose that organizational and individual reflexivity and awareness can enable action and institutional change to overcome long-term institutional contradictions.

Incremental Change & Temporary Stability

The mechanisms of co-existence do not transform institutions into novel constellation of institutions (Gestel & Hillebrand, 2011). Rather, temporarily enabled action leads to an ongoing incremental institutional change and maintenance work result in only temporary stability.

As a result, contending that the continuous co-existence of multiple institutions can respectively constrain and enable agency, the notions of stability and change require reinterpretation.

Contributions on institutional change (Greenwood et al., 2002) have often assumed that stability simply *is*, and that change occurs occasionally due to actors responding to external pressures (Greenwood et al., 2002) or empowered actors creating endogenous change (Battilana et al., 2009). After change, it is assumed that a new or different institution settles and stability is re-established enabling institutions to self-reproduce (Scott, 2004).

However, Lawrence and Suddaby (2006) propose that the taken-for-granted presence of institutions is overemphasized and that mundane efforts made towards the emergence, instantiation, and change of institutions within organizations is inadequately explained (Jarzabkowski et al. 2013-B). Importantly, institutional work does recognise that institutions affect action and that agency is not always, even rarely, heroic individuals. For example, organizational positions are not properties, but socially negotiated and thus potentially fragile and temporary (Zilber, 2008). Therefore, institutional work concerns both the highly visible and dramatic as well as the nearly invisible and often mundane day-to-day efforts that are aimed at creating, maintaining or disrupting institutional arrangements (Lawrence et al., 2009).

Institutional work implicitly proposes an understanding of institutional change that is incremental and mundane as opposed to transformational and dramatic (Lawrence et al., 2013).

Incremental change occurs through institutional work where organizations in their daily work are involved in negotiating between multiple meanings, multiple norms and rules, and multiple actors who hold multiple interests and motivations (Zilber, 2008, p.159). Contending that organizations are constellations of multiple institutions, then institutional change is a matter of on-going purposeful (inter-)action (Lawrence et al., 2009), collective efforts (Zietsma & McKnight, 2009) and political work (Kraatz, 2009; Yu, 2013). Thus*, 'institutionalization is understood as fluid and dynamic, as an on-going process rather than an end point (DiMaggio, 1988)'* (Zilber, 2008, p.159). Because purposeful action, collective efforts and political work encompass mundane efforts and happen on a routine, rather than an exceptional, basis (Schneiberg, 2013) change is more likely to be incremental than transformational.

Furthermore, institutional work is concerned with the activities that are aimed at creating, maintaining and disrupting institutions, irrespective of the effects on the institution. Attention to the accomplishment of institutional work would indicate that a stabilised constellation is the output of the change process. However, institutional work (Lawrence et al., 2009) is specifically concerned with the activities that are aimed at creating, maintaining and disrupting institutions. Lawrence et al. (2006) distinguish between, for example, creat*ing* and creat*ion* of institutions. While creat*ion* of institutions implies a focus on the effect of a given action, creat*ing* institutions implies a focus on the process through which actors attempt to create institutions. Therefore, institutional work, implicitly, understands institutional change processes as continuously evolving.

Explicitly demonstrating that stability is temporary, Zietsma and McKnight (2009) show that both established institutions and proto-institutions compete for legitimacy and that multiple institutions may continue to exist even after a dominant institution has been established. Specifically, Zietsma and McKnight (2009) '*observe that institutional work involves iterative phases of conflict and cooperation'* (Lawrence et al., 2009, p.20). Because multiple actors have different interests and agendas, multiple efforts are made towards different types of institutional work with potentially different intended goals. As a result, the actions and efforts have to be negotiated among actors. As interests and agenda change or develop, actions, efforts and shared meanings have to be renegotiated and the institution can be interpreted as a temporarily negotiated order (Oliver, 1992: Yu, 2013). Thus, institutional change is not stable or linear but rather phases of incremental and iterative development and continuous change.

Finally, defensive responses to multiple institutions result in incremental change. For example, Gestel and Hillebrand (2011) show that multiple institutions can continue to co-exist without the settlement of a dominant institution. Gestel and Hillebrand's (2011) study show that the mechanisms of co-existence (e.g. negative choice and deliberate ambiguity) allow for institutional settlement to be repeatedly postponed. Thus, co-existence of multiple institutions results in just a temporary stability. Negative choice may temporarily enable action by allowing actors to proceed with their daily work by adhering to a particular institution. However, neither negative choice nor deliberate ambiguity leads to a satisfactory situation for the actors in the long term. As actors continue to interact with each other they will start to question and oppose the institution that they chose to adhere to because the institution doesn't satisfy their values. Similarly, over time continued interaction will make the conflict and competition resurface and visible if the inherent conflict is not resolved. As a result, the constellation of multiple institutions is subject to continuous questioning, opposition, negotiation and gradual mutation.

As mentioned previously, institutions have been defined as deterministic and self-reproducing (Scott, 2008), however, because change can be incremental and stability temporary in organizations characterised as constellations of multiple institutions then institutional change becomes self-reproducing too.

Keeping in mind that some orders may have come to be perceived as orthodox, incremental change is not only possible, likely to occur or something that *happens*, rather, change simply *is*. Viewing change as simply *being* reflects a truly processual understanding of institutional theory (Zilber, 2008) and has implications for our understanding of how institutions can be changed, disrupted or maintained (Lawrence et al., 2006).

Institutional work processes

All institutions require institutional work

As discussed previously, the conceptualisation of institutional change as mutating constellations of multiple institutions explains how agency is respectively constrained and enabled, by presenting avenues for partial autonomy and enabling co-existence of multiple institutions. Multiple institutions and mechanisms of co-existence can result in self-reproducing incremental institutional change, temporary maintenance and even disruption. However, the institutional process that mechanisms of co-existence result in can be more-or-less unintended (Gestel & Hillebrand, 2011) or the result of purposeful action (Lawrence et al., 2009).

Contending that organizations are reflective and interest driven, it follows that organizations are motivated to create constellations of institutions that are conducive to, in this case, designing and constructing buildings. As a result, institutional processes are interpreted to be inherently rooted in the organization because individuals taking action do so within the frame of an organization and will try to promote the interests, values and shared meanings of that particular organization (Kraatz, 2009). Disrupting existing and creating new institutions for the purpose of creating a particular constellation of multiple institutions conducive to further the interests of the organization requires purposeful and goal-oriented efforts (Lawrence et al., 2009). Also, Zietsma and McKnight (2009) show that even well-established institutions need intended maintenance to withstand competing proto-institutions (Lawrence et al., 2009). And, specifically in the context of multiple institutions creating integrative processes is important since *'the pluralistic organization does not automatically hold itself together'* (Kraatz & Block, 2008, p.263*)* and Kraatz (2009, p.86) reminds us, that institutional maintenance becomes an on-going '*concern approximately five minutes after the revolution'*.

From this, the question that arises is of course, *how* do processes of creating, maintaining and disrupting occur?

Institutional work as political process

Lawrence et al. (2009) use the notion '*effort*' to describe the purposeful and intended work made towards changing institutions. Since institutional work aims to overcome the 'heroic agent', institutional work concerns both the highly visible and dramatic as well as the nearly invisible and often mundane day-to-day purposeful efforts made towards institutional change or maintenance (Lawrence et al., 2009, loc.101).

Institutional work can be interpreted as political processes (Lawrence & Suddaby, 2006) and many of these political processes have previously been theorised as *'rhetorical, normative or cognitive processes'* (Yu, 2013, p.126). However, later developments of institutional work (e.g. Lawrence et al., 2009; Kraatz, 2009; Yu, 2013) focus increasingly on the process through which organizations negotiate multiple institutions and contend that institutional work is inherently political. In organizations constituted by constellations of multiple institutions, politics offers a possibility to negotiate between different institutions (Kraatz, 2009; Yu, 2013). Therefore, organizations operating within constellations of multiple institutions cannot act purposefully alone. They also have to engage in a range of political processes that constitute institutional work (Yu, 2013; Kraatz, 2009). Similarly, Zietsma and McKnight (2009) show that institutional work is a collective process of negotiating and experimenting with more-or-less novel and leftover institutional

material. Leftover material, referred to as institutional debris, consists of institutional fragments from previous institutions that through the process of co-creation come to form a particular institution.

Institutional work interpreted as political processes emphasise that institutional work is a process of repeated and concurrent success and failure, resistance and transformation (Lawrence et al., 2009, loc.329). Furthermore, institutional work is made by actors who on a routine basis, engage in '*interpretive work to manage ambiguity and contradiction, exploiting interstices…'* (Schneiberg, 2013, p.279). Therefore, institutional work is often mundane and characterised as *'muddles, misunderstandings, false starts and loose ends'* (Lawrence et al., 2009, p.11).

Creating, maintaining and disrupting institutions simultaneously

Early contributions on institutional work propose institutional work for creating, maintaining and disrupting institutions respectively. Lawrence and Suddaby (2006) propose that institutional work aimed at creating institutions involves purposive action within each the three pillars of an institution (Scott, 2004). Altering institutional logics, shared meaning, and theorizing new shared meaning are ways of creating cultural cognitive elements (Lawrence & Suddaby, 2006). Also, educating actors, providing them with new skills and knowledge as well as linking new practices with well-established practices, technologies and rules (Lawrence & Suddaby, 2006) are ways of creating cultural cognitive elements. To Lawrence and Suddaby (2006) political work is associated with creating new rules (as well as property rights and access to material resources).

Maintenance work, on the other hand, involves reproducing existing norms and belief systems and ensuring adherence to rule systems (Lawrence & Suddaby, 2006). Specifically concerning institutional maintenance, Washington et al. (2008) also suggest that institutional maintenance involves telling stories to build shared meaning; develop external supporting mechanisms; and, overcome external enemies by defending against the disruption of existing practices and prevent fragmentation of people who share that meaning.

An institution can be disrupted by undermining and delegitimizing the shared meaning supporting that particular institution. Also, institutions can be disrupted by disassociating practices, rules or technology from their moral foundations and by disconnecting rewards and sanctions associated with existing institutions.

While these actions implicitly refer to a single institution, Lawrence and Suddaby (2006) specifically identify '*policing*' as a practice for managing conflict between two opposing institutions. Policing is defined as *'ensuring compliance through enforcement, monitoring, auditing'* (2006, p.230) and intended to suppress proto-institutions that '*contradict the prevailing institutional logic'* (Hargrave & Van de Ven, 2009, p.123).

However, accepting that change is incremental and stability is temporary, the distinction between creating, maintaining and disrupting institutions fades. Therefore, Lawrence et al. (2009) propose that the three pillars are used as broader concepts to understand institutional work without proposing distinct actions for each type of institutional work. While, Lawrence et al. (2009) do not elaborate on how to do institutional work, they do state that institutional work is inherently political and that it involves negotiation, adjustment, adaption and compromise.

Similarly, in his work on institutional work as leadership, Kraatz (2009) points out that institutional work aimed at creating institutions involves '*engaging in ongoing and highly consequential symbolic exchanges with different elements of* [the]

organization's heterogeneous institutional environment' (Kraatz, 2009, p.73-75). More specifically, Kraatz (2009) proposes that institutional work includes making value commitments to win trust and sustain cooperation; creating coherence and purposiveness in the face of fragmentation; maintaining integrity by controlling emerging and on-going organizational processes; seeking legitimacy by winning external support and demonstrating *'cultural fitness'*; making character defining choices in response to competing demands; and creating institutional integrity by knitting together different constituencies. Without specifically outlining the process through which organizations engage in symbolic exchanges Kraatz (2009) points out that it will require organizational actors to carry out integrative, adaptive and developmental work in an on-going process.

While Kraatz' institutional work concerns responding to multiple external as well as internal demands, Yu (2013) is specifically concerned with integrative work in intra-organizational settings. Yu (2013) suggests that organizations characterised by intra-organizational collaboration need to succeed in integrating multiple institutions through intra-organizational political processes in order to sustain themselves. Integrative work occurs when organizations change or create institutions by layering institutions and compromising between institutions. Importantly, integration is distinct from hybridization (Battilana & Dorado, 2010) were multiple institutions merge and implies purposeful design (Yu, 2013). Contrary, integration, interpreted as layers of institutions and compromises among institutions, happens through on-going efforts to legitimise organizational actions and contests among organizations that pursue their own interests. The integrative process involves lobbying of higher authority and mobilizing resources and opinions (Yu, 2013) and therefore, also depends not only on interests (Lawrence et al., 2009), but also on perceptions and values (Yu, 2013, p.107-108; Phua, 2006). The result of the on-going contest is a constructed temporary negotiated order that enables organizations to gradually adapt to changing conditions (Yu, 2013).

Similarly, Zietsma and McKnight (2009) in their study of the Canadian forest industry show that creating a new institution involves on-going collaboration and competition among (proto-) institutions. Specifically, Zietsma and McKnight (2009, p.143) find that the becoming of a new institution is a '*process of co-creation of institutions involving multiple members of the organizational field, who compete and collaborate through multiple iterations of institutional development until a common template becomes diffused'*. The co-creation process results in multiple proto-institutions coalescing into shared practices and meanings and thus, institutionalisation is characterised by adaptation and change. Importantly, Zietsma and McKnight (2009) also showed, that while action was purposeful, it included experimentation, learning and compromise along the way. In attempts to institutionalise a particular proto-institution, Zietsma and McKnight (2009) showed, that actors made efforts towards changing the normative framing and legitimizing institutions by linking them to orthodox meanings. Also, actors created supportive networks for proto-institutions and obtained sponsorships, which acted as coercive measures to make organizations adhere to particular institutions.

Furthermore, Zietsma and McKnight (2009) showed that creating institutions requires continuous maintenance at the same time. They further showed that intended disruptive work may not be accompanied by proto-institutions ready to replace the disrupted institutions and that an institutional order may be a by-product as opposed to a clearly defined solution to an acknowledged problem (Zietsma & McKnight, 2009). Similarly, Gestel and Hillebrand (2011) showed that creating institutions can

be a by-product of maintaining particular constellations of institutions. Through mechanisms of co-existence, actors attempted to maintain certain institutional arrangements without resolving potential conflict or competition. As discussed earlier, negative choice refers to actors who choose to adhere to the least dissatisfactory institution when faced with multiple competing institutions. However, the negative choice will only lead to a temporary satisfaction and actors will start to question, oppose and re-negotiate the relationship between the competing institutions. As a result, while negative choice can be interpreted as a maintenance mechanism, it does also continuously enable the mutation of a constellation of institutions. Similarly, deliberate ambiguity (e.g. using wide rhetoric to wash-out the perceived competition between multiple institutions) is interpreted to be intended to maintain constellations of institutions, however, it contributes to an on-going mutation of a constellation of institutions. However, negative choice and deliberate ambiguity not only enable mutations but also postpones the point in time when a more purposeful and intended settlement of the relationship between institutions may occur through for example, co-creation. Although the conflict or competition among institutions may never settle, deliberate ambiguity and negative choice can postpone creating and disrupting institutions and thus enable maintenance through what is interpreted to be a political process.

Design-build projects & project performance as constellations of institutions

Many of the contributions on institutional work discussed previously in this theory chapter concern institutional processes at the field level (e.g. Zietsma & McKnight, 2009; Lawrence et al., 2009). These contributions can be transferred to the project-based organization. For example, the temporal, technical, social and spatial distance between projects means that projects are relatively decoupled from one another, similar to organizations in a field. On the other hand, similarly to organizations in a field, project team members travel from completed to new projects, have similar interests, shared purposes and meanings because they adhere to the same regulations, have similar backgrounds, and conduct similar types of projects. Furthermore, collective co-creating of institutions in a field (Zietsma & McKnight, 2009) is also found in project-based organizations where projects compete and collaborate to create, maintain or disrupt certain institutions. Also, projects typically employ the same project team members for the duration of the project, thus people, meanings and stories rarely travel from project to project in real-time. However, as each project develops and is completed, narratives about the project develop and form institutional debris for other projects. Therefore, contending that the project is an organization, then the design-build organization becomes an inter-organizational site for latent institutional material for projects to develop from and provide coupling between projects.

As Kadefors (1995) showed, design-build projects are subject to many regulating mechanisms, and the product of taken-for-granted norms that stabilize project processes and performance. As a result, the project can be interpreted to represent an institution in at least some minimum sense.

However, while a project constitutes an individual organization it is made up from a number of organizations and involves inter-organizational collaboration. In that respect, the project can be considered an inter-organizational site in which multiple institutions come alive and actors identify and negotiate their meanings, norms, rules, and interests. Therefore, in the context of multiple institutions the project can be interpreted as a negotiated constellation of multiple institutions.

The design-build project represents a particular constellation of multiple institutions at the beginning of the project, yet this constellation mutates over the course of the project as the project shifts from one phase to another (e.g. design to build). Furthermore, because multiple interests, perceptions and norms have to be negotiated in the project, the project mutates as project team members make efforts to create certain constellations of institutions or promote certain institutions that satisfy their own perceptions and values. Also, the project contains institutional debris left over from previous projects that become part of a co-creation process.

Similarly, the final building and project performance can also be interpreted as a stabilization of the constellation of institutions developed during the design and build processes on a particular project. To elaborate, the building itself reflects what was perceived to be important and right for the project team, or the most dominant actors in the project team. For example, the successful design, installation and running of mechanical systems reflects, that an understanding of functionality was presented in the project. Similarly, inadequately designed and installed mechanical systems that don't fulfil indoor climate requirement can be interpreted to reflect a lack of integration of the understanding of functionality. However, the constellation of institutions reflected in the final building and the project's performance continues to mutate as people begin to occupy, commission, maintain, and eventually, demolish the building. Potentially, even after demolition, the project may remain an institution or at least provide institutional debris for future projects.

As mentioned previously, no contributions that explicitly inform any potential relationship between institutional work and organizational performance, let alone design-build project performance, have been found. Most literature on project performance adopts a functionalist perspective and are concerned with delivering project on time and on budget (Morris et al., 2010). These contributions are interpreted to reflect a normative understanding of project performance. For example, while there are no regulations regarding project performance in the Danish construction industry, the contractor's project teams receive a bonus if profit ratio meets or exceeds a pre-agreed amount and if the project is handed off on time and with zero errors and deficiencies. While these criteria reflect what is normatively perceived as a successful project (i.e. a project that is delivered on time, with zero deficiencies and with a minimum profit ratio), these criteria are interpreted to be criteria only representing a limited number of interests (i.e. economy, efficiency, and to some degree quality). Evaluating project performance from a multi-institutional perspective is thus less about error and deficiencies at hand-off and meeting a particular deadline. Instead, it becomes a matter of the project team's ability to create a particular constellation of institutions throughout the design and build process that results in a building that integrates the multiple institutions represented in the project. And while, for example, delivering the project on time may indeed be an interest that requires integration on a particular project, the institutions that require integration have to represent the interests of the entire project team and society at large. For example, profit for all the organizations in the project team, creating public space and developing state-of-the-art buildings, are also interests and norms that may have to be

integrated into the project.

Therefore, with a multi-institutional understanding of project performance, a high performance project is defined as a project in which the project team is *able* to create a constellation of institutions that result in a project aftermath that integrates multiple institutions.

On the contrary, a low performance project is defined as a project in which the project team is *unable* to create a constellation of institutions that result in a building and project aftermath that integrates multiple institutions.

Coordination

As mentioned previously, projects require coordination (Kadefors, 1995), especially due to an increasing number of actors interacting in projects resulting in increased design information (Berard, 2012), knowledge-sharing (Thuesen, 2006), communication and synchronisation of efforts (Söderlund, 2010).

The following sections will summarize a literature review of coordination (Urup & Koch, 2014) and further extend and develop the concept of coordination in an institutional works context.

Coordination as structure & interaction

Building on Urup and Koch's (2014) selective review of coordination literature, the following section summarizes the points of Urup and Koch (2014).

Some literature on coordination has adapted a functionalist perspective and has defined coordination as: *managing activities, tasks and uncertainty* (e.g. Flyvbjerg, 2010); *time constraints* and *uncertainties* (Jones & Lichtenstein, 2008); *managing temporal alignment* (Burke et al., 2011); and propose coordination mechanisms such as *temporal embeddedness* in the form of deadlines and project phases (e.g. programing, design, and build phases) (Lichtenstein & Jones, 2008). Also adopting a functionalist view, yet developing an interactional dimension too is Mintzberg's (2009) highly recognized work on coordination. To Mintzberg (2009) coordination is both a matter of standardization of processes, outputs, skills and norms (i.e. formal structure), and direct supervision (i.e. formal interaction) as well as mutual adjustment (i.e. informal interaction). Primarily focussing on coordination as interaction, Gittell (2008) introduced the notion '*relational coordination'*. Relational coordination refers to both formal and informal communication as well as informal relations among multiple parties. Similarly, Jones and Lichtenstein (2008) used the term *social embeddedness* to refer to how recurring relations between project parties results in coordination because roles, expectations and shared understandings become increasingly established and even taken-for-granted when collaboration recurs. Also, Hemphill's (2009) work concerned coordination understood as social interaction and she extended the notion of *adaptive capacity*, and showed that project members used communication, multi-membership and perspective-taking to adapt to the changing requirements of a bridge-building project. Last, but not least, Melin and Axelsson (2005) showed that IT has the ability to coordinate work by for example introducing rhythm and schedule to work processes and by providing structure that guided interaction and communication.

Coordinating as institutions & institutional work

Coordination is explicitly central to the concept of institutional work: *'Institutional work draws a distinctly political approach to institutions in which our core puzzle is to understand the ways in which disparate sets of actors, each pursuing their own vision, can become co-ordinated in common project'* (Lawrence & Suddaby, 2006, p.249), although Lawrence and Suddaby (2006) interpret co-ordination in a broader sense than coordination aimed at designing and construction buildings.

	Mintzberg (2009)	Gittell (2008)	Hemphill (2009)	Melin & Axelsson (2005)
Definition of Coordination	No explicit definition. The structure of an organization is the division of tasks and coordination between them.	Coordination is management of interdependencies between tasks.	Coordination is the organization of different elements of a complex body or activity so as to enable them to work together effectively.	No explicit definition developed.
Paradigmatic Positioning	Functionalist view with assumptions of given management prerogatives. Focus on structure.	Phenomenological approach. Focus on agency.	Social constructivist approach. Focus on agency.	Interpretive social constructivist approach. Focus on agency and structure.
Agency	Human individual. Dominant agency is management.	Collective human. At management and operational level.	Individual human and non-human. At all organizational levels.	Non-human. At all organizational levels.
Coordination Mechanisms	Mutual adjustment. Direct supervision. Standardisation of output, skills, norms.	Frequent, timely and accurate communication. Shared goals, knowledge and understanding. Mutual respect.	Adaptive capacity: perspective-taking, communication, shared objects, affect, and multi-membership.	IT provides: tool to accomplish tasks, rhythm to work processes, technical vocabularies.
Relation to Institutions	Structure focus fits classic institutional theory.	No structure, no explicit relationship. Implicit, institutional entrepreneur-ship.	No structure, no explicit relationship.	Combined structure and agency fits institutional work.
Relationship to Projects and Project Based Organizations	Equal to Mintzberg's innovative organization with its adhocracy.	Inter- and intraorganizational.	Intraorganizational.	Inter- and intraorganizational.

Table 1. The table summarizes the key criteria analysed in the selective literature review on coordination (modified from Urup & Koch, 2014).

The selective review of literature on coordination by Urup and Koch (2014) showed that the understanding of coordination can be interpreted to be a matter of structure as well as interaction. Similarly, the coordination mechanisms proposed are intended to either impose structure *or* nurture social relations.

While several of the contributions mentioned above understand coordination as a matter of both structure and agency, none of the contributions explicitly understand coordination as an institutional concept, let alone a form of institutional work.

However, the reviewed contributions on coordination and coordination mechanisms can be interpreted as a form of institutional work. To elaborate, Mintzberg's (2009) coordination mechanisms of standardization and direct supervision, as well as IT (Melin & Axelsson, 2005) introduce formal structure that assist to legitimize, maintain and stabilize institutions (Slager et al., 2012). In that respect, coordination mechanisms can be interpreted as (potentially overarching) structures.

The majority of the reviewed contributions on coordination do not consider the process of disruption, with the exception of Jarzabkowski and Le (2012) who explicitly understand disruption as an integral part of the coordinating process. While this may be a purposeful omission, it may also reflect the understanding that coordination is broadly interpreted to concern the '*bringing together*' of something, while disruption can be associated with *preventing* the '*bringing together*'. However, purposeful disruption of a particular institution of constellation of institutions may also require coordinated efforts from multiple actors. For example, although rooted in a dialectic perspective, Karl Marx (1848), theorized, that the lower social classes would coordinate to initiate revolution against higher social classes and capitalist economic structures.

On the other hand, most contributions on coordination concern the creating process (of institutions). The contributions on relational coordination propose coordination mechanisms that allow for organizations to adapt to and co-create institutions. More specifically, mutual adjustment (Mintzberg, 2009), communication (Gittell, 2008) and adaptive capacity (Hemphill, 2009) can all be interpreted as potential purposeful mundane efforts that gradually enable the incremental development of shared meanings, norms and rules. Similarly, coordinating through creating recurring social relationships (Lichtenstein & Jones, 2008), developing shared goals, knowledge and mutual respect (Gittell, 2008), and mutual adjustment (Mintzberg, 2009) all require interaction and negotiation of meanings, norm, interests and values, and enables co-creation and adaptation to new institutions.

Furthermore, according to Jarzabkowski and Le (2012) coordinating work in changing organizations require improvisation which can be interpreted to be overlapping with Zietsma and McKnight's (2009) finding that institutional co-creation requires experimentation. Also, Zietsma and McKnight's (2009) concept of co-creating institutions (e.g. political negotiations to move between continuous competition and joint collaboration to legitimize and adapt to proto-institutions) can be interpreted to be somewhat overlapping to Hemphill's (2009) concept of adaptive capacity, in which parties exercise multi-membership in order to coordinate or resolve conflicts of interests.

In an attempt to bridge the literature on coordination and institutional work, Urup and Koch (2014) drew inspiration from Greenwood et al.'s (2008, p.525) conceptualization of '*institutional fields* as *floating*… and *temporally, socially and spatially separate*…' and proposed to define coordination as '*the interactions and structures that bring together related, yet potentially spatially, socially and*

temporally separated, work elements' (Urup & Koch, 2014, p.821).

Similarly, Urup and Koch (2014) proposed two coordination mechanisms: the building of an institution in the making; and the building of institutions by establishing relations between a number of institutions to create a constellation of institutions.

Temporarily stable organizations & dynamic coordination processes

The definition of coordination offered by Urup and Koch (2014) proposes that work elements may be *temporally* separated and that coordination involves bringing these together. This suggests that coordination is an on-going process in which interactions and structures at one point in time can enable and/or constrain interactions and structures at a later point in time.

In contrast, some literature on coordination appears to assume that coordination is self-maintaining in stable organizations. For example, Mintzberg's (2009) coordination mechanisms of standardization and direct supervision assume that organizations are relatively stable entities (Melin & Axelsson, 2005), as standardization can be implemented and seemingly maintained without the need for continuous work.

Similarly, Gittell's (2008) concept of relational coordination can be interpreted to implicitly assume that organizations are stable, even if work elements that need to be coordinated are uncertain and may change. The relational coordination mechanisms of *shared goals, shared knowledge,* and *mutual respect* can all be interpreted to characterize a stable relationship. However, Gittell's (2008) coordination mechanisms concerning communication (e.g. frequent, timely, accurate and problem-solving communication) allow for continuous adaption to changing shared goals, shared knowledge and mutual respect. Also, and perhaps more importantly, the coordination mechanisms enable actors to adapt to changing goals and new knowledge. Thus, implicitly, Gittell (2008) supports a dynamic view of coordination. The dynamic view of coordination is made explicitly by Melin and Axelsson (2005) who criticize Mintzberg's (2009) static understanding coordination for not adequately accounting for the complexities of coordinating work in contemporary construction companies where flexibility to accommodate changes is required. Accepting this criticism, it can however, be argued that mutual adjustment, as opposed to standardization and direct supervision, enables organizations to change or adapt to change, because it allows organizations to gradually adjust to and collectively establish new meanings, norms and rules.

Even more explicitly understanding coordination as a dynamic phenomenon is Hemphill (2009) who proposes that the capacity to adapt to changing circumstances in a construction project is a coordination mechanism in itself. Adaptive capacity, which involves perspective-taking (e.g. being able to understand the perspective of other organizations and individuals), empathy and multi-membership (e.g. being able to assist other organizations with their work), is interpreted to be an entirely interactionist concept explicitly aimed at handling exogenous changes or disruptions to the project.

Finally, Jarzabkowski et al. (2012) developed a process model for how coordinating mechanisms develop proposing that coordinating is an on-going activity to enable actors to respond to exogenous organizational change. Jarzabkowski et al.

(2012) propose the following steps in the coordination process: 1. disruption; 2. orienting to absence (actors becoming aware of what coordinating mechanisms are missing); 3. creating elements; 4. forming patterns; and 5. stabilizing patterns. While the model does understand coordination as a process, it assumes that coordination processes start with disruption and follow a relatively linear and rational development and finally settles in a stabilized form. This is due to Jarzabkowski et al.'s (2012) model of coordinating being primarily concerned with exogenous and transformational change. No contributions were found to show how co-creating and integrative institutional processes enable endogenous and incremental change. However, as discussed previously, creating new structure may arise from competing proto-institutions, institutional debris, and/or out of a muddled process with no clearly defined goal and is only temporary.

Summary of theory

In the context of design-build projects and project organizations, an institution is defined as: as a more-or-less taken-for-granted shared meaning, underpinned by normative understandings and conducts, and potentially rules that guide and provide meaning to social interaction.

The concept of institutional work is introduced to overcome the image of institutions as overarching structures and institutional entrepreneurs as heroic individuals. Institutional work provides the understanding that actors are reflective, driven by interests and make purposeful efforts towards creating, disrupting and maintaining institutions.

Furthermore, projects are interpreted to be characterized by multiple institutions were institutions co-exist in a variety of relationships, including conflict, competition, blending, peaceful co-existence, and domination.

Contributions on institutional work on multiple institutions propose that institutional work requires that actors create, maintain, and disrupt motivations, interests, shared meanings, normative conducts, values, perceptions and rules in a concurrent on-going process characterised by negotiation, experimentation, learning, compromise, collaboration, competition, co-creation, adaptation and integration. Because actors continuously negotiate the institutional order the constellation of institutions mutate over the course of the project. As a result, stability is temporary and change on-going and incremental.

Constellations of multiple institutions afford discretion on reflective action because multiple institutions cause ambiguity and potentially paralysis due to the lack of ability to satisfy multiple conflicting institutions at the same time. On the other hand, co-existence of multiple institutions enables partial autonomy and deviation from institutional pressures by providing multiple institutions for actors to adhere to, room for proto-institutions, co-creation of new institutions and provide room for negotiation of the institutional order.

The concept of co-creation (Zietsma & McKnight, 2009) is interpreted to be overlapping with integration (Yu, 2013; Kraatz, 2009), and layering (Yu, 2013). These concepts all understand institutional work as a collective on-going process in which a new temporary constellation of institutions is created from multiple established and proto-institutions. An inherent part of the institutional process is compromise, negative choice, adjustment, contest, competition, deliberate ambiguity, which are also considered to be related concepts. These concepts all understand that

no single institution uncontested dominates the constellation or that any institution 'survives' mutation and remain entirely stable.

Apart from interpreting the project as a mutating constellation of institutions, project performance is also interpreted as a multi-institutional concept. Project performance is defined as a temporarily stabilised constellation of institution as the project transitions from building phase to hand-off, commissioning and occupancy. Furthermore, project performance is evaluated based on the project team's ability to create a constellation of institutions that result in a building and project aftermath that integrates multiple institutions.

Coordination is also defined as an institutional concept. The literature review shows that previous contributions understand coordination as either a functionalist or relational concept. In order to describe how actors negotiate to coordinate a particular project, coordination is defined as *'the interactions and structures that bring together related, yet potentially spatially, socially and temporally separated, work elements'* (Urup & Koch, 2014, p.821). Also, two coordination mechanisms are proposed: the building of an institution; and the building of institutions by establishing relations between a number of institutions to create a constellation of institutions.

Method

The first part of this research project concerns gaining insight into how project coordination, interpreted as an institutional process, is respectively enabled and constrained. The second part concerns understanding how coordination (and the lack of coordination) relates to project performance.

The third part of this research project involves using these insights to further propose how project coordination and performance can be improved.

First of all, the phenomenon in question, coordination of design-build organization, is interpreted to be inherently social. Design-build projects are social structures that involve multiple actors interacting over time and across inter- and intraorganizational arrangements in order to produce a building.

Secondly, over the course of a project, these actors also interact with, for example, materials, equipment, and IT that, in the ontological context of this research project, cannot be considered to be actors, but rather constitute structures.

Thirdly, the project based organizations and the projects are characterised by multiple levels (e.g. social, temporal, spatial etc.) of interactions that require coordination (Söderlund, 2010, p.46). Coordination itself is thus a social process, and the coordination mechanisms that these organizations develop are equally social.

In summary, an appropriate method for this research project is one that is concerned with capturing the coordination process as it develops in a larger institutional context. It also calls for a method that enables close interaction with, and is highly sensitive to, the empirical world of design-build projects.

In the following sections, the method for how to research institutional processes (i.e. project coordination and performance) will be elaborated.

First, the research design is presented. Secondly, a hermeneutic method is presented to account for how this research project provides insight into complex social phenomena, specifically, context dependent design-build processes. Third, the hermeneutic method is discussed in the context of institutional processes. Fourth, an account of how the literature study and empirical study were conducted is presented, followed by a presentation of how the empirical material was interpreted. Fifth, the method by which the Integrated Design-Build Management [IDBM] concept has been developed is presented. Finally, the trustworthiness and authenticity, as well as the limitations, of this research project are discussed.

Research design

The research design for this research project was intended to be a mixed method design combining a qualitative and quantitative component. The qualitative component was intended to illuminate the questions concerning why, how and what institutional processes are developed in the design-build project. The quantitative component was intended to illuminate how institutions relate to the performance of design-build projects. However, it turned out that gaining access to quantitative data (e.g., financial performance, number of errors and deficiencies, profit ratio, duration of project, owner satisfaction and more) of the design-build projects was difficult.

First, the project team members were reluctant to share information for fear of sharing what was perceived as confidential information. Second, the projects often weren't completed in practice even when officially completed, which means that performance developed and varied as the 'after-math' of the project gradually settled. Third, the quantitative data were social constructions made by the project organization to make the project appear to have finished on time or without deficiencies to avoid fiscal sanctions or to enable the release fiscal bonuses to the project team members. These were not cases of fraud, but rather juridical and normatively legitimized ways of manipulating project performance numbers. Therefore, these fabrications did more to add to the qualitative analysis of how institutions shape design-build project performance than to provide hard facts on project performance. Therefore, I consider the final research design a double qualitative study combined with a minor relative quantitative dimension.

Why study projects?

This research project builds on a multi-level study of seven design-build projects. The study of projects enables a detailed and empirically grounded analysis of coordination of design-build projects and thus enables a deeper understanding (Bryman, 2012, p.66) of the mutating constellations of institutions that characterise design-build projects.

To understand *why, what* and *how* certain institutions are developed on design-build projects, an in-depth ex-ante project study has been conducted. The ex-ante study provided the opportunity to collect *'naturally occurring data'* (Silverman, 2013, p.55) enabling a rich record of what an how institutions are developed and how and why actors make purposive efforts to coordinate projects.

To further understand *what* constellations of institutions characterise design-build projects and *how* these constellations of institutions relate to the project performance, five ex-post project studies have been conducted. The ex-post studies generated emerging patterns of potential relationships between constellations of institutions and project performance. However, as mentioned above, due to manufactured project performance data, comparing project performance was difficult and ambiguous at best. Nevertheless, and perhaps more importantly, the ex-post studies highlighted variation and similarities in meanings, normative conduct and rules across projects (Bryman, 2012).

Because this Ph.D. project was carried out as an industrial Ph.D. and my main work place was the contractor's head office, an informal ex-ante study of the contractor's organization was carried out. The informal ex-ante study of the contractor's organization enabled an understanding of *which* and *how* institutions travel from one project to another and from design to building phase. The study serves as a meta-analysis informing the ex-ante analysis of project 1 and the ex-post analyses of projects 2-6.

Quadri-hermeneutics

In order to gain insight into how coordination is enabled and constrained in design-build projects, and relates to project performance, this research project applies an interpretive sociology perspective (Alvesson & Sköldberg, 2009). The reflexive

interpretation perspective does not aim to reach '*the truth*' of a phenomenon (Alvesson & Sköldberg, 2009, p.101), which would be unfittingly reductionist for the purpose of describing the on-going negotiation of socially constructed meanings, norms, and rules that characterise design-build projects. Rather, the premise of reflexive interpretation is that all empirical material is context related. Because all empirical material in relation to its context is related, the researcher has to interpret the empirical materials and its context to gain insight and a deeper understanding of a particular phenomenon (Alvesson & Sköldberg, 2009).

'*Reflection'* refers to a particular systematic and critical method of interpreting the interpretations while, the term '*reflexive'* refers to a particular type of reflective research that involves reflecting on multiple levels (Alvesson & Sköldberg, 2009, p.7-10).

While these multiple levels can potentially be expanded or modified as appropriate relative to the research phenomenon in question, the term '*quadri-hermeneutics*' refers specifically to a variant of reflective interpretation that consists of four particular levels (Alvesson & Sköldberg, 2009, p.273). These four levels are summarised in the table below.

Level of interpretation	Focus	Theoretical inspiration
Interaction with empirical material	Accounts in interviews, observations of situations and other empirical material	Grounded theory
Interpretation	Underlying meanings	Hermeneutics
Critical interpretation	Ideology, power, social reproduction	Critical theory
Reflection on text production and language use	Own text, claims to authority, selectivity of the voices represented in the text	Post-modernism

Table 2. The table summarizes the four levels of interpretation in reflexive hermeneutics (adapted from Alvesson & Sköldberg, 2009, p.273). The first two levels concern interpretation of the empirical material and require the '*utmost awareness of the theoretical assumptions, the importance of language and pre-understanding'* (Alvesson & Sköldberg, 2009, p.8). The third and fourth levels concerns reflection of *'the person of the researcher, the relevant research community, society as a whole, intellectual and cultural traditions, and the central important, as well as problematic nature, of language and narrative in the research context'* (Alvesson & Sköldberg, 2009, p.8).

Reflexive interpretation & structure

Due to its social-constructivist orientation, Alvesson & Sköldberg's (2009) quadri-hermeneutic method is explicitly concerned with how to capture process. However, it is less explicit about how to capture process in relation to structure. Therefore, in order to understand how to analyse coordination processes in relation to social structures, the interpretive method is further informed by Pettigrew's (1986) work on organizational change.

In his seminal work 'The Awakening Giant' Pettigrew (1986) criticises previous studies on organizational change for neglecting the influence of the broader context in which the change processes occur. Pettigrew (1986) advocates that it is the structures

and contexts that give form, meaning and dynamic to change and that '*Change and continuity, process and structure, are inextricably linked'* (Pettigrew, 1986, p.1).

In fact, he suggests that organizational change can best be identified and studied against a background of structure of *relative* constancy (modified from Pettigrew, 1986, p.36). In Pettigrew's own words: '*The interest* [of the analysis] *is both catching reality in flight, and in embeddedness'* (Pettigrew, 1986, p.37).

Central to Pettigrew's analysis of organizational change, is the understanding that organizations are social phenomena developing in a continuous process that is linked to the historical, cultural and political context of the organization. Pettigrew (1986) suggests a research approach with a vertical multi-level dimension. The vertical multi-level dimension advocates interpreting the empirical material on the following levels: the actor, language, power relationships, social structures, and history. These levels are similar to the first three levels of Alvesson and Sköldberg's reflexive hermeneutics, however Pettigrew (1986) specifically advocates a focus on history and politics.

Pettigrew's research approach also includes a horizontal dimension, one that is concerned with capturing the process of organizational change. In practice, Pettigrew (1986) proposes conducting longitudinal ex-ante studies of events to describe past, present and future events for the purpose of capturing the change process. Specifically, Pettigrew (1986) advocates ex-ante studies in order to use the events to explain processes of language, interacting, acting, reacting, responding and adapting at the actor level and processes of emerging, elaborating, mobilising, continuing, changing, dissolving and transforming at the organizational level (Pettigrew, 1986).

Pettigrew (1986, p.1) acknowledges that the change process is '*untidy'* and recommends that the researcher look for '*continuity and change, patterns and idiosyncrasies, the actions of individuals and groups, the role of contexts and structures, and the processes of structuring'*.

Reflexive interpretation & institutional processes

The research questions presented in this research project aim to understand two different types of institutional processes: an incremental micro-process of coordination through an ex-ante study; and a longitudinal process across projects and from design and build to project performance through an ex-post study. In other words, the ex-ante and the ex-post study are intended to capture two different types of institutional processes. The ex-ante study is intended to provide insight and in-depth understanding of mundane efforts and incremental coordination processes.

Specifically in relation to institutional work (Lawrence et al., 2006) institutional change can be interpreted as a matter of interaction and structure developing through organizational micro-processes (Zilber, 2013). The ex-post study, on the other hand, is intended to understand the development of multiple institutions over the duration of the project in order to produce, what can be referred to as a *still life* of the design-build process in relation to project performance.

Suddaby and Greenwood (2009) review four methodological approaches to researching institutional change: multivariate analysis, interpretive, historical and dialectic approaches. While multivariate analysis assumes that institutions and organizations are relatively fixed and stable arrangements, interpretive, historical and dialectic approaches understand institutions as on-going processes of social interactions.

Although multivariate and the proccessual approaches appear to represent a methodological conflict, Suddaby and Greenwood (2009) recommend using a mix of methodologies:

> *'The notion that institutions are comprised, simultaneously, of content and process elements directs us, necessarily, to the notion that the use of multivariate methods must be complemented by an equal use of qualitative methods, particularly those that focus on the interpretations and categorization of events by the participants, when studying processes of institutional change.'* (Suddaby & Greenwood, 2009, p.189).

While interpretative methods are indeed common in research on institutional change (Suddaby & Greenwood, 2005) reviews of studies of institutional processes (Zilber, 2008; Suddaby & Greenwood, 2005) identify that a wide range of research methods are used: quantitative, qualitative, ethnographic, participant observation, longitudinal case studies, content analysis, symbolic interactionism, cultural framing analysis, social psychology, software-based, discourse oriented, sense-making, triangulation, and multi-level.

However, as Suddaby and Greenwood (2005, p.182) point out, *'the central idea spawned by interpretive assumptions is that institutional change is invariably accompanied by shifts in meaning, understanding, and values.'* With reference to Zilber's (2002) study of an Israeli rape crisis center, Suddaby and Greenwood (2005) highlight interpretive methods superior ability to give insight into highly complex and interwoven levels of analysis, for example, meaning and structure, and society and individual.

Similarly, for analyses in the context of institutional process specifically, Zilber (2008) calls for research methods that are increasingly sensitive to how meaning is created in action on a daily inter-actor level, yet understood as part of a greater physical, social and historical dynamic context. Specifically, Zilber (2008) suggests that researching institutional process requires a complex and sophisticated research design in which methods are combined to account for multiple organizational levels, multiple projects, constellations of multiple institutions and the on-going.

The emphasis on qualitative research advocated by scholars of institutional process aligns with Alvesson and Sköldberg's (2009) understanding of how to appropriately interact with the empirical materials in order to gain insight into a particular phenomenon. On the other hand, Alvesson and Sköldberg (2009, p.35) are very explicit about quantitative research: *'mostly boring, not to say tinder-dry statistical investigations'* while Suddaby and Greenwood (2005) suggest '*equal'* amounts of quantitative and qualitative methods. However, Suddaby and Greenwood (2005) do highlight that quantitative methods were mostly used in neo-institutional studies concerned with organizational isomorphism (Suddaby & Greenwood, 2005) and go on to point out, that interpretive methods are particularly useful to illuminate different institutional processes at different levels of analysis.

