RECASTING COORDINATION: A THEORETICAL REVIEW IN THE CONTEXT OF DESIGN-BUILD PROJECT ORGANISATIONS

Lea Urup[1] and Christian Koch

[1] Department of Civil and Environmental Engineering, Construction Management, Chalmers Unviersity of Technology, Sven Hultinsgata 8, 412 96 Göteborg, Sweden

Coordination, and the lack of it, is frequently ascribed as a key role in successful and less successful building processes. Over the last four decades, the understanding of coordination has shifted from emphasizing formal structures to emphasizing informal mechanisms. A review of four articles shows this development as well as how the formal and informal structures and mechanisms relate. The review is done from a perspective of a large design-build project in Denmark. The review indicates, that formal and informal coordination mechanisms alone are not sufficient to explain coordination in practice. The main coordination mechanisms discussed are mutual adjustment, direct supervision, standardization, relational coordination, adaptive capacity, and IT as a tool to accomplish task and impose a chronological rhythm and schedule on the work processes. From this point of departure a new set of coordination mechanisms for practice is developed rooted in current institutional theory. The mechanisms are internal building of an institution and external building of relationships between a number of institutions. The conclusion is that existing literature on coordination does not fully describe the complexity of coordination in an institutionalised design-build organisation and that a new set of coordination mechanisms rooted in institutional theory contributes to our understanding of complex coordination.

Keywords: coordination, Mintzberg, relational coordination, institutional logic, institutional work.

INTRODUCTION

Coordination is central to design build processes in construction (Apelgren *et al.* 2005, Hemphill 2010, Jones and Lichtenstein 2008). Early discussions of coordination included formal mechanisms such as standardization of work processes, skills, knowledge, and products; direct supervision and informal mechanisms such as mutual adjustment (Mintzberg 1979). While these theorizations appeared useful to a functionalist perspective of large organisations in the manufacturing industry, they were more problematic when applied to volatile project organisations, such as a design-build contractor. A design-build organisation is characterized by temporary project teams made up of actors from different organisations each representing different professions, norms, values and responsibilities (Jones and Lichtenstein 2008, Kadefors 1995). In that light, coordination is the interactions and structures that bring together related, yet spatially, socially and/or temporally separated, work elements. In the following we review four contributions on coordination including Mintzberg

---

[1] lu@mth.dk

(1979) (1983) who studied coordination in manufacturing organisations, Melin & Axelsson (2005), who studied AutoCAD's role in coordination in a building firm, Gittel (2008) who studied relational coordination in nursing homes and Hemphill (2010) who studied coordination in a project organisation in civil engineering. Recent contributions to the field of institutional theory emphasize how most organisations are affected by a number of norms or institutional pressures to which they must relate (for example Greenwood *et al* 2011, Smets & Jarzabkowski 2013). However, where literature on coordination falls short on sufficiently including the impacts of organisational institutional environments, institutional theory appears short of explicitly addressing organisational coordination mechanisms.

The aim of this paper is to contribute to a framework for coordination in project based organisations embedded in complex institutional environments.

The paper's main contribution is a qualified set of coordination mechanisms that go beyond the formal, informal, and actor centered understanding of coordination and embeds coordination into institutional theory. Also, the paper contributes with a discussion emphasizing the complexity of the relationship between coordination and management.

METHOD

The literature review presented in this paper forms part of a Ph.D. study by the first author also involving a case study of a design-build project and the development of an institutional framework of understanding (Urup 2014). The presentation in this paper is a preliminary version of the still ongoing review (Bryman 2008) guided by the also ongoing study of design built processes and institutional theory. The literature review is selective and preliminary and takes its starting point in Mintzberg's extensive work on coordination mechanisms in management and organisations. Through snowballing (Jahali and Wohlin 2012) and database searches pieces of literature on coordination were found, including the key articles by Gittell (2008), Melin and Axelsson (2005) and the dissertation by Hemphill (2010). Together these represent qualitatively interesting contributions important in this context, rather than providing breadth and depth in any comprehensive way. In the following section we review the literature based on a set of criteria (Hart 2009) that are interpreted to be important in the light of extending our understanding of coordination in an institutional theoretical framework within a design build context. The limitations of the present contribution are the use of a few central sources for the literature review rather than a more comprehensive literature search and review (see Maclure 2005 for a discussion). More specifically we have chosen to disregard quantitative and economically oriented concepts such as social network analysis (Hossain 2009), as well as social action and social embeddedness (Jones & Lichtenstein 2008) as it require too much space to give the differences and similarities to an institutional approach justice (Suddaby and Greenwood 2009).