Furthermore, interpretive research methods that draw on phenomenologists such as Berger and Luckmann (1966), are distinctly subjective in focus and therefore suitable for understanding how social roles, routines, and patterns of interaction, become typified so as to appear as an objective reality (Suddaby & Greenwood, 2009). This sits well with Alvesson and Sköldberg's (2009) first two levels, the double-

hermeneutics, which are concerned with '*interpreting interpretive beings'* (Alvesson & Sköldberg, 2009, p.174).

Also, in alignment with Pettigrew (1986), longitudinal methods are recommended in studies of institutional processes. Suddaby and Greenwood (2009, p.183) advocate using a historical approach that enables the understanding of institutions and organizations *'as the outcome of complex phenomena in which multiple causes interact'*. Also, the historical approach is distinctly processual and enables the researcher to construct path dependency (Suddaby & Greenwood, 2009, p.183), which is useful for understanding how coordination in the design-build process relates to project performance. Also, the historical approach enables an understanding of how current projects interact with past and future projects.

With a historical approach, organizations and institutions are not interpreted to be stable entities but rather historically contingent and temporary. In practice, historical methods suggest to arrange processes into phases defined as '*relatively distinct and coherent clusters of activity, temporally bracketed, and organized around common themes'* (Suddaby & Greenwood, 2009, p.184). Arranging the process into distinct phases is useful to understand the history of the building projects subject to analysis in this research project. The design-build projects are each relatively distinct temporally bracketed processes. Also, each project is divided into distinct phases (typically project conception, early design, basic design, detailed design, construction, commissioning, hand-off and so on).

However, Suddaby and Greenwood's (2009) variant of historical analysis is a retrospective analysis that focuses on collecting data of past events. This type of analysis sits well with an understanding of institutions being relatively stable and undergoing transformational change to eventually regain some level of stability. In that respect, the historical approach doesn't enable insights into on-going incremental change processes at the organizational level as collective narratives may sway actors' anecdotes. Also, project team members may not be able to accurately remember and account for interactions retrospectively (Pettigrew, 1986). Instead, the historical approach enables a post-rationalised account of a past process. This of course poses the risk of misrepresenting the timing and content of events. However, the ex-post study does enable a characteristic of the design-build process that can be illustrated as a still life of constellations of institutions.

The process of interpretation

The term reflexive interpretation indicates an open play of reflection across the four levels of interpretation (Alvesson & Sköldberg, 2009, p.283). According to Alvesson and Sköldberg (2009) the hermeneutic process is conducted through abduction. Abduction describes an iterative working process in which the researcher moves freely between the empirical text and the four different levels of reflective interpretation.

The abductive process is particularly useful in order to develop insight, because it does not, as opposed to deduction and induction, seek to verify a stated truth or experience, but rather seeks to develop a picture of a potential pattern in a particular social context by letting the process itself assist to expand on and reveal that very pattern (Dubois & Gadde, 2002; Alvesson & Sköldberg, 2009). Thus, abduction is a useful method for understanding patterns in phenomena characterised by complexity (Alvesson & Sköldberg, 2009).

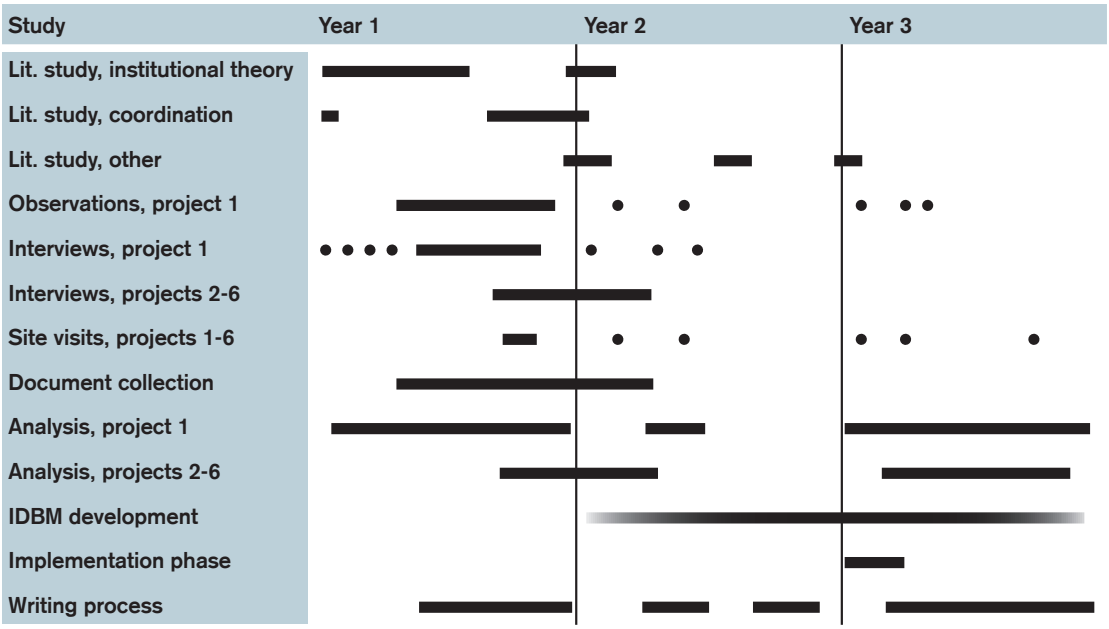


Figure 1. The figure summarizes the research process over the course of the Ph.D. study from June 2013 until June 2016. The figure illustrates that multiple research elements were overlapping in order to allow for an iterative process as per abduction.

The literature reviews on coordination and institutional theory were conducted and prioritised in the beginning of this research project. However, the literature review continued throughout the research process alongside gathering and analysing empirical material and later alongside the development of the IDBM concept. The literature continued to provide new insights to the empirical material and resulted in reconsideration of *how* the empirical material was conducted and *what* the empirical material was aimed at. Equally, the empirical material highlighted topics that required further theoretical knowledge, thus requiring revisiting the literature, which then in return directed the analysis of the empirical material further.

The abductive method also enabled moving between the analysis of design-build projects and the development of the IDBM concept. Once the first draft of the analysis was completed it was very encompassing. From this first draft of the analysis the development of the IDBM concept was begun and at first the concept addressed almost every problem identified during the analyses. However, certain parts of the IDBM concept stood out as being more insightful and original than others. Focussing on these particularly insightful and original parts in turn helped to direct and sharpen the analyses, which again further refined the IDBM concept.

Alvesson and Sköldberg's (2009) quadri-hermeneutic method presupposes that the researcher has an extended repertoire of theories, and historical and political references readily available to use in an intuitive interpretive process.

However, Dubois and Gadde (2002) offer a somewhat more pragmatic approach to abduction and they propose that the researcher systematically moves between the empirical world and a particular theoretical framework. This variant of abduction is also iterative in order to manage the interrelatedness of the various elements in research work (Dubois & Gadde, 2002).

Dubois and Gadde's (2002) abductive model is perhaps less sophisticated than Alvesson and Sköldberg's (2009) since it only involves one level of interpretation

(the theoretical one). However, Dubois and Gadde's (2002) abductive model does enable a focus on a specific theoretical perspective (e.g. institutional work), while also allowing the researcher to be sensitive to context. To that end, Dubois and Gadde's (2002) version of abduction explicitly calls for a tight and evolving theoretical framework. On the other hand, Alvesson and Sköldberg (2009) specifically advocate using multiple theories to broaden reflection and caution against totalizing any one theory. For this research project it has been my ambition to conduct relatively sophisticated multi-level interpretations and reflections. However, due to my modest research experience, Dubois and Gadde's (2002) model did create a pragmatic starting point when I first set out to work with sociological theories in an interpretive and reflexive manner.

Literature study

Three literature reviews were conducted in order to review the main theoretical ideas relating to the research phenomenon in question (Hart, 2009; Bryman, 2012). More specifically the literature studies informed and guided the empirical studies; enabled identification of gaps in the literature; and, enabled the identification of relationships between theoretical concepts and design-build projects.

The three literature reviews included: first, a systematic literature review on institutional theory, more specifically institutional work, was conducted in order to provide the grand theoretical framework for this project; secondly, a selective literature review on *coordination* was conducted in order to provide the mid-range theoretical framework; and finally a selective literature study was conducted on collaborative project delivery and process methods.

Selecting grand theory

Three theories were reviewed for their ability to describe the relationship between agency, structure, and process: institutional theory (Scott, 2008), actor-network-theory [ANT] (Latour, 1987; Callon & Latour, 1981), and structuration theory (Stones, 2005). Based on prior experience from the design-build field, members of project organizations, in general, were interpreted to be reflective about how and why coordinating their daily work is constrained and would attempt, to varying degree, to improve projects based on past experience. In other words, the theory was required to handle and inform somewhat reflective agency. While members of the project organization (inter-)acted to increase collaboration and improve project performance, Kadefors (1995) points out how projects vary little in process and outcome because projects follow well-established social structures. Thus, the theory also needed to handle and inform structure. Therefore, institutional theory and in particular current vibrant research on institutional work was interpreted to be useful due to its ability to describe a balanced, yet dynamic, relationship between structure and agency in contemporary organizations as well as being process oriented (Zilber, 2008). Furthermore, structuration theory was deselected due to its emphasis of knowledgeable agency not offering a framework for understanding how less knowledgeable actors may change structures. Similarly, ANT was deselected due to its emphasis on process and lack of ability to capture structure. Therefore, institutional theory was selected as a framework for this research project.

As mentioned above, the quadri-hermeneutic approach advocates using multi-theoretical positions (Alvesson & Sköldberg, 2009). However, because institutional theory is currently developing widely and rapidly, eventually it became necessary to narrow down the breadth of the theory in order to sharpen the analysis. For example, institutional logics (Thornton et al., 2012) and institutional scholars who incise their work with other theories such as sociology from a French context (Boxenbaum, 2014), pratice-oriented approaches (Jarzabkowski et al, 2012), cognitive psychology (Battilana & D'Aunno, 2009), just to name a few, were gradually deselected because they did not explicitly assist in the answering the research questions.

Selecting mid-range topics

Additional selective literature studies were done on coordination, leadership and management, project management, project performance and collaborative project delivery and process methods. However, all of these, except coordination and collaborative project delivery and process methods, were gradually dismissed as they didn't explicitly contribute to understanding coordination and project performance as mutating constellations of institutions.

The research topics for the midrange theory were based on a number of themes relating directly to the research questions (Hart, 2009; Alvesson and Sköldberg, 2009). Initially, ten themes were identified. However, as the empirical research progressed and, for example, collaboration and project performance were defined inductively, the ten themes were gradually reduced to one that seemed particularly relevant: coordination.

The Literature Review Process

Since the literature review process was not just about accumulating as much knowledge as possible, but rather a means of gaining theoretical perspective to better understand the empirical material, the literature was revisited on several occasions.

Initially, I selected literature from the formal project description reference list, a list produced by my supervisors at MTH and Chalmers. From this point of departure I used a snowballing approach (Bryman, 2012) combined with systematic literature searches in digital databases in order to identify relevant literature and to identify significant authors. First, the literature was skimmed for relevance and in order for the overall theoretically ideas to manifest themselves intellectually. Subsequently, detailed readings were conducted on the literature considered to be of particular value to the understanding of the empirical material.

For example, in Q1 of 2015 I conducted a literature study on collaborative project delivery and process methods. Because I was already familiar with many of the collaborative methods from my previous work experience I did a selective literature study combined with snowballing (Bryman, 2012).

For the review of literature on institutional theory I carried out systematic searches in leading digital article databases such as: Abi Inform, Science Direct, Scopus, and Google Scholar. For example, on August 3, 2013 I carried out a search on Abi Inform by searching for 'institutional theory' and received a staggering 191017 hits. Narrowing it down to articles released in the last three years resulted in an equally staggering 42175 hits. At this point in time I was not prepared to exclude any

literature on institutional theory based on specific criteria, because in keeping with the narrative spirit, I didn't want to risk not finding that particular interesting piece of literature. Therefore, instead I sought out key pieces of literature in institutional theory based on the snow balling method and this resulted in a very focussed reading of five books, which then further directed my attention towards relevant articles. This meant that by December 18, 2013 I was able to conduct a much narrower search on 'institutional logics' + 'design-build' in the Abi Inform database. This resulted in only 18 hits.

Six months into this research project I had collected 279 relevant pieces of literature in the format of either scholarly articles or published books. For quality assurance purposes only peer-reviewed articles were used. Also, I focused my searches on the most recent literature working backwards in time in order to capture contemporary literature and then let that guide me back in time to find key pieces of historical literature. Scott (2004) was an exception that I identified early in the process.

For the topic of coordination a selective literature review was carried out, with Mintzberg (2009) as a central starting point. Other pieces of literature were recommended by my supervisors and found through a literature search and snowballing. The literature search mostly provided literature adopting a functionalist perspective on coordination, while the snowballing method was useful for finding pieces of literature with a relational perspective. Finally, the literature on project management also contributed with articles on coordination (often overlapping with the concept of collaboration).

A literature study was also conducted on project performance. While numerous articles were found on static project performance based on quantitative methods, I found no contributions that informed project performance from a social, let alone institutional works or institutional processes, perspective. Also, at the European Group of Organization Studies [EGOS] conference 2014, during a panel discussion in a stream particularly focussed on institutional processes, a strong call for scholars to begin linking research on institutional processes and organization performance was made. Therefore I turned to literature on collaborative project delivery methods, in particularly integrated project delivery (AIA, 2007) where project performance is discussed partly as a qualitative phenomenon. Also, I reviewed selected literature on key performance indicators to try and define project performance. This literature combined a qualitative and quantitative understanding of project performance.

Empirical research

Selecting projects

The ex-ante project was the first to be selected and was chosen because it was on going in June 2013, when this research project began and allowed for immediate collection of empirical data. Furthermore, the project was approaching the end of the basic design phase and thus provided an opportunity to observe the development and potential institutional change from design to construction phase.

Also, the project was a representative or *typical case* (Bryman, 2012) of the design-build projects that MTH carry out. In that respect, it was considered possible

to capture the circumstances and conditions of everyday situations and thus exemplify design-build projects more generally (Bryman, 2012, p.70). Ultimately, it would have been difficult to predict which design-build project at MTH over the course of the following three years would develop into a particularly interesting case study. In that sense, one has no real choice but an opportunity to observe a small section of a project for a period of time and assume that this particular project and period of time will be as interesting and fruitful as any other.

The ex-post projects were selected six months into this research project. The first step in selecting a number of projects for the ex-post analysis consisted of a search in the contractor's project portfolio database and resulted in no less than a total of 3341 design-build projects. The second step therefore was to determine a set of selection criteria. Guided by an increasing insight into the contractor's project portfolio and the ex-ante project that I was already observing.

1. The project must be carried out under a design-build contract.
2. The project must have a contract target cost of 25 million Dkr. or more, to represent a sufficiently complex project.
3. The project must be completed no later than by May 1st, 2014 in order to be able to generate data on project performance in time for the analysis.
4. The project must have been completed no earlier than January 1st, 2009, in order to increase the chances that project members can still remember details about the process and to avoid the risk of severe after-rationalisation (Pettigrew, 1986).
5. The project must concern only new build as this typically results in newly formed project teams, project contracts, and no pre-build structure that may pre-impose certain logics.
6. The project must not concern the construction of infrastructure or agricultural buildings as these are considered less complex due to their mostly functional requirements.
7. The project must be located in Denmark to ensure that projects are carried out in a similar field and societal context.

The list of criteria reflects a desire to find a relatively homogenous group of projects, or matching organizations (Pettigrew et al., 2001), that resembled the ex-ante project in terms of complexity and project cost in order to be able to join the two analyses at a later point in time: one analysis that informs across design-build projects and across projects in relation to project performance and one analysis that informs coordination in depth.

In retrospect criteria five may have been unnecessary, since through my daily interaction with the contractor's organization I interpreted renovation projects to be faced with similar institutional complexities as new build projects. Also, at one point I considered including projects located outside of Denmark as the ethnographic study showed that international projects are perceived to face many of the same problems and successes as projects located in Denmark. However, after having analysed a project located in Norway, I discarded international projects altogether to avoid engaging in a discussion on difference in institutional context.

Based on the seven criteria a systematic de-selection of projects was conducted. This reduced the number of qualifying projects to 138. Due to considerations regarding

available time-related resources and the breadth of the analysis, around five projects was considered a suitable number. Ultimately, I met with one of the division directors to get his perception of what had characterized the process for the projects, as well as how he remembered the projects had performed. Some projects he simply didn't remember, while others he could speak of in what I perceived to be great detail. Some projects he recommended I look into and others that I refrained from studying. As I was interested in projects that had performed differently, I wasn't particularly looking for projects that had been institutionalised as either successful or unsuccessful. In the end I narrowed it down to five projects: Projects 2, 3, 4, 5, and 6. These five projects represented a mix of projects that had been perceived as highly successful, highly unsuccessful and some that were barely perceived at all.

Generating empirical material

Different methods for collecting empirical material were used for the ex-ante and ex-post analyses, respectively. While the different methods were distinctly applied to the ex-ante and ex-post projects respectively, references to projects 2-6 made during interviews and observations from project 1 helped me understand how institutional debris travelled across projects. In the following, I'll describe in detail the process of generating the empirical material.

Participant observations on the ex-ante project

Since institutional work concerns mundane micro-organizational processes, participant observation was chosen in order to gain insight into the emerging processes of coordination. To avoid rationalised or normative narratives about coordination (Pettigrew, 1986) participant observation (Bryman, 2012) was used as the primary collection method for the ex-ante study and involved observations of the project team during formally organised meetings and informal interaction in the co-located project office. These six months represented the entire detailed design phase and the transition to the building process. While six months hardly represented a historical or longitudinal analysis in relation to the duration of design-build projects, six months was considered long enough to provide insight to the process of coordination work in the project team, similar to Pettigrew's (1986) proposed longitudinal studies. On an ad hoc basis I also observed inter-organizational project review meetings and contractor's coordination meetings. Further, I observed a combined two weeks of informal interaction in the project office. This also included interacting over informal lunches with the team. I also did follow-up observations during the building phase to understand what problems and successes had developed since the initial observations during the design process and early building process. This helped me understand how meanings, norms and interactions developed and changed over the course of the project. In other words, it helped me avoid decontextualizing (e.g. not seeing the design phase in isolation, but rather in relation to the build phase) and deprocessualizing (e.g. not producing a temporal snapshot of the project) of the analysis (Pettigrew, 1986). Observations were audio recorded and photographed. I also wrote rich field notes as I observed and completed the notes in the evening following a day's observations to prevent details fading from my memory over time. During the observations, I took care not to interrupt, interfere or add my opinions to whatever was being discussed. I wanted the events to '*naturally*' evolve

(Silverman, 2013) as it allowed me to observe instances of institutional efforts unfolding in the process (Lawrence et al., 2009).

Interviewing project team members, project 1

In order to get a better understanding of the early project development and design process preceding my observations of project 1 I conducted 29 interviews during the spring of 2014. I also did follow-up interviews in August and September 2014 and August 2015 to understand how the project had developed since the initial round of interviews. While interviews do pose a risk of significant after-rationalization (Pettigrew, 1986) and for collective meanings to have formed a particular narrative (Zilber, 2002) about the project, they do on the other hand allow for the interviewee to have done a series of reflections about the project (Bryman, 2012). Also, contending that actors are indeed carriers of institutions (Zilber, 2002), then interviews present an opportunity to ask questions and receive answers that highlight what institutions particular actors adhere to and why.

The selection of interviewees was based on theoretical sampling (Bryman, 2012) followed by snowballing (Bryman, 2012). The interviewees included project and design managers representing the owner, engineering consultants, architects, contractor, as well as, BIM coordinators, contract managers, owner's consultant, and contractor's process managers. Only the owner's client did not wish to participate. This group represented a relatively broad group and was intended to give insights into constrained and enabled coordination such as experienced by project team members representing different professions and organizational levels (Alvesson & Sköldberg, 2009).

Firstly, interviews provided insight into what dominating discourses were reflected in subjective positions at the individual level (Alvesson & Sköldberg, 2009). These discourses reflect the institutions that individuals adhere to at the organizational level and reflect institutional logics at the field level and societal level (Thornton et al., 2012).

Greenwood et al. (2002) and Suddaby and Greenwood (2005), point to the importance of understanding how actors use rhetoric as a way of demonstrating adherence to particular institutions. According to Alvesson and Sköldberg (2009, p.27) language is a particular important means for legitimization of institutions as it enables '*collective sedimentation of knowledge*'. Thus, paying attention to the way linguistic, social, historical, politics and theoretical elements are woven together (Alvesson & Sköldberg, 2009) is inherently part of interpretive research on institutions.

Therefore, interviewing on different levels provided a deeper understanding of actors' values and interests that affected the negotiation of the institutional order of the project.

During each interview an event map was developed on an A3 roll of paper with the interviewee. The maps resembled Pettigrew's (1986) proposed longitudinal study of events, albeit in retrospect, and became a detailed document containing what the interviewee perceived as important. The map itself facilitated the memory of the interviewee and helped me understand what had occurred in the process leading up to my observations. For the ex-ante study this allowed for a greater contextual understanding of the interactions I observed (Pettigrew et al, 2001). These interviews were typically two hours long and characterised as a combination of workshop, oral history interview (Bryman, 2012) and open-ended interview (Silverman, 2006).

During all these interviews I did my best to actively listen, curiously ask questions and not be judgemental. On the latter issue, for example, I did not explicitly disagree or agree with my interviewees, because I didn't want to emphasise any sort of illegitimacy or legitimacy regarding their stories. This might have made them overemphasise descriptions of particular behaviours or make them modify their anecdotes (Kvale, 1996). This of course is difficult, especially when also trying to build trust and comfort in the interview situation. According to Silverman (2013) even the slightest nod (or lack thereof) or sound, such as a 'hmm' or 'hmm hmm' is a judgement of another person's statement.

All interviews were audio recorded and fully transcribed in order to assist my memory in the upcoming analysis process and to more thoroughly examine people's answers.

Interviewing project team members, projects 2-6

The same interview setup was used for the interviews conducted for projects 2-6. First, an interview with the contractor's project manager was conducted to get an initial understanding of the project and project context. Subsequently, I interviewed the architect's project manager, the engineer's project manager, the owner's project manager and the contractor's design manager. These interviews represented a combination of semi-structured and open-ended interviews. The combination of interview styles allowed me to drill into events of particular interest, yet enabled the interviewee to give rich descriptions of events they found of particular interest. The interviews also enabled me to add events to the process map I had originally made with the project manager and highlight any potential discrepancies between narratives. The process event maps generated during these interviews covered the time from project conception to issues regarding facility management and end-user experiences. Two interviewees were unable to participate and some project members had participated on two of the five ex-post cases, which resulted in only 17 interviews instead of 25. In those cases, where project team members had been involved with more than one project, I only conducted one long interview where two or even three projects were discussed. I tried to keep the project team members focussed on elaborating one project at a time, however, discussing two projects in a row meant that project team members would often compare or contrast the two projects. As a result, projects were, perhaps unjustly, made to be either more similar or different than would have been the case, had I conducted separate interviews for each project.

Collecting documents

The interviews and observations were supported by the collection of documents. Documents for each project were retrieved from the contractor's project database, from administrative staff in the contractor's organization, the contractor's intranet, public websites, field-related journals and from the interviewees. The documents consisted of e-mails, reports, contracts, articles, agreements, professional standards, photos, drawings, BIM-models, and meeting minutes. The documents were considered naturally occurring data (Silverman, 2013) and enabled an insight into the norm for project communication and how meanings were reproduced within and outside the project organization. In the context of institutional processes, documents were interpreted to be useful because actors *actively construct the seeable and the sayable by specifying what will be documented and what will be ignored* (Zilber, 2008, p.158).

Informal ethnographic study of the design-build organization

Although the dissertation does not present a separate analysis of the contractor's organization, an unstructured analysis was conducted of the contractor's organization and serves as a meta-analysis for the studied projects. The unstructured analysis used a combination of three research methods: hermeneutic ethnography (Alvesson & Sköldberg, 2009), interviews and documents. The ethnographic method resembled auto-ethnographic research as the contractor's head-quarters became my main work place throughout the research project and my understanding of the organization grew out of participating in regular VDC/BIM-department meetings, regularly communicating my research to the members of the organization outside of the VDC & BIM department, and interacting with colleagues on a daily basis.

More formally, I had six meetings with the CEO. The first meeting was a formal audio-recorded interview but gradually these meetings became less formal and resembled work meetings and conversation between two colleagues. These meetings provided insight into what institutional work was being done in the organization and what meanings were underpinning the institutional work. Also, conversations with the CEO allowed me to understand how current problems and successes at the project level and issues dominating the discourse in the field and wider society affected the institutional work of the contractor's organization.

Site visits to the completed & occupied buildings

In order to understand project performance, I also visited each of the buildings and was either given a guided tour by those I interviewed or conducted an informal nose-around. The site visits, in conjunction with the interviews, gave me an opportunity to understand how the constellation of institutions was reflected in the buildings. These site visits occurred before, during and after the interviews.

Interpreting empirical material

The empirical material was analysed through interpretation. The interpretive research approach emphasises intuition as a means to acquire insight and knowledge, and Alvesson and Sköldberg describe the process like this:

> *'This* [knowledge] *is achieved, not by laborious pondering, but rather at a stroke, whereby patterns in complex wholes are illuminated by a kind of mental flashlight, giving immediate and complete overview. Knowledge is then often experienced as self-evident.'* (Alvesson & Sköldberg, 2009, p.91)

The intuitive process was an on-going process occurring while conducting observations, interviewing, reading documents, writing up the analysis, reading the literature, and even while sleeping.

Similarly, the writing process was an integral part of the interpretation process. While insights did appear as glimpses during observations and interviews as well as when reading transcribed interviews and field notes, the writing process enabled me to connect (and disconnect) all these mental flashlights in multiple ways to try and create a coherent story, put these glimpses into a broader context, and find patterns that would reveal the institutional process of coordination. Apart from on-going writing of preliminary chapters of the dissertation, in January 2014 I wrote an article for the EGOS conference specifically concerning institutional logics in design-build

projects based on the ex-ante study of project 1 (Urup, 2014). Also, in the spring and summer of 2014 I wrote an article on coordination, inspired by both the ex-ante studies and the ex-post studies (Urup & Koch, 2014).

Intuition was the only explicit analysis method used. However, as I worked with the empirical material, I discovered, that the words '*one*' [in Danish: *man*] was used by project team members when they were describing broader norms that *one* in general had to adhere to. Similarly, the phrases '*after all*' or '*of course*' [in Danish: *jo*] was used to describe phenomena or actions that were taken-for-granted. The following quote illustrates an example of the use of the phrase '*after all*':

> *'Well, they wouldn't do* [what they had been asked to do] *because I didn't have the authority to say it. But I had the authority to ask the design manager to say it, because he is the one who has to say it, he is the manager of the detailed design, after all. He had to say it, but he couldn't say it of course, because he didn't have the authority over the guy he had to say it too, after all.'* [Contractor's design manager.]

The quote illustrates that the contractor's design manager perceived a particular phenomena, in this case the formal organization hierarchy, to be an overarching structure determining legitimate communication patterns among project team members. For example, only a particular type of manager is able to and expected to say certain things illustrated by the use of '*after all'* and '*of course'*.

Understanding how institutional process affects coordination, Project 1

For the specific purpose of gaining insight into how institutional processes respectively enable and constrain coordination, I interpreted my observations and interviews for Project 1. I found that the interpretation process was indeed one of mental flashlights and in order to capture these flashes I wrote down rich notes on my reflections within hours of conducting observations and completing interviews.

The interpretations for the analysis of project 1 did not require an additional structured analysis and appeared entirely intuitively. To begin with the analysis included insights on institutional work and institutional logics, however, in order to narrow down the scope of the analysis, I gradually refined the scope of institutional theory to only include institutional work. The theory on institutional work had provided me with three key themes (Alvesson & Sköldberg, 2009, p.285), that guided my interpretations: episodes of constrained and enabled coordination; interaction and purposeful efforts aimed at changing or maintaining meanings, norms and rules; and, taken-for-granted meanings, norms and rules, (Lawrence et al., 2009). Specifically, I re-read transcribed interviews and field notes from observations and was interpreting how actors, when interacting in the project, simultaneously negotiating and justifying their perceptions and way of conducting everyday work. This provided insight into what meanings were being produced and how these meanings interacted and shaped the process of coordinating the project.

This was indeed a muddled process, in particular for two reasons: first, interpreting what actually constituted an institution was challenging; second, interpreting three different institutional phenomena at the same time (institutions, constellations of institutions and institutional work) was also challenging.

First, defining what constitutes an institution was challenging because it required catching stability in process (Pettigrew, 1986) and because different theoretical definitions of an institution lead to different results. Specifically, Scott's (2008)

definition required that the institution had only one meaning, few norms, and potentially several regulations and would be able to reproduce itself over time. However, with such a deterministic definition, only the design-build project itself overall represented an institution. While the design-build project may indeed represent an institution, it was not conducive to understanding the process of coordination. Similarly, following a true institutional works definition of an institution (Lawrence & Suddaby, 2006) my focus would be attuned to established procedures and either meanings, norms or rules. With such an open definition of an institution, everything that I observed became an institution. At one point during the analysis process I had at least twenty different institutions representing multiple levels. For example, institutions included: the design-build norm of formally planning the design process according to the linear phase model; the normative understanding that late project changes are unavoidable; the societal understanding the buildings of the 21st century represent particular technological standards and architectural values; and the rule of sanctioning deadlines, just to mention a few. With such an encompassing definition of an institution, it became difficult to understand how they all related to each other and how they mutated over time. Also, and very importantly, it became difficult to understand how these institutions were specific to design-build project and not representative of projects in the construction field in general.

As a result, a meaning-oriented definition of an institution was the most fruitful in order to try and establish the taken-for-grantedness of shared understandings that were, after all, interpreted to be found in the empirical material to specifically concern design-build projects. The meaning-oriented definition of an institution allowed me to operate with a manageable number of institutions (eight) where the interpretation of the relationships among, and institutional work associated with, these eight institutions appeared intuitively *right*.

The second issue pertains to interpreting stability in process (Pettigrew, 1986). Other scholars concerned with institutional process, for example, Thornton et al. (2012) (e.g. blending of institutions), Gestel and Hillebrand (2011) (e.g. negative choice and deliberate ambiguity), and Goodrick and Reay (2011) (e.g. constellations of institutions) studied institutional process within the overarching structures of societal level logics. Other scholars, interested in the micro-institutional-process at the organizational level, for example Smets and Jarzabkowski (2013) analysed institutional work from an entirely processual perspective without clearly defining the stabilised elements of the two organizations they studied. For this research project, I have chosen to combine the methods of describing process (i.e. mutating constellations of institutions), micro-processes pertaining to the process of mutating constellations of institutions (i.e. institutional work), *and* the stabilised elements (i.e. institutions). The institutional process of the mutating constellation of institutions is analysed in order to understand *how* the process of coordination develops. Similarly, institutional work is analysed to understand *why* the constellation develops as it does, however, at the micro-level. Nevertheless, in accordance with Pettigrew's (1986) point, that organizational change can best be identified and studied against a background of structure, I perceived it to be necessary to at least attempt to explain *what* it is that develops, *what* it is that relates, and *what* it is that is being worked on. First of all, when looking across all six projects, it was interpreted that stabilised shared meanings did develop, while the relationship between the institutions developed over the course of the project. Furthermore, defining individual institutions enabled me to better inform the processual analysis, inform the relationship between projects 1-6, and finally, to be able to develop a proposal for an integrated design-

build concept. To the latter point, specifically, in the context of this being an industrial Ph.D., identifying the stabilised elements was fruitful in order to, for example, enable project managers and the contractor's organization, to understand more specifically, *what* it is that potentially conflicts, blends or co-exists peacefully and *what* it is they have to work on. To elaborate, the processual analysis presented in this research project was found to fully engage project team members because it spoke directly to the frustrations that they deal with on a daily basis. However, the processual analysis also left project team members with the perception that evaluating every everyday situation as a potential opportunity for institutional work was an overwhelming expectation. In other words, the identification of institutions increased a practice-oriented application of this research project.

Understanding constellations of institutions & project performance, Projects 2-6

For the purpose of understanding how constellations of institutions relate to project performance and compare across projects, I also interpreted the empirical material for projects 2-6 intuitively to begin with. However, while, in my experience, these flashes of light did produce immediate, complete and clear overview as described by Alvesson and Sköldberg (2009) I found that I was struggling to maintain the clear overview once I had experienced numerous flashes across projects. In other words, as the material grew richer, combining these countless flashes in to *a pattern-finding process of 'generalising within* [and across] *cases'* (Alvesson & Sköldberg, 2009, p.129) in order to produce a coherent and focussed analysis was difficult. Therefore, I used a structured analysis method to support my many ad hoc interpretations.

First, I interpreted what structures appeared in the projects and how they affected efforts towards coordinating the particular project. I repeated that process in reverse: identified episodes of constrained or enabled coordination, which highlighted what structures were being produced in the projects. However, this prevented me from understanding how the constellation of institutions developed over the course of the project and also resulted in an overwhelming amount of insight.

Then, instead, I returned to the event maps, which enabled me to understand how each constellation of institutions had developed from project conception to occupancy. However, this method also resulted in an overwhelming amount of detail that made it difficult to compare insights across projects.

In both attempts I nearly drowned in my empirical material. A truly inductive analysis approach was clearly useful for generating a deep understanding of particular dimensions of the cases, but prevented me from generating patterns across time and projects. As per the abductive method, and for fear of drowning a third time and never resurfacing, I returned to the literature.

My third review of the literature on institutional work inspired me to narrow down the scope of my analysis to focus on the mundane efforts of organizations and individuals in order to better understand the broader patterns of changing constellations of institutions that I was interpreting (Lawrence et al., 2009).

Also, early on I had developed an understanding of coordination as an institutional work process and the ex-post research design simply did not enable me to create insight into the coordination process in projects 2-6. Specifically, while interviewees would talk about how they coordinated, I interpreted their anecdotes to reflect normative perceptions of how project teams coordinate. For example, interviewees often perceived the project office to increase communication and make people more polite to each other. However, concrete examples of how it had actually enabled

either technical or social coordination were not found. As a result, the analysis on coordination processes gradually dissolved from projects 2-6 and the analysis became focussed on constellations of institutions as still lifes and project performance.

As a result, in the end, and after at least five iterations between the empirical and the theoretical material, I was able to refine and combine the event maps and the analysis of institutions to gradually create a characteristic or still life of the constellation of institutions of each project. These still lifes enabled me to find emerging patterns across all five projects and between design-build processes and project performance.

Understanding and evaluating project performance, Projects 2-6

The analysis of project performance for projects 2-6 was intended to be static and quantitative. However, as mentioned previously, project performance was interpreted to be a processual phenomenon as well as predominantly qualitative, more specifically, a fabricated combination of norms, perceptions, and values. As mentioned previously, my literature search on institutional theory and organizational performance provided no literature to start with.

As a result, for a long time I struggled to define project performance: whatever definition I developed it appeared to be a compromise unfitting for the empirical material.

For example, re-work on the building site is normatively perceived as an indicator of poor performance since it means that parties weren't able to coordinate the design project or plan the building process efficiently. Also, any type of rework results in fee erosion for the involved parties and thus directly impacts each party's final profit. However, projects 2-6 all illustrated that the project teams were able to adapt and deliver buildings that fulfilled project requirements despite having to do degrees of rework. In that respect, rework on site was an ambiguous performance criterion.

Similarly, at one point I had included the number of lawsuits as performance criteria too. While the presence of lawsuits is not normatively considered an indicator of low project performance, it does however indicate, that the project team was unable to resolve disagreements during the design or build process. However, the absence of arbitration cases may not either necessarily indicate the project teams ability to coordinate their work, but may also be a result of everyone being willing to accept fee erosion during the project, rather than start a lawsuit. Often, compiling material from a long and complex process in order to provide evidence of who is guilty of delaying the design process was described by interviewees as time consuming at best, and an impossible task at worst. Therefore, the number of lawsuits was also a most ambiguous performance criterion too.

As I conducted site visits to the projects, the buildings themselves also contributed to shaping my understanding of project performance. For example, the choice of materials was interpreted to reflect whether functionality, economy or aesthetics dominated or had been integrated. Similarly, for example, sophisticated water collection systems integrated into park facilities were interpreted to reflect integration amongst landscaping and sustainability.

In the end during one of the final iterations on the analysis of projects 2-6, I decided to discard the literature and the idea of categorising the ex-post projects into high and low performing. Partly due to the aforementioned limitations of the literature and partly due to the relatively clear manifestations of institutions in the final building, I defined project performance as an institutional concept instead (Lawrence et al., 2009). As a result, the method by which I defined project performance arguably

deviates from the systematic method that I have used otherwise. On the other hand, the institutional definition of project performance that this dissertation offers is indeed a result of abduction and can be considered a contribution too.

Developing an integrated design-build management concept

In addition to interpretively analysing and discussing existing design-build projects, this research project also aims to develop a new integrated design-build management concept. The IDBM concept offers a method by which actors can attempt to change their institutional environment at the organizational and field level. Theory on institutional work and processes (Lawrence et al., 2009; and others), would understand proposing methods purposefully aimed at enabling institutional change (such as the IDBM concept) a fitting addition to the analysis of current institutions in design-build projects. Similarly, Alvesson and Sköldberg's reflexive hermeneutics is specifically concerned with critical theory, and thus, a central consideration to Alvesson and Sköldberg is how agents can contribute to organizational and societal change (Alvesson & Willmott, 2006). Alvesson and Willmott (2006) are primarily concerned with '*(micro-)emancipatory transformation'*, which, in the context of institutional theory, is a contradiction in terms. However, institutional work, is specifically concerned with, not emancipation, but at least reflective, purposeful, and savvy navigation of a particular institutional order. Similarly, the IDBM concept does not propose a method for enabling emancipation. However, it does propose increased awareness, reflectivity and purposeful shaping of the institutions and constellations of institutions enabling and constraining project coordination and performance.

Suggesting new meanings, norms, rules & interaction

The IDBM concept contains a number of suggestions for new meanings, norms (and rules) as well as institutional work to create, diffuse and maintain these new meanings and norms at the organizational and field level. The concept was created in two ways: by intuition where ideas appeared like glimpses of insight (Alvesson & Sköldberg, 2009) through an on-going intuitive interpretation process; and by structured interpretation. Structured interpretation was conducted in four steps: first, findings from the analysis of projects 1-6 informed the concept; second, literature on collaborative project delivery and process methods informed the concept; third, feedback from project experts; and fourth, creating a synthesis between the three previous steps.

To elaborate, the first step of developing the concept was directly informed by the analysis of projects 1-6. The observations and interviews provided numerous examples of events and efforts that I interpreted to have enabled coordination of the projects. Then the underpinning meanings and norms of these event and efforts were interpreted as to what they were and how they related to the remaining constellation of institutions and then gradually adapted to the IDBM concept. Because project 1 provided deep insight to coordination intensively during the detailed design phase and sporadically during the building phase, the IDBM concept primarily proposes changes to the design phase.

The second step, included conducting a selective literature study on collaborative project delivery methods, including: integrated project delivery (Ashcraft, 2006;

Lahdenperä, 2012); partnering (Lahdenperä, 2012); alliance model (Lahdenperä, 2012) and design-build (e.g. Lähdenperä, 2001; Bygningsstyrelsen, 2012). The literature study also included collaborative process methods, including: TrimBuild (which is the contractor's re-interpretation of the LEAN concept for collaborative building processes); target value design (Zimina et al., 2012); virtual design and construction (Kunz & Fischer, 2012); integrated design (Knudstrup, 2008); LEAN (Koskela et al., 1997; Green & May, 2005); and knot-working (Korpela & Kerosuo, 2014). These methods were reviewed systematically in order to understand how they: interpret the relationship between structure and agency; interpret coordination as either a functional or relational phenomenon; and their ability to contribute to an integrating constellation of institutions. Also, the methods were reviewed in terms of their likelihood of becoming legitimised in the context of a Danish contractor, given that other companies and scholars have developed many of these methods in different contexts (i.e. other industries and geographical regions).

The third step included receiving reflective feedback on the concept from experts (e.g. experienced project team members, department directors at the contractor's organization, a group of architects and an expert group from the contractor's virtual design and construction [VDC] department) and was carried out in the form of workshops. The workshops were intended to illuminate resistance (e.g. institutional barriers) and opportunities for the concept that could help me refine the concept. Also, the implementation helped ensure the trustworthiness and authenticity of the concept.

The workshops were referred to as *implementation* and consisted of a series of workshops held in Q3 of 2015. An actual implementation on a real project would have taken years given the duration of the design-build projects, and therefore a workshop setting, representing a temporary testing environment, was selected. Workshops enabled larger groups of experts to engage in testing parts of the concept and enabled a collective reflective discussion. I both participated in, and observed, these discussions in order to facilitate the workshops and to interpret meanings, values, and perceptions either contradicting or supporting the IDBM concept.

A total of four workshops were conducted. Each workshop lasted 2,5 hours and involved participants testing systematic iteration and defining new project roles on three large current projects (townhouses, health-care and commercial).

The first workshop included members from the contractor's VDC department alone and was intended as an internal practice-run to test the workshop setup as well as illuminate the relationship between the two proposed proto-institutions; VDC and the IDBM concept.

A second workshop was held with a mixed group of project members, representing project procurement, a BIM coordinator, the contractor's self-perform civil works, the contractor's self-perform carpentry, and the contractor's design and engineering department. The group was intended to also include the contractor's self-perform concrete, design managers, project managers, and the contractor's tender department, however, last-minute cancellations reduced the number of participant significantly. This second workshop group was intended to illuminate how the IDBM concept would relate to each of the contractor's departments and professional roles in a project.

A third workshop was held for the contractor's project managers, design managers, contract managers and self-perform concrete manager in project 1. This workshop was intended to get this particular expert group to imagine implementing IDBM retrospectively and identify potential implications for the success of the building phase if project 1 had been conducted with the method of IDBM.

A fourth workshop was held for an expert group of 13 of the contractor's design managers. This workshop was intended to get the project and design managers to model the use of IDBM in practice to highlight potential constraints and opportunities.

Also, albeit not a workshop, a presentation of the concept was made for a group of around 30 architects and provided feedback on the concept from experts outside the contractor's organization.

The fourth step in developing the IDBM concept included carefully reviewing how the different parts of the concept that had been adapted from the analysis of projects 1-6, the literature and expert feedback related to each other. In other words, if the different suggestions presented in the IDBM concept would create a constellation of institutions enabling coordination or not.

Trustworthiness & authenticity

Since notions such as *truth* and *objectivity* ontologically contradict reflective interpretation sensitive to ambiguity, context and change processes, a reconsideration of terminology for accessing the research is appropriate.

Alvesson and Sköldberg, (2009, p.98) propose the following methodological principles be applied to reflexive interpretive research:

1. *'coherence'* (e.g. the interpretation should be logically consistent);
2. *'comprehensiveness'* (e.g. regard for the whole of the work);
3. *'penetration'* (e.g. the underlying central problematic should be laid bare);
4. *'thoroughness'* (e.g. all the questions raised by the text should be answered);
5. *'appropriateness'* (e.g. the questions should be raised by the text, not by the interpreter);
6. *'contextuality'* (e.g. the text should be set into its historical-cultural context);
7. *'agreement 1'* (e.g. the interpretation should agree with what the author really says, without distortions);
8. *'agreement 2'* (e.g. the interpretation should agree with established interpretations of the text);
9. *'suggestiveness'* (e.g. the interpretation should be 'fertile' and stimulate the imagination);
10. and '*potential'* (e.g. the application of the interpretation can be further extended).

Principles 1-5, 7 and 8 I interpret to fall under the term *trustworthiness* proposed by Bryman and Bell (2011, p.395) which builds on four criteria:

1. *'credibility'*, replacing internal validity and meaning ensuring good research practice and confirmation of results with research subject;
2. *'transferability'*, replacing external validity and meaning transferring results to other milieux;
3. *'dependability'*, replacing reliability and meaning keeping a complete record of all phases;

4. and '*confirmability'*, replacing objectivity and meaning research not overtly allowing personal values to affect results (Bryman & Bell, 2011, p.395).

The first criterion, *credibility*, is, although appropriate, somewhat broad; what constitutes *'good research practice'*? Alvesson and Sköldberg's (2009, p.98) principles 1-5, 7 and 8 specifically represent examples of '*good research practice'* in a hermeneutic context.

The second criterion, *transferability*, I interpret to have some overlap with Alvesson and Sköldberg's (2009) 10th principle *potential* and the ability to extend interpretation beyond the research topic at hand. However, transferability can be interpreted as relatively instrumental, while the ability to extend an interpretation, requires careful reflective efforts. Also, since the text itself, the specific empirical material, is the central element to the hermeneutic approach (Alvesson & Sköldberg, 2009), the transferability to another milieu (Bryman & Bell, 2011), e.g. a different empirical context, is not of explicit importance. Therefore, *transferability* and *potential* can be combined into *extendibility.*

The third criterion, *dependability*, does intuitively also seem appropriate in a hermeneutic context too, although not included in Alvesson and Sköldberg's (2009) principles.

The fourth criterion, *confirmability*, is the furthest from Alvesson and Skölberg's (2009) principles. As per the quadri-hermeneutic approach, interpretations are inherently subjective, affected by personal experience, social context, history, and values. Therefore, as a researcher, it is not a matter of '*allowing*' personal value (Bryman & Bell, 2011, p.398-399). However, it is important to critically reflect upon how these values affect research results (Alvesson & Sköldberg, 2009) and this can be interpreted as a way of not overtly allowing personal values.

Therefore, for this research project '*trustworthy'* research is interpreted to adhere to the following criteria:

1. *'coherence'* (e.g. the interpretation should be logically consistent);
2. *'comprehensiveness'* (e.g. regard for the whole of the work);
3. *'penetration'* (e.g. the underlying central problematic should be laid bare);
4. *'thoroughness'* (e.g. all the questions raised by the text should be answered);
5. *'appropriateness'* (e.g. the questions should be raised by the text, not by the interpreter);
6. *'agreement 1'* (e.g. the interpretation should agree with what the author really says, without distortions);
7. *'agreement 2'* (e.g. the interpretation should agree with established interpretations of the text);
8. and '*extendibility'* (e.g. the application of the interpretation can be further extended into other research areas or milieu).

Bryman and Bell (2011, p.398-399) also propose another aspect of assessing qualitative research called '*authenticity'*.

Authenticity, also builds on a number of criteria:

1. *'fairness',* meaning ensuring that research fairly represents different viewpoints among members;

2. *'ontological authenticity'*, meaning research helping members gain a better understanding of their social milieu;
3. *'educative authenticity',* meaning helping members to better appreciate the perspectives of other members of their social setting;
4. *'catalyst authenticity',* meaning research acting as an impetus to members to engage in action to change their circumstances;
5. *'tactical authenticity',* meaning research empowering members to take the steps necessary for engaging in action.

The five criteria relating to authenticity are not explicitly developed within the hermeneutic approach. However, because this research project constitutes an industrial Ph.D. project authenticity is interpreted to be relevant. In particularly, criteria 2-5, have been important.

The first criterion, *fairness,* has been fulfilled by interviewing a broad range of actors, but is, however, not considered important to reflexive hermeneutics. While Bryman and Bell's (2011) notion of fairness is interpreted to imply a democratic ethic, the hermeneutic approach would be more concerned with letting the text guide whose viewpoints are most needed in order to enable the desired insight. Also, rather than ensuring fair representation, the hermeneutic researcher would be concerned with reflecting upon *how* the representation affects the empirical material.

On the other hand, ontological authenticity is related to Alvesson and Skoldberg's (2009, p.98) principle of *suggestiveness* and '*interpretations should be fertile'*. The catalyst authenticity is similar to Alvesson and Sköldberg's (2009) principle of *suggestiveness*, in particular, the interpretations' ability to '*stimulate imagination'*. The assumption here is of course, that members are *motivated* to *imagine* alternative meanings and ways of conducting their daily work, before they can *engage in action* or be *empowered*. However, this line of thinking is related to *purposeful action, interests, motivations and efforts* towards creating, maintaining or changing institutions, which is the core focus of institutional work (Lawrence et al., 2009). Authenticity is also closely related to the ideas of theorizing institutional change (Greenwood et al., 2002). While the purpose here is not to conduct action research, it is important, however, to point to the refinement of Alvesson and Sköldberg's (2009) principle of *suggestiveness* that Bryman and Bell (2011) have inspired, in order to place the research in the context of an industrial Ph.D. project.

Also, throughout my research project I have openly discussed my research with employees at MTH, as well as the people I observed and interviewed. Also, I have presented and discussed my research at the quarterly reference group meetings, where fellow researchers, members of the funding boards, the CEO of the contractor's organization and project managers have been present. I have also presented and discussed my research findings during one-on-one meetings with the CEO, department directors, and project, design, and contract managers. Last, but not least, the implementation workshops also served as ways of ensuring authenticity. Therefore, the research process has facilitated all four types of authenticity: *ontological authenticity* (e.g. helping members gain a better understanding of the institutional dynamics of the project organization)*; educative authenticity* (e.g. helping members to better appreciate the perspectives of other members of the project organization); *catalyst authenticity* (e.g. motivating members to engage in (inter-)action to change the constellation of institutions in the project organization); and, *tactical authenticity* (e.g. empowering members, in this case, by providing the intellectual insight into how and why to enable institutional work.

The researcher's self-awareness

Since all reflective research is a product of the researcher's subjective interpretation (Alvesson & Sköldberg, 2009) a consideration of my subjectiveness as a researcher and its influence on this research project is important. True to my research project, I will approach this from an institutional perspective, meaning I will focus on the norms and cultural-cognitive meanings I, for various reasons, interpret myself to adhere or object to.

Firstly, I hold a master's degree in Civil Engineering in Architecture & Design from Aalborg University, Denmark. The programme is built on the concept of integrated design; the integration of the architectural and engineering disciplines throughout the design process. Although I'd claim not to be a religious proponent of anything in life, my educational background has shaped my way of understanding what constitutes *a good design process*. That not only guides me towards the solutions I have proposed in the IDBM concept, it also frames what I interpret to *a poor design process* when I observe a project organization in action.

Secondly, I worked six years as an architect and engineer for two different organizations in North America – one that primarily did design-bid-build projects and one that primarily did integrated project delivery and partnering projects. This has given me first hand experience on being part of design teams under different types of collaborative (and less collaborative) project delivery methods. Obviously, like anyone else would have had, I have had good and bad experiences with both. This meant that I had some preconceptions about particular project delivery methods when I started this research project. For example, I interpreted design-build projects to be less collaborative than integrated project delivery and, perhaps therefore, when conducting observations, focussed on constrained coordination rather than seeing when coordination was enabled. However, as I immersed myself in this particular research project, the theory and empirical data gradually became my point of reference instead of my previous professional experience. Last but not least, I have had good colleagues at MTH, who have continued to challenge me on the origin of my ideas (e.g. any sympathy expressed towards the architects), which has forced me to consciously reflect on how my professional background and previous experience might affect my research.

Thirdly, as an industrial Ph.D. student I have had to consider the interests of both the contractor's organization and the university. In that sense, my research has been executed in a political arena (Bryman, 2012). To that end, I have spent around 1100 hours in the contractor's office over the course of the three years and have undoubtedly started to take certain meanings and mundane actions for granted. This might have prevented me from asking certain critical questions. More importantly, I have had to be conscious not to create an IDBM concept that, as a narrative, fits within the MTH context, but rather brings new perspective to the organization (Zilber, 2009, p.221). For example, just over a year into my research, MTH established a VDC division, with the purpose of changing the IT tools, work processes and collaborative methods for the purpose of increasing project productivity. There were several overlaps in the work conducted by the VDC division and my research, for example, the proposal to organise work as design sprints. At times it was easy to get pulled in by the slipstream of the work of the VDC division, especially as it quickly grew in size and legitimacy, and feel that my own research was more *right* if it fitted within the VDC framework. Thanks to my supervisors, I was continuously reminded to stay true to the purpose of my own research: improve project coordination and project performance by interpreting them as institutional processes.

Last, but not least, the IDBM concept contains a recommendation to organise the design process in a series of design sprints referred to as 'systematic iteration'. Although systematic iteration was inspired by the iterative design process suggested by integrated design, the use of an iterative abductive research method may have subconsciously inspired me. More specifically, in the process of justifying the use of an iterative abductive research method, I also supported the legitimacy of systematic iteration. In other words, have I developed a solution to a problem that is framed by the methodological narrative of abduction (Zilber, 2002).

Critique of method

Apart from the shortcomings already mentioned in the previous sections, there are a number of other critical points to address. I will begin with those points that are related to the overall research project and finish with points that are related to each of the project analyses respectively.

The ontological framework for this research project has limited capacity to inform the relationship between institutions, agency and technology. Institutional theory, including institutional work, is rooted in a phenomenological ontology that *'starts and end with individuals'* (Alvesson & Sköldberg, 2009, p.36). And while Lawrence et al. (2009) explicitly criticize the emphasis on heroic institutional entrepreneurs, institutional work is nevertheless based on *'a growing awareness of institutions as products of human action and reaction'* (Lawrence et al., 2009, p.6) and that institutional work is *'intended'* and *'purposive'* (Lawrence et al., 2009, p.10-12). This means, that technology constitutes either dead objects that can be used by actors unilaterally or structures that can impose patterns, standardization and terminology onto human interaction. However, Melin and Axelsson (2005) showed that the introduction of AutoCAD in a small construction firm in Sweden not only provided structure, but also changed the social meaning of certain tasks. Similar, Raviola and Nörback (2013) showed that technology changed social meaning in an Italian newspaper agency. The empirical material gathered for this research project shows that the contractor's organization is implementing BIM and VDC heavily across the organization. While the effects of BIM and VDC don't show in the empirical material for ex-post projects 2-6, observations of project 1 showed how technology potentially interacted with the project and that the use of BIM and VDC is changing the meanings underpinning the projects. For example, if the modelling of detailed information in early design phases creates a shared understanding that a fully detailed and coordinated project is possible to deliver before the building phase begins. This is a change from current understandings where a fully detailed project before construction is considered a utopian dream. However, since IT is interpreted as structure alone, it is ontologically beyond institutional theory to say how IT may interact with human actors and change social meaning. This is a shortcoming of the theory of institutional work.

The ex-ante study

First, project 1 started before this research project and is not going to be completed within the timeframe for this research project either. While project 1 has already

served its purpose by gaining insight into how processes of coordination, it would nevertheless be a more comprehensive analysis if I had been able to observe the entire design and building processes and the after-math of the project. Had I been able to collect an ex-ante account of how project team members negotiate and make efforts to finish the project and how the perception of project performance is constructed, I would have been able to further account for the relationship between process and project performance and further enriched my ex-post analysis of projects 2-6.

Second, in relation to project 1, finding that particular point in time or in an organization (Jarzabkowski et al., 2013-A) where the everyday mundane work coming together in particular constellations of institutions can be studied in real time was also a critical methodological challenge. I decided to spend more time observing formally organised meetings than informal interaction in the project office. However, perhaps the meetings created a forum in which adherence to particular norms become more prevalent for project team members, because they formally represented a certain role or profession. In that respect, understanding how relational coordination mechanisms, such as multi-membership and perspective-taking enabled or constrained the coordination process, may have been more observable outside of meetings or had I chosen to shadow, for example, one of the project or designer managers (Silverman, 2013).

Similarly, as elaborated previously, defining a stabilised institution when observing a process in flight was challenging. When the perspectives encompassed under the term institutional theory span definitions ranging from the design-build project alone being an institution, to multiple norms, rules and meanings constituting institutions, the aggregation level of institutional theory is, in that sense, unclear and a short coming of the theory.

Third, the analysis of project 1 and the IDBM concept are more concerned with the design process, than the building process. This can seem paradoxical, when the outset for this research project is design-build projects and the project is rooted in a contractor's organization. However, the empirical material collected in project 1 during the design process showed that project coordination was repeatedly being constrained as multiple institutions co-existed and that the project team had come to take these constraints entirely for granted. Thus, there was an interesting challenge alone in analysing and proposing changes for the design process.

Furthermore, the interviews from project 2-6 and follow-up interviews for project 1 during the building process showed, that many of the issues encountered during the building process, were caused by poor coordination of the design process and project. This insight further justified the decision to focus the IDBM concept on the design process.

The ex-post studies

Projects 2-6 represent a perhaps too homogenous group to be able to claim that I have done a comprehensive study of design-build projects and that the findings are transferable. I argue that the insights gained from interpreting projects 2-6 can be extended to other design-build projects because the analysis of projects 2-6 showed that all five projects followed certain patterns, yet were not identical, in process and outcome.

Another critique concerns the type of results that are produced by the hermeneutic approach. The quadri-hermeneutic approach doesn't aim to reduce, but rather embrace the complexity of a phenomenon. The strength of the interpretive method combined with institutional theory is that it has enabled me to describe complex constellations of institutions on design-build projects. Furthermore, the interpretive method enables complex explanations for why project coordination is either enabled or constrained and can perform either high or low, or both at the same time. However, increasingly complex explanations are equally complex to understand and communicate. Therefore, finding opportunities to comprehensively communicate my research to MTH was difficult, jeopardizing the ontological authenticity (Bryman & Bell, 2011).

State-of-the-art design-build projects

The analysis of six design-build projects is presented in this chapter in two separate parts.

The first part concerns the analysis of project 1, the ex ante study of a detailed design phase transitioning into the building phase. The first analysis aims to understand what, how and why mutating constellations of institutions and institutional work enable and constrain the coordination process.

The second part concerns the analysis of projects 2-6, the ex post studies, and aims to understand how constellations of institutions during design and build phases are related to project performance.

Part 1

The first part concerns project 1, the ex ante study, and aims to understand what, how and why constellations of institutions and institutional work enable and constrain coordination.

First, project 1 is described qualitatively. Second, the relatively stabilized institutions that were interpreted to have developed in the project are presented. Third, the constellation of these multiple institutions is presented as it developed over the course of the project. Fourth, an analysis of the efforts that were made to create, maintain or disrupt the institutions and/or constellation of institutions in project 1 is presented, also chronologically. Finally, the chapter ends with a summary.

Description, project 1

Project 1 concerns the design and build of a new headquarters for a large private client in Copenhagen, Denmark. Table 3 summarizes the key project characteristics for the project.

	Typology	Size, m^2	Target cost, mio. Dkr.	Design-build cost, mio. Dkr.	Estimated cost, mio. Dkr.	Design begun	Construction begun	Anticipated completion
Project 1	Office	48,000	703	872	Around 1100	Spring 2012	Spring 2014	Q1, 2017

Table 3. The table summarizes the basic characteristics of project 1.

During project conception, the client hired its own in-house property development company [the owner] to initiate and lead the project. The initial process of the project included setting up a project organization [from now on *the project team*] and conducting a building program analysis. For that purpose, the owner hired an owner's

advisor consultant [in Danish: *bygherrerådgiver*] and carried out a series of meetings with the client and their user representatives. During the programming phase, the owner invited three architects to compete for the project, by having each architect develop a preliminary concept for the building. The owner also conducted 3-4 interviews with the architects over a period of four months. During these interviews, the architects were able to gain a deeper insight to the client's requirements, as well as demonstrate their ability to collaborate with the client, the owner and the engineers. The owner had hired a large local engineering consultancy prior to the architectural competition. The engineering consultant was hired to assist all three architects in the development of their project concepts. At the end of the four-month conceptual design phase a prominent architect won the project.

At this point in time, the project consisted of a number of spaces, including a large trading floor, data center, small offices, open office space, meeting rooms, kitchen, reception area, two large atria, underground parking, canteen and more. The building geometry consisted of two distorted squares tied together by a third large atrium that served as the building's main entrance and foyer. The building is relatively complex with high requirements for indoor climate performance, high security levels, large open spans, interconnected atria and office space, limited repetition across the six storeys and a complex curtain-wall façade.

Upon assigning the architect and as the basic design phase began, the owner invited three contractors to collaborate and bid on the project. At first, the contractors were given two weeks to prepare a preliminary target cost for the project. Then, similar to the process of hiring the architects, the owner interviewed the contractors on numerous occasions to evaluate if their understanding of how to collaborate in the project was aligned with that of the owner's organization. One contractor was deselected for proposing a no-guaranteed-maximum-price model. The remaining two contractors had proposed to participate in the design process to assist keeping the project costs within the target cost and at the end of the basic design phase offer a fixed price for the building of the project. The two contractors each proposed a target cost that, according to the owner, were only 2 m Dkr. apart. In the end, the owner chose the contractor who had the lowest profit ratio on additional work to the contract, with whom they perceived to share an understanding of how to collaborate.

The contractor did not charge a fee for participating in the early design phase. However, a collaboration agreement was established in which the contractor was entitled to the design-build contract were they able to meet the target cost by the end of the basic design phase.

Over the next eighteen months the architects headed the project team and developed a basic design project in collaboration with the engineers, the owner, the client representatives and the contractor. The project team consisted of:

- The owner: two project managers.
- The client: a project manager, four user representatives.
- The architects: around 30 members of staff, headed by one project manager, one design manager and one project coordinator.
- The engineers: around 20 members of staff, including a manager for each engineering discipline and a cross-disciplinary project manager.
- The contractor: two senior project managers and two senior design managers.

Apart from the architects, engineers and contractor, the project team also included the client's interior design consultant, the client's project advisor consultant, and the contractor's self-perform sub-contract managers.

Furthermore, on an ad hoc basis, the project team interacted with the city planning authorities, the city architect, the major, the local fire department, and the neighbors.

The design process was divided into a number of sub-phases organized in what will be referred to as a linear phase model (Danske Ark, 2010): first a programming phase in which the owner and client defined preliminary project requirements and established project funding; then a conceptual design phase where the engineers and architects developed a conceptual architectural and engineering design proposal; then followed a basic design phase where the architects, engineers, owner and contractor further developed the conceptual design to a '*preliminary design project*' (in Danish: *forprojekt*) intended to be 50% complete according to the consultant and collaboration agreement; and finally, a detailed design phase where the project team was intended to detail and coordinate the remaining project. At the end of the detailed design phase the project team was to hand in the '*final design project*' (in Danish: *hovedprojekt*).

Project team members described the basic design phase as a relatively smooth process with project team members collaborating and only minor conflicts of interest and conflicting ways of conducting work. During the basic design phase the contractor had engaged two project managers and one design manager in the project. Also, the contractor had engaged sub-contractor managers for the façade, structural building systems and interior finishes and the project team had engaged a façade supplier, due to the scale and complexity of the façade. Despite making efforts to engage multiple actors representing both design and construction expertise, by the end of the basic design process, the project team struggled to produce a preliminary design project sufficiently detailed for the contractor to offer a fixed project cost and as a result the design-build contract was postponed four months until the autumn 2013. In October 2013, the owner and the contractor were able to negotiate a final project cost of around 870 mio. DKr. and a design-build contract was signed.

When the project entered the detailed design phase the contractor formally hired the architect, who hired the engineering team, and took over the lead of the detailed design phase. The detailed design phase was kicked-off with a contractor's project review and the contractor releasing a time schedule for the detailed design phase. The contractor also engaged an additional design manager and assigned an in-house BIM coordinator to the project. Around three months before the start up of the construction phase, the contractor also assigned numerous sub-contractor managers.

At the end of 2013, half-way through the detailed design phase, the project team members expressed confidence in the project quality and their ability to hand in a final design project to the deadline in March 2014. The atmosphere was optimistic and relatively respectful among parties.

However, during the detailed design phase the pressure on the entire design team gradually grew, as the deadline for the hand-in of the final design project in March 2014 was approaching. The project team members started referring to the process as a '*slippery eel'* that would escape ones fingers just as one thought one had a grip on it. During design meetings the contractor's design manager would rhetorically emphasize the importance of meeting the deadline to the architects and engineers.

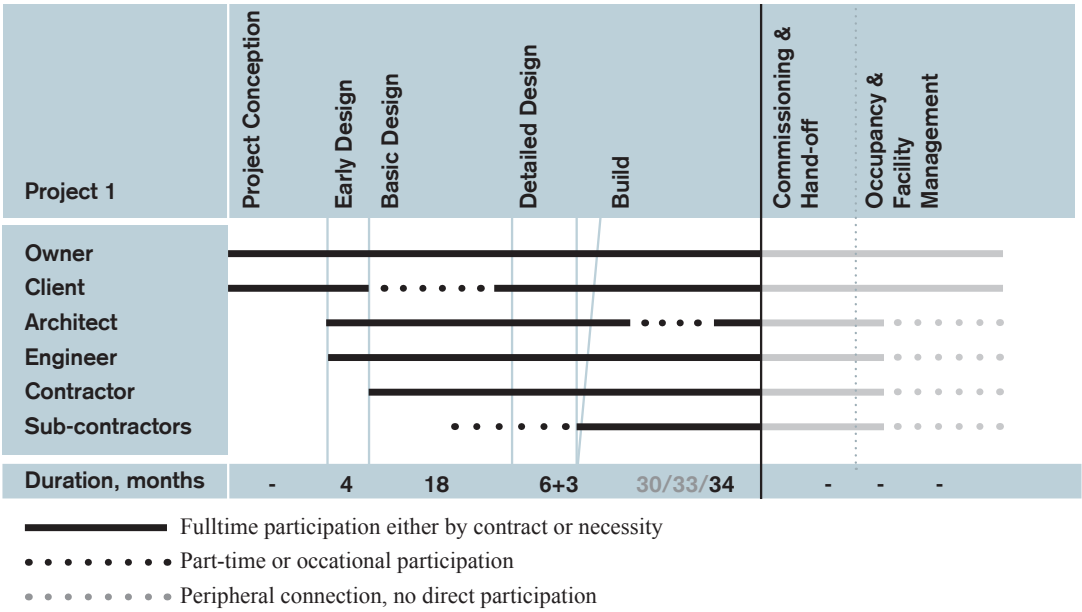


Figure 2. The figure illustrates which actors collaborated and when. Also, the figure illustrates the duration of each phase in relation to each other.

They in turn, cried out for more guidance on what to work on and when. During this phase, the engineering project manager began repeating to the contractor on numerous occasions that he would not guarantee a fully coordinated and complete design project at the deadline, but that he would guarantee that something was released.

In the final two to three months of the detailed design phase the contractor also started initiating contracts with suppliers and sub-contractors, including their own self-perform contractors. To avoid internal competition among the contractor's self-perform departments an internal collaboration agreement was made, where fiscal profit and loss would be distributed according to a pre-agreed ratio. Also, an agreement was made with the concrete element supplier, that any savings resulting from product optimization would befall the supplier, as an incentive for them to decrease the initial cost.

During the last months of the detailed design phase in the beginning of 2014 the design team was still working on the layout of the building. In particular, indoor climate, floor layout and façade configuration on the first and sixth floor presented a challenge to the project team.

Nevertheless, in the end, a design project was handed-off in time for the deadline at the end of the detailed design phase and the engineers avoided sanctions. Several parts of the design were not clarified and a new deadline for the remaining details was established for early summer 2014. When the design team was unable to deliver the remaining details to this deadline, the deadline was further postponed until August 2014.

Outside of project meetings, the contractor gradually started requesting access to project material in order to prepare for construction start up. The project material was passed on to the self-perform civil work and concrete teams, who reviewed the project material and deemed it of poor quality and not constructible. The self-perform contract managers proposed the construction start date was postponed. However, by April 1st construction began as originally scheduled. At the beginning of the building

process the contractor established a project office on site, however, the contractor's design manager, the architects and engineers remained at the owner's project office for another six months until they returned to be located at their own organizations respectively. During the building process the contractor's two project managers transferred to different projects and organizations and a new, and only one, project manager was assigned the project instead.

Furthermore, the building process was divided into a number of phases: excavation and civil works were carried out, the construction of the structure (in Danish: *råhus*); the exterior finishes (in Danish: *udvendig aptering*); interior finishes (in Danish: *indvendig aptering*); and hand-off. Parallel to these phases ran commissioning and preparation of the hand-off manual. No phases were formally planned to proceed the hand-off of the final building.

The building process has generally occurred relatively smoothly according to the contractor's project manager and design managers. The contractor's process manager claims the building process has been '*hectic'* and the contractor's self-perform concrete manager says the building process has been characterized by '*the usual lack of due diligence'*. The contractor has been granted a 12 weeks extension to finalize the build and the project and design managers are confident that they can deliver the project within that timeframe or less. The concrete work contract has increased by over 20% from 100 mio. Dkr. to 121 mio. Dkr. within the first six months of the project.

An unidentified number of issues during the building process were caused by the lack of finished and accurate engineering design of, for example, the steel roof for the atrium. Once the building phase had begun the supplier of the steel roof deemed the original engineering design insufficient and the steel structure had to be re-designed. The result of the combined design errors was increased project costs and lost time and the contractor has sued the engineering and architect team for 30 mio. DKr.

One success story of the project is the façade, where the façade supplier installed the façade two months quicker than scheduled and to a very high quality.

As of May 2016 the project has yet to be completed. The original deadline of October 2016 has been postponed until the start of 2017. The project cost has increased from 870 mio. Dkr. to over 1.1 bil. DKr. and the contractor's division director acknowledges that their profit will be minimal at the end of the project. The detailed design work is still on-going. The glass partitions between meeting rooms and the atrium are too large to be able to fulfill the requirements for soundproofing and the contractor and owner continues to work a solution to solve this. Similarly, the engineering team is still unable to provide a solution that fulfills the requirements for smoke ventilation. The project teams current strategy is to negotiate with the planning authorities that certain ventilation requirements can be waived. The architects have expressed some concern with not being sufficiently involved in the project meetings during the latter part of the building phase, but have decided to resume participation during all of 2016. The project team members continue to collaborate in what is perceived by project team members as *'business as usual'*. This business as usual is interpreted to constitute a peculiar mix of mutual respect, frustration and acceptance. The project team continues to meet on a weekly basis for project meetings. The project is, within the contractor's organization, celebrated as a success and an exemplar use of BIM and early collaboration.

Key challenges

The project description above shows that the main challenge facing the project organization is their lack of ability to coordinate their efforts in order to produce a coherent and detailed design project that integrates all the work elements in the project. On-going efforts to improve floor layouts, interior finishes, mechanical and electrical systems, and fulfilling the zoning bylaws and building codes illustrate that the project team struggled to find integrated solutions. Despite efforts that increased communication and collaboration between the parties, and despite introducing structural coordination mechanisms such as project phases, deadlines, project reviews and 3D modeling, the project team was unable to produce a fully coordinated design project at the end of the design process. In the short term, the result was acceleration of the concrete works (raw structure) and increases in work scope and therefore project costs (e.g. concrete foundation, concrete structures, and steel). While the project team continues to collaborate and the contractor continues to build to fulfill the project requirement, the lack of coordination has resulted in fee erosion for the contractor and potential fee erosion for the engineers.

The project description above also shows that the main strength of the project team was their ability to build the project seemingly smoothly, despite the lack of coordination of the design project.

At this point in time, we do not know how the overall building will perform once the building is occupied. However, most likely, the building process will progress without major disruptions, the parties will collaborate to agree a final hand-off date and quality, the building will mostly reflect integration by operating more-or-less as intended, be occupied immediately, or even before, the build is completed.

Meanings, norms and rules in project 1

As a basis for analysing how institutions relate and develop over the course of the project, the first section in the analysis of project 1 concerns identifying more-or-less stabilised structures. During project 1, a number of structures that were more-or-less taken for granted and considered normative design-build practice developed. Also, the project team, while not collectively discussing or explicitly defining coordination and the use of particular coordination mechanisms, made purposeful efforts to create proto-institutions (and enable interaction) that were perceived to facilitate coordination. While the efforts will be discussed later the structures, both taken-for-granted ones and proto-institutions, will be presented in the following analysis.

Each structure was supported by a particular shared meaning, and potentially multiple norms and structures.

Overall, five themes were interpreted to have developed. These themes are: quality, collaboration, economy, efficiency, and coordination. For each theme one or two different institutions are interpreted to have developed, including: quality understood as phenomenology, functionality and aesthetics; collaboration as pragmatism and trust; collaboration as professionalism and loyalty; cost optimization; cost reduction; designing and building efficiently; leadership and management; and coordination. Multiple norms and rules underpin each institution, and in some cases the same norm or rule underpins more than one institution. As a result, each institution and how each institution is interpreted to be an institution, is briefly introduced, through examples of norms, meanings and rules.

Also, all the institutions that develop over the cause of the project are summarised at the end of this section.

The institution of phenomenological quality, functionality & aesthetics

The institution of phenomenological quality, functionality and aesthetics is interpreted to have been underpinned by a shared meaning that the building consists of space (or number of spaces) that humans will perceive, see, feel, and use in a particular way that can be designed. The underpinning norms of the institution include extending deadlines, accepting late changes, design developing from concept to detail, and early collaboration between engineer and architect. Apart from norms, the institution of quality was also underpinned by a number of rules, including, for example: the hand-off manual, the collaboration agreement, the service specifications, and the consultant and design-build contract. All project team members were interpreted to adhere to the institution of quality.

In the following, examples of the meanings and norms are presented to illustrate how phenomenological quality, functionality and aesthetics represent an institution.

Bending, extending and reinterpreting design and deadlines

When the project approached the end of the detailed design phase and the deadline for handing off the main design project arrived the project team agreed that the project had not been coordinated and developed to the level of detail that they had previously intended. In particular, the engineering project manager began repeating during project and design meetings that he would no longer guarantee a fully coordinated project would be handed off to the deadline but that *'something'* would be handed off. Because the contractor had maintained a sanction on the engineering work originally introduced by the owner, a main design project was indeed handed off. However, the project team had gradually been reinterpreting what was required to be contained in the main design project to correspond with what was actually handed off. As a result, the contractor accepted the design project; the engineers avoided sanctions; and, the project team developed a new deadline for the hand-off of the remaining design project three months later. This deadline was then further extended with two months and later the deadline more or less dissolved although the project team continued to work on the project. Extension of deadlines is interpreted to have been a result of pursuing on-going collaboration among the organizations to enable each profession to represent their particular area of expertise or quality in the project once the contractor started constructing the building.

Also, the engineers choose to compromise freezing the project at the formally agreed deadline and risked their professional integrity in order to not jeopardize project quality. This is illustrated in the following quote:

> '*…on January the 13th we said 'alright, now we'll use this* [BIM model]*'. Then, last week we imported the latest model and simply gave up. We cannot keep working on a completely out-dated model. ...you can decide to get irritated or perhaps this is just the future, all these continuous changes that we have to accept. The thing is, as consultants, we worry that we miss something and are held responsible for it…'* [Engineer, project manager.]

The reinterpretation of project content and bending of project freezes enabled the consultants to finish their work to a point where the contractor was comfortable (e.g. avoiding design responsibility and ensuring quality) constructing the building.

Battling for quality

Apart from bending the rules to enable quality, quality is further interpreted to be an institution because the architects were willing to battle for the continued existence, if not dominance, of quality. Below, a quote from an interview with the architect's project coordinator illustrates how important quality was to them:

> *'Right now, we are caught in between what* [the owner] *expects us to draw and what they have actually purchased* [from the contractor]. *That is one of the battles we are taking right now. Also, we think we are seeing, that certain contractor solutions are being chosen due to economic considerations, because it is cheaper. Then, as we gradually review it* [the particular solution] *we find that there are some disadvantages to it and we end up in the same place as we were to begin with, right… if only we had been allowed to be part of that process, we might have been saved several of these battles and round about work.'* [Architect's project coordinator].

Quality is interpreted to be an institutionalised meaning because the architects were willing to *'battle'* to improve the quality of a particular design solution. In this case, the battles resulted in rework and prolonging of the design process, in other words, compromise of the institution of efficiency, yet the architects were willing to battle for the pursuit of improved quality once the contractor and owner had altered the project to reduce project costs.

The institutions of collaboration

In the project team the notion *collaboration* was used to describe people working together, not necessarily towards the same goal, but, very broadly, communicating in *good tone*. However, distinct meanings of collaboration were interpreted to have developed.

The institutions of collaboration were interpreted to have developed into two distinct institutions: collaboration as pragmatism and trust; and collaboration as professionalism and loyalty.

The institution of collaboration as pragmatism and trust is interpreted to have been underpinned by a shared meaning of *personal interaction* and be associated with the normative conduct of early collaboration, and normative understandings of multi-membership, mutual adjustment, access to knowledge and skills, affection and mutual respect, and re-interpreting project content. The establishing of a target cost, project office and collaboration agreement are interpreted as initiatives that were intended to be relatively instrumental although predominantly associated with moral obligation.

The institution of collaboration as professionalism and loyalty was interpreted to be underpinned by a shared understanding of the importance of *adhering to formal structure*. This meaning was underpinned by the norm of conducting work in multiple parallel processes, conducting meetings, and the understanding that working independently and respect of formal organizational hierarchy was important. Further, shifts in organizational leadership, the linear phase model, and formal consultant

agreements were interpreted to underpin this particular institution of collaboration. Also underpinning the institution of collaboration was the understanding that there were distinct professional responsibilities and stereotypes (i.e. each profession represents a particular area of expertise, set of values and characteristics). Collective narratives and jokes, segregated professional roles and formally segregated responsibilities are interpreted to have underpinned the understanding of distinct professions.

In the following examples of the institutions are presented to illustrate how they each represent an institution.

Pragmatism & trust vs. Professionalism & loyalty

The owner and contractor had agreed that the contractor should be involved in the project during the basic design phase, which was perceived by the project team as early collaboration. The owner explained the purpose of engaging the contractor in the basic design phase in the quote below:

> *'I talked to several contractors, actually mostly with MT Højgaard, about how to do these things* [putting together a project] *to ensure that communication was effective from the start. ...So therefore it was… ….a very conscious choice to base it on dialogue and over an extended period of time. ...I have then since wondered why MT Højgaard haven't entered the scene more. ... I thought, wow! – now I'm really getting a great opportunity to get the contractor to challenge those bloody consultants!'* [An owner's representative.]

In the quote above, the owner is not explicit about how they want the contractor to challenge the consultants. Rather, the quote illustrates that the owner is interested in the contractor taking an active role in the development of the project and challenging the consultants more broadly. Also, the owner and contractor agreed to develop the project based on a target cost, which was explicitly intended to enable the contractor to not strictly focus on project costs. Therefore, the owner is interpreted to have wanted a dynamic interplay between the different professions (and the institutions they were perceived to embody) represented in the project in order to optimize the project holistically.

The owner seemed to understand collaboration as predominantly an interactional phenomenon. For example, based on an understanding that interaction would lead to collaboration, the owner expected the contractor to be pragmatic and be able to shift focus from project cost to quality. Also, the owner established a joint project office for the architects, engineers and contractor at the owner's own head office. The project office was, according to the owner, intended to increase informal personal interaction, which was perceived to make project team members *'more polite'* and less likely to argue over project work. This was perceived as the essence of collaboration. However, in particular, the owner's representative would explicitly call out to criticize the work and cry down the concerns of other project teams members during project and design meetings.

Similarly, in the broad perception of collaboration there were multiple variants. The architect's design manager perceived collaboration as a matter of being pro-active in terms of collecting information and addressing design problems. He specifically referred to the engineering team as '*reactive*' and '*a heavy dance partner*' when asked what characterised collaboration in the project team. In other words, the architect expected the engineers to interact and engage in the design process and

deviate from their perception of a value-chain and the professional norm to focus on finalising detailed design work. Also, the architects were interpreted to be pragmatic about organizational responsibilities when trying to collaborate. For example, the architects initiated the collaboration with the façade supplier and proposed numerous solutions for cooling systems in a particular part of the building during project meetings.

Within the contractor's organization collaboration was interpreted both as an individual psychological phenomenon (e.g. being kind, trusting, empathetic, and having the right profile for the project team) and a structural phenomenon primarily concerning being loyal to formal organization structures. For example, the contractor's project manager was furious with the architects for continuously introducing project changes during the detailed design phase and expressed dismay with their *'disrespectful'* attitude and *'lack of loyalty'*.

Similarly, the engineer's project managers adhered to an understanding that collaboration involved each organization acting according to their particular normative professional role and responsibility. At the same time, the engineers developed the understanding that pragmatism was necessary in order to maintain collaboration and make the project progress. This was illustrated by the previous quote, when the engineers accepted changing the model during the detailed design phase.

As mentioned, supporting the institution of collaboration as loyalty, respect and professionalism was an understanding of normative professional distinction and stereotyping. Apart from developing understandings of *how* to collaborate the project team also developed an understanding of whom the *others* in the project team were.

At some indefinable point in time during the basic design phase the contractor began cultivating a narrative about the architects as being poorly disciplined, technically incompetent, uncompromising in their pursuit of improving the aesthetics of the building. The precursors for this stemmed from a recent previous project collaboration where the quality of the main design project had been exceptionally poor and the project challenging to build. As a result, the contractor's staff developed the understanding that architects in general were of a particularly sensitive nature and unable to plan and execute a design process. Despite the architect's steady work and calls for a more proactive engineering team, the contractor developed a narrative about the architects as being, in summary, *the bad guys*.

On the contrary, the contractor generally had good faith in the engineering team and cultivated a narrative about the engineers as being reasonable, rational, competent, and victims of late changes imposed by the client and architect. The contractor's team of managers was not particularly fond of the engineer's project manager, who they perceived to be particularly defensive in all matters, nevertheless, they trusted the engineers would meet the deadline and provide a design project of reasonable quality. Because the contractor and engineers shared a similar understanding of what constituted an efficient process and a high quality project (e.g. freezing the project in order for the engineers to finalize the technical details and for the contractor to fix the project cost) there was inherent sympathy, trust and mutual respect between the contractor and engineering team. It wasn't until the end of the detailed design phase, when the engineering project was released to the contractor's self-perform sub-contractors and the client expressed frustration with the poor indoor climate, that the contractor changed their rhetoric about the engineers. Suddenly and instead, the contractor began to blame the engineers for having underestimated the

complexity of the project and not being sufficiently competent to handle the job.

Similarly, during the detailed design phase newcomers to the contractor's project team were observed to quickly adapt and join in on these narratives and jokes, which were interpreted as a way of becoming socially accepted. Also, the otherwise relatively decoupled project team members of the building organization were observed to develop the same narratives and jokes during the early building phases.

Not only the contractor developed these jokes and narratives. Without going into detail, the engineers were interpreted to develop similar narratives as the contractor, while the architects were interpreted to develop narratives about the contractor as particularly opinionated and willing to compromise quality for the sake of reducing project costs.

In summary, lack of empathy among professional groups developed as a mutual norm.

The institutions of collaboration understood as professionalism, loyalty and respect, was also supported by the normative understanding and formal agreements that each organization was responsible for a particular area of professional expertise. According to the contractor's design manager the architects were responsible for the aesthetics of the building, while they perceived themselves as responsible for '*optimizing the project'* (interpreted to mean getting the owner the most building for the money invested). The architect's design manager perceived the architects as the stewards of project quality including, aesthetics, functionality, phenomenonology, sustainability, cost and constructability.

Characteristically, each organization perceived their legal responsibility to be rather narrow, while they perceived their interest in the project's overall success much more encompassing. Furthermore, and paradoxically, they also perceived the interests of the other organizations to be rather narrow.

For example, the project team developed the understanding that explicit decision-making was the client's responsibility alone. To elaborate, during the basic design phase, in the spring of 2013, the architects had asked the client to clarify their last requirements in order for the design team to finalize the design project for the upcoming project freeze that summer. At this point, the client started attending project meetings on a weekly basis instead of the bi-weekly basis that they had until then. However, the client had difficulties finalizing their requirements. The client's organization was large and the client's representatives claimed to not always be authorized to make the decisions she perceived she was being asked to make by the project team. The architect's design manager claimed the client's organization was inexperienced and immature to handle the complexity of the project. The contractor pointed out that the client only received incoherent and sporadic information from the architects and engineers. The architects, contractors and engineers agreed that the result of the lack of owner's decisions was that the project team struggled to finish the preliminary design project and offer a fixed project cost, and that the detailed design phase and design-build contract was postponed until the autumn of 2013.

In summary, there were multiple perceptions of why the client was unable to make decisions. The architects explicitly understood that the owner was responsible for decision making. Despite the contractor understanding decision-making as a collective and interactive process by suggesting that the architects and engineers had failed to deliver the necessary information to form a basis for a decision, the contractor still understood it to be the client's responsibility.

The institutions of economy

Two distinct institutions of economy are interpreted to have developed; cost optimisation, and cost reductions.

The institution of cost optimisation is interpreted to have had the shared meaning of *reducing project cost without compromising project quality*. This meaning is interpreted to have been underpinned by the conducts of early involvement of the general and sub-contractors and suppliers, and the establishing of a target cost.

The institution of cost reduction is interpreted to have been underpinned by a shared meaning of *pursuing short-term economic gains*. Also, late involvement of suppliers and sub-contractors and intertwined project cost, profit and contingencies are interpreted to be underpinning normative conduct. The normative understanding to avoid risk and responsibility and the rules of for example, sanctioned deadlines and deliverables are interpreted to underpin the meaning of pursuing short-term economic gains.

In the following the two institutions are presented separately.

Cost optimisation through project integration

The institution of cost optimization was illustrated by a previous quote, where the owner's representative had hoped and expected the contractor to challenge the consultants. A concrete example of cost optimization includes the façade system. To elaborate, the project team involved a façade supplier during the basic design phase, which was perceived as early involvement. According to the architect, the purpose of involving the façade supplier during the basic design phase, was to get accurate information on product and construction details, explore realistic design opportunities, get accurate pricing and be able to see the façade at the production facility before it was installed on site. In other words, early involvement is interpreted to have been initiated in order to integrate at least quality, functionality and cost of the façade design.

Since cost optimization through project integration was not supported by rules or normative conduct, but rather was perceived to be experimental and a deviation from the norm of late involvement, cost optimization is interpreted to have been a proto-institution.

Cost reductions by pursuing short-term economic gains

The institution of short-term gains refers to, in particular, the owner and contractor pursuing short term gains regardless of the long term costs or effects. In project 1 there were several examples of actors pursuing short-term gains, however, it is also interpreted to be a fading institution as no one spoke openly about or justified their actions by referring to wanting to pursue short-term economic gains.

The project developed multiple norms to pursue short-term economic gains. One example included, the engineers being hired without competition. The owner's representative justified the hiring of the engineering consultancy by referring to them as a large and renowned organization whom he perceived had the competencies to do the work. The architect's design manager also mentioned that the engineering consultant was a client of the owner, because the engineering consultant's headquarters was a property leased from the owner. In that respect, the architects perceived the engineers to have been hired on a political basis rather than a competence basis. Although the owner's representative denied this when interviewed,

the architects referred to the collaboration as a '*forced marital arrangement'* and the architects claimed the engineers were slowing down the design process by not providing the necessary technical inputs when required.

Second, norms included the project team negotiating the target cost. During the conceptual design phase the contractor presented their target cost of 732 mio. DKr. To avoid making the contractor's project managers focus on project cost alone, the architect recommended the target cost be increased with 100mio. DKr. Despite this recommendation and the owner claiming to have perceived the target cost as a relative number subject to change, the owner negotiated the target cost down to 703 mio. Dkr. around the time of starting the basic design phase.

In addition, the owner did not sign a design-build contract with the contractor until the beginning of the detailed design phase and the contractor was only guaranteed the contract if they were able to meet the target cost at the end of the basic design phase. In other words, despite having been made aware that their actions could jeopardize collaboration and quality, the owner pursued short-term economic gains after all.

Similarly, and third, avoiding risk and responsibility is interpreted to have been a taken-for-granted norm in the project that supported the understanding that reducing potential economic costs was important. For example, the owner wanted to avoid, or at least, reduce their risk by using a design-build project delivery method to begin with. The following quote illustrates the early involvement of the contractor was perceived as a way of passing responsibility from the owner to the contractor:

> '*The main argument for choosing design-build project delivery is that, given the project team and the project at hand, they* [the owner] *want to be able to place the responsibility* [for the project and project team] *somewhere. And that has been placed with the contractor MT Højgaard, and now they have the responsibility for the building. They are also responsible for the consultants* [architects and engineers] *and they are responsible for all the sub-contractors. It wouldn't be like that if a different delivery method had been chosen. Then the owner would be responsible for many of these actors, and that is why they wanted to park* [the responsibility]*...'* [Owner's advisor consultant representative.]