FRAMEWORK OF UNDERSTANDING

In the following we develop our framework of the main characteristics that we review in the literature on coordination (Hart 2009). The framework consists of the following dimensions: definition of coordination; paradigmatic position; agency; coordination mechanisms; relation to institutions; project based organisations; management/leadership; and IT.

First, the definition of coordination is important. There are several closely related concepts aiming at describing interaction involved in carrying out work. These include, apart from coordination, also collaboration, communication, cooperation and management (see for example Dewulf and Kadefors 2012, Hossain 2009). Hence, it is important to position a definition of coordination. One can find coordination aspects in many building project activities. Previous reviews, such as Jha (2004), find more than fifty types of coordination activities and De Saram & Ahmed (2001) more than sixty. However, we contend that such broad definitions are at risk of losing explanatory strength.

Second, and in addition to the definition, it is important to scrutinize the theoretical positioning of coordination. A particular theoretical positioning would often ontologically concern the issue of internal and extra organisational context, while epistemologically it would often concern the issues of understanding the relationship between structure and agency (Burrell and Morgan 1977). The paradigmatic embeddedness of the reviewed literature may be weak or strong and this offers the opportunity to carefully consider how a particular coordination mechanism may be translated in an institutional theoretic framework (see below).

Third, the understanding of agency is important. As coordination focuses on interaction, it is central to ask between whom and/or what the coordination occurs. Some would understand coordination as interpersonal (methodological individualist, Emirbauer & Mische 2007), others would perceive it is at a combination of structural and agency oriented elements (Mintzberg 1986). Others again might argue for interaction between both social and material elements and understand agency as centered in networks (Callon 1986) or as embedded in social relations (Jones and Lichtenstein 2008).

Fourth, the coordination mechanisms themselves are of course central. In reviewing the literature, we note that it is more common to provide a concrete set of mechanisms for coordination, like Mintzberg's (1986) five, which structures his entire argument. Across the reviewed literature there appears to be no limitations to the types of mechanisms (see also Jha 2004, De Saram and Ahmed 2001). However, as with the definition of coordination, the broader the conceptualization of coordination mechanisms, the weaker the concept's analytical power. Furthermore, the level of empirical support may weaken or strengthen a particular contribution's identified coordination mechanism.

Fifth, the relation to institutions is relevant. An institution, can be defined as a 'more-or-less taken-for-granted repetitive social behaviour that is underpinned by normative systems and cognitive understandings that give meaning to social exchange and thus enable self-reproducing social order.' (Greenwood *et al*. 2008, pp. 4–5). The recent development of institutional theory includes institutional work (Lawrence *et al*. 2009), institutional complexity (Greenwood *et al*. 2011) and institutional logic (Lounsbury & Boxenbaum 2013a, b, Thornton *et al*. 2012). These contributions have reopened a discussion of agency: some liberating it from its earlier institutional embeddedness; others convening structure and agency as structuration (Thornton *et al* 2012). In this discussion, there appears to be a possibility to translate previous concepts of coordination into an institutional framework. This framework may provide a new understanding of organisation and organisational processes suitable for the analysis of a design build project organisation.

Sixth, considering the contributions related to project based organisations is important. Coordination in project-based organisations is here assumed to, first to, occur internally within each of the projects which is both intra- and interorganisational. Secondly, coordination occurs externally between projects in the each of the individual organisations that are part of a building project set up. This need for coordination is due to the fragmentation of competences and contradictory dynamics within the individual organisation and the in the project organisations (Koch and Bendixen 2005). Besides, we are also interested in the longer-term coordination between projects, completed as well as concurrent, as well as between projects and the established departments of a project based organisation.

Seventh, management and leadership can frame, enable and constrain, the acts of coordination. Kotter (1996) characteristically distinguish between management and leadership by pointing at two types of management: leadership is concerned with driving change, whereas management is concerned with administering existing organisations. Coordination would play a role in both.

Eight, IT would usually embody standardised routines which enable efficient coordination when the IT-routines mirrors the actually practices. Also, IT facilitates coordination through change of the organisational routines by providing new ones embedded in software. Communication supporting IT would enable linking separated work elements in time and space. More specifically in a design build context, building information models enable identification of collisions between collaborators design and transfer of complex information among others (Guo *et al*. 2013).