The quote illustrates that there was an understanding that the project contained a certain risk and that the risk could be allocated to a particular organization in the project team. On the other hand, despite the owner adhering to the understanding that the risk of the project was allocated with the contractor the owner was actively engaged even in design meetings, which by the contractor's design manager was perceived as out of the ordinary, but acceptable.

Not only the owner wanted to avoid responsibility. Despite the contractor formally having the responsibility for delivering the project once the design-build contract was signed, the contractor withdrew from the design meetings during the basic design phase to avoid design responsibility. To elaborate, the architects were hired as the formal leader of the project, however, the contractor's design manager expressed lack of faith in the architects' ability to lead the project: the contractor perceived the basic design process to be too unstructured with too many uncertainties left unresolved. Therefore, explicitly to avoid being held responsible for potential design error later on, the contractor's design manager withdrew from the design meetings and described

their efforts as *'gathering ammunition'* for when the anticipated conflict between the contractor and the consultants (architects and engineers) would arise. The architect, engineers and the owner left the contractor's withdrawal uncontested and thus the contractor's withdrawal is interpreted to have been perceived as legitimate.

A last example of the institution of reducing economic cost concerns the norm of engaging suppliers and sub-contractors late in the detailed design phase or not until the building phase. While the architects initiated inviting the façade supplier to the project during the basic design phase and the contractor agreed to this, the contractor did not engage other sub-contractors or suppliers until the end of the detailed design phase. As illustrated previously, the owner had hoped the contractor would actively challenge the design. On the other hand, the contractor hired the concrete element supplier and asked them to do the optimization of that particular building system. In other words, the contractor was not able to challenge the design without accurate product and manufacturing information provided by the sub-contractors and suppliers. However, the contractor tendered the individual building systems, including the concrete elements, to a number of sub-contractors and suppliers in order to get competitive pricing. Because the suppliers and sub-contractor's offers were only valid a certain period of time the contractor waited as long as possible to engage the sub-contractors and suppliers.

The institutions of efficiency

Within the theme of efficiency one institution is interpreted to have developed: designing and building efficiently.

The institution of designing and building efficiently is interpreted to have a shared meaning of *sense of progress.* The understanding that *creating the right solution the first time was important and right* supported this. Sequential involvement of actors, shifts in organizational structure and the norm for planning project freezes are interpreted to be underpinning norms. Similarly, the linear phase model and the collaboration agreement underpin the institution of designing efficiently.

Also, efficiency was supported by the understanding that *urgency and determination to build was important and right.* The normative conduct of overlapping the design and building processes, and the understandings that exercising adaptive capacity and avoiding doing rework are necessary underpin the urgency and determination to build. Furthermore, sanctioned deadlines and the hand-off manual are interpreted to be rules that underpin the urgency and determination to build.
In the following the two understandings supporting the institutions of efficiency are presented.

Creating the right solution the first time

During project conception and early design phase the project team established a plan for the design process to follow the linear phase model: early design phase ending with deciding on the winning architectural proposal; basic design phase ending with the preliminary project and the freezing of the structural building systems; and the detailed phase ending with the main design project. The linear phase model is interpreted to be a taken-for-granted norm. For example, the interview extract below illustrates that the owner had difficulties explaining why they had decided to use the

linear phase model and why I interpret the linear project phase model to be an institutionalized norm developed in project 1:

> Interviewer: '…[you have chosen] *a traditional phase model, but who has considered if that model is useful for this project?'*
>
> Owner's representative: '*Well, that's like…, it's self-evident.'*
>
> Interviewer: '*Ok, could you please explain because I don't know enough to understand exactly why that is?'*
>
> Owner's representative: '*Well, that is a sort of natural course, that one… …has to go through these phases in order to get to the final…, that you then have to build. Well, completely naturally we have these phases with programming and competition and regarding the project, the architects project and so on. And then, well… you get to, having the detailed design in place and…. Finally, you end up with, having a basis for production, right… that is sort of… I think it would be untraditional, if one didn't follow this… … It wouldn't be… perhaps so fortunate, because then… ….then it would be something different to what one is used to doing, right?'*

The owner's representative refers to the linear phase model as the '*natural'* way of progressing a design process, thus making the linear phase model a taken-for-granted structure supporting the understanding that a project develops from architectural concept to detailed project.

While the linear phase model was formally implemented due to professional norm the linear model also outlined a particular value-chain which was perceived to be the most efficient way of working. In particular, the engineer's representatives developed an understanding that doing work more than once was a waste and considered inefficient. This was particularly clear during observations of project meetings during the detailed design phase. During the transition from basic to detailed design phase mechanical engineers had been assigned to the project, which, according to the architect was much too late and a significant underestimation of the complexity of the project on the engineers' part. Nevertheless, during project and design meetings the mechanical engineer repeatedly justified the lack of progress of the mechanical design with not having a finished architectural design to base his work on. The architects in return blamed the clients for not having made the necessary decisions. Furthermore, the engineers perceived their work to be at the tail end of the architects' work. In other words, the project team adhered to a particular perceived value-chain that is interpreted to have been as follows: first, the architect was expected to produce an idea, then the owner and client were to decide if they wanted that idea or not, then the contractor would provide a price, the contractor and client would then make a final decision, and subsequently the engineers would finalize their design.

The value-chain was supported by the project team, who according to the architect's design manager had agreed to freeze the project at certain points during the design process. The project freezes were intended to facilitate an efficient workflow and technical coordination by locking certain parts of the project in order to enable the engineers to develop the detailed design and the contractor to develop a fixed project cost. The quote below illustrates how the contractor's project manager

perceived the project freezes to enable a more efficient and stabilized workflow for the consultants and the contractor:

> *'....well, in order to not waste the consultant's time and ask them to redesign, ...I would have liked that we had agreed to finalize the main project for the structural part of the building before we started excavating. Then, we could have postponed the remaining parts and instead focused on closing the deals concerning the structural parts of the building and then get some time afterwards to complete the interior and exterior finishes.'* [Contractor's project manager].

The quote illustrates that the contractor's project manager perceived finalising different parts of the building in sequence to be more efficient. Implicitly, the project team's current working methods of finalising multiple parts of the building simultaneously during the six month long detailed design phase was perceived to result in resources wasted on redesign.

In summary, the linear phase model, the value-chain, and project freezes are interpreted to be norms perceived as a time and cost control mechanism to enable an efficient workflow understood as not wasting time re-doing design work.

Urgency and determination to build

Not only the design process was perceived as having to be efficient, so was the building process. Doing things right the first time was also, without going into detail, a major concern within the contractor's building team. In addition to creating the right solution the first time the project team also associated efficiency with a certain urgency to begin the build and determination to continue progressing the build once started. As shall be elaborated in detail later, the contractor's self-perform sub-contract managers had openly complained about the level of technical coordination of the main design project and proposed that the construction start be postponed. However, the sub-contract managers worked with the design material at hand and began construction as originally scheduled. The understanding that adapting to the level of coordination of the design project by, and figuring out missing details as work began was interpreted to be perceived as part of the sub-contract managers' professional identity. For example, the sub-contractor manager took pride in being able to complete the civil works despite the lack of coordinated design project and referred to it as '*business as usual'*. Also, the adaptation was perceived to be required because there was a perceived urgency to build. During a site visit the owner explained that he couldn't quite understand why the design process had to be so long and why the construction process could not have started sooner. Furthermore, the design and project managers were interpreted to have developed the understanding that the project team would, regardless of how much time given, never be able to produce a fully coordinated project. Thus adapting to the current level of coordination would be more efficient (i.e. adaption would produce more-or-less immediate and tangible effects) than awaiting a fully coordinated project and the only way to get started to meet the final project hand-off deadline and avoid sanctions.

In that respect, the capacity to adapt was interpreted to be a result of and further supporting that avoiding fiscal sanctions for being late with handing off the final building creates urgency within the contractor's organization to begin the build.

The institution of leadership & management

The institution of leadership and management is interpreted to have had a shared orthodox meaning of *being a matter of distributing 'carrot and stick' appropriately.* The shared meaning is interpreted to be underpinned by the normative understanding that carrot, and in particular, stick is managed through formal structure, e.g. legal contracts, waive sanctions, and appropriately distributing risk and reward.

Leadership as appropriately distributing risk and reward

While assigning leadership and management positions to the members of the project team was interpreted to be a deeply taken-for-granted phenomenon beyond the design-build project, the contractor in particular was interpreted to have understood leadership as a matter of managing formal structure.

For example, while the organizations in the project team were aware of the technical complexity of the project, they underestimated the social complexity (i.e. multiple meanings, norms and rules) that developed during the detailed design phase. The contractor's design manager repeatedly stated that the project team was not a '*kindergarten'* and that the other project members ought to know what to work on and when. While the contractor had a clear understanding of what they expected the architects, engineers and owner to do, they also expected the architects, engineers and owners to automatically share that understanding and be able to translate that into specific work activities in the order that would lead to a coordinated main design project structured by the building process. The kindergarten metaphor was used in a degrading way and used to associate the other project members with children unable to help themselves. More importantly, not being able to automatically figure out what to do next was used to support the understanding that the architects and engineers were unprofessional. The contractor's design manager argued that the architects and engineers had been hired to do a professional piece of work, and thus the kindergarten metaphor was used to justify that it was not the contractor's responsibility to manage or lead the activities and work process of the architects and engineers. As long as the contractor repeated and maintained the date of the final deadline, the contractor insisted the architects and engineers ought to be professional enough to figure out for themselves what to do to get there. During one design meeting the architects and engineers explicitly asked for a detailed schedule for the detailed design phase. While the contractor had produced an overall schedule for the detailed design work, this was not updated, further detailed, referred to, or visualised during design meetings. Instead, the design managers would respond with *'you* [the engineers] *just need to focus on finishing the structural design.'*

In summary, the understanding of leadership being a matter of *carrot and stick* and that professional norm would lead actors to automatically figure out what to work on and when, prevented the contractor from conducting perspective-taking, multi-membership and enabling sufficient communication to guide the project organization towards a coordinated design project.

In addition, while the deadline for the preliminary design project was not sanctioned, the owner had originally sanctioned the deadline for the main design project in order to put pressure on the engineers to meet the deadline. The interviews show that this was done apparently without much reflection and by adhering to a professional norm. However, the contractor had worked with the architect on a previous project that had performed exceptionally poorly and was highly aware that the architect's design

project might be lacking technical coordination. Therefore, to encourage the architects to share their project with the contractor in order to increase preparation for construction the contractor had waived the sanctions against the architects in case of late hand-in of the final design project. In other words, the contractor had the perception that the sanctions (or lack of sanctions) could be used instrumentally to encourage a particular type of interaction (i.e. sharing the design project across organizations).

The instrumental use of fiscal mechanisms was often referred to as a matter of appropriately distributing *stick and carrot*. This was perceived not only to be legitimate, but by some the essence of the leadership dilemma and project members would openly discuss this type of leadership both inside and outside of meetings.

The institution of coordination

Coordination as a technical phenomenon

According to the contractor's design manager the main constraint to coordination during the detailed design phase was that the architects and engineers simply didn't '*understand'* the importance of a fully detailed and technically coordinated design project in time for construction. In particular in the contractor's organization there was an understanding that the design manager's responsibility was ensuring the constructability of the main design project. Therefore, during design and project meetings, the design managers would take on a more technical role and provide technical advice on specific design solutions in terms of their functionality, cost and maintenance requirements. Perhaps because the contractors cultivated the narrative of the architects being concerned with aesthetics only, the contractor's design managers had developed the understanding that their primary responsibility was to guard the functionality and cost of the design solutions. Also, the contractor's design manager (and project managers) was originally trained as an engineer and, as a contractor, had expertise on how to build buildings. This is interpreted to have made them more inclined to focus on the technical coordination of the design project as opposed to, for example, coordinating the social structures and interactions. Also, during the detailed design phase the contractor, despite being formally the leader of the project, had the understanding that respecting the work flow of the architects and engineers was important and that it was unprofessional and patronizing of the contractor to micro-manage the work of the architects and engineers. In addition, the contractor's design managers were involved in the contract negotiations with the sub-contractors and suppliers in collaboration with the project managers. All this, combined with a great sense of loyalty to their organization (the contractor) made the contractor's design managers perceive themselves as the bridge between the design organization and the contractor's build organization. As a result, the contractor's design manager and project managers did not perceive their responsibility to concern coordination of the social work elements of the entire project.

Summary of institutions

The analysis of institutions showed that five themes and eight relatively distinct institutions were interpreted to have developed in project 1. Table 4 summarises the institutions and the meanings, norms and rules that underpin each institution.

Theme	Institution	Shared meaning	Normative understanding & conduct	Rules
Quality	Phenomenological quality, functionality & aesthetics (WE)	The perception, look, usability and materiality of spaces.	Extending deadlines. Accepting late project changes. Design develops from concept to detail. Engineers and architects collaboration from project conception.	Hand-off manual. Collaboration agreement.
Collaboration	Collaboration as pragmatism & trust (WE).	Personal interaction.	Multi-membership. Mutual adjustment. Early collaboration. Access to knowledge/skills. Affection & mutual respect. Reinterpreting project content.	Target cost. Collaboration agreement. Project office.
	Collaboration as professionalism, loyalty & respect (WE).	Adhering to formal structure.	Multiple concurrent work processes. Meetings. Independent work. Respecting formal organizational hierarchies. Each profession represents a particular expertise, set of values and characteristics. Narratives & jokes. Lack of mutual empathy. Segregated roles and responsibilities.	Organizational shifts. Consultant agreements. Linear phase model. Separate contracts and legal responsibilities.
Economy	Cost optimisation (P)	Reducing project cost without compromising project quality.	Early involvement of contractor, sub-contractors and suppliers.	Target cost.
Theme	**Institution**	**Shared meaning**	**Normative understanding & conduct**	**Rules**
Economy (continued)	Cost reduction (WE)	Pursuit of short-term and/or opportunistic economic gains.	Late involvement of suppliers & sub-contractors. Avoiding risk and responsibility. Urgency & determination to build. Intertwined project cost, profit and contingencies.	Sanctioned deadlines.

Efficiency	Designing & building efficiently (WE).	Create the right solution the first time.	Sequential involvement (i.e. Value-chain). Shifts in organizational structure. Project freeze.	Linear phase model. Collaboration agreement.
		Urgency & determination to progress work.	Adaptive capacity. Overlap between design and building processes. Avoiding doing rework. BIM.	Sanctioned deadlines. Hand-off manual. ICT-agreement.
Coordination	Leadership & Management (TG).	Leadership as a matter of 'carrot & stick'.	Waive sanctions. Appropriately distributing risk and reward.	Incentives & sanctions. Linear phase model.
	Coordination (TG).	Coordination as a technical discipline.	Ensuring constructability of design project. Preliminary design project. Main design project. BIM.	Consultant agreements. Linear phase model. ICT-agreement.

Table 4. Institutions and underpinning meanings, norms and rules, interpreted to have developed in project 1 over the course of the entire design and build processes. [P, proto-institution. WE, well-established institution. TG, taken-for-granted institution.]

In the following sections, the relationship between these multiple meanings, norms and rules and how they developed over the course of the design and build processes will be analysed in order to understand the process of coordinating the project.

The constellation of institutions in project 1

The analysis of institutions in project 1 illustrated that multiple institutions developed in the project. These multiple institutions co-existed in different types of relationship that mutated over the course of the project.

In the following these relationships and how they are interpreted to have mutation are presented. Due to the project concept and early design phases being analysed ex-post these analyses will be brief, while the ex-ante study of the end of the basic design, entire detailed design and early building phases will be analysed in depth. The analysis is structured chronologically to illustrate what relationships between the multiple institutions developed in each phase of the project.

Project conception

Before the design process began, the owner and client were able to integrate their interests: building the client's new headquarters was a shared goal and made the parties mutually dependent on each other. At this point, while the constellation consisted of relatively few actors (and thus norms and rules) the owner and owner's

advisor consultant wanted to enable quality through collaboration while also wanting to place the responsibility (perceived very broadly) to be placed with the contractor as illustrated by the quote previously. To increase the duration of collaboration, the engineers were hired by the owner to facilitate the three different architectural teams in developing their design proposals for the initial competition.

In summary, the institutions of quality, collaboration as pragmatism and trust, and collaboration as professional distinction are interpreted to have peacefully co-existed.

Early design phase

Peaceful co-existence: Good collaboration

Over a period of four months, the early design phase, the four organizations in the project team (owner, client, engineer and architect) collaboration in what was interpreted to be relatively peaceful co-existence: there are no accounts of conflicts, competition or ambiguity in the empirical material (although this is partly likely to be a result of after-rationalization and fading of memory. At the end of the four-month long early design phase the constellation was disrupted with the introduction of the contractor and the institutions of cost optimization: the architects and engineers explained they suddenly had to scramble to produce a minimum of a coherent design material, that the contractor would be able use as a basis for developing a target cost.

While the project team developed a relatively peaceful constellation of institutions at this point the empirical material shows, that precursors for institutional fragmentation developed already during the early design phase. Fragmentation (i.e. institutions increasingly requiring diverging action to be fulfilled) is interpreted to have occurred both gradually and occasionally. Gradual fragmentation of institutions occurred when, for example, the project team agreed to divide the project into standardized sub-phase (i.e. organizing the design process to follow the linear phase model) with adhering deadlines and deliverables. As will be discussed shortly, the phase model unfolded, or at least supported, a number of understandings that caused institutions to fragment.

Occasional fragmentation occurred for example, when the owner negotiated a reduction of the target cost for the purpose of reducing the project cost. To elaborate, during the conceptual design phase the contractor proposed that the project developed on the basis of a target cost. The owner agreed to this and the two parties shared the understanding that the target cost was a relative figure that may change over the course of the design process. However, once the contractor had presented their target cost of 732 mio. DKr., the owner negotiated the target cost down to 703 mio. DKr. According to the owner, this was done because the scope of work included in the contractor's bid could be reduced (e.g. a double floor system was replaced with a traditional single concrete slab floor). When interviewed, the owner claimed to fully expect the scope and cost of the project to increase during the design process. The contractor, on the other hand, interpreted the target cost as a tight framework. Since the contractor did not receive a fee for participating in the basic or detailed design phase, the contractor perceived that their only way to secure business was to meet the target cost by the end of the design process in order to win the design-build contract. Therefore, the contractor guarded the target cost carefully. When the owner decided to negotiate a reduction of the target cost, despite defying the architect's recommendations, this only further increased the contractor's focus on guarding the target cost, thus shifting their focus away from optimizing the project to meet the

owner's requirements.

In addition, the owner did not sign a design-build contract with the contractor until the end of the basic design phase and the contractor was only guaranteed the contract if they were able to meet the target cost. In that respect, pursuing short-term gains by creating incentive to keep project costs under control constrained coordination of the project long-term.

These events or actions are interpreted to be part of a gradual process of fragmentation, however, they are interpreted to represent relatively condensed periods of time and thus represent episodes that can be interpreted as instances of occasional fragmentation fueling the gradual fragmentation.

In negotiating the target cost, the owner adhered to the institution of pursuing short-term economic gains and professional norm, which facilitated the diversion of the contractor's focus from participating in creating an integrated project to guarding of the target cost.

Perhaps, because the negotiation of the target cost and the contractor guarding the target cost were perceived by the contractor and owner as normative conduct, they did not recognize the fragmenting effects of their efforts or listen to the architect's recommendations to increase the target cost. Instead, when interviewed the contractor and owner's representatives perceived the basic design phase to have been characterized by '*good collaboration*'.

Basic design phase

Fragmentation disguised as peaceful co-existence: Organizations starting to develop different meanings and adhering to different norms

Subsequently, during the basic design phase, the constellation of institutions gradually fragmented as the remaining organizations in the project team also began increasingly to maintain particular institutions. To elaborate: the architects continued to develop the design project guided by their perception of quality, the engineers were, according to the architect, adhering to the perception of a value-chain which made the engineers reactive and await the architectural design to be completed so they could finalize the structural, mechanical and electrical solutions; the contractor also adhered to the normative understandings of the value-chain, focused on avoiding risk and decided to withdraw from design meetings; and, the contractor increasingly started guarding the target cost. For example, according to the design manager, the architects were struggling to produce a coherent design project and the contractor's design manager wanted no part in it to avoid being held responsible if and when the design project was deemed incomplete at the time of hand-in (and would result in rework and delays on site). Therefore, at some point during the basic design phase, the contractor's design manager decided to withdraw from the design meetings lead by the architects. Instead, the contractor considered it their foremost responsibility to ensure that information about the development of the target cost was communicated in a clear and timely manner to the owner. The communication was considered important in order to negotiate additional costs with the owner and avoid the contractor's fee eroding.

Because the fragmentation of institutions did not result in any perceivable conflicts between the project team members during the design phase, the constellation was perceived as peaceful co-existence between institutions during the basic design phase disguising the gradual fragmentation.

However, as illustrated in a previously quote, the owner hired the contractor to participate in the basic design phase and hoped the contractor would challenge the design and introduce cost effective solutions.

However, when the contractor was invited to participate in the basic design phase, they had a clear understanding that they were entering the architect's domain. For example, the self-perform concrete contractor was invited to participate in a number of design meetings during the basic design phase. However, while the early collaboration could have enabled early communication and access to accurate information, the contractor did not perceive it legitimate to actively engage in the design process. This is illustrated by the quote below:

> *'There were a lot of design meetings where I participated… it was right from the start we were sitting at the architect's head office, downtown, and I was wondering…. …I think, the constellation itself on these big design-build projects… …this thing where we participate for a period of time during the collaboration phase, where the engineers and architects mostly relate to the owner, right. We* [the contractor] *have such a strange role, we are a kind of lay representative… we can't really enter and… ….get mad and say 'why…' …well, I just sometimes wonder why we would participate is these design meetings, five meetings in a row, and nothing happened and you had meeting minutes and a lot of things and… 'any action on this item?, no, well, move on to the next item' and…. I just thought, it makes no sense to participate in these meetings because nothing happens and I wonder why even join in on that type of collaboration* [design-build]. *Perhaps I haven't seen the light but having the engineers and architect answer to the owner during this period* [the basic design phase] *and then we hire them and the poorer the owner has managed the process, the poorer the quality of the project we take on and I don't understand why we do this.'* (Sub-contractor manager, p.4-5).

In order words, the owner had intended the basic design phase to be characterized by purposeful competition among institutions followed by integration between the different institutions, however, fragmentation disguised as peaceful co-existence occurred instead.

Occasional integration: Being able to create building solutions that fulfill all institutions

Occasional integration occurred for example, when the project team engaged the façade supplier early on. The engagement of the façade supplier enabled each of the project team members to pursue a particular institution to the fullest: the architect pursued a façade of high material quality with a complex geometry and a particular tint and reflection of the glass; the engineers pursued ensuring that the façade would be able to withstand the wind pressures as well as support the required thermal indoor climate; the contractor wanted most accurate pricing with as little contingencies as possible and a professional installer; and the owner wanted a façade that would turn their building into an architectural landmark to attract future clients. Also, the early involvement of the façade supplier enabled site visits to the production site that further supported the gradual development of a shared understanding of what qualities the façade was able to embody. The gradually developing understanding of the façade system and the growing respect for the façade supplier is also interpreted to have made the owner accept an increased cost of the façade of over 60% without conflict or reducing their overall satisfaction with the project. Because the project team made

efforts towards creating a new constellation of institutions by disregarding the value-chain and the pursuit of late purchases, but rather enabled early engagement of the supplier and multi-disciplinary design work, the project team was able to pursue and satisfy multiple and different institutions through common efforts.

Importantly, the constellation was not integrated due to a broad compromise among the parties. The constellation is interpreted to have been integrated because each institution maintained its distinct meaning (e.g. did not blend or merge with other institutions), yet common efforts were able to satisfy all the institutions represented.

Despite occasional integration of institutions occurring during the basic design phase, the basic design phase was perceived by project team members to be characterized as good collaboration before the awaited battle. The precursors for the battle emerged at the end of the basic design phase when the project approached the deadline for project freeze. At the end of the basic design phase signs of the fragmentation began to emerge as disruptions to the project started occurring. For example, the client was unable to make the final decisions, the engineers unable to provide recommendation on best-for-project solutions, and the project cost was increasing by around 100 mio. DKr.

Detailed design phase

The detailed design phase is interpreted to represent the most complex constellation of institutions during project 1. During the detailed design phase the most numbers of actors with different understandings, goals and interests participated and the project team was under time pressure to produce the main design project. The main design project is interpreted to represent the culmination of the constellation of institutions. In other words, the project team would have had to coordinate all their efforts in order for the project team to produce a completed design project that satisfied all the institutions represented in the project.

Conflict I: The design process becomes a *'gothic knot'*

By the end of the basic design phase the project shifted from having been led by the architects to being led by the contractor. At this point in time, the contractor expected the entire organization to shift its efforts towards a different shared goal (i.e. preparing design material for construction purposes) and that the activities in the design process would be structured by the construction process (i.e. what gets installed and produced first is also what gets designed first). In institutional terms, the contractor wanted and expected the institution of efficiency (i.e. efficient building process) to dominate the constellation.

The following field notes from a project meeting during the detailed design phase illustrates the competition between the institutions of efficiency and quality:

> *The architect's representative presents the drawings. The architect's representative says that one of the proposals requires that some of the concrete columns be shifted. The contractor's design manager's eyes open wide! The contractor's design manager puts a hand on his chest and asks for a defibrillator. People laugh. The architect's representative seems serious but doesn't seem to understand the implication of changing the columns. The*

> *owner's representative says they would like the meeting room alongside the façade. The contractor's design manager points out related issues regarding fire and escape routes. He asks if placing the meeting rooms along the façade means shifting more columns and beams. The architect's representative says that some of the columns would have to be shifted. The contractor's design manager says the concrete project is frozen. The owner's representative says it surely can't make that much difference to shift a few columns. The client's representative says they have chosen the floor layout where the meeting rooms are located along the façade and that she wants the decision noted in the meeting minutes. The contractor's representatives say nothing.* [Project meeting, February 20th, 2014, end of detailed design phase, project 1].

In addition to the vignette, the façade can be used as an example to illustrate how the contractor maintained the understanding that the project was locked by the time the detailed design phase began. The contractor's design manager was keen to avoid changes to the façade during the detailed design phase in order to avoid increased costs as well as to avoid *'coming across as a complete fool'* to the façade supplier.

While the contractor expected the building process to structure the design process, this didn't happen. While the architects and engineers may rhetorically have agreed to work towards the goal of producing a fully coordinated main design project, the architects continued to propose improvements to the layout of the building that would improve the flow. Similarly, as mentioned earlier, the engineers openly stated that they wouldn't guarantee a fully coordinated project at the end of the detailed design phase.

Furthermore, at the beginning of the detailed design phase the architects and engineers had only handed-in a preliminary design project that was formally planned to be around 50% complete. The 50% complete mark corresponded with the normative linear phase model; the project team's shared understanding of what constituted the preliminary design project; and, what had been stated in the service specifications and collaboration agreement. Therefore, in order for the architects and engineers to complete the main design project to the quality the owner had required, they needed and had to be able to continue pursuing architectural quality integrated with the engineering disciplines, for example, mechanical design. Therefore, the architects and engineers, while expecting the contractor to dominate the project, needed an integrating constellation of institutions to work towards satisfying the institutions that they, the architect and engineer, adhered to respectively, (e.g. continuously improve functionality, aesthetic concepts, structural design, floor layouts, indoor climate etc.). In other words, the architects and engineers were dependent on integration among institutions in order to satisfy the institutions that the architect and engineer were respectively perceived to normatively represent in the project.

The competing understandings are interpreted to represent a conflict because satisfying the understanding that changes are legitimate and the understanding that changes are not legitimate at the same time wasn't possible. In other words, the fragmentation of institutions during the basic design phase postponed project integration until the detailed design phase and unintended turned competing institutions into conflicting institutions.

As a result, the detailed design phase was characterized as competition that developed into an unsettled conflict between on the one hand, the need to integrate

multiple institutions to maintain the institution of quality and on the other hand, structuring the design process according to the construction process to pursue an efficient building process.

While peaceful co-existence and fragmentation characterized the basic design phase, a conflict among institutions arose during the detailed design phase. The gradual fragmentation of institutions during the basic design phase resulted in lack of coordination during the basic design phase and increased the urgency to integrate institutions during the detailed design phase. Because fragmentation was disguised as peaceful co-existence, the project team effectively postponed integration of all the institutions in the project. As a result, integration became even more required and urgent during the detailed design phase. As a result, when the project entered the detailed design phase, the constellation of institutions changed more or less instantly from peaceful co-existence to conflict and competition.

The unsettled conflict between integrating all the institutions in the project and making a particular institution (i.e. efficiency of the build) dominate, caused the detailed design process to drag-on, stall and re-circuit respectively. The process became what one sub-contract manager referred to as a *'gothic knot'* – a process with no beginning or end.

The following vignette from a project meeting illustrates that multiple institutions imposed conflicting demands on the project and formed a *'gothic knot'*:

> *The owner's advisor representative lists a number of points from the meeting agenda. He says there are major problems with the meeting rooms placed along the façade and that the project team would like to recommend to the clients, that the meeting rooms are moved 1 meter away from the façade into the building. The client's project manager asks if the meeting rooms will be made longer. The owner's advisor representative says 'no', the meeting rooms are just shifted further in. The client's project manager suggests that a drywall is built between the meeting rooms and the façade – a proposal the engineers made at a previous meeting and had rejected. The group starts laughing and points at the engineer's representative. Someone pulls out a drawing and points out, that this proposal was originally the interior designers' proposal 6 month earlier. The client's project manager asks if it will ever be possible to have meeting rooms along the façade. The architect's design manager says it is possible only if cooling is installed. The room falls silent. The client's project manager says it is going to be bloody difficult to present to the client's peers, that they can't use the space along the façade. The owner's representative asks if it can be drawn up in a larger format… the client's representatives cuts him off because they also think it looks ridiculous with that 1 meter space. The client's representative continues to add arguments for why shifting the meeting rooms is not a good solution. One of the client's representative suggest that they install cooling, but the owner's representative points out, that it will cost time and money. The engineer's project manager stresses that cooling is technically possible, but that it definitely will cost time and money. The client's project manager says they have to involve their organization in order to make a solution. The owner's advisor representative makes a quick closing remark and moves on to the next item on the agenda.* [Project meeting, detailed design phase, project 1]

The vignette illustrates that the project team was unable to decide on the location of the meeting rooms because the particular solution they were discussing (meeting rooms located 1 meter from the façade) didn't satisfy all the institutions represented in the project. The proposed solution resulted in the required indoor temperatures and thus fulfilled functionality, however, the proposal *'looks weird*' and didn't fulfill the institution of quality understood as aesthetics. Similarly, moving the meeting rooms to the façade would have compromised the indoor temperatures. Additional mechanical cooling could have compensated for the higher indoor temperatures, but would have increased project costs and thus didn't satisfy the understanding that project cost savings should be pursued. Since none of the project team members called any of the institutions into questions (e.g. by crying down any of the suggestions), the project team members are interpreted to have accepted the importance of all the institutions. Since the project team was unable to satisfy all institutions, the client wanted to involve upper management to, implicitly, decide on the institutional order on this particular part of the building. As a result, and short of finding a solution, the project team could only postpone the issue of locating the meeting rooms.

While project members were able to perceive the inefficiency of the process, they developed simplified normative explanations for the inefficiency: the architects were frustrated with the lack of time to complete the project and lack of access to suppliers; the engineers were frustrated with the lack of owner's decisions and unfinished architectural design; and, the contractor was frustrated with the architects for continuously modifying design solutions. The contractor's design and project managers described the other project members as disloyal, disrespectful and incompetent or simply, as one of the contractor's design manager put, it '*not understanding how the process was supposed to be'*.

However, the engineers did understand the contractor's need to structure the detailed design phase according to the building process. During one design meeting when the contractor's design manager's rhetoric towards the architects and engineers had been particularly firm and insisting on meeting the deadline for the main design project, the engineer's project manager exclaimed *'We get it! The problem is, the project keeps changing!'* On the other hand, the architects, while perhaps understanding the contractor's reasoning, continued to battle for improved project quality, as illustrated by a previous quote, even if it meant changing the project.

Conflict II: access to information vs. competitive purchases

Apart from being unable to develop a shared understanding of how to structure the design process during the detailed design phase, the project team developed another conflict between, on the one hand, gaining access to information in order to finish the detailed design work, and on the other hand, pursuing competitive purchases from sub-contractors and suppliers.

The understandings of pursuing short-term gains, value-chain and the phase model are interpreted to have supported the understanding that detailed design and construction planning was not supposed to occur until the detailed design phase transitioned into the building phase. While the architects initiated inviting the façade supplier to the project during the basic design phase and the contractor agreed to collaborate, the contractor did not engage other sub-constructors or suppliers until the end of the detailed design phase just in time for construction. In other words, the contractor did not adhere to the understanding that the sub-contractors and suppliers were able to facilitate design development and coordination of the project. However, one

exception includes the contractor engaging the concrete element supplier during the detailed design phase and asking them to do the optimization of that particular building system. In other words, the contractor understood that they were not competent to challenge the design without accurate product and manufacturing information provided by the sub-contractors and suppliers. Despite this insight, the contractor adhered to the norm of tendering the individual building systems, including the concrete elements, to a number of sub-contractors and suppliers in order to get competitive pricing. Because the suppliers and sub-contractor's offers were only valid for a limited period of time due to market fluctuations and the contractor pursuing as accurate a price as possible with a minimum of contingencies, the contractor waited as long as possible to engage the sub-contractors and suppliers. In other words, there was a conflict between the understanding that increasing quality required gaining access to supplier and sub-contractor information early on in the design phase and the understanding and norm for pursuing of short-term economic purchases.

Temporary blending: inherent sympathy among organizations

Alongside the conflicting and competing institutions, institutions also temporarily merged or blended. As described previously, as professional narratives developed, the contractor and engineer shared the understanding that freezing the project was essential to the contractor in order to provide a final project cost and to the engineer in order to finish the engineering design. Similarly, around the time the contractor developed the narrative of the architects as the bad guys, a normative sympathy among the engineers and contractor was interpreted to have developed (i.e. the engineers being *the good guys)*. The perception of the engineers as the good guys lulled the contractor to trust that the engineers would deliver coordinated design work in time for construction. Nevertheless, and despite project team members referring to the project as a '*slippery eel'* that would escape their hands as soon as they felt they got hold of it, the lack of coordination of the engineers' main design project was interpreted to be a surprise to the project team. The following vignette illustrates the build up to the surprise (adapted and modified from Urup & Koch (2014)):

> *During a project meeting in January 2014, the engineer claimed to have worked throughout the design process on the indoor climate of the building but had struggled to come up with an adequate ventilation solution for many of the areas in the building because there were so many uncertainties, including floor layouts. Over the following weeks alternative cooling systems, new façade configurations, and window blinds were introduced. It was also suggested to the client that the meeting rooms were moved away from the façades. Another week would pass before the client would return with what everyone else expected to be a decision as to where the meetings room were to be located. Instead the client showed up empty-handed and started the discussion about potential solutions to the indoor climate all over again. This issue was repeated on several occasions. Finally in February 2014, the owner's advisor asked the engineers to present the results of the latest indoor climate simulations. During the presentation it became clear that the indoor climate was unable to fulfill code recommendations, which was unacceptable to the client. The following week, during a project meeting, the client expressed critical concern with the poor indoor climate. The engineers responded by saying that they had written a formal notice in October 2013, raising concerns with the indoor climate themselves. From the lack of*

response and quiet mumbling around the table, it appeared nobody had paid much attention to this notice at the time. At the meeting another long discussion about potential solutions to the indoor climate took place. The contractor expressed concern with alternative cooling methods due to cost, but had hesitated to say so because they were in the process of compiling a formal letter listing all the issues that may cause cost overruns. The owner didn't say much. The client expressed great frustration and disappointment with how the entire team had let the indoor climate slide. No one else said much.

Finally, by early March 2014, when the entire detailed design project was due to be completed within three weeks it became clear to everyone that it wasn't going to be. The concrete structures, the façades, the layout of the floor plans, the water and sewer design; none of it was completed or coordinated. Interestingly, the collective reaction in the project team was interpreted to be one of great surprise, shock and disappointment with the engineering team. Suddenly, the contractor's project manager started referring to the engineers as incompetent and having underestimated the complexity of the project.

The vignette illustrates that the engineers adhered to formal communication methods (i.e. writing a notice), formal organizational hierarchies and the value-chain by passively awaiting the remaining project team members to use the information contained in the notice and make a decision upon which the engineer could base their work. While the project team members understood that they should have read the notice (given the lack of explicit response), the team members were interpreted to have ignore the notice due to: lack of respect of the engineers; because the project team had underestimated the complexity of the task of designing the building; the project team understood the project to be continuously changing; and, the contractor having faith in the engineers' ability to resolve the indoor climate issue regardless of the other design changes.

Furthermore, but concerning the structural design, the contractor had maintained the sanctions against the engineers in the case of late final design project hand-in. This was contrary to the contractor waiving the sanctions against the architects in regards to a late hand-in of the main design project. The sanctions against the engineers were interpreted to have been maintained without much reflection, because the contractor generally had good faith in the engineering team and trusted the engineers would meet the deadline and provide a design project of sufficient quality to be built. However, the sanction on the engineers meant that they increasingly focused on protecting their own work in order to meet the deadline rather than sharing their work in order to improve the overall project. For example, the engineers did not, despite having contractually agreed to, upload their BIM model every two weeks for fear of the contractor requiring changes that would jeopardize meeting their deadline. This conflicted with the contractor's wish to thoroughly review the project in order to prepare for construction, however, the contractor did not perceive the problem or challenge the engineers not uploading their BIM model. In other words, the normative sympathy between the contractor and the engineers is interpreted to have created a blind spot that prevented the project team from critically accessing if the project was being coordinated and progressing.

Fragmentation: diverging understanding of deadlines and deliverables

The project team did not only experience conflict arising from different normative

understandings of how to structure the detailed design phase, conflict also arose from gradually fragmenting understandings of what the main design project deadline and the deliverables entailed. While, as previously mentioned, the project team developed the understanding that extending the deadline for the main design project was necessary to continue collaboration, increase project quality and allocate design responsibility, there was not a shared understanding that it was legitimate and right.

To elaborate, along with the linear phase model came two major deadlines: the hand-in of the preliminary design project at the end of the basic design phase; and the hand-in of the main design project at the end of the detailed design phase.

With the deadlines came different understandings of what was supposed to be handed-in. According to the architect's design manager the design was supposed to be 50% complete for the preliminary design project at the end of the basic design phase. However, the project team had no method and made no efforts to quantify the progress of the design project. Instead, at the transition from basic to detailed design phase, the contractor conducted a project review in order to determine what areas needed the most work in time for construction. In other words, the norm to adapt to circumstances and collaborate dominated over adhering to formal structure, which was interpreted to have caused no ambiguity in the project team.

However, the formal structure became, to some actors, increasingly important during the detailed design phase where the contractor's self-perform contract managers were not expecting, but requesting, a design project sufficiently coordinated and detailed for construction. However, according to the contractor's design manager and self-perform contract managers they had never received a fully coordinated project and therefore they didn't expect a fully constructible design project. For example, the contractor's design manager explicitly expected and accepted that the main design project would be lacking coordination and expressed sympathy towards the architects and engineers due to the on-going changes they had to integrate in the project.

Similarly, towards the end of the detailed design phase the engineer's project manager began regularly stating, without apology, that he would not guarantee a '*comprehensive*' main project in time for the deadline, but that he would guarantee that something was released. This did not seem to provoke or concern one of the contractor's design managers. When interviewed, he explained that he was expecting the design project to be unfinished and expressed faith in the construction team being able to proceed as planned with the project in its current state. He emphasized the importance of respecting the design process of the architect and engineer and understood the design phase to extend into the building phase to an unspecified point in time. The other contractor's design manager, on the other hand, was furious. He explained that the contractor had hired the consultants to deliver a fully coordinated and constructible design project and that a late hand-in and uncoordinated design project was unacceptable. He repeatedly referred to the architect and engineer's lack of professionalism by not respecting or understanding that they were hired by the contractor to produce a design project ready for construction.

In other words, there was a conflict between, on the one hand, the understanding, that handing in a not fully coordinated main project was acceptable, and on the other hand, that the main design project should indeed be a fully coordinated and detailed project ready for construction.

Early Building phase

Decoupling and gradual domination: The build begins and progresses regardless

Towards the end of the detailed design phase, two-three months before construction began, the contractor began negotiating with and hiring the respective sub-contractors and suppliers. During this period the contractor's project managers also began conducting internal project coordination meetings. Despite the increasing awareness that the main design project was not going to be as completed or coordinated as the project team had formally agreed, the contractor's building team gradually started preparing themselves for the construction process to begin. The contractor's site manager began blocking off the nearby bike paths, fencing the site, and building access roads for the delivery trucks. The project managers brought in the trailers for the onsite project office and had the trailers re-decorated with new paint and flooring. The project manager in charge of the organization began gradually assigning sub-contractor managers to the project and they spent the last three months leading up to the construction phase reviewing the project for orientation purposes. The project manager also assigned two process managers that began producing a detailed construction schedule. In the weeks leading up to construction start the one process manager started conducting work meetings with the self-perform sub-contract managers. Several of the self-perform sub-contractor managers complained over the poor level of detail of the design project they had received in the weeks leading up to the release of the main design project and explicitly suggested to the project manager that the construction start date be postponed until the designers had produced a more detailed main design project. During a so called '*start-up meeting*' one sub-contractor exclaimed *'then they* [the consultant] *will learn once and for all*.' During interviews, the sub-contractors also independently agreed, that the quality of the design project was, after all, better than most projects. However, the civil work contractor explained how components in the sewer project had yet to be sized preventing him from ordering the materials needed. Also, the sewer project had not been coordinated with the structural project and in several places the sewer pipes collided incorrectly with the foundation. Nevertheless, the coordination and process meetings continued and the contractor's process manager delegated tasks and responsibilities to the contractor's project team members.

It was never clearly stated that the construction process couldn't be postponed, yet the construction process began as planned on April 1st, 2014. Despite the poor quality of the sewer project that the engineers had produced, the civil works began. The civil sub-contract manager arranged ad hoc meetings with the engineers and asked that a particular engineer, whom he knew from previous projects, reviewed and helped size the project.

Once the building process began it didn't stall. There were sporadic delays along the way and the process manager referred to the building process as *'rather chaotic'*. He also explained that overall the build progressed according to the schedule, which was reviewed and modified continuously. Even when the roof for the atrium had to be re-engineered, the contractor put their legal department in charge of dealing with the lawsuit against the architects and engineers. As a result, the lawsuit was a process parallel to that of the construction process. While the building process was affected by the delays that resulted from having to re-engineer the steel members for the roof, the contractor's design team and the architects and engineers were able to continue to

collaborate in order to finalize the remaining design project.

The efforts made towards isolating the particular conflict, extract it from the project and deal with it in parallel to the construction process, the determination to begin and progress the build regardless of the state of the design project, and the decoupling between the project team and the contractor's building team, are interpreted to be the main mechanisms that enabled the building process to progress. And, as a result, the build gradually came to dominate the constellation of institutions.

Once the building phase began the understanding to progress the build regardless became sufficiently established or legitimate to be able to dominate the constellation of institutions. Once the construction phase began the other organizations were interpreted to have accepted and adapted to the domination of the build.

For example, the architects gradually withdrew from participating in the project and design meetings during the building phase, as they perceived themselves to be without influence any longer. Similarly to when the contractor withdrew from the design meetings during the basic design phase, the architect's withdrawal was left uncontested by the remaining organizations. The contractor was interpreted to, at first, have developed the understanding that this was a relief to the contractor since no more new ideas would be introduced to the project and the contractor would be able to act increasingly autonomously (e.g. purchase materials that they perceived to be of satisfactory quality and cost, without having to negotiate with the architects).

However, it was not a complete domination because the contractor did make some efforts to include the architects and engineers in project and design meetings, in order to continuously ensure the quality of the project and avoid legal responsibility for the design project.

For example, the contractor's design manager continued to expect and pay the architects and engineers to actively participate in resolving design issues. Or, as in the case of the smoke ventilation, the continued collaboration between the contractor and the engineer enabled the project team to apply for dispensation with the permitting authorities, when they were unable to design a solution that fulfilled the building code requirements. And, equally important, by including the architects and engineers the contractor maintained legitimacy with the owner for allowing the representation of the remaining institutions that the owner perceived to be of value. Maintaining legitimacy with the owner was important to the contractor, because the contractor needed to negotiate extra costs and extension of the building schedule with the owner. Apart from the 100 mio. Dkr. that the project cost had increased by during the design process, the building further increased by another 100 mio. Dkr. during the building process. To avoid fee erosion the contractor was dependent on maintaining a good relationship with the owner in order to ease the negotiation as to who was responsible for the increased project cost. Similarly, the contractor had to negotiate to extend the schedule by 6-8 weeks on top of the 3 months that the building schedule had already been extended.

Also, one year before scheduled completion of the build the architect's design manager resumed participation in the project meetings. This was partly encouraged by the owner and contractor, who wanted to continue to collaborate to resolve minor design issues, and partly because the architect wanted more influence. The architect's design manager later expressed regret with having withdrawn previously. In other words, the architect regretted becoming subordinate to the domination of the build and resumed participation, not to challenge the build, but at least to be able to influence the build.

Partial integration: fulfilling most, but not all, project requirements

Apart from domination and integration among multiple institutions some institutions remained fragmented during the building phase. An example of this is the how the contractor and engineering team continued to try and resolve the ventilation for the atrium throughout the detailed design phase. However, due to the lack of ability to integrate the mechanical design with the architectural and structural design, the engineers and contractors continued to try and resolve the mechanical design during the building phase and less than one year from project completion. While all other institutions became more or less integrated during the building phase, this particular area of the project remained fragmented. Short of being able to develop a solution that fulfilled code requirements, the project team began negotiating with the permitting authorities, if the requirement for smoke ventilation could be either altered or waived. In the end, the result may be the exclusion of a particular design solution (i.e. if the planning authorities waive the requirement for the smoke ventilation).

Pre-cursors for project performance

While the building has not been completed by the time this dissertation is written, early indicators of how the constellation of institutions manifest itself in the final building are starting to emerge. For example, once the building phase began, the façade was delivered and installed by the façade supplier in 4 months rather than 6 months, to a very high quality and to the contract price. In other words, early collaboration between architect, sub-contractor, contractor, owner and engineers enabled an integration of institutions that manifested itself in the finished product: the façade is a high quality landmark fulfilling the owner's requirement and the architect's vision; the façade was installed without delays, re-work or cost overruns and thus satisfying the institutions of building efficiently and cost optimization; and last, but not least, only time will tell if the façade is able to create, combined with the mechanical systems, the indoor climate that the engineers strived for and the client required.

Summary of constellations of institutions

Project 1 is characterized by a constellation of institutions that gradually increase in complexity (i.e. multiple meanings, norms and rules requiring negotiation) over the course of the basic design phase and gradually decrease in complexity over the course of the building phase. The detailed design and early building phase are considered the most complex constellations of institutions where the largest number of actors adhering to multiple meanings, norms and rules interact.

The constellation of institutions gradually mutated over the course of the project. During the project conception and programming the constellation is interpreted to have been integrated. The early design phase was interpreted to be characterized by peaceful co-existence, however, over the course of the basic design phase the constellation of institutions gradually and occasionally fragmented although the fragmentation was perceived by project team members as peaceful co-existence. During the basic design phase there were also episodes of occasional integration. Once the detailed design phase began the constellation of institutions was

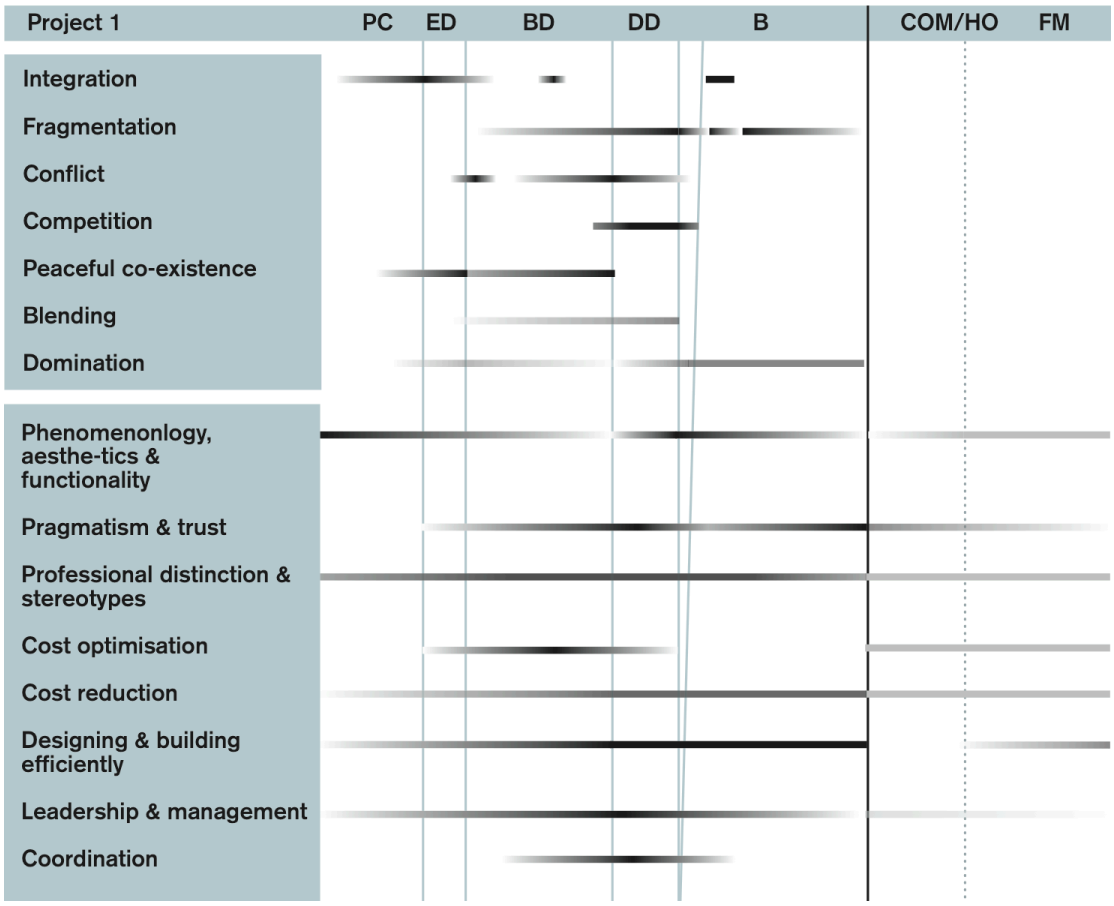


Figure 3. The figure summarizes the development of institutions as well as the constellation of institutions over the course of project 1.

characterized by conflict and competition among institutions. In particular, competition and conflict arose between the understanding to structure the design process according to the building process and the understanding that integration of institutions was required in order to increase project quality. Integration among institutions also occurred given that a relatively coordinated design project was developed after all. Temporary blending also occurred during the detailed design phase and resulted in temporary coordination, but resulted in sudden conflict when, for example, the mechanical engineering design was unable to fulfill thermal indoor climate requirements. During the building process the constellation of institutions gradually became dominated by the norm of the build, while remaining institutions became relatively subordinate.

Over the course of the project the institutions in the constellation integrated (gradually, partially and occasionally), fragmented (gradually and occasionally), co-existed peacefully, blended, competed, conflicted and dominated.

While conflict, peaceful co-existence, blending, competition and domination were defined theoretically in a previous chapter, integration is defined inductively and fragmentation is introduced and defined inductively.

Integration of a constellation of institutions is defined as multiple and distinct institutions all being satisfied through common action and effort. Importantly, integration doesn't include blending of meanings, norms and rules. Rather, occasional integration resulted in the project team ensuring critical evaluation of work and

satisfaction of the different institutions in the constellation. Contrary, gradual integration posed the risk of institutions blending and the project team members not sufficiently critically assessing project work, threatening the coordination process.

Fragmentation of a constellation of institutions is defined as multiple and distinct institutions requiring increasingly divergent efforts to be satisfied, however, without conflict or competition. While fragmentation was perceived as peaceful co-existence fragmentation constrained the project teams ability to bring together the different work elements and thus coordinate the project. However, fragmentation also enabled the project team members to pursue a particular institution to allow for developing design ideas that satisfy a particular institution to the fullest.

The analysis of project 1 showed that it is the lack of integration of institutions during the basic design phase that creates urgency for integration of institutions during the detailed design phase. However, during the detailed design phase the need for integration in order to increase project quality compete and eventually conflict with structuring the design process according to the building process to increase efficiency of the build. It is the lack of integration of institutions during the basic design phase and competition among institutions during the detailed design phase that constrains the project teams ability to produce a fully coordinated main design project. In the long run, the result of the lack of integration among institutions was redesign of the steel roof, lack of ability to fulfill smoke ventilation code requirements and potentially indoor thermal comfort requirements.

Integration among institutions during the design process and the decoupling and gradual domination of the build enabled the project team to construct a building that is interpreted to be on course to integrate multiple institutions, as illustrated for example, by the successful design, delivery and install of the façade system. The relatively '*smooth*' construction process indicates that integration not only has occurred, but has characterized the project. In order to understand how mundane on-going integration has occurred, as well as how for example, conflicts and fragmentation, occurred, the following section presents an analysis of institutional work interpreted to have been conducted in project 1.

Interactions and efforts made towards coordinating project 1

As mentioned previously, the project team, made more-or-less purposeful efforts to implement structures and enable interaction that were perceived to facilitate either integration or the domination of particular institutions.

The empirical material also showed that the organizations in the project team made purposeful efforts towards making the project teamwork towards certain goals. The following sections present an analysis of how the project team carried out (or didn't carry out) institutional work to create, change or maintain institutions and constellations of institutions in order to enable project coordination. The following analysis also discusses the intended and unintended consequences of the institutional work.

The conception of the project

In order to understand why the constellation of institutions developed as it did in project 1 the first step is to understand how the particular constellation of institutions for project 1 was initiated before and during project conception.

First of all, the constellation was partly a result of normative conduct and taken-for-granted assumptions about what was right in a design-build context. In the case of project 1, the owner and client initiated the project together. In determining the project setup, the owner, a professional property developer adhered to the taken-for-granted norm of conducting an early programming phase and by planning the process according to the phases of early design, basic design, detailed design, building, and hand-off (standardized by the Danish Association of Architects).

Similarly, the owner invited three architects to participate in a competition early on. This is interpreted to be a normative practice that maintained the understanding that the architect was the key actor in shaping the project and that architectural quality was a priority. This legitimized the domination of the architect and the institutions that the architects were perceived to represent (e.g. phenomenological quality, functionality, and aesthetics). Furthermore, the owner sanctioned both the architects and engineers if they didn't meet the respective project deadlines. This was also interpreted to be a normative conduct guiding the understanding that providing sufficient stick would keep the project on schedule.

Secondly, other completed or on-going projects served as inspiration for institutional creation or as warnings of institutional disruption. The interviews and observations show that efforts were made with distinct references to at least five of the contractor's previously completed or on-going projects. These projects were either used to illustrate what was considered best practice or worst practice in order to legitimize current efforts in project 1. For example, project 5 (presented in the next chapter) was often used as a reference on worst-practice. Specifically, in project 5 the contractor's organization had not been sufficiently focused on keeping track of the gradually increasing project scope with the result that the contractor and owner were unable to negotiate and agree on the final project cost. As a result, two project managers had been assigned to project 1 – one who was responsible for managing the organization and one responsible for managing the development of the target cost relative to the project scope. Also, project 5 guided the owner's understanding of what constituted design-build best practice as illuminated by the quote below:

> *'We were truly inspired by the process* [in project 5] *because we followed the entire project very, very closely, and considered if we should invest in it. And looking at the way the contractor handed-off that project, we said, 'we will never do that!'. And that is how this project was born.'* [Owner's representative].

Similarly, the architects, engineers and owner's representatives would refer to completed building projects (such as iconic building around the world and buildings the project team members had visited, designed, built, worked or lived in themselves) when trying, for example to solve the indoor climate solutions. In other words, other projects served as institutional debris that project members drew on in order to justify and make dominant the understanding they adhered to.

Early design phase

During the programming and conceptual design phase the owner and owner's advisor consultant initiated several efforts towards disrupting the normative design-build process for the purpose of gaining access to accurate information and optimizing the cost and quality of the build. For example, the owner invited the contractor to participate in the basic design phase and also hired the engineers before even assigning the architects. Also, the owner established a joint project office where project team members could informally interact and have easy access to each other's expertise. While these efforts seemed to be reflective and purposefully aimed at increasing interaction and the quality of the project, the owner also decided to divide the process into a number of phases that design-build projects normatively follow: programming, conceptual design, basic design and detailed design.

Once the architects and engineers had produced a conceptual design proposal, the owner and contractor were interpreted to have tried to create a new constellation by inviting the contractor to join the project team at the end of the early design phase. To ensure that the project cost and quality was optimized in conjunction, the owner and contractor set in motion institutional work that would ensure that actors adhered to a shared understanding of the project and made efforts towards a shared goal and thus enabled an integrated constellation of institutions: the early interviews and target cost are examples of this as mentioned previously. However, despite the owner's awareness to make efforts to enable integration, the owner also adhered to some taken-for-granted norms (e.g. the linear phase model, negotiating a reduction of the target cost and sanctioning the hand-in of the design project and final building).

The efforts were interpreted to be more or less fragmented because they represented a combination of taken-for-granted project conduct and what was perceived by project team members, not necessarily as novel, but somewhat experimental. As described previously, the experiments were based on overcoming the problems experienced on previous projects. In other words, purposeful and reflective efforts towards creating a new institution in project 1 were not based on a holistic analysis of the constellation of institutions as it would develop over the course of the project, and therefore the efforts appeared as fragmented.

While no perceivable consequences of combining taken-for-granted structures and reflective experiments are interpreted to have arisen during the early design phase, mutations to the constellation of institutions started emerging during the basic design phase.

Basic design phase

During the basic design phase, the owner, architect and contractor carried out institutional work, for example, the architect suggested to the owner that the target cost be increased by 100 mio. DKr. and thereby intended to allow the contractor to focus on the quality of the project instead of attending to financial administration. Despite the owner dismissing the architect's proposition, the architect's efforts were interpreted to represent an attempt at coordinating understandings through perspective-taking. Also, during the basic design phase the owner and contractor were interpreted to have conducted institutional work when agreeing to letting the contractor participate in the basic design phase and disrupting the design-build norm of only the architect and engineers engaging in the basic design phase. These efforts

are interpreted to represent a successful increase of communication and shared understanding of the purpose of the project.

Taken-for-granted institutional maintenance and gradual fragmentation

Despite the owner's intension to create integration among institutions during the basic design phase, the organizations were interpreted to mainly be concerned with maintaining the respective institutions they adhered to. While the organizations intended to maintain individual institutions they were not interpreted to have intended to constrain project coordination. In other words, maintaining individual institutions was not perceived by project team members to disrupt the integration of the constellation of institutions.

There were several reasons for that. For example, when negotiating the target cost, the owner, while otherwise intending to create an integrating constellation of institutions, diverted the contractor's focus from contributing to creating an integrated project to guarding of the institution of cost reduction (i.e. guarding the target cost to be sure to get the design-build contract and later avoid fee erosion).

Furthermore, the constellation of institutions during the basic design phase was new in the sense that there was no norm for the contractor to participate in the basic design phase. While the architect, engineer and owner had a norm for collaboration during the basic design phase, the contractor did not. Therefore, the project team was interpreted to have had no taken-for-granted understanding of what early contractor participation might entail. The new constellation could have resulted in the organizations collectively reflecting and trying to purposefully create a new and particular institution. However, this did not happen. Instead, it was left up to the individual organizations to interpret and define new meaning, normative conduct and rules with the new collaboration form. The architects interpreted the early collaboration as an opportunity for multi-membership and access to cost and product information. This was similarly to the owner's understanding. As a result the architects initiated for example, the engagement of the façade supplier. In other words, their interpretation and new meaning was to integrate the contractor's competencies in the basic design phase.

While the contractor accepted to participate in the design meetings they, however, developed a different understanding of what participation in the basic design phase meant compared to at least the architect's and owner's understanding. The contractor's design manager didn't perceive it as valuable to actively engage in design meetings for as long as the architects were formally leading the process and as a result, withdrew from design meetings.

Instead, the contractor considered it their foremost responsibility to guard the target cost. The contractor's project team, at this point, consisted of very senior project and design managers. While this in itself does not automatically lead to institutional maintenance, the point is, they had a well-established understanding of what the contractor's role was during the detailed design phase, not the basic design phase. The contractor enacted institutional maintenance during the basic design phase in anticipation of the conflict that arose during the detailed design phase (i.e. delays to the main design project, lack of decisions, and late changes). Furthermore, since they did not consider the architects competent to lead the design process, they thought it legitimate to adhere to the institution of avoiding risk and only participate in project meetings.

During the basic design phase, no collective awareness that leading the project was a

matter of leading many organizations developed. Nor was collective awareness or articulation of how the project team might maintain an integrated constellation interpreted to have occurred. As a result, the contactor and engineers increasingly maintained taken-for-granted institutions and reproduced existing patterns of interaction. Thus, the basic design phase became equivalent to a prolonged introductory phase for the contractor: a great opportunity to get familiarised with the project's goals and the other participants. The consequence was an unintended fragmentation of the constellation of institutions. Therefore, unintended, the project team postponed integration until the detailed design phase and thus created increasing urgency and need for integration during the detailed design phase. While the owner had made efforts during the basic design phase to create an integrated design process, the basic design phase, became a mix of attempted change and unintended maintenance.

Institutional integration initiated, but not maintained

The gradually increasing institutional maintenance is also interpreted to be a result of the owner expecting the integrated constellation to automatically mutate itself towards integration as long as the initial efforts towards creating an integrating constellation of institutions were made. In other words, the owner's representatives, when interviewed, were interpreted to not have reflected or foreseen that efforts had to be made towards maintaining integration of the constellation of institutions. Adhering to professional norm, the owner had appointed the architects to lead the project during the basic design phase and thereby sparked the shared understanding that the institutions represented by the architect were to dominate the basic design phase. The empirical material shows no indications that for example, formal organisational hierarchies were renegotiated; that the collaboration agreement was ever discussed or re-evaluated once signed; or that time and space was allocated to discuss and evaluate collaboration in the project team. Rather, tension arising from poor collaboration and conflicting understandings was perceived as an uncomfortable topic that project team members deliberately avoided. Therefore, unintended, taken-for-granted professional norms resulted in fragmentation due to lack of on-going maintenance of the integrated constellations of institutions.

Detailed design phase

Contractor's efforts to dominate

At the transition from basic design to detailed design the project team went from a new uncontested constellation of institutions to a well known one. Since the design-build norm was interpreted to be for the contractor to lead the detailed design phase an array of understandings and norms suddenly guided the project team.

In the same way that the contractor had previously understood, accepted and enacted, and thereby also maintained, that the architect's meaning of quality dominated, the contractor expected that the institutions they normatively represented (cost optimisation and the build) were to dominate the detailed design phase. The following quote illustrates this perception:

> *'I think we have neglected one thing. Back when we were awarded the contract and officially took over the detailed design management responsibility, we should have turned the whole thing around and made a new*

> *structure and said: 'Dear friends, now we are in charge. And in our world we manage the project in a different way'. Then we need to manage that the architects show up, have rehearsed, show up on time, bring along the correct material, and we know what they bring along, and that those things are presented and that something has been released in advance and that's how we take charge of that process. That way we would be in charge of the design-build delivery and present things in the order we need it in order to get the project approved* [by the city's permitting authorities]. *...I think* [the process] *slid into the same organizational pattern that had been created by the owner prior to* [the contractor] *joining the project. ...we were part of that for a long period of time. ...well, we had to be a bit defensive, because we didn't have a contract. The architects, engineers and owner's advisor had a contract. We didn't, we had only given a target cost and were working on creating a contract. But we were not in charge… the organizational chart…. You're not in charge until you have signed a contract.'* [Contractor's design manager].

The quote also illustrates a sense of failure: that something else should have been done to avoid the current situation characterised by delays and lack of coordination. As mentioned previously, the detailed design phase was characterised as a conflict between integration and domination and no collective, reflective and purposeful efforts were interpreted to have been made to resolve the conflict.

However, one attempt to resolve the conflict and integrate the constellation of institutions was the contractor hosting a joint BIM review. During the detailed design phase the contractor assigned a BIM-coordinator to the project. The BIM coordinator's responsibility was perceived to include: coordination of the three different models; ensuring the constructability to the design project; and to ensure that the quality of the BIM model was adequate as per the ICT-agreement (Information and Communications Technology Agreement). As an extension of existing project reviews and design meetings, the contractor's BIM coordinator and design manager conducted a BIM review session with the architect and engineers' BIM coordinators. Prior to the meeting the contractor's BIM coordinator ran a collision control based on a merged 3D model consisting of the individual models from each design discipline. The BIM coordinator then selected the most important collisions and used them as illustrations during the BIM review session.

Throughout the BIM review session, the contractor's BIM coordinator and design manager used the list of collisions to emphasise how poor the quality of the design team's BIM work was. In return, the architect's BIM coordinator pointed out that the contractor's time schedule was outdated and that the architects and engineers needed guidance from the contractor's design managers on specifically what to work on and in which order, in order to meet the deadline for the final design project. In other words, the architects and engineers were expecting the contractor's design managers to lead a collective design process.

The BIM review session was characterised by an atmosphere of degrading criticism, blame and mutual disappointment. The initiative to conduct a BIM review was an opportunity to bring the different project organizations together by creating a shared understanding of the goal with the model, the design process and the project. However, the BIM review ended up constraining coordination because the review was used to maintain and segregate individual institutions.

Another on-going attempt at resolving the conflict was the contractor's design

manager who gradually became increasingly firm in the rhetoric towards the architect and engineers in an attempt to make the other organizations understand, accept and adhere to the institution of building efficiently. He did so by stressing the importance of making the building process structure the detailed design process and the need for loyalty and respect towards the formal organizational hierarchy, the deadlines and the project freezes.

The contractor's two design managers each perceived that they had only one tool each to try and settle the conflict: one emphasised the importance of collaborating by accepting the conflicts in the design process empathising with the work processes of the architects and engineers, and accepting that the detailed design process would drag on; the other emphasised the importance of rhetorically and continuously reminding the architects and engineers that they were contractually hired by the contractor and thus, from his viewpoint, obliged to adhere to the interests of the contractor's organization.

Mundane & Collective efforts towards integration: Satisfying multiple institutions through common effort

While the conflicts, competition, fragmentation and occasional integration often were more perceivable during the empirical observations, the observations and interviews illustrate that on-going integration also occurred during the detailed design phase.

One example of on-going integration concerns the issuing of the building permit for the project. To elaborate, during the design process, the city's master plan for the area was under development and the project was a landmark for the local area. Originally, during project conception, when the owner started negotiating with the city to purchase the land for the project, the city was involved in deciding on the winning proposal from the architects' competition in the early design phase. Nevertheless, during the detailed design phase the city wouldn't approve the design. According to the architects the city had changed their requirements. According to the contractor, the architects hadn't respected the requirements laid out in the master plan. The building permit for project 1 depended on the parties reaching an agreement, and as result the master plan and the building developed in mutual negotiation during the basic design phase.

The owner and the architect headed the negotiations with the city jointly. The contractor's design manager deliberately decided to not get involved in the negotiation meetings with the city during the basic design phase to avoid being held responsible for problems related to the city issuing the building permit.

However, the contractor's project manager was continuously communicating with the city's permitting authorities in order to ensure that the building permit would be issued and the building process could progress as scheduled. The following quote illustrates the on-going and mundane efforts made towards coordinating the project:

> *'The city's permitting authorities receives seven copies of the building application…* [one for each of the departments that need to approve the permit application]. *It is the Centre of Building that is responsible for gathering all the approvals and issuing the main building permit. At the Centre of Building, there is a particular person, whom I have been continuously communicating with to ensure, that nothing is lagging in their system.'*
> [Contractor's project manager]

However, not only the contractor's project manager made efforts to coordinate the

design work and the expectations and procedures of the city permitting authorities. The following field notes from a project meeting illustrate that while some actors adhered to formal structure, other actors, for example the city, were perceived to typically compromise formal regulations and procedures to coordinate the project:

> *The engineer's project manager says that the client needs to decide what type of security system they want on each door. It is a matter of fire safety. The engineers' project manager refers to a notice, where the engineers' recommendation is clearly stated. The owner's representative asks if it has been passed on to the client. The engineer's project manager says nothing gets sent directly to the client and that everything has to pass through the owner's advisor. The owner's advisor asks if there are other things pertaining to the permitting authorities. Someone says that the requirement to hand-in structural calculations before the issuing of the building permit cannot be met. Someone says everybody knows this, including the city's permitting agency. The engineers' project manager says that the permitting authorities can decide to enforce certain requirements that will stall the design and building process. 'But that is exactly why the city won't enforce the requirements', says the contractor's design manager.* [Project meeting during detailed design phase].

Despite the implied adaptive capacity of the city, the ongoing negotiations with the city resulted in uncertainty about the geometry of the building and the opening in the façade and the project team was unable to freeze the design. In other words, the lack of coordination between the city, owner and architect constrained the efficiency of the building process and the possibility to optimize project cost and quality.

During the detailed design phase, as the building process approached, the contractor's design manager decided to get involved and started participating in the meetings with the city, owner and the architect in an attempt to negotiate a compromise and enable the issuing of a building permit. In the end, a building permit was issued a few weeks before the construction start date.

Maintenance when change is expected: Leadership confusion & paralysis

The project organization had developed norms that had become taken-for-granted during the basic design phase that they carried over to the detailed design phase. For example, the project team continued to conduct the same meetings, on the same weekday, the project team was still located at the joint project office, and perhaps most noteworthy, the owner's advisor continued to run the meetings. In other words, while the transition from basic design to detailed design marked an organisational change, normative conduct changed relatively little. However, there was a joint expectation within the project team, that the contractor would somehow initiate or exercise leadership. The following quote illustrates the confusion concerning leadership:

> *'But we also have to remember that MT Højgaard are actually also design manager. I'm not entirely sure what it is, they are design manager of, well, which… …what is their area of responsibility and what is the responsibility of the owner's advisor consultant, because right now, it appears to me that there is joint design management, which is impossible in my opinion. You can only have one design manager, you cannot share such a responsibility*.' [Project

manager, structural engineering].

During the transition from detailed design to building process, there was no formal shift in leadership, nor was a clear establishing of leadership perceivable. And, because the architects and engineers expected the contractor to lead the project during the detailed design phase, they too did not conduct institutional leadership to change the constellation of institutions. As a result, institutional management became even more prevailing during the detailed design phase than it had been previously.

Similarly, the contractor had assigned two project managers to the project interpreted to represent the institutions the contractor perceived to be most important: collaboration and cost. Specifically, one project manager was understood to be responsible for managing the contractor's organization (including for example assigning and coordinating sub-contract managers, administrative staff and more); and the other project manager was understood to be responsible for managing the project cost (including updating project costs and tracking extra project costs). In other words, the contractor considered their project managers to be responsible for managing the contractor's organization only. The contractor's project managers did not perceive their responsibility to concern coordinating the social elements of the project, including critically reflecting on the meanings, norms and rules that they themselves, and other project team members, adhered to.

Also, conflicting understandings of what the shared goal for the project team was supposed to be created ambiguity for the contractor's project and design managers: on the one hand, continuous changes to the project was accepted because there was a taken-for-granted perception that late changes were simply unavoidable and because they increased the scope of the work and therefore increased their contract sum; on the other hand, there was a perception that the project had to be frozen in order to prepare for as efficient a building process as possible. The lack of shared understanding among the contractor's project and design managers constrained the contractor from making unified efforts towards changing the constellation of institutions.

The building phase

When the project entered the building phase the constellation of institutions changed and the contractor and the institution of building efficiently became legitimately dominant, as described previously. The empirical material indicates, that no purposeful or dramatic action was involved in this change rather the change was interpreted to be a taken-for-granted change that all the project members expected, understood and enacted. As described previously, the contractor, despite the design process being a '*slippery eel*' started preparing for the build as scheduled and conducted adaptive capacity by working with the design material available to them.

On the one hand, the contractor made an effort to create a coupling between the design process and the building process by continuing the collaboration with the architects and engineers throughout the building process. On the other hand, the beginning of the building phase also meant the contractor building up a new organization: the seven project, design, sub-contractor managers and BIM coordinator that had participated during the detailed design phase, now increased to around 40

people, excluding the workmen, in a matter of weeks. The members of the new contractor organization hadn't interacted with the design team during the design process. This decoupling allowed the contractor's building team members to approach the project with, not purposeful determinism, but rather taken-for-granted expectation to start the build, relatively unaffected by the conflicts that had dominated the project organization during the detailed design phase. More specifically, the contractor's building team picked up the design project in its current state, and rather than lingering over the reasons why it hadn't been completed, went along with it and try to figure out how to build it. This was interpreted as reproduction of the norm. The owner, architect, engineer and city's architect, who approved the project in time for construction, were also interpreted to accept the dominance of the build once the project approached the building phase.

However, as mentioned previously, the build did not replace the remaining institutions. For example, the contractor encouraged the architect to resume participation. Also, the contractor continued to rhetorically push the architects and engineers to finish their work. However, during the building phase references were made to the expenses associated with '*stalling the cranes*' and delaying work crews and suppliers if the architects and engineers did not finish in time. Also, the sub-contract managers would pressure the design team for what they most urgently needed to be able to carry out either closing the sub-contracts, enable the suppliers to begin production or enable work on site to progress.

The urgency that the materialization of the physical structure imposed on the project team members and the contractors' ability to adapt their work processes to compensate for the lack of coordination of the design project enabled the building process to progress. The references made to the materialization of the structure and the purposeful efforts to continue collaboration are both interpreted to represent mundane efforts that ensured domination of the build and the existence of the institution of quality.

The domination of the institution of the build was interpreted to be a result of purposeful mundane efforts made towards making sure the project would meet the deadline and a taken-for-granted expectation by all project team members that they understood, accepted and enacted.

Summary of institutional work in project 1

In the early design and basic design phase institutional work aimed at creating a new constellation of institutions was conducted, but during the basic and detailed design phase, the organizations in the project team primarily exercised institutional maintenance. In particular, institutional maintenance was fuelled by: the early involvement of the contractor which disrupted the normative pattern of interaction and contractor's lack of ability to adapt their understanding of their role in the new collaboration; ambiguity caused by different understandings of when and if design project coordination was important and right; diverging understandings of whether collaboration was a structural and interactive phenomenon; lack of communication; senior project managers and design mangers with taken-for-granted assumptions about project conduct; lack of mutual respect and lack of perspective-taking; adherence to segregating juridical regulations (e.g. the contractor's design managers avoiding taking on design responsibility for fear of liability); and the understanding that leadership was a matter of distributing risk and reward appropriately rather than

how to coordinate social understandings, norms and rules.

Even opportunities that could have assisted in creating an integrated constellation of institutions, such as the BIM review, turned into an occasion for institutional maintenance resulting in further fragmentation of the institutions.

The lack of collective awareness, reflection, discussions and efforts to change the constellation of institutionalised norms, rules and meanings that each organization adhered to was a significant constraint on the project team's ability to integrate the different institutions in the (design) project.

Some purposeful efforts are interpreted to indeed have enabled coordination. In the case of for example the façade, successful multi-membership, purposive pursuing of integration and disrupting the understanding of a value-chain and pursing short-term economic gains enabled the design and installation of a façade that fulfilled multiple institutions.

The most important point concerning the project team's efforts towards designing the façade is, that the organizations were able to maintain the meanings of multiple different institutions of phenomenological quality, aesthetics, functionality, cost optimisation, and efficiency of design and build process by creating new ways of interacting (e.g. early collaboration, multi-membership, and site-visits).

Summary part 1

The analysis of project 1 consisted of three levels of analysis that gradually built on each other: the outline of relatively stabilised meanings (and underpinning norms and rules) that developed in project 1; an analysis of the mutating relationships between these multiple institutions; and, an insight into the efforts that were made towards creating, maintaining and disrupting institutions and/or the constellation of institutions.

Institutions

A number of structures that were more-or-less taken for granted and considered normative design-build practice are interpreted to have developed in project 1. Each structure was underpinned by a particular shared meaning, and potentially multiple norms and structures. Over the course of the project, eight institutions were interpreted to have developed and include: quality understood as phenomenology, functionality and aesthetics; collaboration as pragmatism and trust; collaboration as professionalism and loyalty; cost optimization; cost reduction; designing and building efficiently; leadership and management; and coordination.

Constellation of institutions

Building on the insights from the analysis of institutions, the second analysis showed that the relationships between these multiple institutions changed over the course of the project. In the early design phase an integrated constellation of institutions was intended (and possibly established), while the basic design phase was characterised by occasional integration and increasing institutional fragmentation perceived as peaceful co-existence. Integration of a constellation of institutions is defined as institutions remaining independent but all satisfied through common effort, while fragmentation refers to institutions drifting apart so that diverging efforts are required

to satisfy each institution. During the detailed design phase, the constellation of institutions was characterised by competition and conflict between; on the one hand, the need to continuously integrate institutions in order for the institutions represented by the architects and engineers (i.e. quality, functionality, and aesthetics) to be maintained in the project; and, on the other hand, the need to let the building process dominate and structure the design process in order for the contractor to increase the efficiency of the building process. The unsettled conflict was the main constraint on the project team's ability to coordinate the project.

To elaborate, when the constellation of institutions was integrated, the design and/or build process progressed and the final product (e.g. the façade) satisfied (potentially) all the institutions in the project team. When institutions were integrated over a long period of time or perceived as being identical or mutually supportive, the design process progressed, however, it constrained the project members ability to critically assess each others work (ex. the contractor not assessing the work of the engineers) and the result was a design project of poor quality and rework and delays on site. Similarly, partial integration occurred when the project team was able to coordinate some of the institutions, while others remained un-integrated. As a result and despite integration between some institutions, the overall constellation remained fragmented, because not all institutions were able to integrate. The result was delays to the design and build processes and potentially the exclusion of a particular design solution (i.e. if the planning authorities waive the requirement for the smoke ventilation).

When institutions peacefully co-existed the design process progressed, however, peaceful co-existence disguised the increasing fragmentation and therefore created urgency for integration during the detailed design phase, indirectly fuelling the institutional conflict between integration and domination during the detailed design phase. When institutions competed and conflicted, as in the detailed design phase, the process dragged-on, stalled and re-circuited.

During the building process the institution of the build gradually came to dominate the constellation of institutions and other institutions became subordinate and enabled the building process to progress. In the transition between detailed design phase and building phase, the decoupling of the design organization and the contractor's building organization enabled the change in the constellation of institutions. While the contractor's construction team had to exercise adaptive capacity in order to work with the uncompleted design material, gradually the build forced the remaining institutions to compromise or adapt.

While adaptive capacity may have enabled the project to progress, even the building process was not entirely stable as disruptions continued to occur partly due to the lack of coordination that had been developed during the design process (and partly due to lack of coordination during the building process).

Institutional work

The analysis of institutional work showed that the owner and architect exercised institutional work aimed at creating an integrated constellation of institutions during the early phases. However, institutional maintenance by the owner, architect, engineers and contractor gradually fragmented the constellation of institutions. During the detailed design phase, the organizations in the project team primarily exercised institutional maintenance. The empirical material shows that only a few attempts were made to change the constellation of institutions and that these were

made with the aim to make a particular institution dominate, not to integrate multiple institutions. No collective efforts were made to analyse, reflect upon or change the constellation of institutions after the early design phase.

While the early efforts towards creating a particular constellation of institutions were driven by the owner, by the time engineers and architects joined, the constellation had reached a level of complexity that enabled the constellation to mutate more or less without purposeful efforts. In other words, by the time the architects and engineers joined the project, during the basic design phase, the project team was interpreted to already have started to produce certain meanings, norms and rules that would guide (if not entirely predict) the course of the project. Once the constellation was initiated it started mutating according to more-or-less taken-for-granted patterns during the design and build processes. Therefore, the lack of on-going institutional work aimed at creating and subsequently maintaining an integrated constellation of institutions was a significant constraint on the project team's ability to coordinate the project.

The most important enabler for project coordination was interpreted to be the project team members' ability to: deviate from normative understandings of how to collaborate (i.e. the value-chain and segregated responsibilities) and formal structures intended to improve efficiency alone (i.e. the linear phase model); exercise multi-membership; take the perspective of other organizations, while still being the stewards of a particular or multiple institutions.

In summary, the constellation of institutions gradually mutated over the course of the project and project coordination was a result of institutional debris from previous projects; taken-for-granted understandings of what constituted a design-build project, normative understandings of roles, responsibilities, collaboration, coordination and leadership; and reflective efforts aimed at creating, disrupting, and/or making dominant existing institutions.

Part 2

Analysis part 1 was aimed at understanding the relationships between multiple institutions and efforts made towards changing or maintaining the institutions and relationships between multiple institutions to understand the process or project coordination. The second part of the analysis concerns understanding how institutional processes affect project performance. A project's performance is not defined as a snapshot in time, for example at the hand-off date, but rather interpreted as a project phase around the time of project hand-off and subsequent occupancy where the constellation of institutions temporarily stabilizes.

First, the projects 2-6 are briefly and qualitatively described. Second, the analysis of what institutions and constellations of institutions developed on each project is presented. Third, each project's performance is analyzed and discussed. Finally, a summary of projects 2-6 is presented.

It is beyond the scope of this dissertation to present the full analysis of the institutional process of all the six projects in detail. Therefore, for each section of the analysis project 5 is emphasized to illustrate key points, while the remaining projects are summarized. The last section regarding project performance, however, includes a full discussion of each project's performance.

Descriptions, projects 2-6

Projects 2-6 are briefly described in the two graphics below. Table 5 summaries quantitatively the main project characteristics. Figure 4, illustrates the timeline for each project in order to show the overlap between collaborating actors relative to the design and build phases.

	Typology	Size, m^2	Target cost, mio. Dkr.	Design-build cost, mio. Dkr.	Year completed
Project 2	Office	32,000	850	1100	2011
Project 3	Office	33,000	856	858	2011
Project 4	Residential	23,000	206	238	2014
Project 5	Office	20,000	698	841	2013
Project 6	Office	5,000	66	72	2012

Table 5. The table summarizes the basic characteristics of projects 2-6.

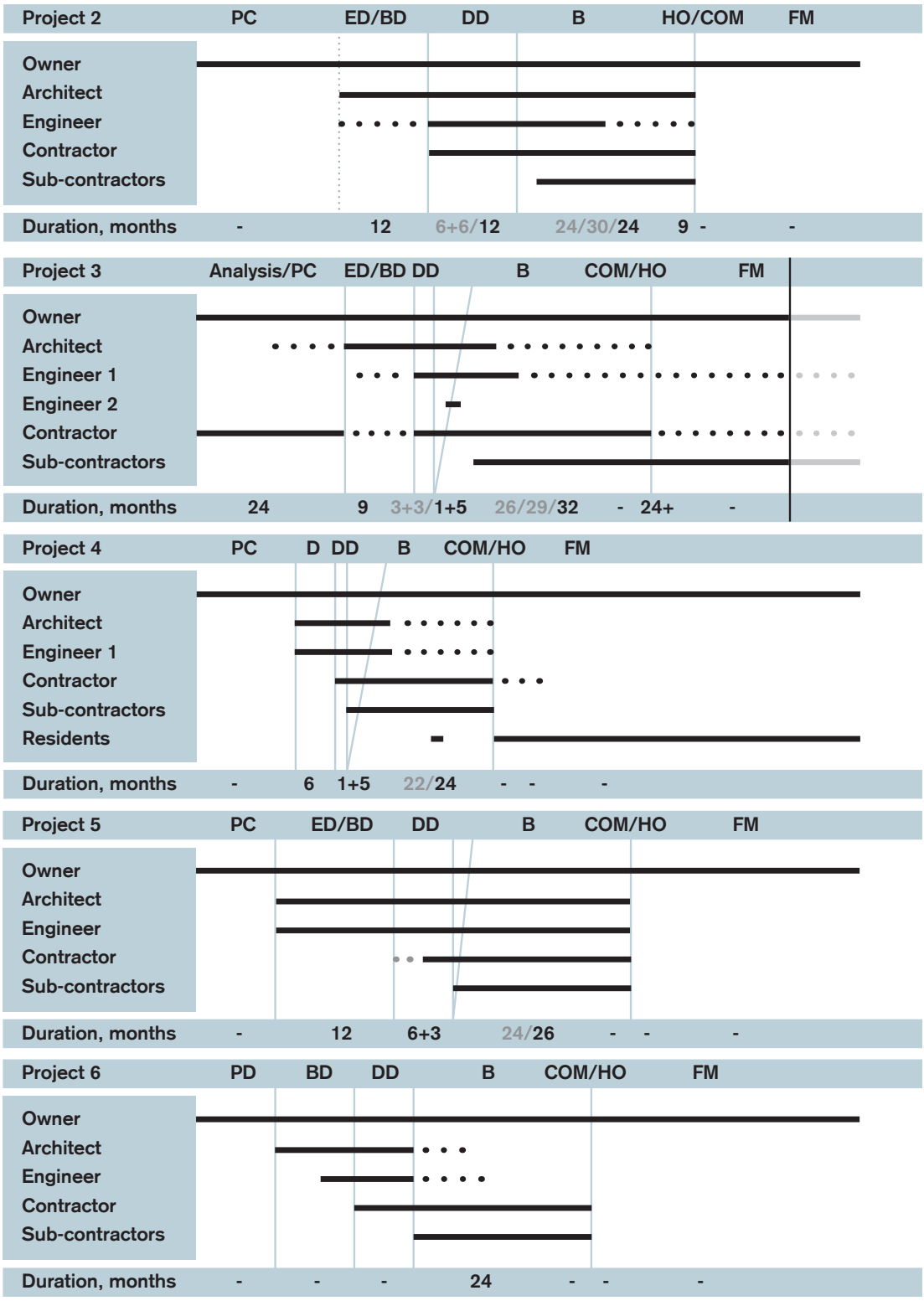


Figure 4. Summary of project timelines and timing and duration of actor involvement.

Project 2 concerns the design and build of a large office building for a public client and was characterized as a '*typical*' design-build project by project members. The project was planned as an extension and replica of an existing building on site, that the architect and contractor had designed and built three years earlier. During the basic design phase the architect and engineer prepared a preliminary design project. Then, a two-month long negotiation period occurred, and eventually a design-build contract cost of 913 mio. kr. was established. The contractor entered the project team and hired the owner's architect and engineering consultants for the detailed design phase. Over a period of six months the project team designed the project. However, due to underestimation of the complexity of the technical details, the detailed design phase was extended and the building phase postponed for another six months in order to coordinate the design project for construction. According to the architect, the detailed design work was on-going until the very end of the building phase. During the detailed design phase the project scope increased and the project cost increased by 24% and in order to reduce project costs the project team made a formal agreement to purchase materials overseas and share the savings at a pre-agreed ratio or receive a bonus. Due to the increased scope of work, the project was extended with six months. However, the building phase was described as '*uneventful*' by the contractor who was able to accelerate the building process and hand-off the project six months prior to the negotiated deadline. In the end, the contractor celebrated the project as a success, while the architect was frustrated and ambiguous with process and project. Both the owner and contractor agreed the process had been successful. However, after project hand-off, the owner expressed dissatisfaction with the quality of the building materials and said *'it looks bad'*.

Project 3 concerns the design and build of an office building for a private client and by project members described as a *'sort of partnering project'*. The project was originally initiated as a development project between the contractor and the owner. The contractor had purchased the site on which the owner wanted to locate their new head office. The owner conducted two years of analyses to define their project requirements. During this process, the owner selected a prominent architectural consultant based on previous collaboration and without competition. Together the owner and architect developed a basic design project which included a complex geometry and three atria. The building was also intended to meet low energy class 2 as per the Danish building regulations. Three contractors were invited to bid on the project and in the end MTH was selected based on their shared perception of the collaborative design-build model that the owner envisioned. To enable the contractor to focus on project quality as well as cost the owner guaranteed the contractor a profit ratio of 0-9%. Furthermore, the project team operated with *open-books* (i.e. the contractor disclosing detailed project costs to the project team). Once the project had been awarded to the contractor a negotiation round was carried out in which the project target cost was reduced with almost 11%.

Once the target cost had been agreed the detailed design phase began and the contractor hired the owner's architect and the contractor's own in-house engineering consultants to prepare the main design project. No other engineering firm had been involved up until the detailed design phase began. During the detailed design phase many late uncoordinated cost reduction were made and on-going changes constrained the engineer's ability to produce a coordinated main design project. As a result the design-build contract was delayed with four months, however, the contractor began the building process as originally planned without a signed design-build contract. The

detailed design phase was described as chaotic, with many late changes and urgency to complete design in time for construction. The building process, on the other hand, was described as smooth and collaborative. The project was scheduled for completion in September 2011, but due to a cloud burst in July 2011 the building interior suffered extensive water damage. As a result, a new completion date of December 2011 was negotiated. In December 2011 the owner was able to occupy the building while the contractor was still finishing the building. Once the building was occupied it turned out the mechanical system didn't have the capacity to heat the building sufficiently and couldn't meet the original energy performance target. Two years after project hand-off the contractor, mechanical and electrical sub-contractors and owner's facility management were still in the process of trying to understand and solve the problems pertaining to the indoor climate.

Project 4 concerns the design and build of a large apartment building for a private investor. The project was developed in collaboration with a prominent architect consultant who had won the projects by competition. Once the architect and owner had developed the basic design for the building a number of contractors were invited to bid on the project. MT Højgaard won the project and hired the owner's consultants for the detailed design phase. While completing another building that was part of the same development, the contractor had gradually developed an understanding of the architect and engineering team and the project during the design process. The contractor did not establish a joint project office, and the architects were not hired for project inspections or invited to participate in project meetings during the building phase. The contractor's project manager considered the design project to be of poor quality but nevertheless began construction as scheduled. The architects and engineers continued detailed design work during the building phase. The collaboration between in particular the architect and contractor was poor and characterized by verbal fights and deep frustration. During the building process rework was required on for example, steel beams, concrete slabs, balcony floors and interior paint. Furthermore, the façade sub-contractor went bankrupt during the project and the architect expressed deep frustration with the reduced quality of the materials the contractor purchased. In the end, the contractor's profit ratio was 0%. Once the building was occupied it turned out, that the in-floor heating system was insufficient to cover heating demands and residents were dissatisfied with the poor quality of the interior finishes.

Project 5 concerns the design and build of a large office building for a large private client and is characterized by a rough and problematic process and many conflicts among project participants. The project consisted of two office buildings: a four storey round building and a three storey trapezium shaped building, connected by an underground tunnel and sophisticated landscaping. By competition, the owner had awarded the project to a prominent architectural consultant and a large engineering consultant. Together the three had conducted a programming, early and basic design phase and in April 2011 contractors were invited to bid on the project. The bidding material consisted of a basic design project and a list of 3500 items that the consultants had estimated was included in the project. The contractor was given ten days to prepare a bid. This was the beginning of what one of the project managers referred to as *'the avalanche of problems'*. The contractor was awarded the project during the summer of 2011 and had intended to take over the owner's consultants and start detailed design immediately after. However, due to a delay of the building process on another project, the contractor's project and design management team did

not take over the owner's consultants and start detailed design work until October 2011. The detailed design was due to be handed-in in December 2011 and the owner had sanctioned late hand-in of the design project. The project team delivered a design project to the deadline but it was of very poor quality and detailed design work continued throughout the building process. Once the building process began the contractor established a project office on site, yet communication and collaboration among parties was poor.

During the early building process the owner and architect were adding scope to the project and the contractor and owner were unable to agree on project costs. This disagreement over payment of increased project costs and continuous design changes infused the project with conflict, yet the contractor was able to continue the building process. The building process was characterized by on-going negotiations between the parties, repeated rework on site and on site ad-hoc design development. At project hand-off the contractor was able to deliver a finished and coordinated building, while change orders for over 100 mio. Dkr. remained unsettled. In the aftermath of the project, the contractor and owner settled an agreement to cover just the project cost and the contractor sued the architectural consultant for numerous errors in the design project. However, the building is interpreted to have fulfilled project requirements and the building reflects integration of phenomenological quality, owner's values, sustainability, landscaping, aesthetics and functionality.

Project 6 concerns the design and build of a small office building for a private client. The project was an extension to an existing building on site and described as a repeat of the previous project. The architectural consultant and contractor in project 6 had also built the previous buildings on site. The basic design project had been developed by the architect alone and included a three storey rectangular building with both open and closed office space and standard materials and building solutions.

The contractor was awarded the contract and hired the owner's consultants for the detailed design phase. In order to reduce design fees the contractor and architect agreed on a reduced scope for the main design project. It was referred to as '*half a main design project'*. In order to reduce project cost, the building layout was changed to open office space exclusively, automatic exterior solar shading was reduced to interior curtains, and features such as interior green walls were eliminated.

Once the excavating of the building began it was discovered that the building was incorrectly located on the site plan and that excavating would protrude past the public pavement. The building was shifted back to stay just clear of the property easement. During the building process the contractor and owner conducted project meetings without the architects and no joint project office was established. In the end, the project was handed-off to the original deadline and the contractor made a satisfactory profit. The architect accepted the compromises made to the architectural quality and the owner and contractor agreed that there were no errors or deficiencies at project hand-off. Within a year of completion the building has had few minor warranty issues and the interior has been entirely rebuilt by the owner's tenant.

Institutions developed in projects 2-6

From the interviews, it is interpreted that a number of institutions developed in projects 2-6. These institutions are presented below, using project 5 to illustrate extracts from the analysis that has been conducted for all five projects. It is beyond the scope of this dissertation to present the full analysis of all five projects here, instead, the findings will be summarised across all five projects at the end of the section.

Institutions in project 5

Project 5 is interpreted to have developed the following institutions: cost reduction (i.e. pursuit of short-term economic gains); phenomenological quality, functionality and aesthetics; efficiency to build (i.e. urgency and determination to build); collaboration as professionalism, loyalty and respect (i.e. distinct professional roles, segregated goals and responsibilities, the linear phase model, and shifts in organizational leadership); and, collaboration as pragmatism and trust.

The following quote describing the detailed design phase illustrates multiple institutions:

> *'....actually, I think the owner thought* [not including the contractor in the design meetings] *was to their advantage, because if they were able to add scope to the project without us noticing, it was free. And I have no doubt that is what they thought… and the owner wasn't ready to finalise the project when we got the project* [during the detailed design phase]. *The owner was still developing their requirements. However, we had been given the job to finish the project from its current state and not develop it much further. But the owner was still developing and they would do that without us, so we wouldn't be there to point out the extras and claim more time and money and so on. And the architects didn't care, they just wanted to draw something that was better.'* [Contractor's design manager].

First, the contractor's design manager expressed the understanding that someone (in this case the owner) would attempt to incorporate solutions into the project that they would not have to pay for. This is interpreted to illustrate a taken-for-granted assumption, that project team members will pursue short-term economic gains, despite compromising trust, collaboration and coordination.

Secondly, the quote illustrates that the contractor perceived the purpose of the detailed design phase to be producing a coordinated main design project, by adhering to the norm of the linear phase model. To that, the contractor's design manager expressed frustration with how the architects continued improving the design in order to pursue quality, aesthetics and functionality.

Third, the quote also illustrates that the contractor's project manager had the perception that the project team had segregated interests and responsibilities. Specifically, the owner was developing '*their*' requirements, the architects '*just wanted… …something better'* and the contractor has been hired to finish the design and build the building and '*not develop it* [the project] *much further'*.

Furthermore, despite the delayed engagement of the contractor and the reduced time that the project team had to detail the main design project, the contractor began construction work as scheduled. Also, during the building phase disputes over additional project costs arose. Nevertheless, the contractor continued the build until the owner was able to occupy and manage the building. These two examples indicate that the urgency and determination to build was also developed in project 5.

The contractor's proposal to establish a project office, waive the sanctions for the late hand-in of the main design project, the continued expectation that the owner and contractor would be able to settle the financial disputes, the continued building process and the owner's final agreement to cover a portion of the additional project costs, illustrate that the understanding of collaboration as pragmatism and interaction was developed in the project team.

Institutions in project 2-6

Similar to project 5, multiple institutions developed in projects 2, 3, 4, and 6. Table 6 summarises the institutions that developed in projects 2-6 respectively.

Theme	Institution	Underpinning meanings, norms & rules	Project 2	Project 3	Project 4	Project 5	Project 6
Quality	Phenomenological quality, aesthetics & functionality	Architect & engineer dominate preliminary design process.	Architect, engineers and owner develop preliminary design proposal.	Architect and owner develop preliminary design proposal.	Architect, engineers and owner develop preliminary design proposal.	Architect, engineers and owner develop preliminary design proposal.	Architect and owner develop preliminary design proposal.
		Architect & engineer continue collaboration with contractor during the build.	On-going collaboration among contractor and architect to develop design solutions.	Decrease in collaboration during building phase, but on-going inspections. Continued collaboration during occupancy to resolve indoor climate.	On-going collaboration between contractor and owner. Ad hoc collabora-tion between contractor and architect to solve problems.	On-going collabora-tion among contractor, architect and engineer to develop design solutions.	Collaboration stops once the build begins.
	Sustainability	Green design. Public use of private space. LEED certification	-	Low energy consumption.	-	Low energy consump-tion, on-site water collection & treatment. Park area open to the public.	-

Theme	Institution	Underpinning meanings, norms & rules	Project 2	Project 3	Project 4	Project 5	Project 6
Collaboration	Pragmatism & trust	Compromise & interaction	Architect compromise. Postpone-ment of build. Joint project office to enable interaction.	Mutual trust and respect among project managers. Build begins before contract is negotiated.	Not developed.	Architect and owner pragmatic about formal structure and deadlines. Contractor continues build despite conflicts and lack of payment.	Architect and contractor informally agree to develop half a main project. Architect accepts compro-mises to quality once build begins.
	Professionalism, loyalty & respect	Adherence to formal structure. Segregated responsibilities. Value-chain.	Contractor negotiate cost and time. Segregated responsibi-lities. Value-chain developed. Contractor dominated the detailed design phase and build.	Joint responsibi-lity underpinned by guaranteed profit to the contractor. Value-chain developed.	Contractor act more-or-less autono-mously during building phase. Segregated responsibi-lities. Value-chain developed. Contractor dominated the building phase.	Contractor frustrated with architect and owner for lack of adherence to formal structure. Segregated responsibi-lities. Value-chain developed.	Segregated responsibi-lities. Value-chain developed.
Economy	Cost optimization	Reducing project cost without compromising quality.	-	Reduced project cost by 11% while phenomeno-logical quality and aesthetics was maintained	Not developed.	-	-
	Cost reduction	Pursuit of short-term economic gains.	Formal incentives to pursue cheap purchases.	Number of heat exchangers reduced which compromi-sed indoor climate.	Products and sub-trades purchased based on lowest price.	-	Closed offices converted into open office space. Green walls eliminated.

Efficiency	Designing & building efficiently	Urgency & determination of the build.	No urgency developed. Acceleration of building phase to catch up 6 months.	Build began despite lack of coordinated main design project and no design-build contract.	Determina-tion to build despite accelerated building process resulting in many errors and deficiencies at hand-off.	Build begins despite delayed collabora-tion during design phase. Build progresses despite on-site design develop-ment and lack of payment.	Build begins and finishes as scheduled.
		Analytical approach to design, planning and decision-making.	-	Extensive preliminary user analysis. Quantitative analysis methods used as basis for decision-making. Design process organized around themes.	-	Not developed.	-
		Linear phase model. Value-chain.	Formally agreed, but compromi-sed.	Formally agreed, but compromi-sed.	Formally agreed, but compromi-sed.	Formally agreed, but compromi-sed.	Formally agreed and maintained.

Table 6. Institutions developed in projects 2-6 and examples illustrating how each project adhered to the respective institutions.

Table 6 illustrates that a number of relatively stable meanings and norms developed in projects 2-6 and that many are reoccurring across projects (including project 1), for example the pursuit of short-term economic gains, collaboration, urgency and determination to build, distinct professional roles and responsibilities, phenomenological quality and aesthetics and functionality, leadership as managing formal structure and collaboration as pragmatism and trust. On the other hand, some meanings and norms only occurred on few projects, for example, the pursuit of long-term gains.

In the following section the relationship among these institutions and how they develop over the course of the project will be elaborated.

Constellations of institutions in project 2-6

In projects 2-6 a number of institutions developed and mutated in different constellations of institutions. These constellations of institutions are presented below,

using project 5 to illustrate extracts from the analysis that has been conducted for all five projects. It is beyond the scope of this dissertation to present the full analysis of all five projects here, instead, the findings will be summarised across all five projects at the end of the section.

Constellation of institutions in project 5

Project programming, early design phase and basic design phase

During the early and basic design phases the owner, architect and engineer are interpreted to have developed a constellation of peaceful co-existence between institutions of phenomenological quality, aesthetics and functionality, collaboration as interaction, and sustainability. There are no anecdotes reporting conflicts among the parties. At the end of the basic design phase, the owner was expecting to tender the project as per professional norm. However, according to the contractor's design manager the owner and architect were unable to manage the design process and as a result, the project team was unable to produce a coordinated preliminary design project at the end of the basic design phase. As a result, the project was tendered based on a project description and a list of 3500 items included in the project, instead of a comprehensive 3D model or set of drawings as per professional norm. The contractor's project team referred to this as tender based on a '*Basic Design +*' and claimed that the list of items was used by the owner as an instrument to accurately compare bids from different contractors to pursue the lowest project cost. However, the lack of project detail meant that many design solutions and details were to be developed during the detailed design phase with the assistance of the contractor. Therefore, the basic design + bid represented the first major disruption of the constellation of institutions: on the one hand, the owner interpreted the bid given for the 3500 items to be a fixed price for the entire project; on the other hand, the contractor interpreted the bid to include only the 3500 items and any changes or additions to the list would result in request for changes with potential additional costs. The divergent understandings of what was and wasn't included in the project resulted in an on-going conflict and negotiations between the owner and contractor.

Detailed design phase

Another consequence of the 3500 item list-bid was that the contractor was unable to get an overview and understanding of the project, because they couldn't see how the items on the list were interrelated, as would have been possible with a set of drawings or a 3D model. Determined to finish and hand-off different project, the contractor had delayed and compromised collaboration in project 5 during the detailed design. As a result, urgency to understand the project increased once they did enter the project. As a result of the delayed participation of the contractor, the project team only had three months to coordinate the project before the build was due to start.

To the contractor, gaining access to the design project was critical, in order to optimise the project and prepare their organization for the building process. However, the owner had, in the pursuit of short-term economic gains and design efficiency, sanctioned the late hand-in of the main design project. As a result, the architects wanted to avoid project changes that would jeopardize the main design project deadline and therefore were reluctant to share the design project with the contractor. The architect and contractor were unable to create a shared understanding of the

purpose of the detailed design phase, nor were the sanctions waived and the architects given, for example, fiscal incentives to share their design with the contractor.

Furthermore, all organizations were trying to pass on design responsibility and therefore, the basic design+ project resulted in on-going negotiation as to who was responsible for decisions made before the contractor entered the project organization. The disagreements over design responsibility shifted the project team's focus and efforts away from collaborating and coordinating the project.

Adhering to the institution of collaboration based on trust and interaction, the contractor proposed working with open books and waiving the sanctions on the design project. However, according to the contractor, the owner dismissed both proposals. These efforts indicate that the contractor was trying to create an integrated constellation of institutions, although it was perceived by the owner as an attempt to dominate.

Instead, during the detailed design phase, distrust gradually developed among the project team members. This resulted in each organization increasingly maintaining particular institutions during the build, which caused gradual fragmentation of the constellation of institutions.

Building phase

While increasing maintenance of institutions during the building phase resulted in the constellation of institutions fragmenting, efforts aimed at integration did occur. For example, the contractor proposed conducting a project review phase during the early building phase, which was accepted by owner. Not only did the owner and architect agree to the review, the contractor's design manager perceived that the owner had '*respected the process*' and not introduced new ideas or made changes to the project after the project review.

Despite the successful project review and integration of the institutions of quality and efficiency, the constellation was only partially integrated. First of all, according to the contractor's design manager, the architects continued proposing improvements to the project in the pursuit of quality. Also, other institutions in the constellation, the pursuit of short-term economic gains and the urgency and determination to build, developed into conflict and competition.

To elaborate, the distrust and poor collaboration during the detailed design phase resulted in the hand-in of a poorly coordinated design project, albeit in time for the deadline. As a result, design work was carried out simultaneously to building work on site as an interactive collaboration between the workmen and the architects, thus compromising the contractor's wish to optimise and plan the building process efficiently.

Furthermore, the owner and the contractor's conflicting understandings of what was and wasn't included in the project resulted in continuous disruption of the project: the contractor had to continuously accelerate, stall and redo work on site to enable the progression of the build. Also, the owner wouldn't approve any change orders resulting in on-going negotiations. Specifically, project costs increased by 21% over the course of the building phase with the cost of the concrete contract increasing by 61% alone. Also, six month into the building phase the owner had approved less than 0.5% of the requests for changes that the contractor had issued and more than 100 mio. Dkr. were outstanding between the two parties.

Furthermore, the quote below illustrates how conflicting understandings and norms constrained the project team's ability to build efficiently:

> *'...well a normal day was just full on, morning until evening, you had no time at all to sit down and think and plan. ...it was* [all about] *the handling of problems and challenges ... there wasn't always energy for planning and management, and we didn't even know what bloody well to plan, because we didn't always know when we were supposed to complete the project, and what we were supposed to bloody build, because* [the owner] *hadn't ordered it, and they hadn't paid for it!'* [Contractor's Project Manager]

During the building phase the contractor had expected the institution of the build to dominate the constellation of institutions. This was illustrated by the contractor's project and design managers expressing great frustration with the other project team member's lack of willingness to compromise and lack of understanding and respect towards the contractor. Furthermore, the contractor continued the building process despite not receiving payment for owner approved changes, fully expecting to be able to reach a settlement with the owner at some point.

However, the owner continued to challenge the institution of the build by refusing to sign off on changes and additional purchases, and questioning the contractor's integrity. Similarly, the contractor continued negotiating with the owner in order to cover the cost of the project. In other words, both the owner and contractor competed in the pursuit for economic gains. The conflict between collaboration, quality, and mutual pursuit of economic gains resulted in the building process being characterised by political negotiation that constrained trust, respect, open communication and integration among institutions. According to the contractor's project manager the project team weren't able to openly discuss design and building solutions and complained that there had been no time or mental resources to do actual planning work. As a result the building phase was characterised as a continuous unsettled competition between the institutions of the efficiency of the build, quality and short-term economic gains. Also, conflict arose from the mutual pursuit of economic gains by the owner and contractor. Similarly, stopping the build in order to settle the conflict and allowing the build to dominate would have compromised the urgency and determination to build and potentially increased project costs even further.

Hand-off, commissioning & occupancy

Considering the number of conflicts that characterised the detailed design and build phases, it almost seems impossible that the project team managed to hand-off a completed building at the end of the building process only two months behind the original schedule. The empirical material shows that the main reason for this was that the understanding of urgency and determination to build dominated, despite continuously being challenged by other institutions. The contractor simply never perceived it as an option to stop or postpone the build despite the main design project lacking coordination and the owner not approving or paying for requests for changes.

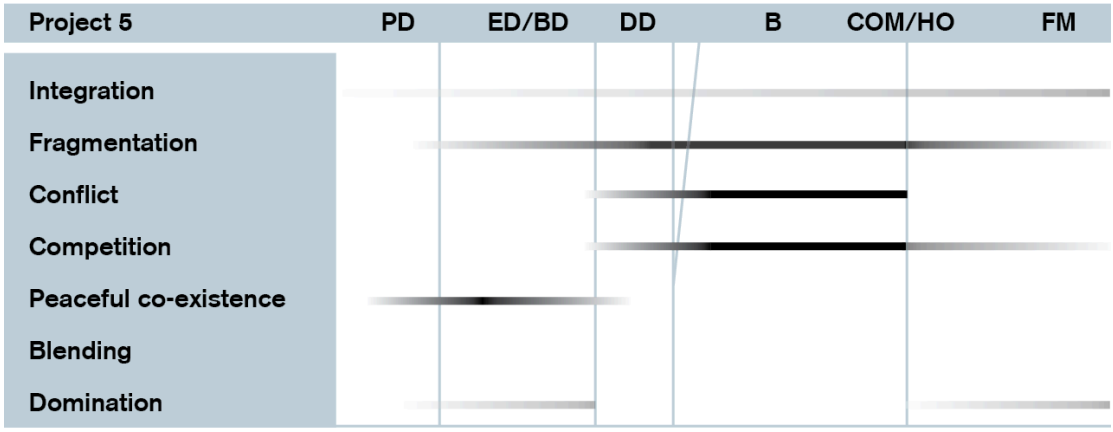
However, about six months before the project was handed-off, a financial settlement was made for a portion of the outstanding payments and this, according to contractor's project manager, enabled the contractor to complete the final stages of the build. Also, the owner agreed to move into the lower levels of the building while the contractor completed the upper levels, resulting in an overlap between occupancy and build of two months.

Two years after completion the building operates almost entirely as required according to the owner. The contractor, façade supplier and owner are currently collaborating on redesigning the exterior shading solution, which proved to be insufficient and the parties have agreed to share the cost. To avoid delays and quickly be able to resolve the issue, the team has decided to not involve the architect in the process. Apart from the exterior shading, the final physical building reflects integration of phenomenological quality, functionality, sustainability, innovation and the owner's professional values: (e.g. openness, state-of-the-art technology, quality of life, and uncompromising product quality).

In the contractor's organization, the project serves as a bad example due to the lack of fiscal profit and poor collaboration. On the one hand, project 5 has become institutional debris for remaining projects. In project 1 efforts were made to overcome some of the constraints that characterised project 5. Furthermore, project 5 contributed to the contractor's organization establishing new procedures for how bids for tender and project contracts are reviewed and approved. On the other hand, the contractor has developed an understanding that this was a one off project with an unusually un-collaborative owner and architect.

A still life of the constellation of institutions in project 5

The figure below summarises the development of the constellation of institutions over the course of project 5.



PD, Project development - **ED,** Early design - **BD,** Basic design - **DD,** Detailed design - **B,** Build - **COM,** Commissioning - **HO,** Hand-off - **FM,** Facility management

Figure 5. The figure illustrates the development of constellation of institutions in project 5.

Project 5 was characterized by a constellation of on-going competition and conflict between institutions. During the detailed design phase economic short-term-gains and quality conflicted (i.e. the architect wanted to meet the deadline to avoid sanctions while also continuously wanting to optimize the quality of the project; and the contractor wanted access to the project in order to optimize it for production and project cost savings). During the build the constellation of institutions was interpreted to have been characterized by on-going competition. However, this time economic short-term gains competed with the efficiency of the building process. During project 5 the contractor made several attempts at either integrating institutions or making the institution of the build dominate, however, the project team continued to contest the

domination.

While it is possible to imagine on-going competition resulting in disruption of the project (e.g. the building process coming to a halt or never finishing) project 5 illustrated that when institutions were sufficiently established they sustained the competition for long enough to produce a finished building and that the competition was instead settled during the project aftermath (i.e. the contractor's fee was eroded). From such a perspective, the understanding that the building was of more value if completed may have dominated the constellation after all. In other words, while the competition between the owner and the contractor characterised the narrative about the project, the constellation can be interpreted to be a variant of domination exposed to severe contest.

Constellations of institutions in projects 2-6

Similar to project 5, projects 2, 3, 4, and 6 developed constellations of institutions. A brief analysis of each projects constellation follows below, including a summarizing table at the end.

Project 2

At project conception, the project was described as a repeat of existing projects in order to increase efficiency and reduce design costs while maintaining a particular level of quality. During the early and basic design phases the architect and engineers worked on the project in what was interpreted to be integration among collaboration, quality, designing efficiently, and cost optimisation. During the detailed design phase the contractor's pursuit of short-term economic gains began dominating. For example, the project organization chose to operate with closed calculations, which supported the shared understanding that the contactor's profit ratio was dependant on their ability to reduce the project cost. When interviewed, the owner stressed that each organization's finances was '*no one else's business*'. Furthermore, during the project cost negotiations it was suggested that a potential 40 mio. Dkr. could be saved by purchasing a number of materials from Southeast Asia. The owner and the contactor agreed that this was worth pursuing and a formal agreement to purchase materials was established. Also the architect was fiscally incentivised to pursue cost savings. While agreeing to this, the architect expressed frustration from being caught in the dilemma between having agreed to purchase cheap materials, while at the same time insisting on better quality to preserve professional integrity and fulfil the owner's expectations, and at the same time maintain good collaboration with the entire project team. Ambiguously accepting the domination of short-term gains the architect continued to compromise on project materials and did not challenge the contractor. The lack of challenge did, at least retrospectively, greatly frustrate the owner.

At the beginning of the detailed design phase, the project team decided to postpone the start of the build by six months, so as to increase the level of detail of the design project in order to increase the quality and efficiency of the build.

As the detailed design progressed the owner made several major changes to the original project, which increased the cost of the project. The contractor covered the increased project costs with the savings from the purchases from Southeast Asia. This meant that the owner's accumulated savings were reduced from an anticipated 40 mio. Dkr. to 2 mio. DKr. The contactor justified their actions by claiming they saved

a number of work processes, however, the owner was left with a perception of having paid full price for poor quality. Nevertheless, the owner's representative expressed a certain ambiguity about the contractor: on the one hand, he thought the contractor was *'bending the rules'* to accommodate their own interests; and, on the other hand, he perceived it to be *'part of the game'*.

The project was originally scheduled to be handed off to the owner in March 2011, however, the contractor negotiated an additional six months due to increased project scope. Nevertheless, the contractor was able to optimise and accelerate the building process and reduced the building period with six months, equally. Before the building was handed off in March 2011, the owner and contractor negotiated and settled on a premium that the owner paid for receiving the building six months prior to the negotiated schedule. Although the contractor justified their actions by referring to the juridical provisions for design-build projects, the owner was once again left with a sense of fundamental distrust towards the contractor: a sense that the contractor was *'greedy'*.

Once occupying the building, the owner found that the cheap materials required extensive maintenance and repair work. However, the owner had agreed to take full responsibility for the overseas purchases and was left to resolve the problem independently. The contractor made a significant profit, while the architect expressed great frustration with the ambiguous demands that she had had to satisfy during the process and poor quality of the final building.

Project 2 was interpreted to be characterized by ambiguous domination and co-existence simultaneously. On the one hand, the project team developed an understanding that collaboration was important to increase coordination and made efforts towards increasing collaboration by for example establishing a project office. The project team also made efforts to preserve the co-existence of multiple organizations by engaging the architects and engineers in the design during the building process alongside the contractor and owner. On the other hand, while the architects and engineers interpreted this as an attempt to enable the co-existence and potentially the integration of multiple institutions, the contractor interpreted the institution of economic short-term gains to be dominating. Also, the entire project team formally agreed to make efforts towards pursuing short-term economic gains. In other words, although the project team expected and accepted the domination of the pursuit of short term economic gains during the detailed design and build phase, the project team members were ambiguous about the relationship between collaboration, quality and pursuit of short term economic gains.

Project 3

During project conception, the owner had spent two years conducting extensive analyses in an attempt to clearly define their project requirements. Then, the owner purchased the site from the contractor and selected an architect based on shared values, specifically; '*their ability to be mindful of project costs and not exclusively pursue aesthetics*'. During the early and basic design phases the architect and owner worked together on developing the preliminary design project, while the contractor prepared the site for construction.

At the beginning of the detailed design phase the contractor was awarded the project based on their ability to collaborate. The architect remained directly hired by the owner and the project team grew into what was referred to by the contractor's design manager as a trio characterised by open and honest communication, where

'everyone pulled in the same direction' and trust and mutual respect grew stronger over the course of the project. However, the engineering disciplines were not independently represented in the project management team. Rather, the contractor's engineering team had been assigned to the project and hired under the representation of the contractor's design manager.

The architect had organised the design process according to themes and interaction occurred during scheduled meetings and workshops, and the project team was not co-located at any point. Supporting the structured design process was the owner's analytical approach to decision-making: *'we are world-champions of analyses*!' their project manager proclaimed during an interview. For example, quantitative analysis of internal flows were made to determine if a bridge diagonally suspended across the multi-storey atrium was cost-effective compared to walking the perimeter of the atrium. According to the owner, all decisions had been made during the basic design phase. Nevertheless, according to the engineering project manager, the trio did not respect the project freezes and, in particular, the contractor continued to propose project changes during the detailed design phase in order to optimise the cost of the project. The optimisations, which later proved to be reductions, included for example, reduction of the heating capacity of the mechanical systems.

In other words, during the detailed design phase, quality, cost optimisation, collaboration and efficiency, which had otherwise been integrated during the basic design phase, were being challenged by the pursuit of short-term economic gains and urgency to build. As a result, the constellation fragmented during the detailed design phase.

However, the contractor started construction work with the outlook to be awarded the design-build contract. Gradually, as building work progressed, the constellation is interpreted to have regained a state of integration as the engineers finished their work. Six months prior to project hand-off a cloudburst damaged the building. However, the project team was able to collaborate with the building insurer in order to avoid internal negotiations over increased project costs. Also, the contractor was able to accelerate the building process and the owner able to postpone the move-in date. As a result the project was only delayed with three months.

The building reflects integration among architectural quality, functionality, sustainability and economy. Also, the project team was able to reduce project costs with 16% and all project team members made a profit. However, while integration was re-established during the build the result of the fragmentation during the detailed design phase was that for example, the mechanical system was insufficient to meet heating demands in the final building.

Therefore, while the project team may have been able to integrate multiple institutions, the project team was not able to fully integrate all the institutions in the constellation.

Project 3 was characterised by integration of institutions more or less throughout the design and build processes. Integration started already in the project development phase where the owner, contractor and architect were able to coordinate their efforts and interests towards a shared goal (i.e. a new headquarter for the client on a site owned by the contractor).

Nevertheless, during the basic design and detailed design phases the project team made efforts towards integration as well as causing unintended conflict. Examples of integration included, the project team's ability to analytically approach design development, maintain a shared project goal, be problem solution oriented and avoid

escalation of conflict. On the other hand, an example of gradual fragmentation turning into conflict includes, the contractor's design manager continuously proposing changes to the project in order to reduce project costs, despite the contractor's self-perform engineers requiring the project to be frozen in order to finish the design project in time for construction.

Project 4

During the project development and early design phase, the understanding that only certain actors were able to add value to the project dominated; the architect explicitly claimed to see no value in involving the contractor during the early design phase. The constellation of institutions was interpreted to have been relatively settled during the basic design phase where quality and functionality dominated with the sub-existence of collaboration and cost optimisation.

Once the contractor was awarded the project, at the beginning of the detailed design phase, the constellation was disrupted with the institution of the pursuit of short-term economic gains and the urgency and determination of the build. However, the institutions of quality, cost optimisation and collaboration did not cease to exist as the architect continuously appealed to the contractor to, for example, increase the quality of the materials, hire sub-contractors based on their ability to deliver the specified product instead of the cheapest product. However, the contractor wanted to maintain the domination of short-term gains, in order to ensure their own profit. To avoid having the architect disrupt the constellation and jeopardize the contractor's ability to build within the project cost, the contractor acted increasingly autonomously. Also, the contractor dismissed the architect's design manager when she warned, that according to her experience, the façade supplier would not be able to deliver the required quality of work. According to the architect and contractor, the project was characterized by poor collaboration, lack of mutual respect, lack of communication and perspective-taking among in particular the architect, owner, contractor and sub-contractors.

During the building phase the institution of the build dominated. However, the lack of coordination disrupted the project by stopping and delaying work on the building site. Specifically, rework on the steel beams, concrete slabs, balconies, the bankruptcy of the façade supplier are all examples of how poor coordination during the detailed design phase disrupted the project during construction and compromised building efficiency and economic gains.

Towards the end of the building phase the urgency and determination to build continued to dominate. In order to meet the final deadline, the contractor accelerated the building process. As a result, the different trades were working simultaneously and working conditions and quality of work became subordinate to finishing to a particular deadline. The final building reflected the domination of the pursuit of short-term economic gains: while the buildings were perceived as an architectural show-piece, residents complained over the poor quality of materials, the lack of heating capacity to enable the required indoor climate, and many errors and deficiencies pertaining to the interior finishes. Interestingly, the contractor's fee eroded and no profit was made on the project.

In summary, the constellation of institutions was characterised by domination of a particular institution yet, under on-going competition from the remaining institutions.

In project 4 the domination of the contractor and the institutions of pursuit of short term economic gains and the urgency and determination of the build, was also

expected by the project team, however, it was not left uncontested. While the contractor was expecting to manage the project relatively autonomously in order to reduce project costs and finish the build to the agreed deadline, the architect had the understanding that a certain level of quality was required in the project. As a result, the architect challenged the contractor and owner's decisions to for example, cut quality of materials and use of particular sub-contractors. In other words, the architect expected a minimum of integration between the different institutions in the constellation. While the institutions of short-term economic gains and the progression of the build were interpreted to indeed have dominated, the architect continuously challenged the domination. In the early phase of the build, the challenges represented competition for domination however, the build increasingly dominated and the remaining institutions instead fought for integration (e.g. architect appealed for increased collaboration and quality of materials).

Project 6

During the programming phase and project conception, the owner was interpreted to have been guided primarily by efficiency and short-term economic gains. For example, the project had been defined as a copy/paste project of an already existing building on site. Also, the owner brought in the same architect and engineering team, and later at the detailed design phase, the same contractor who had built the other buildings on site.

During the early and basic design phase, the architect and owner collaborated to pursue a design to fulfil phenomenological quality and functionality in what is interpreted to have been peaceful-coexistence. For example, the architect included a number of features, for example, a vegetation wall in the reception area, closed offices, landscaping and more.

At the beginning of the detailed design phase the contractor was engaged in the project. At this point, the constellation of institutions is interpreted to have shifted from being dominated by architectural quality and functionality, to being dominated by the pursuit of short-term economic gains. Because the contractor wanted to reduce the project costs in order to increase their profits and meet owner's required project cost, the contractor made an agreement with the architect to only produce what was referred to as '*a half design project'.* The building was considered to be of relatively low complexity and the contractor felt confident in their ability to develop design details on site in close collaboration with the sub-contractors and workmen. Also, the contractor perceived their professional managing role to concern optimising the project economically and expected to dominate the project team. For example, the contractor acted more or less autonomously and did not extend the architect's contract to include finishing the main design project or inspections of the build. Also, the contractor conducted design and project meetings without the architect. Also, the green wall, landscaping and closed offices were later cut from the project by the owner and contractor in order to reduce project costs. The owner, engineer and architect expected and accepted the shift in institutional domination. This was illustrated for example, by the architect having agreed to, and when interviewed not being particularly ambiguous about, only producing a half-finished main design project and accepted that architectural features were cut from the project.

During the build the project was dominated by the urgency and determination to build. At the beginning of excavation it was discovered that the building had been incorrectly drawn on the site plan and that the excavation would have to extend onto the pavement. However, the excavation was shifted back onto the site and the

building process progressed. According to the contractor's project manager, the permitting authorities *'probably didn't even notice'* that the original drawing had been incorrect.

At hand-off there were few or no errors and deficiencies. According to the contractor the owner was relatively relaxed with the quality of finishes because it was a property intended for leasing, not for the owner to occupy themselves. In that respect the constellation of institutions remained dominated by the pursuit of short-term economic gains with the institutions of quality, functionality, and collaboration being subordinate.

In summary, project 6 was characterised by stabilised domination of particular institutions at particular points in time. Also, the domination was interpreted to be sequential in that institutions were interpreted to be more or less decoupled from project phase to project phase. Also, sequential domination was characterized by the absence of institutional conflict, competition or ambiguous compromise. This was illustrated by the mutual acceptance of the domination of the institutions of pursuing short-term economic gains during the detailed design phase and the determination to build during the building phase.

Sequential domination can also be characterized as a form of decoupling institutions during the design and build processes and enabled the project organization to handle the complexity of multiple institutions. In project 6 cost optimization measures were decoupled from the early and basic design phase, while the pursuit of architectural quality and long term gains were decoupled during the detailed design and building phase.

Summary of constellations of institutions in projects 2-6

While all projects developed constellations of institutions that mutated over the course of the project, and each constellation is different, the still lifes of each constellation suggest that there are three characteristic constellation types with a number of variants: domination, integration, and competition and conflict. Project 2 was characterized as ambiguous domination, project 3 as partial integration, project 4 as contested domination, project 5 as conflict and competition, and project 6 as settled and sequential domination. These characteristic types are defined as representations of the constellation of institutions during the detailed design and building phase (i.e. when the highest number of institutions is interpreted to have developed). These characteristic constellation types are analyzed in relation to project performance in the following.

Project performance in projects 2-6

In the following, an analysis of each project's performance in relation to each project's constellation of institutions is presented.

Project performance is defined as a phase at the transition from building phase to continued commissioning, hand-off and occupancy. While the transition itself represents a change in the constellation of institutions, the building itself and the time immediately following the transition also mark a temporarily stabilised constellation of institutions that were developed during the design and build process.

Project 2

As the detailed design phase progressed, project 2 became characterised by ambiguous domination: conflicting demands imposed on the project caused ambiguity to the architect and made them compromise on the architectural quality of the design solutions in order to maintain collaboration, loyalty, and increase project cost savings. In the end, the owner's project manager complained that the building required extensive maintenance and repairs within the first year of occupancy and that the building solutions *'didn't look good'*. Apart from a bittersweet perception of the building the project reinforced the owner's perception of the contractor being greedy, which further maintained professional segregation and lack of professional empathy. Also, the architect expressed disappointment with the final quality of the building and said the process was *'frustrating*' and *'stressful'*.

During the detailed design and building phase the institution of the build and pursuit of short-term economic gains gradually came to dominate the constellation. As a result, the contractor was able to accelerate work and hand-off the building six months prior to the negotiated deadline and increase their profit by covering additional project costs with the savings from cheap material purchases.

Within the contractor's organization project 2 is perceived as a success. However, the analysis shows that not all institutions were satisfied and thus the project is not unequivocally successful.

Project 3

Project 3 was characterised by an integrated constellation of institutions. While the constellation of institutions is interpreted to have been integrated during the early and basic design phases the constellation began fragmenting and conflicting during the detailed design phase as different understandings and norms started pulling efforts in divergent and conflicting directions. During the detailed design phase, the project team was unable to integrate institutions as the need for project cost reductions, project freezes, continuous changes to the design project and the urgency to build started conflicting with each other. While the project team perceived the organization to be integrated due to mutual respect and collaboration, the final building indicates that the project team was only partly integrated. Specifically, the building reflects integration between phenomenological quality, aesthetics, functionality, and the values of the owner's organization. As the owner's representative exclaimed: *'when you look at the building you can't see that we had to save 100 mio DKr.* [16% of the project cost]'. Similarly, the project team's ability to adapt to and repair the damages caused by the cloudburst and only be three months delayed, indicate that the project team was able to integrate despite disruption. However, in the aftermath of the project, the mechanical heating system was short of heating capacity, with the result

that the lower levels of the building could only be heated to 17° C, during the winter. Also, the architect expressed embarrassment from not having been able to deliver a building that was not as low-energy performing as the owner had intended and paid a premium for.

And while the contractor and architect made a profit on the project, the project team more-or-less dissolved at project hand-off constraining the project team's ability to resolve the issues relating to the indoor climate.

Within the project team and the contractor's organization, project 3 represents a textbook project in terms of collaboration. However, the analysis shows that there was fragmentation and conflict during the detailed design phase that resulted in mechanical design errors and later fragmentation during project occupancy when the project team was unable to resolve the problems pertaining to the indoor climate even two years after project hand-off.

Project 4

Project 4 was characterised by a constellation of contested domination and conflict. The unsettled domination resulted in the interior finishes being of poor quality and insufficient heating capacity. In that respect, the building reflected the domination of the institution of pursuing project cost reductions over quality, functionality and collaboration. On the other hand, a building was constructed, handed-off and occupied after all and in that respect, at least the project team was able to create representation of multiple institutions in the building.

Project 4 could serve as an example of poor collaboration, however, the stories of the process from project 4 appear to have been forgotten or suppressed in the contractor's organization. In the contractor's organization project 4 is celebrated as a success partly due to the architectural and public prominence surrounding the project.

Project 5

Project 5 was characterised by a constellation of conflict during the detailed design phase as well as conflict and competition during the building phase. The conflicting institutions resulted in extensive rework and increased scope of work during the building phase. For example, the concrete contract alone increased from 80 mio. Dkr. to 150 mio. Dkr.

Despite the many conflicts, the final building reflects integration of multiple institutions including; state-of-the-art technological and architectural design, functionality, owner's organization values, and, sustainability. For example, light fixtures were integrated in the wooden strips that clad the ceiling and follow the curves of the building. Also, the exterior park functions as both a recreational area for the owner's employees, whilst also being a public park to enrich the neighbourhood in general and contains a sophisticated water collection system. However, while the building visually represents integration, the contractor's fee was entirely eroded and the process was characterised as stressful and mentally straining.

Project 5's performance is thus ambiguous for several reasons: the project team was unable to integrate the multiple institutions in the project during the design and build process, yet, they were able to produce an integrated product; and, while the final building was integrated, the contractor did not make a profit, and thus the constellation of institutions was not entirely, but only partially, integrated. Despite conflicting institutions during the detailed design phase and competing institutions during the building phase, the project team was able to sufficiently maintain the co-

existence of multiple institutions and deliver a finished building that reflects integration. This is interpreted to be a result of the project team's shared determination to interact to maintain distinct institutions in the project: the architect and engineers insisted on pursuing functionality and quality, and the contractor and owner were determined to complete the build regardless.

Project 6

The constellation of institutions in project 6 was characterised by settled sequential domination. While the design and build processes were perceived by the project team to have been *'smooth'* and *'unproblematic'*, the anecdotes from the empirical material indicate that there were changes and rework to be carried out during the building phase. Also, while the project is perceived by the contractor to have been a success due to project team members having made a profit and the owner being satisfied with the project, the project also reflects that the institutions that were developed over the course of the entire design and build processes were not represented in the final building. Specifically, many of the architectural features that were developed during the early and basic design phases were cut from the project during the detailed design and building phase. And while the project team may have accepted this and developed the perception that the project satisfied the owner's requirements despite lacking these features at the time of project hand-off, the final build didn't reflect all the multiple institutions that had been developed over the course of the project. Instead, the building reflected the last institution to have dominated the constellation: the institution of the pursuit of short-term economic gains.

Relationships between design-build constellations and project performance

Still lifes of constellations of institutions and project performance

First of all, the analysis showed that there is a potential correlation between the characteristic constellations of institutions during the design and build processes and the projects' successful integration of all institutions at project hand-off and during subsequent occupancy and facility management.

While it can be argued that all projects were dominated by the understanding that the building must be completed, because every studied project did manage to deliver a finished building regardless of the circumstances of the design and build processes, acknowledging variation in constellations of institutions is fruitful to understand variation in project performance.

For example, in project 2 the owner developed disappointment with the project performance when maintenance and repair work was required during the first year of occupancy. And since the owner was legally responsible for the risk associated with the overseas purchases the project team did not collaborate to resolve the problems pertaining to maintenance. As a result, the constellation had found a stabilized order reflecting domination of a particular institution. Specifically, the poor quality of materials and extensive repair and maintenance work on the building in project 2, reflects on the domination of the pursuit of short-term economic gains and the subordination of the institutions of collaboration, architectural quality and functionality.

Similarly, projects 4 and 6 both reflected conflict, domination and integration

respectively.

It is worth noting that project 3 reflected the integration of the trio: the owner, the architect and the contractor's design manager. However, the poor quality of the indoor climate reflected the institutional fragmentation and conflict during the detailed design phase where the engineer struggled to complete the mechanical design due to on-going project changes; the architect and contractor continued to propose change to optimize the project; and the contractor reduced the number of heat exchangers in order to cut project costs. Also, while the trio represented the owner, the architect and the contractor, the project team did not equally represent for example, a mechanical engineer, who could have acted as a steward for the indoor climate. In order words, the trio only partially represented the institutions represented in the project and thus, the final building also only partially satisfied all institutions.

Projects 4 and 5 were characterized by conflict and competition. In project 4 an on-going conflict between quality, collaboration, and short-term economic gains conflicted during the detailed design phase. Gradually, the constellation developed into quality and collaboration challenging the domination of the build and continuous pursuit of short-term economic gains. The final building is interpreted to reflect the conflict and the domination of the pursuit of short-term economic gains: the poor quality of materials, the dissatisfied residents, the insufficient heating systems, damages to the interior walls caused by the overlapping trades, the bankruptcy of the façade supplier, and the lack of profit for the contractor.

Project 5 is similarly characterized by conflict between collaboration, avoiding sanctions, preparing for the building phase, continuous improvements to the architectural design and disputes over increased project costs. Interestingly, project 5 produced a building that reflects integration of multiple institutions, as described previously. Therefore, project 5 can be considered a deviating case, a paradox and indeed a high performance project. However, the contractor's profit was entirely eroded, which means not all institutions were satisfied after all.

Interestingly, despite projects 4 and 5 being characterized by similar constellations of institutions they performed very differently. Project 4 reflects conflict and on-going contested domination, while project 5 reflects integration. The difference is interpreted to be the contractor acting increasingly autonomously in project 4 and purposefully having pursued decoupling of institutions to pursue cost reductions. In project 5, on the other hand, the contractor is interpreted to have pursued purposeful integration among collaboration, economic gains and the build.

Therefore, the performance of project 5 can be interpreted to be a deviation from the pattern: despite the conflicting and competing institutions that characterized the design and build processes, the project team was able to produce a building that reflects integration. As mentioned, this is attributed to the slight dominance of the understanding that finishing the build was more important than resolving the conflicts and settling the competition. However, a competition implies either a draw or a winner and a loser. And in this case, while the building might have won to the degree that it reflects integration, the contractor made no profit. In that respect, the projects performance reflects a competition, or at least, partial integration.

Particular phases and project performance

Across the five projects, certain phases are interpreted to be characterized by certain constellation of institutions.

On all five projects the early and basic design phases are interpreted to be relatively stable with peaceful co-existence or integration among institutions. For

example, typically the owner, architect and engineer collaborated during these phases; and the project team members had a shared understanding that architectural design and functionality dominated.

At the transition to detailed design phase the constellation of institutions changed in projects 2, 3, 4, and 5 with competition and conflict between the institutions of quality, economy, efficiency, and collaboration.

The conflicts that developed during the detailed design phase gradually settled during the building phase where the determination to build dominated in projects 2 and 6 and integrated with the constellation of institutions in project 3. In projects 4 and 5 the conflicts did not settle and the building process continued to be characterized by conflict and competition.

The constellation of institutions around hand-off and occupancy was interpreted to have been relatively integrated in projects 5 and 6. However, in project 2, 3 and 4, the constellation of institutions became conflicting when the building failed to satisfy the perceived required level of functionality, durability and sustainability. In project 2 a perception of disappointment developed with the owner despite the project team agreeing to pursue cheaper materials from Southeast Asia. In project 3 there was an on-going conflict between the owner's understanding of having purchased a fully functioning building, the contractor's understanding of no longer being responsible for the project, yet wanting to collaborate to resolve the problem, and the engineers and sub-contractors being engaged in new projects. In project 4 residents complained over the quality of materials and lack of heating capacity, while the project team engaged in other projects.

In summary, the conflict during the detailed design phase and hand-off constrained project performance. Also, the ability to collaborate and create an integrated constellation of institutions during the early and basic design phase and during the build phase is interpreted to be a main enabler to successful project performance.

Summary of project performance in projects 2-6

Table 7 summarizes the relationship between the constellation of institutions that characterized the design and build processes and the constellation of institutions reflected in the final project.

Project	Process characteristic	Project performance
2	Ambiguous domination.	Domination with compromise of other institutions.
3	Integration.	Partial integration.
4	Contested domination and competition.	Compromise of multiple institutions.
5	Competition and conflict.	Partial integration.
6	Settled domination.	Domination.

Table 7. Relationships between project characteristics and project performance.

The analysis showed that the final building and subsequent project aftermath in projects 2, 3, 4 and 6 all reflected the constellation of institutions as it developed

during the design and build processes.

Projects 2 and 6 were characterized by ambiguous domination and settled sequential domination respectively.

Project performance in project 2 was characterized by poor quality resulting in extensive maintenance and repair work and a disappointed owner and architect.

Similarly, project 6 was perceived to fulfill owner's requirements, although the building did not reflect the institutions that had been represented over the course of the project.

Common for projects 2 and 6 is that the contractor made a substantial profit and that the finished buildings reflect the domination of a particular institution (i.e. the pursuit of short-term economic gains) while the remaining institutions are represented but subordinate.

Project 3 was characterized by both integration, fragmentation and conflict during the design process and integration and disruption during the building process. The fragmentation during the detailed design phase resulted in the final build only partially representing the institutions represented in the project.

Projects 4 and 5 were both characterized by conflict and competition during the design and build processes. The final building of project 4 is interpreted to reflect the conflict and the domination of the pursuit of short-term economic gains, while, interestingly, project 5 reflects, at least partial, integration.

Summary part 2

Institutions

The analysis showed that a range of institutions developed in projects 2-6, including: phenomenological quality, functionality and aesthetics; sustainability; collaboration as pragmatism and trust, collaboration as professionalism and loyalty; cost optimisation; cost reduction; designing and building efficiently. Also, some institutions only developed on few projects, for example: the collective pursuit of long-term gains; and, an analytical approach to organization, decision-making and design development.

These are interpreted to represent institutional debris introduced by organizations in the project team.

Types of constellations of institutions

Each project developed different constellations of institutions over the course of the project. During the detailed-design and early build phase the five projects are interpreted to represent three main types of constellations of institutions: domination of a particular institution; integration among the majority of institutions; and, conflict and competition among institutions. However, each project represents variation within these types including: ambiguous domination, settled and sequential domination, and contested domination.

Sequential settled domination was characterized by shared acceptance of the domination of a particular institution for example, the pursuit of short-term economic gains, such as illustrated in project 6. Ambiguous domination was illustrated in project 2 where project team members formally agreed to pursue short-term economic

gains but were frustrated and ambiguous about the compromises they had to make regarding functionality, quality, and collaboration.

Integration occurred in project 3 where the majority of institutions were integrated. Despite integration during the basic and detailed design phase, diverging understandings of the relationship between quality, efficiency and economy started fragmenting the constellation of institutions with the result that the mechanical design was compromised and never fully integrated in the project, even when the remaining project was integrated.

Conflict, competition and contested domination were illustrated by projects 4 and 5 where the continuous pursuit of improved project quality conflicted with the mutual pursuit of economic gains and urgency to build. While conflict predominantly characterised the detailed design phases and the early build, the constellation developed into being characterised by competition during the building process (e.g. the architect continued to challenge the contractor's work in project 4 and the owner continued to not approve or pay for requests for change in project 5).

Project Performance

The analysis showed that there is a potential correlation between the constellation of institutions during the design and build processes and project performance.

Specifically, the analysis showed that the final building and subsequent project aftermath in projects 2, 3, 4 and 6 all reflected the constellation of institutions as it developed during the design and build processes.

The performance of projects 2 and 6 reflected compromise and the lack of integration among a number of institutions due to the domination of a particular institution. The performance of project 3 reflected partial integration. Similarly, projects 4 and 6 reflected conflict, domination and integration respectively.

Project 5 stands out: the design and build processes in project 5 were characterised by conflict and competition, yet the building reflects partial integration. Integration was attributed to in particular, the contractor's determination to progress the build and the architects and contractor's determination to collaborate despite conflicts.

Discussion

The following chapter presents a discussion of the empirical findings from the six design-build projects in relation to the literature reviewed for this research project. First, a discussion of the research design and method is presented followed by a discussion regarding institutions and constellations of institutions. Then, a discussion of institutional work is presented and the chapter finishes with a discussion on project performance.

Research design & method

Methodological insights from the ex-ante study

The observations of project 1 allowed for a deep insight into the mundane everyday efforts that were made towards coordinating the project. Also, by observing the project for over six months it was possible to gain an insight into the intended and unintended consequences of these efforts and therefore to understand whether or not these efforts actually resulted in coordination. In that respect, ongoing observations helped to develop a processual understanding of coordination (Zilber, 2008).

However, observing the coordination process in action made it challenging to interpret what constituted stabilizing elements in the project. As discussed previously in the method chapter, deterministic definitions of institutions made it possible to more-or-less only define the design-build project itself as an institution, while a definition rooted in institutional works (Lawrence & Suddaby, 2006) made every established conduct, procedure, understanding and rule an institution in itself. In that respect, catching stability in flight (Pettigrew, 1986) was challenging using observation as an isolated method.

Methodological insights from the ex-post study

The ex-post studies of projects 2-6, on the other hand, enabled a relatively uncomplicated catching of institutions. However, since only five (or less) interviews were conducted for each project, not all the stewards representing institutions in the project (Kraatz, 2009) were heard. While it was not obvious during the interviews that certain institutions were not mentioned, it became clear when site visits to the projects were conducted. The final buildings reflected a much wider range of institutions than I was able to extract from the interviews alone. For example, sustainability was very rarely mentioned during the interviews, yet four out of five buildings had some sustainable elements (e.g. water collection systems and LEED certification). Similarly, the meta-analysis of the contractor's organization showed that health and safety was rhetorically emphasized (and site visits to project 1 illustrated that safety measures were also highly enacted on site). Yet, health and safety never emerged in the material from the interviews on projects 2-6.

In that respect, while the ex-post method may have enabled clear deciphering of stabilized institutions, catching multiple institutions requires interviewing a broad representation of institutional stewards or conducting more structured interviews.

The relationship between analysis part 1 & part 2

The ex-ante and ex-post studies were intended to shed light on two different types of institutional processes. The ex-ante study was intended to shed light on the micro-process of institutional work in order to understand the process of coordination. The ex-post studies were intended to inform how the development of multiple co-existing institutions during the design and build processes relate project performance.

While the two analyses were relatively distinct in purpose and method, they did also support each other. For example, while the ex-ante method made it challenging to catch particular institutions, the ex-post studies allowed for a much clearer distinction between institutions. Therefore, once taken-for-granted meanings and patterns of interaction on project 1 had emerged, these were compared to the empirical material from projects 2-6 to understand if they were specific to project 1 or design-build projects more broadly. Therefore, the study supports the recommendation of Suddaby & Greenwood (2009) using a combination of methods to research institutional processes.

However, combining methods to capture stabilized institutions only worked for those institutions that were indeed stabilized. In other words, capturing proto-institutions was a challenge with the ex-post method, while it was quite possible with the ex-ante method. One example of this includes, BIM. To elaborate, the ex-ante study allowed for observations of how the BIM coordinator's role was interpreted by the project team. Also, the observations showed how efforts were made towards coordinating the project through BIM reviews on project 1 – even though they failed. These failed efforts would probably not have been captured by an ex-post method, and thus not given insight into how proto-institutions enter or contest the constellation of institutions.

Institutions in projects 1-6

Challenges defining institutions

Extending the points concerning the challenges pertaining to clearly defining what constitutes an institution, projects 1-6 illustrated that even the definition developed for this research project (i.e. an institution was defined as a more-or-less taken-for-granted shared meaning, underpinned by normative understandings and conduct, and potentially rules, that guide and provide meaning to social interaction) was not unproblematic.

For example, the meta-analysis of the contractor's organization showed that BIM was being rhetorically and economically supported on the projects by the head organization. Also, increasing use of BIM standards in Denmark (and abroad), the engagement of a BIM coordinator and the efforts made towards conducting BIM reviews on project 1 illustrate that BIM can be interpreted as a proto-institution. However, given the meanings-oriented definition of institutions and the more-or-less taken-for-grantedness of these meanings, BIM is currently framed as normative conduct, normative understanding and rules supporting the taken-for-granted meanings of coordination and building efficiently.

Similarly, taken-for-granted meanings appeared in the empirical materials that could have been interpreted as institutions, including; the understanding that late changes are inevitable; and, that cost, time and quality are linked. To elaborate, late changes being inevitable were interpreted to be one of the primary default explanations for any delays or constraints that the project team experienced. Late

changes were openly referred to and used as justification for redoing, postponing and stalling work. Late changes were often described as part of the *'natural development'* of a project. However, the analysis of projects 1-6 showed that late changes during the detailed design and building phases were a result of lack of integration between institutions during the early and basic design phases. For example, in project 1 the early and basic design phases were characterised by peaceful-coexistence between the institutions, which only postponed the moment when integration of institutions had to occur. By the time the project team expected integration to occur (i.e. during the detailed design phase) a conflict between the need to integrate institutions and the need to let the building process structure the detailed design phase arose. This conflict constrained the project team's ability to integrate institutions. As a result, developing final design solutions that could by agreed upon and interpreted as decisions made was a muddled process that dragged on. This muddled process was interpreted as late changes. However, changes were supported by moral obligations (e.g. proposing late changes made project team members *'disloyal')*, formal procedures (e.g. change orders and request for changes) and legal sanctions (e.g. service specifications) and thus could have been framed as an institution.

Similarly, there was a shared understanding that quality, cost and time were inevitably connected: i.e. an increase in quality would result in increase in either time or cost or both; and a decrease the cost would result in decrease in project quality and time. However, because the design-build projects (except project 3 and to some extent project 1) were unable to integrate all institutions in the early and basic design phase, the project teams were unable to produce a holistic optimisation where increased quality could also have resulted in decrease in cost and time. In other words, the result of peaceful co-existence or sequential domination that characterised the design processes of project 1, 2, 4, 5 and 6 was that projects could not be optimised holistically. Therefore, the project teams had developed an understanding that the negative reductive relationship between cost, quality and time was not only a norm, but a law of nature.

In other words, while these taken-for-granted meanings could have been interpreted as institutions, they are instead framed as rationalised myths (i.e. *'structure that have become isomorphic with the myths of the institutional environment*') (Meyer & Rowan, 1977, p.340).

Constellations of institutions in projects 1-6

Coordination: processes of integration & fragmentation

The analysis of project 1-6 showed that institutions developed in multiple types of relationships. Projects 2 and 6 were characterized by sequential domination, similar to institutional change theorized by e.g. Suddaby et al. (2006). Projects 4 and 5 were characterized by conflict and competition, also discussed previously by e.g. Rowlinson and Jia (2015), and Viking and Lidelöw (2013). Project 3 was characterized by integrative processes, such as shown by Zietsma & McKnight (2009), Kraatz (2009), and Yu (2013).

Project 1, specifically, provided insight into how a constellation of institutions can develop during a design-build process and illustrated peaceful co-existence, integration, fragmentation, conflict, and competition.

In particular, project 1 provided a deeper insight into integrative processes by illustrating that integration could occur occasionally, partially or continuously.

Although Zietsma and McKnight (2009) were concerned with co-creation at the field level their study suggested that co-creation of new institutions involve collective collaboration as well as competition and conflict among institutions. Similarly, project 1 illustrated that the project team was able to collaborate and integrate multiple institutions in the case of the design and build of the façade system, while quality and efficiency otherwise competed and conflicted during the detailed design phase.

The institutional process studied by Zietsma and McKnight (2009) is interpreted to develop purposefully but without a clearly defined common goal, while the project teams in projects 1-6 had to fulfill a relatively defined common goal, as well as divergent sub-goals. While the institutions in the field studied by Zietsma and McKnight (2009) collaborated, competed and conflicted in the pursuit of individual interest, the project team in project 1 had to balance individual and common interest to enable integration in order to deliver a high performance project.

Project 1 suggests that coordination for the purpose of producing high performance projects require the purposeful, occasional and temporary fragmentation followed by collective, purposeful and occasional integration of multiple institutions. Fragmentation enabled the project team to pursue individual institutions in order to optimize the design according to each particular institution, while integration enabled the satisfaction of each institution through common uniform effort.

Also, Yu (2013) is concerned with integrative processes at the intra-organizational level that are potentially goal oriented and show that new institutions are the result of on-going contest and political negotiation forming a temporary negotiated order. Similarly, project 1 showed that the design and process was indeed one of on-going contest (and collaboration), for example, when the project team had to negotiate and lobby with the city architect and permitting authorities to ensure the issuing of the building permit. Furthermore, the similar, yet varying project performance of projects 2-6, indicate that the build is precisely, a negotiated order or a number of institutions that depends on actors' values, perceptions (Yu, 2013) and norms (Phua, 2005). However, on project 1, the project team members were not interpreted to be political savages in pursuit of their own interests alone, rather the project team members made efforts to maintain multiple institutions throughout the project. In other words, integration was not only necessary due to the co-existence of multiple institutions; it was also pursued for the purpose of delivering high performance buildings.

Occasional, on-going or partial integration of institutions

While Yu (2013), Kraatz (2009) and Zietsma and McKnight (2009) do not theorize the phenomenon of integration of institutions, the findings from projects 1-6 suggest, that integration occurs occasionally, partially and more-or-less continuously.

Project 1 illustrated occasional integration where, the by now much discussed example of engaging the façade supplier in the basic design phase, was an occasion of integration where all institutions represented in the project were satisfied, yet remaining independently represented. Project 1 suggests, that integration doesn't have to be a permanent state of the constellation or formally structured. Implicitly, integration is considered to be occasional by Kraatz (2009) and Yu (2013) given that they consider the institutional environment a temporary negotiated order. In that respect, no particular relationship can be anything other than occasional. However, project 1 suggests that occasional integration followed by occasional fragmentation could be purposefully aimed for, as opposed to being a result of failing to win a

contest for permanent domination.

Project 3 illustrated attempted permanent states of integration in that integration occurred from the early stages and more or less through out the project. For example, the project team reflectively made efforts towards changing the constellation of institutions towards integration from the beginning of the project by selecting the project team based on shared understandings, values and norms and managed to predominantly maintain the integration through out the project. However, project 3 did experience disruptions in the form of, for example, a cloudburst. Nevertheless, the project team was able to adapt and recreate an integrated constellation of institutions.

This perception of institutional change, as a pursued stabilized state continuously under contest from external disruption (Suddaby et al., 2006) and competing institutions (Greenwood et al., 2011) is currently represented in the literature, however, only Zietsma and McKnight (2009) and Yu (2013) are concerned with integrating processes of institutions.

Apart from occasional or stabilized integration, projects 1, 3 and 5 show that a constellation of institutions can also be partially integrated. Partial integration means that multiple institutions are integrated while one or few institutions remain fragmented. In project 1, the institutions were interpreted to be relatively integrated while the project team has been unable to design a solution for smoke ventilation that fulfilled code requirements. In project 1, partial integration is attributed to lack of integration during the basic design phase and temporary blending of institutions during the detailed design phase that constrained the contractor's ability to critically assess the quality of the engineers' work.

In project 3 the final building was interpreted to satisfy all institutions, except being able to fulfill requirements for the indoor climate due to insufficient heating capacity. The lack of complete integration in project 3 is attributed to a stabilized integration among the three key project members (owner, architect, and contractor) who neglected to critically consider if they were able to develop and maintain all necessary institutions intended to be represented in the project.

In project 5, the building was interpreted to satisfy all institutions, except profit for the contractor. The lack of complete integration in project 5 was attributed to conflicting and competing institutions.

While partial integration can resemble domination, the difference is that domination often concern the domination of a single institution with one or more sub-ordinate institutions (e.g. Greenwood et al., 2002) while partial integration indicates that multiple institutions integrate and collectively dominate, with only one or few institutions remaining fragmented. Also, often the literature assumes that domination occurs through a process of contest (e.g. Greenwood et al., 2011) while integration occurs through a process of collaboration. In that respect, integration is also different from co-creating (Zietsma & McKnight, 2009) which occurs through a process of collaboration and competition.

Fragmentation as a pursuit of expertise

Apart from integration, project 1 showed that institutions can also fragment during a design and build process. Despite the owner's attempt to create integration through both formal structures (e.g. target cost) and interaction (e.g. early contractor involvement and establishing a project office) the contractor, owner, architect and engineer gradually started developing and adhering to different understandings of

what was important and right for the project. While this gradual fragmentation is interpreted to have constrained coordination, the example of the design of the façade solution indicates that fragmentation can be used purposefully in order for each institution to be satisfied. More specifically, the architect actively engaged with the contractor, owner, engineers and façade supplier in order to ensure that the right color of frame, tint and reflection of glass, and slope of windowpanes were selected. Similarly, the contractor engaged with the façade supplier, architect, owner and engineers to ensure accurate pricing of the façade, reduce contingencies and nuture the owner's acceptance of the increased costs associated with the façade. In other words, project 1 suggests that purposeful fragmentation of the constellation of institutions can be used to pursue excellence within each institution represented in the project.

Importantly, project 1 also suggests that an integration process should follow fragmentation in order to prevent the postponement of a conflict until, for example, the detailed design phase.

Similarly, fragmentation as a pursuit of expertise was illustrated by its absence in project 2. For example, in project 2 where the architects continued to accept compromises to the quality of the building solutions and materials in order to satisfy the dominating institutions (e.g. short-term economic gains and collaboration as personal interaction and affection). According to the architect, the owner considered the architect the steward and defendant (Kraatz, 2009) of quality of interior and exterior finishes and blamed her for accepting the solutions proposed by the contractor. In other words, by attempting to be loyal to the contractor and pursue short-term economic gains that the project team had agreed to, the architects had to compromise on their expertise. As a result, in project 2, the institution of quality was subdued. However, in order for the institution of quality to have become manifest in the final building the institution of quality would have had to challenge the dominating institutions either by competition or by fragmenting and pulling the project in a different direction until a potential conflict could have arisen. Also, as expressed by the architect in project 2 when interviewed: on the one hand, compromising one institution may not have resulted in its incomplete fulfillment in the final building; on the other hand, compromising avoided the risk of being entirely expelled from the constellation of institutions.

Fragmentation has not been developed in the literature on institutional processes. While segmenting and partitioning of work (Waldorff et al., 2013) was proposed as a an avenue for co-existence of otherwise conflicting institutions, fragmentation indicates a processual understanding; i.e. that institutional are increasingly requiring diverging efforts to be satisfied and that fragmentation is a temporary development, not a permanent condition. Perhaps the lack of attention to fragmentation of institutions is due to limited attention to micro-processes of multiple institutions as well as limited attention to the outcome of institutional processes. To the latter point; it is this research project's focus on institutional processes in relation to project performance that emphasizes the fragmentation process. In other words, because the end goal is to produce a high performance project, fragmentation emerges as an important processual mechanism that can be used purposefully to increase excellence within a particular institution (e.g. professional area of expertise).

Institutional masquerade: fragmentation disguised as peaceful co-existence

Similar to temporary blending, peaceful co-existence resulted in the same postponement of institutional conflict as negative choice and deliberate ambiguity

(Gestel & Hillebradn, 2011). In project 1 peaceful co-existence developed the perception among project team members that the basic design process was characterised by collaboration, when rather, it disguised the fragmentation of the constellation of institutions and postponed integration of the multiple institutions. In that respect, a fussy and broad conceptualisation of collaboration within the project team acted as a mechanism of co-existence similar to deliberate ambiguity (Gestel & Hillebrand, 2011). Gestel and Hillebrand, (2011) showed that deliberate ambiguity resulted in the postponement of an institutional conflict, such as the conflict that arose during the detailed design phase in project 1.

Finally, as described previously, peaceful co-existence can disguise fragmentation, since neither caused tension among project team members. However, peaceful co-existence (Koch & Buser, 2014) was interpreted to represent a potentially stable state deprived of the ability to develop endogenous change, while fragmentation indicated continues movement of institutions in diverging directions.

Institutional work in projects 1-6

Paradox of working on institutions and/or constellations

Contributions on institutional work (Lawrence et al., 2009) have mainly concerned purposeful work on one institution at a time, albeit in a context of multiple other institutions. Even in studies that concern institutional processes of multiple institutions (e.g. Zietsma & McKnight, 2009; Yu, 2013), there is a core assumption that actors are trying to either make a particular institution dominant or create a proto-institution. Thus institutional efforts have predominantly been framed as directed towards one institution in particular (an important exception is Jarzabkowski et al., 2013-A).

However, the analysis of project 1 showed that institutional work breaches more than one institution, and that project team members had to work on integrating multiple institutions simultaneously in order to coordinate the project. For example, the contractor's design managers were expected to be able to both guide and assist the architects and engineers to further develop the design project, while also having to prepare the contractor's construction team for production.

However, in the process of coordinating multiple institutions, while also maintaining individual institutions a paradox was interpreted to have arisen.

To elaborate, while work aimed at maintaining an institution resulted in the maintenance of that particular institution, it also had the unintended consequence of resulting in disruption of the constellation of institutions. For example, when the owner and contractor in project 1 had agreed to use a target cost and engage in early collaboration this was intended to create an integrated constellation of institutions.

However, the owner also negotiated a reduction of the target cost, which disrupted the constellation of institutions because it steered the contractor's focus away from optimising the project and instead towards guarding the target cost. By maintaining an individual institution (i.e. trying to keep project costs to a minimum) the owner constrained the project team's ability to maintain an integrated constellation of institutions.

Similarly, the reverse was also true; attempts at maintaining the constellation of institutions required the organisations to compromise the institutions their normatively represented. This was illustrated on project 1 where the contractor's

design manager had maintained an understanding of professional segregation to avoid responsibility but ultimately decided to engage in the negotiations with the owner, architects and city in order to ensure the issuing of the building permit and the progression of the building process. Another, and perhaps more critical example of this, was when the contractor's design managers developed an expectation that the final design project would be lacking in quality and further accepted to extend the deadline for the hand-in of the remaining design project at least three times during the first year of construction. On the one hand, the expectation of a poor design project and the practice of extending the deadline numerous times enabled the design project organization to continue work that fed into the construction work on a just-in-time basis. On the other hand, the expectation of a poor design project and extending the deadline numerous times also reinforced the shared understanding that a main design project is not required or even intended to be fully coordinated. The understanding that a design project wasn't intended to be fully coordinated undermined the contractor's efforts towards making the design team deliver a fully coordinated main design project in time for construction and jeopardized the efficiency of the construction process. In other words, in their attempt to maintain the constellation of institutions and enable the design process to continue to fulfill owner's requirements, the contractor jeopardized the efficiency of the construction process (a single institution).

The paradox between changing a single institution and a constellation of institutions is interpreted to be an indicator of a larger change in the field of design and construction. The change is interpreted to involve a gradual development from non-collaborative project delivery methods guided by opportunistic economic gains and efficiency, to increasingly collaborative project delivery methods guided by quality and project performance stability. If organizations become increasingly collaborative and oriented towards pursuing long-term gains, the paradox may potentially dissolve and institutional work aimed at a single institution will be integrative with institutional work aimed at a constellation of institutions. However, it is beyond the scope of this dissertation to elaborate on this discussion further.

Project performance of projects 1-6

Project performance as a mix of intended and unintended consequences

The paradox between working on a single institution and a constellation of institution pertains to the discussion on intended consequences versus unintended consequences (Lawrence et al., 2009).

Institutional work concerns purposeful actions aimed at creating, maintaining or disrupting institutions (Lawrence et al., 2009) and while recognizing that actions have consequences that can be either intended or unintended, institutional work is explicitly not concerned with the consequences of action.

However, design-build projects have a relatively clear purpose (albeit sometimes poorly defined and continuously negotiated and changed): the development of a building that satisfies a number of institutions. As a result, on the one hand the project team has an interest in managing the integrating constellation of institutions in order to increase the amount of intended consequences in order to stabilise project performance. On the other hand, project performance can be defined as a combination of intended and unintended consequences of institutional work carried out during the

design and build processes. Contending that the current constellations of well-established and proto-institutions on design-build projects result in a paradox between efforts aimed at single institutions and efforts aimed at the constellation of institutions, then project performance is per definition a result of intended and unintended consequences.

While no literature was found on institutional processes and organizational performance explicitly, previous contributions on institutional processes frame temporarily stabilized institutional arrangements as '*negotiated orders'* (Oliver, 1992; Yu, 2013). In accordance, project performance was previously defined in this dissertation as a temporary stabilisation of the constellation of institutions reflecting a particular negotiated order. Similarly, the analysis of projects 2-6 showed that project performance was a negotiated order of proto-institutions and institutional debris. Due to the ex-post method, it was not possible to gain insight into the mundane institutional work carried out on projects 2-6. However, the analysis of project 1 and the finding that there is a paradox between working on a single institutions and a constellation of institutions, show, that project performance is also the result of intended and unintended consequences of actors negotiating, experimenting, competing, fighting, collaborating, and doing what they perceive to always have been doing.

Project performance is relatively stabile, yet subject to variation

The process of negotiating, experimenting, competing, fighting, collaborating, and doing what they perceive to always have been doing, closely resembles the process of co-creating institutions (Zietsma & McKnight, 2009). While co-creation among multiple institutions in a field (Zietsma & McKnight, 2009) was described as process that doesn't follow a particular path (although bearing traces of institutional debris), projects 1-6 suggest that constellations of institutions in projects develop according to certain patterns. To recap: peaceful co-existence characterized the early and basic design phases, but was gradually eroded by the perception of a value-chain, the pursuit of short-term economic gains, late changes, and lack of institutional leadership that fragmented the constellation of institutions and was repeated across projects. The lack of integration among institutions during the early and basic design phases resulted in a conflict during the detailed design phase between understanding coordination as a means to increase project quality and understanding coordination as a means to enable efficient building processes. During the building phase the institution of the build dominated either autonomously, in competition, or in collaboration with remaining institutions. And in the transition to occupancy, all projects struggled to integrate all institutions (e.g. mechanical installations were associated with deficiencies; poor quality of materials; and fee erosion). In other words, the analysis of projects 1-6 suggests that while actors negotiate, experiment, compete, fight, and collaborate, they to some degree reproduce the same intended and unintended consequences from project to project. This supports the findings of Kadefors (1995) who showed that projects vary little in process and outcome.

On the other hand, project teams were able to create different constellations of institutions and projects that performed differently. This is attributed partly to institutional work albeit it being sporadic, short lasting, and mostly initiated by individual organizations in each project. And to that end, until projects succeed in collectively, reflectively, purposefully and continuously integrating constellations of institutions, projects are interpreted to more-or-less remain similar, yet different.

Integrated design-build management

The analysis of project 1 presented in a previous chapter showed that the coordination process was constrained when institutions conflicted, competed, dominated or temporarily blended. On the other hand, coordination was enabled when the project team was able to occasionally integrate and fragment the constellation of institutions.

Furthermore, the second analysis showed that constellations of institutions developed in the design-build process were reflected in the projects' performance.

In the following section, proposals as to how the constraints on coordination may be overcome and how coordination can be further enabled are presented. The proposals are interpreted to bridge and extend research on coordination, collaborative project methods and institutional theory, and combined constitute a management concept referred to as Integrated Design-Build Management.

The IDBM concept is based on the empirical analysis of the six design-build projects as well as a selective literature study of collaborative project delivery and process methods. These include: virtual design and construction (Kunz & Fischer, 2012); integrated project delivery (e.g. Cohen, 2010; Lahdenperä, 2012); partnering (e.g. Lahdenperä, 2012); project alliance (e.g. Lahdenperä, 2012); scrum (e.g. Sutherland, 2014); LEAN (e.g. Koskela et al., 1997); target value design (Zimina et al., 2012); knot-working (Korpela & Kerosuo, 2014); BIM (Berard, 2012); integrated concurrent engineering (Khanzode, 2010); and pull-scheduling (Ballard, 1999). It is beyond the scope of this dissertation to include the full analysis of these project delivery and process method, therefore, in the following, references will primarily be made to the empirical analyses.

The purpose of the IDBM concept is to enable project teams to coordinate projects (i.e. occasionally and purposefully integrate and fragment institutions) to enable project performance that satisfies multiple institutions represented over the course of the project.

In the following the key points of the concept are presented. First, new meanings and underpinning structures are proposed, including: leadership and management; collaboration and coordination; separating design and build; an integrated phase model; project and process requirements and performance evaluation; and BIM as a social tool. Secondly, the proposed meanings, norms, and rules are discussed and thirdly, the chapter is summarized.

An elaborated description of particular parts of the IDBM concept (in particular the normative process models) can be found in Appendix 1.

Proposed meanings, norms, rules & interaction

The IDBM concept proposes to create, disrupt and maintain a number of meanings, norms, rules and ways of interacting in order to enable project coordination. The proposals offered by the IDBM concept are aimed at enabling a gradually integrating constellation of institutions over the course of the design process and enabling a final building that reflects integration of the institutions represented in the project. Importantly, an integrat*ing* constellation of institutions refers to a constellation that increasingly becomes integrated and involves occasional fragmentation. In other

words, the IDBM concept does not propose a method for a single institution to dominate the constellation alone and this is an important point of departure.

Leadership & management

The IDBM proposes that project team members interpret leadership and management as institutional concepts.

Specifically, leadership is interpreted to be institutional work aimed at creating and/or disrupting institutions or constellations of multiple institutions. Leadership involves engaging in on-going collective negotiating, experimentation, compromise, learning, layering and creating new meanings, values, norms, perceptions, and rules. In the project, leadership is aimed at collectively, reflectively, purposefully and gradually developing an integrating constellation of institutions. Importantly, leadership is also aimed at occasionally fragmenting the constellation of institutions in order to pursue the satisfaction of each institution.

Furthermore, management is interpreted to be institutional work aimed at maintaining an existing institution or constellation of multiple institutions. Management involves collective governing and negotiating to ensure the adherence to and reproduction of existing shared meanings, normative conducts, and regulations. In the project, management is aimed at maintaining a particular institution to support either the process of integrating or fragmenting the constellation of institutions. Also, management can be aimed at maintaining a constellation of institutions once stabilisation of the constellation is required.

These definitions extend the understandings proposed by Alvesson (2011). Alvesson (2011) proposes to understand management as the reproduction of basic values, assumptions and meanings in the form of socialising new employees, and continuing to keep current employees interested and motivated. Leadership, on the other hand, is interpreted as work aimed at '*attaching positive meaning to one's intentions, acts, arrangements and outcomes'* both within and outside the organization (Alvesson, 2011, p.159). Therefore, Alvesson (2011) interprets management to be mainly focussed on *internal* institutional *maintenance* and leadership to be mainly focussed on both *internal* and *external* work aimed at *creating* institutions.

Therefore, the coordination process (i.e. occasionally fragmenting and integrating constellations of institutions) can be interpreted as a combination of leadership and management.

Apart from institutional leadership in projects, institutional leadership also has to be developed outside of the projects. Organizations have to conduct institutional leadership to enable an integrating constellation of institutions across organisational support functions and project production and through partnerships or long-term relationship with other organizations where shared meanings, norms and rules can be developed and maintained.

The role of reflectivity

While the coordination mechanisms presented in the theory chapter of this dissertation can serve as a tool box for leadership, the most important aspect of leadership is reflectivity. This includes reflection of the coordination process, as well as reflection of what norms, rules and meanings collaborating organizations adhere to.

This resembles Hemphill's (2009) proposal that the ability to understand the perspective of others is a coordination mechanism in itself. Importantly, this also includes self-reflectivity, i.e. an organizations' ability to critically reflect upon what taken-for-granted meanings, norms and rules it adheres to itself. In addition, understanding ones own perspective, and what meanings, norms and rules underpin that particular perspective has the ability to coordinate because it enables the purposeful disruption or development of shared understandings. This was illustrated in project 3 where the owner conducted extensive programming analyses and guaranteed the contractor a certain profit. Contrary, project 2 illustrated how the contractor did not reflect on their own norms and meanings and pursued short-term economic gains despite compromising mutual respect, trust, and the quality of project materials. Furthermore, as illustrated by all the studied projects, competition for domination among understandings and norms occurred during the detailed design phase and in project 4 and 5 also during the building process. In other words, the lack of self-reflection constrained the project teams' ability to integrate the institutions, and instead enabled institutional maintenance.

Separating Design & Build

The IDBM concept proposes to separate the design and build processes into two temporally and socially distinct processes. Temporal distinction means that design work is only done during the design process in which the project is coordinated before the building process begins. Social distinction means that two distinct constellations characterise the design and build processes respectively: an integrat*ing* (i.e. on-going occasional fragmentation and integration) constellation of institutions characterises the design process; while the building process is characterised by an integrat*ed* constellation of institutions.

The purpose of separating the design and build processes is to resolve the institutional conflict between coordination for the purpose of pursuing integration and coordination for the purpose of building efficiently. While the conflict could be settled by proposing that one or the other institution become dominant, separating the design and build processes acknowledges the importance of maintaining both quality, efficiency and long-term economic gains. The separation of the design and build processes enables coordination of institutions *before it is too late*. This means, changes to the design in order to integrate a particular institution can be relatively easily done during the design process, without jeopardizing the stability of the building phase once building systems have been ordered, produced and perhaps even installed.

Therefore, the IDBM concept proposes that separating the design and building process is built on a shared understanding among project organizations that the main design project has to be fully coordinated before the building process begins. This shift in meaning is accompanied by a re-conceptualisation of the design and building processes: a virtual project followed by an assembly process.

Design as virtual action & build as assembly

First, the design process can be conceptualised as a virtual project. A virtual project implies the extensive use of digital tools to facilitate the design development and to

represent the main design project, which also implies a much more active engagement of the contractor, suppliers and sub-contractors in design work. The virtual design project would culminate with the hand-off of a fully coordinated virtual project. In the studied projects, the design process was perceived by the contractor more or less as an extended architectural workshop with co-existing organizations awaiting integration to occur during the detailed design and building phases. IDBM proposes an interpretation of the virtual project as a process of analysis and coordination of all the institutions intended to be represented in the project's performance.

Second, the building process would be referred to as an assembly process in order to emphasise that coordinating efforts are intended to occur during the design process, and not during the building process.

Collaboration & coordination

The IDBM concept proposes change of the meaning of collaboration. Specifically, the IDBM concept proposes that a shared meaning of collaboration as coordination becomes institutionalised *or* that coordination is developed as an institution in itself.

The purpose of changing the shared meaning, conduct and rules that support collaboration is to resolve institutional conflicts, enable shared goals, and ensure that accurate information is available to the team when needed.

To increase the shared meaning of collaboration as coordination, the term *collaboration* can be continued to be used, while, for example, analytical selection of organizations to collaborate in the projects is emphasised.

To develop a shared understanding of coordination that extends past its technical meaning to also encompass the social, projects could develop and rhetorically refer to a project's particular *coordination strategy*. The project coordination strategy could include a definition of coordination and outline what coordination mechanisms the project team are making efforts to develop in the project and how. The coordination strategy is intended to act as an instrument to spark collective reflection.

New Coordination Mechanisms

The IDBM concept proposes that both functionalist and relational coordination mechanisms are developed in projects and that the specific setup of coordination mechanisms is tailored to each project.

However, as developed under leadership and management, the IDBM concept also proposes a new coordination mechanism to create an integrating constellation of institutions: self-reflection. Self-reflection emphasizes the importance of not only developing the ability to understand the norms, values, meanings and perceptions of other organization and take their perspective, but also ability to understand one's own perspective (e.g. what institutions an organization adheres to itself). This coordination mechanism can be referred to as *reflective capacity*.

In addition to reflective capacity the IDBM proposes that *transparency* be considered a coordination mechanism. Transparency is overlapping to coordination mechanisms such as accurate, timely and frequent communication (Gittell, 2008), but also encompasses, for example, honest communication. Honest communication is defined as project team members communicating genuine intent, ambiguity, and potentially socially illegitimate ideas and perceptions. In other words, while the coordination process itself is defined partially as a political process in which actors

compete for domination (Lawrence et al., 2009) coordinating a project to increase project performance requires that actors increasingly negotiate the institutional order not to dominate, but to integrate. While competition for domination potentially requires not disclosing genuine intent, collective efforts aimed at integration, on the other hand, require transparency. Transparency enables integration because the social elements that require integration become increasingly perceivable.

The integrated phase model

The IDBM concept proposes that the currently institutionalised linear phase model be replaced with a phase model that supports integration of institutions during the virtual project process.

The *integrated phase model* enables project teams to respectively fragment and integrate the institutions during the virtual project process. Furthermore, the integrated phase model is aimed at resolving the conflict between integration and domination during the detailed design phase, by enabling integration from the beginning of the design process.

The integrated phase model is based on the understanding that the virtual design project develops from multiple fragments of design (abstract or detailed) to a gradually integrated design project. The IDBM proposes the project team works on both conceptual and detailed design at the same time.

Design development as systematic iteration

The IDBM concept proposes that the current multiple sub-design-processes running in parallel be replaced with a series of two to four iterative project loops each consisting of a number of short design sprints during the detailed design phase. The iterative work process is referred to as *systematic iteration*.

Systematic iteration is based on an analytical approach to organizing work elements during the design development phase in order for the project team to work through the design project two to four times. Iteration enables re-evaluation and re-development of the different institutions required to be represented in the project, while systematic iteration enables coordination (i.e. purposeful occasional fragmentation and integration).

Systematic iteration means dividing the design development phase into a number of distinct loops. In each loop all institutions are represented and pursued. Since the project team works with both detail and abstraction in all loops, the design develops from several fragmented design proposals in the first loop, towards gradually integration of the multiple fragments. By the end of the last loop the multiple design proposals have the potential to have been integrated and form a single coordinated design project. Parallels to structuring work as systematic iteration are found in concepts such as scrum (Sutherland, 2014), integrated design (Knudstrup, 2008); and knot-working (Korpela & Kerosuo, 2014).

Project & process requirements & performance evaluation

The IDBM concept proposes that the project teams work with project and process requirements and performance systematically and continuously, in order to facilitate reflective and collective efforts towards the integration of all the institutions represented in the project.

The proposals support the meaning that project performance is not a simple quantitative snapshot measure, but rather a negotiated order of intended and unintended consequences of institutional work and taken-for-granted institutional debris.

In that respect, project and process requirements and performance evaluation is intended to both *keep the project on track* as well as continuously purposefully and collectively *define, and potentially redefine, that track*.

BIM as a social tool

The IDBM concept proposes that BIM is increasingly understood as a social tool, not just a technical tool. While functionalist coordination through for example, 3D geometry reviews, scannings and collision controls, 4D planning of the building process, and quantity takeoff's for cost estimation and production, were applied to varying degrees in projects 1-6, BIM was not perceived as a tool to create social coordination.

The IDBM concept proposes that BIM is understood as a tool for institutional change. For example, the BIM review sessions be used as an opportunity for perspective taking and building mutual trust and respect. To elaborate, the BIM review session could center around the purpose of trying to create collective responsibility for design errors detected in the 3D model, collective responsibility for problem solving, and multi-membership). Furthermore, the project team could use the BIM review session as an occasion for understanding how and why certain project team members might be constrained in delivering required work. To do so, the BIM review would have to be a collective effort where the project team members make efforts to integrate institutions, not maintain or make dominant any one institution in particular. This requires collective reflection and discussion, as well as a change in rhetoric.

Reflections on the IDBM concept

The IDBM concept proposes enabling coordination by creating an integrating constellation of institutions that occasionally and purposefully integrate and fragment respectively.

The IDBM concept is an outline of meaning and normative structures that not only leave room for but also encourages reflective and purposeful actions aimed at creating integrating constellations of institutions. Since no two projects are identical, the constellation of institutions will vary from project to project. This variation is reflected in the IDBM concept, in that some of the proposed structures are relatively extensive and guiding (see Appendix 1), while other are relatively undefined. For example, the change of the meaning of leadership towards reflective social

fragmentation and integration is a relatively uncompromising recommendation of the IDBM concept. On the other hand, the loops and design sprints proposed for systematic iteration are intended for adaptation to each individual project without compromising their inherent meaning of enabling systematic social fragmentation and integration.

In the following, opportunities and resistance to the IDBM concept are discussed.

Opportunities and resistance to the IDBM concept

IDBM as a stepping stone (from current disruption)

The design-build project delivery form offers an opportunity for architects, engineers, contractors, suppliers and owners to collaborate for an extended period of time, before the build begins. However, as we saw in Project 1, extended collaboration caused confusion about how the contractor was supposed to interact with the rest of the project team during the basic design phase (e.g. the contractor withdrew from design meetings) and exercise leadership during the detailed design phase (architects expected clear guidance, contractor expected consultants to be *'professional'* and able *'to think for themselves'*). In other words, the IDBM concept proposes a further disruption of current design-build practices which may cause confusion and paralysis at worst. On the other hand, as project 1 illustrated, disruptions to well-established patterns of interaction in design-build projects are already occurring and thus there is an opportunity for the IDBM concept to be diffused as well as support further co-creation of a new design-build norm.

In order for the IDBM concept to become part of a co-creation process for a new design-build process, the meanings, norms, rules and interactions proposed by the IDBM concept require institutional work.

The sections below discuss what and how this institutional work can be done. Although institutional work contributes to creating, disrupting and maintaining institutions at the same time, in the following each is discussed separately to enable a discussion across the proposals. Therefore, the text below may appear somewhat fragmented.

Creating

The IDBM proposes to create a reflective and analytical approach to coordinating institutions and constellations of institutions in projects.

Creating a shared understanding of reflective integrating leadership, social coordination and the separation of design and build could be supported through narratives about how institutional fragmentation during the design process performance can result in poor buildings that reflect a lack of integration. For example, project 3 could be used to illustrate how the lack of bringing in the necessary skills during the design process and the contractor reducing the capacity of the heating system resulted in a finished building that was unable to meet indoor climate requirements. And Project 5 could be used to illustrate how lack of coordination of project expectations can result in inefficient building processes and significant fee erosion. Similarly, project 3 could also be used to illustrate that integration among institutions resulted in (more-or-less) integrated buildings.

Along side these narratives, reflective discussion among project teams could be facilitated in order to develop more nuanced understandings of the relationship

between institutional processes and project performance. Such reflective discussions could take the form of everyday conversation, as well as more formal project presentations where project teams share their story with other project team members and support staff at the respective organizations.

Furthermore, the IDBM concept suggests, that someone, either an individual or an organization, is formally appointed the responsibility of institutional leadership and management in a given project, to emphasize that institutional work is an on-going effort within the project team in order to create or maintain an integrating constellation of institutions. While, for example, integrated project delivery (AIA, 2007) suggests that assigning a group leader is unnecessary since the contract structure aligns the interest of the parties, the analysis of project 1 showed that divergent understandings and norms caused fragmentation and conflict during the basic and detailed design phase and that on-going maintenance of the integrated constellation of institutions was indeed required.

Apart from developing new narratives about the project, redefining professional roles can also support the IDBM concept. For example, the early involvement and central role of the contractor during the virtual project process can result in a shift in the meaning of what constitutes the contractor. In projects 1-6 the meanings associated with the contractor was closely related to the building process and segregated from, in particular, the meaning associated with the architects. The IDBM concept proposes that the meaning of the contractor changes to one of consulting contractor during the design process who provides virtual design and analysis services, as well as, extended project management services.

Similarly, the emphasis on the virtual project and re-framing of the building process as *building assembly* supports a shift in meaning of the contractor, sub-contractors and workmen. To avoid the meaning of building assembly to be interpreted as a degradation of the skills and responsibility of those involved in the building assembly, the project team would have to develop new narratives about the work carried out on site to give it legitimate and attractive meaning.

Furthermore, the normative structures proposed by the IDBM concept (i.e. the integrated phase model, systematic iteration, and project and process performance evaluations are structures that underpin the proposed meanings of reflective, integrating leadership.

First, stressing *systematic* iteration might increase the legitimacy of iteration. In project 1 in the previous analysis, when interviewed, in particular the contractor's representatives had an understanding that iteration was equal to a chaotic and inefficient process that only enabled architectural quality and increased project costs. Therefore, emphasizing systematic iteration as a method by which the design process becomes increasingly efficient will make systematic iteration more legitimate. Also, systematic iteration unfolds an extensive and relatively guiding work structure that can help prevent reproduction of taken-for-granted existing work structures.

Secondly, an appreciation of the ambition of trying to integrate the project has to be developed and legitimized. If systematic iteration can be associated with increase productivity without extending the expected duration of a design process or increasing its cost, systematic iteration will satisfy the institutional logics of efficiency and economy.

Thirdly, to gain legitimacy, systematic iteration has to leave room for the project team to adapt the loops and design sprints to each project. As illustrated by the

analyses of project 1-6 early collaboration among all organizations is rare and thus, it is important for systematic iteration to be able to adapt to a particular project and accelerate the process of integration if required.

Disrupting

First, the new meaning of leadership also means disrupting the previous meaning of leadership as being a matter of distributing carrot and stick appropriately and a matter of being a hard or soft person.

The analysis also showed that structures for distribution of risk and reward are supported by regulations (e.g. design-build standards, collaboration agreements, design-build contracts and sanctioned deadlines), normative conduct (e.g. the project managers using increasingly firm rhetoric and engaging in verbal fights to make particular institutions dominate) and shared meanings (e.g. stick and carrot are considered the primary, and sometimes only, mechanisms to make a particular institution dominate). As a result, disrupting the institution of leadership and management requires multi-level efforts.

The new meaning of leadership as institutional work aimed at creating an integrating constellation of institutions also requires the disruption of previous understandings of leadership as a matter of making a particular institution dominant. The finding that actors take-for-granted the pursuit of dominance was supported empirically as well as theoretically. For example, Zietsma and McKnight (2009, p. 148) address how *'institutional actors create new institutional arrangements, and adapt them as they compete for dominance in disrupted environments.'* Therefore, the pursuit of integration requires an institutional change to happen. Specifically, the project team needs to create the shared understanding that satisfying all institutions in the project does not, contrary to common perception, lead to compromising individual institutions. In other words, understanding that the collective and long-term gains also result in stable and profitable projects for the individual organization has to be created.

Similarly, creating institutional management requires disruption. In projects 1-6 fragmentation resulted in frustration among project team members, however, purposeful fragmentation requires an appreciation of the divergent institutional demands.

Second, the separation of the design and build processes would result in a temporal gap between the design and build process respectively, while building systems are being produced off site and until construction work on site is ready to begin. In order for the separation of the design and build processes to become legitimate the urgency to begin the build has to be disrupted. Also, the temporal void has to be either accepted or filled with something that is perceived to be meaningful. Acceptance of a temporal void may be developed through discussion within the project team that the void is necessary to ensure the required project integration. Meaningful activities may include visits to building systems production facilities. This would enable the project team to experience how a complete and coordinated design project enables efficient production processes. Also, the project team may begin to prepare the hand-off manual during this phase. This would enable coordination of interfaces between the sub-contractors and potentially result in a higher build quality. Furthermore, preparing the hand-off manual during the time between design and building process would shift the project team's focus towards delivering a finished building.

The separation of the design and build processes may also meet resistance from those adhering to the understanding that the overlap between design and build processes is necessary in order to save time and meet the final deadline for the finished building. Therefore, in order for the separation of the design and build processes to become legitimate the project team has to be able to increase the efficiency of the design and build processes respectively and maintain current project durations.

Third, the integrated phase model proposes working simultaneously with detail and concept. Working simultaneously with detail and concept during the design development phase requires a disruption of the current well-established norms of the linear phase model and the value-chain. This could be achieved through delegitimization of the linear phase model and the value-chain. To elaborate, the linear phase model and the perception of a value-chain could simply be referred to as *old-school* or, if time for reflective discussion is granted, anecdotes illustrating how the linear phase model results in an institutional conflict during the detailed design phase and is unable to lead to high performance projects could be told. Furthermore, the linear phase model and value-chain could be framed as the means for a particular institution to dominate as opposed to integrating institutions.

Furthermore, because systematic iteration proposes an extensive work structure for the project team, systematic iteration will meet resistance from those adhering to the understandings that *'the project team is not a kindergarten'* and that *'as professionals, project team members ought to be able to figure out what to do for themselves'*. These understandings can be delegitimized if they become understood as irresponsible lack of leadership and lack of competence to grasp *'the slippery eel'*.

Maintaining

Since coordination requires both integration *and* fragmentation of institutions the IDBM concept implicitly proposes that certain institutions can be purposefully maintained.

The current meanings of collaboration, phenomenological quality, aesthetics, functionality, sustainability, cost optimization, building efficiently are proposed to be maintained because these are interpreted to support high performance projects (i.e. both integrative processes as well as valuable qualities in the final build).

Furthermore, while individual well-established institutions can potentially be maintained, the IDBM concept is ultimately a proposal that offers stabilization of project and project performance. While the process of integrating (and fragmenting) is dynamic and one of inherent change the IDBM concept proposes stabilization of the project by creating an integrated project performance.

To elaborate, while it is beyond the hermeneutic method to quantify for example, potential time and fiscal savings, the IDBM concept offers projects the ability to purposefully reflect upon and change constellations of institutions or adapt to changing constellations of institutions. This in itself offers a degree of stability and predictability of project performance.

Furthermore, the integrating constellation of institutions can reduce the number of both anticipated and unforeseen conflicts among institutions and organizations during the projects. Therefore, integration of institutions can increase stability, predictability and performance of individual projects as well as portfolios of projects.

Methodological consideration

IDBM is a leadership and management concept, not a project delivery method

Project delivery methods such as IPD and partnering have focussed mainly on reconfiguring the economic structures or normative work processes (e.g. tools, processes, contracts, multiparty agreements, and distribution of risk and reward) and only implicitly proposed new meaning to projects. However, none of the project delivery methods reviewed explicitly proposes to also change the shared meanings underpinning projects.

The IDBM concept aims at creating institutional change, by proposing new and disrupting existing shared meanings and norms for work processes and collaboration. In that respect the IDBM concept represents a contribution by attempting to '*overcome the tendency to use tools, techniques and formal structure to engineer culture*' (Bresnen & Marshall, 2010, p.162). Since institutional change is an on-going process requiring experimentation, collaboration, reflection, and potentially competition and conflict, the IDBM concept is, like for example the concept of LEAN (Green & May, 2005), not a delivery method that can be applied as a instrumental framework, rather it is a proposal to on-going efforts towards changing the project and collaborating organizations from within the framework. Therefore, the IDBM concept is interpreted to be leadership and management work.

Transferability of the IDBM concept

While projects 1-6 showed that design-build projects in Denmark at the beginning of the 21st century developed the institutions of quality, efficiency, economy, collaboration and coordination, other project delivery methods, projects in different geographic regions, and future projects may develop different constellations of institutions. The IDBM concept proposes a method that will enable organizations and project teams to coordinate projects other than design-build ones, outside of Denmark and in the future.

Furthermore, while it may be challenging to separate design and build due to the well-established norm of overlapping design and build processes, separating the design and build process is an institutionalized norm on design-bid-build projects.

Therefore, design-bid-build projects offer a second possible collaboration form for creating integrated projects. Design-bid-build projects constitute 52,2% of the contractor's project portfolio and while the contractor is typically not invited to participate in the design process in these projects, as strategic relationships with key client develop, the contractor could be invited to participate as a consultant during the design process.

Similarly, extended collaboration to also encompass an understanding of shared project responsibility are also found in integrated project delivery (AIA, 2007) and partnering projects (Lahdenperä, 2012).

Therefore, the IDBM concept is based on, but not limited to, design-build projects. Because the IDBM concept is a management concept and not a project delivery method, it can be applied to a variety of project delivery methods, including design-build, design-bid-build, integrated project delivery, and partnering.

Similarly, the IDBM concept can be applied to design-build projects where the projects follow the linear phase model and the contractor has been invited to

participate in only the detailed design phase.

On those projects, the project team has no choice but to alter the process structures proposed by the IDBM concept or accept that normative design-build structures dominate. However, the IDBM concept would recommend that the contractor takes full responsibility for executing institutional leadership for the remainder of the design process. This includes, making efforts to articulate, discuss and create an integrated constellation of institutions with the other organizations in the project team, or collectively and openly negotiate the domination of a particular institution.

Also, the IDBM concept would recommend that the contractor consider forming a new project team, with new architects and engineers to disrupt previous patterns of interactions and enable a new integrated institution or the domination of a particular institution. Furthermore, the urgency to build could be disrupted and the start of the build postponed until a coordinated design project is available.

Conclusion

This chapter presents the conclusion concerning the chosen theoretical framework and research design, as well as concluding insights into project coordination and project performance. Finally, the conclusions of the IDBM concept are presented.

Theoretical framework & research design

The purpose of this research project is to understand how coordination defined as an institutional process of design-build projects is constrained and enabled and how coordination (or the lack of it) relates to project performance.

In order to gain this insight, coordination was defined as both as structural and relational phenomenon.

Also, an institutional works perspective was adapted in order to be able to understand coordination as a social process. An institution was defined as: a more-or-less taken-for-granted shared meaning, underpinned by normative understandings and conduct, and potentially rules, that guide and provide meaning to social interaction.

Importantly, the project is characterized by a constellation of institutions i.e. multiple institutions developing in particular relationships to each other and mutating over time. As a result of mutation, constellations of institutions are characterised by incremental change and temporary stability. While institutions can be more-or-less taken-for-granted and self-reproducing, the purposeful mutation of the constellation of institutions requires institutional work aimed at creating, maintaining or disrupting institutions. Institutional work is concerned with explaining how reflective actors change or maintain institutions and interaction to coordinate projects.

To understand coordination and coordination in relation to project performance a combination of literature studies and a double-qualitative empirical study of design-build projects was chosen.

The first qualitative study concerned gaining insight into the phenomenon of coordination. Following the institutional works perspective, gaining insight into emergent micro-processes of coordination required ex-ante project observations and collecting project documents. In order to account for past events and future expectations, the observations were accompanied by interviews with project team members.

The second qualitative study concerned understanding any potential relationship between institutional processes during the design-build phases and project performance. Project performance was defined as an emerging temporarily stable constellation of institutions. To understand potential relationships between institutional process and project performance, an ex-post study was conducted of five completed design-build projects. Specifically, the longitudinal ex-post studies did not enable an understanding of the micro-processes of institutional work, rather, it enabled understanding relationships between institutions through episodes of for example, conflict, ambiguity, negotiation, and the intended and unintended consequences of these episodes.

Both the ex-ante and ex-post studies were analysed and discussed through reflexive interpretation at four levels: the empirical material itself; as concepts of

coordination and institutional process; in a broader societal (or at least field level) context; and critical reflection of the role of the researcher.

The coordination process constrained

For all the studied projects, the main challenge to the project teams was, to varying degree, enabling coordination among institutions during the design process.

During the early and basic design phase institutions in project 1 co-existed in what was perceived as peaceful collaboration, however, the project team became gradually fragmented and the need for integration of institutions was postponed until the detailed design phase. As a result, an institutional conflict arose during the detailed design phase between on the one hand increased design quality, cost optimization, functionality; and, on the other hand, building efficiently.

While partial integration enabled coordination among a number of institutions, on-going integration and temporary blending constrained the project team's ability to critically access the progress of the design process and the quality of work of other project team members.

Reflection and purposeful efforts to coordinate project team members were interpreted to have occurred at project conception based on previous project experience and as new actors entered the project. Also, institutional work aimed at creating a new institution or mutate the constellation of institutions took the form of minor experiments inspired by previous projects and tailored to each new project. There was no collective, on-going or holistic reflection concerning a greater transformation of the constellation of institutions in order to improve coordination. Instead, project members were left to interpret variation in collaboration form independently and predominantly began maintaining particular institutions for the purpose of making it the dominant institution in the constellation. As a result, the design process stalled, re-circuited, or dragged on and the main design project was delayed and not fully coordinated.

The coordination process enabled

Regardless of the constraints on coordination during the design process, the project team succeeded in beginning and progressing the building process.

Coordination occurred when project teams were able to integrate institutions, by satisfying different institutions through unified efforts. Integration in project 1 developed as partial, on-going and occasional integration. However, to enable coordination, integration was only required occasionally. Occasional integration also offered opportunity for potential occasional fragmentation, which ensured the project team's pursuit of satisfying a particular institution and critical reflection of the work made by other project team members. Thus, coordination was enabled through an on-going process of integration and fragmentation of institutions in the constellation. Integration of institutions required institutional leadership and was primarily conducted at project conception.

The project team succeeded in starting and progressing the building process because the determination to build gradually came to dominate the constellation of institutions. The domination was supported by: the project team being able to adapt to

the project to continue collaboration by extending the overlap of the design phase further into building phase; decoupling the design team from the construction team; the construction team making efforts to figuring out what should be built when the main design project was lacking coordination and detail; and by extending the deadline of hand-off of the finished building. Also, as the project team developed the shared understanding that the build had to begin and progress the remaining institutions either gradually or more-or-less instantly became subordinate. However, the contractor continued encouraging collaboration, accepted rework, and continuously re-adjusted the building schedule to accommodate the progression of the design project; this shows that the institution of quality and collaboration was maintained to some degree.

Constellations of institutions & project performance

The analysis of projects 2-6 showed that project performance is an emerging qualitative construct as the aftermath of the projects gradually settled.

While each project developed multiple relationships between multiple institutions over the course of the projects, projects 2 to 6 were characterized by particular still lifes of constellations of institutions. These still lifes included: settled domination, ambiguous domination, contested domination, integration, conflict and competition. Overall, three main types of constellations characterized the six projects: domination; integration; and, conflict and/or competition.

Constellations of institutions characterized by either type of domination resulted in project performance that predominantly satisfied the dominant institution. This was illustrated in projects 2 and 6. The institution of pursuing short term of economic gains dominated both projects and both project teams expected and more-or-less accepted that the remaining institutions were compromised. As a result, project 2 didn't fulfill the owner's requirements for maintenance, while project 6 was characterized by reductions to the architectural quality. On the other hand, the project teams made satisfying profit on both projects and did not need to extend the deadline for the hand-off of the final building.

An integrated constellation of institutions resulted in a final building satisfying the institutions represented in the constellation. On-going integration resulted in project performance where all the institutions in the constellation were integrated. This was illustrated by project 3. However, in project 3 on-going integration resulted in the project team's lack of ability to critically assess if all necessary institutions were represented in the constellation of institutions and as a result, the mechanical design was underestimated and incorrectly designed and installed. Fragmentation of institutions resulted in inability to resolve mechanical deficiencies during occupancy.

Constellations of institutions characterized by conflict and competition resulted in project performance characterized by fee erosion for the contractor and architect. Interestingly, the final buildings of project 4 and 5 performed very differently at the end of the projects. Project 4 was unable to negotiate project hand-off with zero error and deficiencies or extension of the deadline for the final build. Also, the indoor climate and building materials were of poor quality resulting in dissatisfied residents. On the contrary, project 5 resulted in a building in which the majority of institutions in the constellation were integrated and a highly satisfied owner.

The IDBM concept

The IDBM concept presents proposals for new meaning, norms and rules to improve project coordination. The IDBM concept is based on the understanding that an increasingly, collective, reflective and analytical approach to leading and managing the social structures and interactions in projects can improve project coordination and project performance. Also, the IDBM concept builds on the insight, that occasional integration and fragmentation of institutions in the constellation improves coordination.

Specifically, the IDBM concept proposes that coordination can be improved through: institutional leadership and management; separation of the design and build phase; an integrated phase model; increased use of BIM as a social tool; new coordination mechanisms and the development of coordination strategies; systematic and on-going definition and evaluation of project and process performance.

Contribution

The contribution of the research presented in this dissertation is three fold: insight into project coordination; insight into project performance; and a proposal for a new integrated design-build management concept.

Insight to project coordination

First the ex-ante study represents an empirical contribution: observations and site-visits provided a detailed account of how project teams coordinate and don't coordinate. Second, the analysis of project 1 has provided insight into the coordination process of design-build projects adding to our understanding of coordination as a matter of structure and interaction, by introducing an institutional works definition of coordination.

Second, the ex-ante study has contributed to a limited body of literature on design-build projects in an institutional perspective by providing insight into how coordination is respectively enabled and constrained through a process of purposeful efforts and taken-for-granted meanings, norms and rules.

Third, the research presented in this dissertation developed the concept of institutional integration further, by distinguishing between partial, full and occasional integration of institutions, as well as introducing the concept of institutional fragmentation.

Fourth, the analysis of coordination provided a processual model of coordination (i.e. occasional integration and fragmentation) understanding coordination as an on-going process of negotiation, adaptation, experimentation and reproduction of taken-for-granted structures.

Insight into project performance

The ex-post analysis has contributed to research by highlighting that project performance is a qualitative and social construct that develops as the aftermath of the projects settles. Furthermore, project performance can be interpreted to reflect the constellation of institutions that characterized the design and build processes. Thus, the analysis (part 2) adds to a limited body of research by shedding light on potential relationships between constellations of institutions and project performance.

A proposal for integrated design and build management

Finally, this dissertation contributes to practice by proposing a new integrated design and build management concept that is not exclusively concerned with creating new formal structure, but predominantly shared meanings and norms.

Also, the IDBM concept contributes to the concept of institutional work by extending its application to normative proposals for design-build practice. Specifically, the IDBM concept proposes how organization can use institutional work to purposefully integrate and fragment constellations of institutions to stabilize and increase project performance.

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Appendix 1

The following appendix contains an elaboration of particular parts of the IDBM concept. These may be of particular interest to practitioners.

Collaboration & coordination

Early collaboration

To enable the integration and fragmentation of all institutions during the design process, the IDBM concept proposes that collaboration between stewards of the different institutions represented in the project (e.g., the owner, architect, engineers, contractor, key sub-contractors and suppliers) starts before the design process begins as the project idea is being formed.

Repeated collaboration

One implication of beginning collaboration during project conception is that participating organizations cannot enter the project based on bid. Instead, the IDBM concept proposes that organizations purposefully develop relationships with other organizations with whom they share understandings and values, who have the necessary technical and social skills, and the capacity to collaborate on large design-build projects. Social skills refer to an organization's awareness of and ability to participate in institutional change.

With the institutionalisation of the IDBM concept comes the challenge of ensuring that the level of skills and reflexivity remain high. This means making sure the organizations in the projects continue to critically reflect and develop meanings, norms and skills within their own organizations.

The project core group

Another implication of early collaboration is that each organization has to be represented by a small number of people. The IDBM concept proposes that each project develops a *project core group*. The core group consists of a number of stewards each representing the institutions represented in the project, for example, the owner, the architect, the main engineering disciplines, and key sub-contractor and/or suppliers.

The core group has to remain small in order to enable collective reflection on how to enable and continuously maintain coordination among organizations. The core group is responsible for enabling both integration as well as fragmentation as required by the project.

However, each organization is also responsible for representing a particular area of expertise, and thus perhaps, a particular institution. The IDBM concept proposes that temporal domination of particular organization can be used purposefully to fragment the constellation of institutions.

Importantly, while each representative is responsible for a particular area of expertise, not all required areas of expertise might be represented by the core group. It is the core group's responsibility to ensure that all areas of expertise are included in

the design team at the required point in time during the design process.

The project team

The IDBM concept proposes that projects host a design team consisting of experts in the different areas required to develop the project.

An implication of this proposal is that the design team members are engaged in the project on an ad hoc basis as required by the project. The project team is responsible for maintaining a particular institution and pursuing it purposefully, as well as willingly integrating their work with the remaining project as and when required.

The dynamics of an ad hoc design team enables fragmentation of institutions and makes it even more critical that the core group enables occasional integration.

Collaboration contracts

The IDBM concept doesn't seek to establish collective responsibility through contract or fee structures, such as other project delivery methods (e.g., IPD and partnering) but rather establish collective responsibility through shared meaning and norms. For that reason, the IDBM concept doesn't propose details for a particular contract structure or a particular fee-structure. However, the IDBM concept proposes that projects use two collaboration contracts.

First, to signify the importance of active engagement and organizations taking responsibility for the project, a collaboration contract is made between all the organizations represented in the project core group at the beginning of the virtual project.

The collaboration contract may include, but is not necessarily limited to:

- Value-statements to build shared meaning and execute collective reflection
- The organizational structure of the core group
- Each organization's responsibility (institutional leadership, area of expertise, representation of particular institutions or institutional logics, participation and so on)
- The overall project requirements (e.g., target cost, schedule, profit, quality level, visions and so on)
- The project's coordination strategy (e.g., definition of coordination and what and how coordination mechanisms will be developed (e.g., integration of institutions, adaptive capacity, mutual respect, direct supervision, BIM, project office, and so on)
- A map of the virtual project process & process performance requirements (workshops, deliverables, deadlines, and so on)
- Use of standards or other agreements (ex. ICT-agreement)
- Distribution of project cost, profit and contingencies

The term 'collaboration contract' is useful because it emphasizes that the point of it is to make the organizations collaborate in order to develop and coordinate a project, but that organizations have a legal responsibility to deliver a virtual project. In other words, the virtual project is as important as the physical building project.

The first collaboration contract covers the entire virtual project process and

finishes with the hand-off of the finished virtual project.

The collaboration contract proposed by IDBM replaces current consultants agreements, service specifications, and collaboration agreements.

Following the collaboration contract for the virtual project is a collaboration contract for the assembly of the building.

The collaboration agreement is made between potentially all the organizations in the project core group to ensure that all the required institutions remain represented in the project; however, during the assembly phase, deliverables are different (e.g. a physical, not a virtual, building).

New roles

The separation of the collaboration contracts for the virtual and physical projects allows the contractor the opportunity to offer a contractor consulting role during the virtual project. Currently, the norm is for the contractor to offer their services for free during the design process and collect their profit during the building process. However, by offering the contractor a fee for not only participation but leadership of the virtual project, the contractor is incentivized to share their knowledge and exercise multi-membership with the other organizations. At the end of the virtual project process, once a finished virtual project and a final project cost had been established, the owner could be free to take the virtual project and bid it out to other contractors. This opportunity might appeal to some clients still adhering to the understanding that pursuing short-term economic gains create value. However, due to the contractor's involvement in the virtual project, that particular contractor would have given the most accurate price and have the deepest understanding of the project. This would allow the contractor participating in the virtual project to produce and assemble the physical project more efficiently and to the required quality than competing contractors. Therefore, over time, the opportunity to open up the project for bidding at the end of the virtual project may become more symbolic to inspire trust rather than actual practice.

Project phases as gradual integration

The integrated phase model

The following section elaborates on the proposed structure for the integrated phase model.

First, the integrated phase model is based on the understanding that the virtual process is characterised by an integrating constellation of institutions, while the assembly phase is characterised by an integrated constellation of institutions, as illustrated by figure 8.

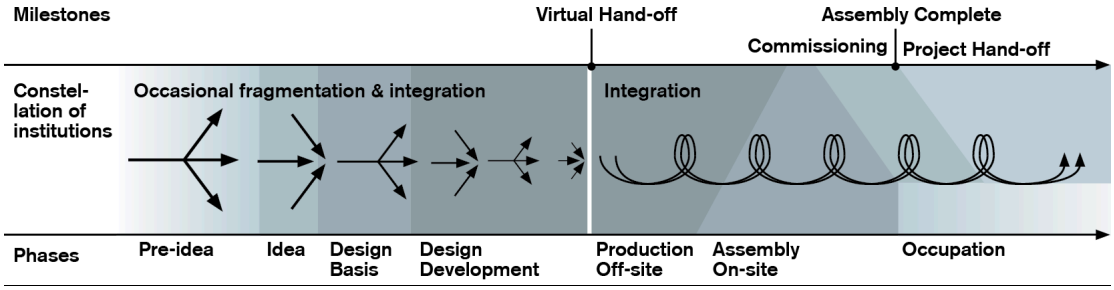

Figure 8. Figure 8 illustrates the phases of the integrated phase model and the different constellations of institutions during the virtual project and assembly respectively.

Similar, to the currently institutionalised phase model, the integrated phase model divides the virtual project process into a series of sub-phases inspired by integrated design (Knudstrup, 2008): idea, design basis, design development and synthesis. Although being a fussy boundary, everything before the virtual project is referred to as pre-idea. Everything after the virtual project is referred to as building assembly.

Pre-idea

During the pre-idea phase, the project has yet to be established and efforts are directed towards initiating and nurturing strategic relationships and reflecting on institutional debris available from other on-going or completed projects. It is also during the pre-idea phase that the project team starts developing their business case and opportunities for project funding.

Idea

The distinction between pre-idea and idea can be blurry and during the idea phase the project team continues to refine their business case. However, during the idea-phase, members of the coming core group participate with early urban analysis (e.g. building typology, traffic, property market, historic, socio-demographic and so on) in order to help refine the owner's business case.

During the idea phase the project core group is gradually established which may involve interviews and workshops to determine the best group for the project. The idea phase involves a preliminary analysis of the institutions represented in the project. The idea phase also involves defining reference projects, although the pitfall to avoid here is to 'copy' old design ideas and unintentionally pick up intuitional debris that compromises the ability to meet project requirements. *Integration*

workshops could be a part of the ideas phase too, where project teams collectively reflect and develop awareness of social coordination and the specific coordination strategy.

The idea phase also includes developing a target cost for the project and clear definitions of how increases are covered or decreases shared. Also, process performance criteria and preliminary project requirements are established during the idea phase. Questions such as: Why are we building? Where are we building? And who is participating in the project? should all be answered during the idea phase. Finally, a coordination strategy and process map is developed and the collaboration contracts for the virtual project are made.

Design Basis

During the design basis phase, extensive analyses are made to clearly define project requirements in detail. During this phase user group analyses are carried out to establish a detailed building programme. Also, analyses of building assembly logistics, soil analysis of the site, wind and sun studies, archaeological analyses, phenomenological analyses, just to mention some that might be relevant, are carried out.

Particular opportunities or obstacles to this project are identified during the design basis phase. Opportunities may include collaborating with the local authorities on developing the local urban master plan. Another example would be the opportunity to develop new products in collaboration with building system suppliers.

The extensive and comprehensive analyses carried out during the design basis phase enable the contractor, engineers and suppliers to be more proactively involved in the design development (Koch & Buhl, 2013) in the virtual project.

Design development

Not until the design development phase begins, does the design team begin to sketch out ideas, find details on product and building systems. The design development phase is characterized by the simultaneous efforts to develop both conceptual design and detailed information. In current design-build design processes, these two follow as a sequence: from concept to detail. With IDBM, the two occur simultaneously based on the understanding that the details inform the concept as much as the concept informs the details. Or put in other words, the details is what enables the design team to fully understand the consequences of certain conceptual choices, and thus detailed design is required for both technical and social coordination.

The design phase constitutes a series of distinct loops each representing a single iteration of the building design. The loops ensure a systematic iterative development of the entire building design: the building design will have been thoroughly developed a number of times. With each loop, it is not the level of detail that increases, but rather, the level of integration between the different institutions (and e.g., building systems) in the project that increases. In the following sections, a more detailed description of the work carried out in these loops follows.

The output of the design development phase is one coherent design proposal, in which all building systems and their interfaces have been explored, evaluated and chosen for their ability to fulfill the project requirements.

The design development phase finishes with the hand-off of the virtual project.

Presentation & off-site production

The establishing of the second collaboration contract for the building assembly marks the beginning of the presentation & off-site production phase. The presentation of off-site production phase concerns preparing design material for production and the start of off-site production based on the virtual project. During the presentation & off-site production phase the contractors starts preparing the building site. Also, the project team starts preparing commissioning and the hand-off manual in collaboration with the owner's facility management. The project team also conducts site visit to production facilities to gain insight into production methods and strengthen collaboration with suppliers.

Building assembly & commissioning

During the building assembly phase early construction work on site begins and the building systems are delivered and assembled on-site. It is beyond the scope of this research project to propose new structures for the building process and therefore this will not be developed in detail.

Alongside the installation of building systems, commissioning of building systems occurs. Commissioning continues into occupancy until all buildings systems have been commissioned for all four seasons.

Hand-off, occupancy & facility management

The project is handed-off to the owner at the end of building assembly, however, the project team continues to collaborate with the owner's facility management, to ensure that the building is commissioned to perform as required. It is beyond the scope of this research project to propose new structures for the building process and therefore this will not be developed in detail.

Kick-offs & project reviews

Each phase begins with a collective kick-off workshop where the upcoming process is developed and mapped and the project team begins developing a shared understanding of what the goal of the phase is. Work structures and process tools are collectively developed. Also, interfaces between project team members and work activities are defined and work groups are established as required.

Similarly, each phase finishes with a collective project review. During the project review project progress and quality is evaluated. Also, project shortcomings are identified and strategies for how these can be addressed are made.

The process performance is also evaluated. During the process performance review, shortcomings of the completed process are evaluated and potentially altered for the following phases. Also, importantly, each organization's performance is evaluated, and if necessary, organizations are dismissed from the project team and new organizations representing particular institutions or contributing to an integrated constellation of institutions are brought in.

Once the project team has approved the project and process performance review and the next phase can begin.

Duration of phases

For each project the duration of each sub-phase will have to be specified explicitly.

The IDBM concept doesn't propose a particular duration of each sub phase, but it does indicate the relative duration of each sub-phase to another. The design basis phase is about half the duration of the design development phase. This emphasizes the need for in depth analysis of for example, site conditions, building systems, owner's requirements, before the actual design development and integration begin. Also, notable, the design development phase is as long as the building assembly phase. This indicates the emphasis of diligent coordination before the building process begins.

Design development as systematic iteration

Loops

The first loop is characterised by the highest degree of fragmentation and the project team is guided by the question: *what would be a great idea?* This question guides each organization to develop excellence or best-practice design ideas within each of their respective areas of expertise. The first loop is characterised by mutual education, team inspiration, and idea generation.

The first loop finishes with a project review in which the design proposals developed during the loop area systematically evaluated against the project requirements. The project review process can extend over several days and is a collective effort including the entire project team. The evaluation of design ideas is intended to result in the exclusion of certain proposals narrowing down the number of options to work on during loop 2. At the end of loop 1 the project team is metaphorically speaking, left with a spread of disconnected jigsaw puzzle pieces. Also, project cost estimates, scope, schedule and process performance are reviewed. Finally, the project team determines if and how to proceed with the project and project team.

During the second loop the project team works with fewer options for building systems and overall design proposals. The guiding question during the second loop is: *what works for the project?* Because the project team work with both details and abstraction simultaneously, they are able to begin analysing which ideas work together. Thus, the second loop represents the first level of integration. At the end of loop 2 the design project and process is evaluated as it was at the end of loop 1. Metaphorically speaking, the project team have sorted the jigsaw puzzle pieces during loop two and started putting together the first pieces.

During the third loop the goal is to develop one fully integrated design proposal. Therefore, the guiding question for loop 3 is: *what works with everything else in the project?* The focus of the third loop is ensuring that all parts of the project satisfy all

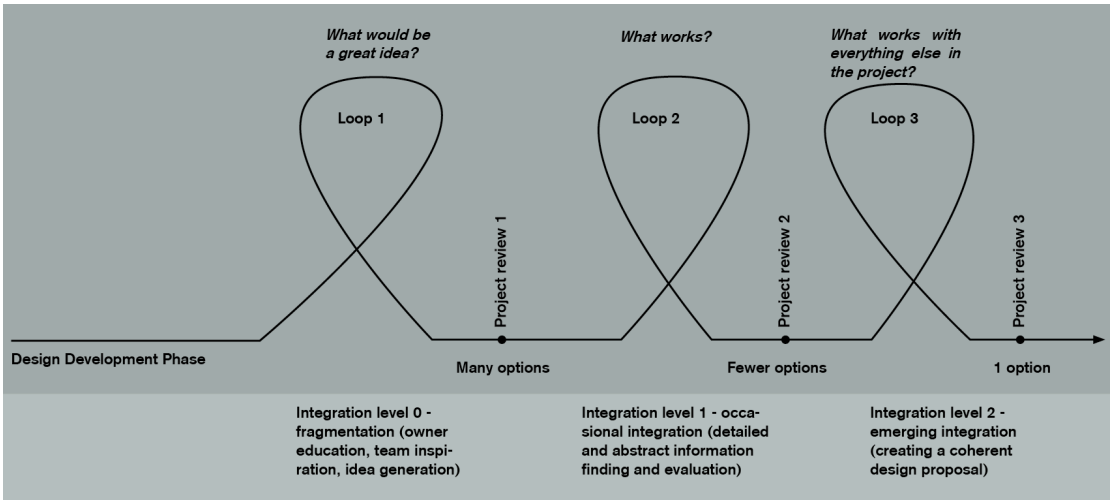

Figure 9. The figure illustrates the three loops, the guiding questions of each loop and associated levels of integration.

Institutions required. At the end of the loop 3 the project and process are evaluated and the project team determines if and how to proceed with a collaboration contract for the building process. Finally, a completed and coordinated virtual project is handed-off to the owner. Metaphorically speaking, the project team have now solved the jigsaw puzzle.

Design sprints

Each loop consists of a number of short design sprints. Each design sprint lasts one to two weeks and has a particular theme or focus. The content and sequence of themes are determined for each project and should reflect purposeful planning by the project team to enable project coordination.

The duration of each design sprint cannot be extended. Once the design sprint is temporally over, the project team moves on to the next design sprint. At the end of a design sprint, design work is not necessarily complete, but remaining work will be finished during the following loop.

Duration & content

The IDBM concept recommends three loops to ensure integration. However, it does not propose specific durations of each loop. The duration of a loop depends on the complexity of the project.

Similarly, the content of each loop can vary across projects depending on project complexity or particular constellation of institutions.

For example, during the implementation workshops when testing the IDBM concept, the workshop team developed the following design sprints for a project consisting of 81 housing units, mixed row-houses and apartments (note, the project was already developed to preliminary design project).

During loop 1, the design sprints were organised on an inside-out basis, meaning that the project team had to start with detailing the floor layout, then design the layout of the green areas and outdoor lighting, then installations in the houses and finally determine the structural design of the buildings. This organization allowed the project team to develop the design project based on how to fulfil occupancy functionality requirements.

During loop 2, the design sprints were organised on a unit-to-unit basis. The project team would develop one type of unit during the first design sprint, and then move on to a different type of unit in the following design sprint. This organization allowed the project team to develop the principles for loadbearing structure, ventilation, power and heating and cooling across all the housing units.

During Loop 3 design sprints were organised around individual building systems so that each design sprint focussed on a particular building system.

Organization of design sprint

Each design sprint is organised over a particular work structure in order to enable fragmentation and integration of institutions.

The IDBM concept proposes the following work structure for the design sprints during the first loop: collective kick-off, independent team work 1, presentation 1, integrated design session, independent team work 2, presentation 2, project evaluation, and finally process review.

During loop 2 and 3 an increased focus on integration would guide the workflow. This might mean, for example, that during loop two and three, independent work is increasingly replaced with project teamwork and integrated concurrent design sessions.

Kick-off

The kick-off session is intended to give the project team a shared understanding of the success criteria, goal and workflow for the particular design sprint. Therefore, it is essential that the projects core group as well as the design team is present.

The leader for the kick-off session is responsible for developing a shared understanding of the project and process goal. Collectively, the project team will then define performance criteria for the particular work element in focus, interfaces between building systems and project team members, and determine work groups.

Independent work 1

The kick-off session would be followed by independent work by each of the organizations or areas of expertise across the multiple organizations in the project team.

The goal of independent work is to develop best-practice design proposals within each area of expertise. Independent work may include research and development of architectural concepts, mechanical systems, IT simulations, water collection scenarios and importantly, critical evaluation of design solutions.

Independent work may still involve a number of people teaming up, but because the focus of the first loop is not a high-level of integration, but rather developing ideas that best satisfy each institution, independent work is more reliant on expert knowledge about a particular design solution, than shared understandings. Minimum three proposals are required: the first proposal might be the normative choice; the second proposal might be the obvious alternative; while the third proposal may require some creative and critical reflection.

Presentation 1

Once the project team members have completed independent work it is time to present the work to the project team. The presentations include presenting the three proposals of, for example, the building envelope. Importantly, all project team members or working groups present proposals (e.g. not only the architects, but also the engineers, the contractor, the supplier, the owner and potentially more have developed proposals pursuing their particular area of expertise.)

Each area of expertise is responsible for presenting the design proposals, as well as an analysis of how the three proposals meet, or fail to meet, project requirements.

It is then possible for the project team to identify which proposals need more work and if certain proposals can be dismissed or selected.

Independent work 2

After the integrated design session it is then time to continue independent work in order to collect more information, develop new or refine the existing design proposals.

Integrated design session

The integrated design session is intended to be a workshop, in which the project team interacts to integrate the independent design proposals into one or a few holistic design proposals. During the integrated design sessions each organizations ability to add detailed and accurate information to the project is critical. This is because the integrated design sessions are intended to specifically solve particular design problems and establish a platform for integration of both technical and social work elements.

The integrated design session enables the potentially equal integration of all institution, in that the session is not based on for example, a preliminary architectural design. Furthermore, the integrated design session enables the development of a shared understanding of the particular design solution and a forum for negotiating the institutional order of the design.

Presentation 2

The second round of presentations includes presenting refined and potentially new proposals to the project team. As in the previous presentation round, all proposals are evaluated in relations to the project requirements.

Design evaluation

Presentation round 2 is followed by the design evaluation. The purpose of the design evaluation is to select those design proposals that can met project requirements (i.e. embody all institutions represented in the project) and dismiss, or at least consciously select, design proposals that cannot meet project requirements. The design evaluation is thus intended to enable reflective and purposeful negotiation of the constellation of institutions, as it will be represented in the final building.

Process review

The final stage of the design sprint is the process evaluation. Since design sprints and loop are repeated, evaluating the project team's ability to coordinate their work is important to be able to make on-going adjustments to the process and foster collective reflection.

Project & process requirements & performance

Project requirements

Project requirements cover both the owner's requirements as well as the requirements of the other organizations represented in the project. Therefore, the core group develops the project requirements collectively.

The project requirements are intended to reflect the particular constellation of institutions that the core group wants the final building to reflect. Therefore, the project requirements depend on the specific project.

A detailed, yet preliminary version of the project requirements is developed during the idea phase. For each phase requirements are evaluated and refined to reflect changes and learning that has occurred. The project requirements can be changed, and the on-going evaluation enables the project team to become aware of how project changes affects their ability to integrate the project and re-organize the design process accordingly.

The project requirements must be an accurate representation of the institutions the project team wants represented in the final project. For example, an owner might want the project to target a 100% safety record, however, once the design process begins, the owner might be more concerned with keeping the budget. In such a case, the 100% safety record requirement should be shifted to a lower priority, even if this seems unethical and socially illegitimate. Alternatively, the requirement can act as a mechanism to make organizations act on their value statements. In any case, the coupling or decoupling between project requirements and intended constellation of institutions should be an open discussion in the project team.

Process requirements

The process requirements depend on the specific coordination strategy and constellation of institutions that the project team intends to develop. Therefore, like the project requirements, process requirements are specific to each project.

For a project of high complexity, where magnified purposeful fragmentation and integration is required, process requirements may emphasize mechanisms supporting fragmentation and integration respectively. The requirements can be expressed through a set of questions forming the basis for collective evaluation, including for example:

- Does the design team develop best practice design solutions?
- Do other project team members challenge my work?
- Does the design team exercise multi-membership?
- Does the design team have adequate time to research component solutions?
- Does the design team have the time to simulate design solutions?
- Does the design team have the hard- and software to simulate the design solution?
- Is information timely?
- Is information accurate?
- Has the number of proposals been narrowed down since last loop?
- Have project criteria changed?
- Has the scope of the project changed?

The process criteria can, just like the project requirements, be changed during the process. However, since the process criteria are intended to reflect the coordinating strategy and desired constellation of institutions, the project team will have to reflexively evaluate on any changes made to the process criteria.