RESULTS

In the following we present a table summarizing the findings of the literature review.

Table 1: Findings of the literature review

	Mintzberg	Gitell	Hemphill.	Melin & Axelsson
Definition of Coordination	No explicit definition. The structure of an organisation is the division of tasks and coordination between them.	Coordination is management of interdepend-dencies between tasks.	Coordination is the organisation 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.	Phenomenolo gical 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 organisational levels.	Non-human. At all organisational levels.
Coordination Mechanisms	Mutual adjustment. Direct supervision. Standardisati on of output, skills, norms.	Frequent, timely and accurate communicati on. Shared goals, knowledge. 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 logics and work.
Relation to Management & Leadership	Managers and leaders privileges to some degree free of structure.	Managers and leaders free of social structures.	Managers and leaders free of social structure.	IT results in structure which affects managers.

The compilation of the results in a brief table like this one drives simplification as several of the authors incorporate nuances and ambiguity into the very center of the argument and conceptualization. Some notable results of the review (entered in the table 1) are that definitions of coordination are not precise, or even absent, that paradigmatic positioning and understanding of agency differ considerably. Whether project based organisations encompasses special coordination forms are not dealt with and therefore asks for a conceptualization. Only Melin and Axelsson is providing an understanding of the coordination role of IT, an understanding that can be expanded

from their main example of CAD into projectmanagement software and in principle also other types of IT.

A number of coordination mechanisms are identified that is further discussed below. Some of them overlap like Hemphill understanding of shared object and Melin and Axelssons understanding of IT. Also the relationship to management and to institutions is dealt with below.

DISCUSSION

Coordination and institutional theory

The aim of the literature review is to position coordination in an institutional framework. While Mintzberg doesn't explicitly develop a definition, his understanding of organisation as structure would sit well with classic institutional theory. Contrasting Mintzberg, Gittell's definition of coordination and understanding of organisation is human-agency-centred and would sit well with institutional entrepreneur/agency theory. Hemphill's definition of coordination and understanding of organisation is very broad not indicating any limitation to who or what can coordinate. This paradigmatic positioning is complicated from an institutional point of view given its broad approach to agency and lack of recognition of structure. Therefore, these three texts do not explicitly contribute much to the development of a current institutional understanding of coordination. However, if we decouple each of the coordination mechanisms from their respective paradigms, they may be able to inform an institutional understanding of coordination after all. In that light, we would contend that both structural and agency oriented coordination mechanisms would sit well with a structuration oriented understanding of institutional work and logics (Lawrence *et al*. 2009, Thornton *et al*. 2012). This means that routines, standardisation of process and products, relational coordination and adaptive capacity could be included in institutional structures, ie. the organisational norms. Melin and Axelsson (2005) do offer some preliminary considerations as to how structure and agency may be combined in a coordination context that sits well with institutional work. They call for a more sophisticated development of Mintzberg's notion 'Mutual Adjustment', and thus his understanding of informal communication, and discuss how informal communication relates to formal structures imposed by IT (CAD). Further, they implicitly offer an understanding of coordination that sits well with a broader current institutional framework including both institutional work and logics: *"If an information system or an organization contains a coordination logic, principle or pattern not harmonious with each other, competing forces, for example, can be a part of human actors' use of information systems."* (Melin & Axelsson, 2005: 9). However, Melin and Axelsson do not explicitly define coordination, implicitly they offer a definition by referring to Mintzberg. Also, with a focus entirely on a particular IT application Melin and Axelsson's understanding of coordination fails to capture the entire complexity that characterizes coordination in organization influenced by many institutional logics. In a complex institutional context the issue of interactions bringing different institutions together in various relationships is central. These relationships could be characterised by either conflict, enabling compromises or more profound mergers of different institutions (Lawrence *et al* 2009 Thornton *et al* 2012, all of which would imply different coordination mechanisms.

Coordination and design-build project organisations

If we consider an institutional understanding of coordination in the context of design build projects, we see that Mintzberg's understanding of project based organisations as *"merely"* being dominating by adhocracy and mutual adjustment underestimates institutional complexity of project based organisations (Urup 2014). Design-build project based organisations would, despite their label, often imply a hybridisation between vertical organisational hierarchies including for example centralisation of certain tasks, networks of professionals and temporary projects teams for specific tasks, such as discussed by Hemphill (2010), Koch & Bendixen (2005) and Urup (2014). The reviewed literature therefore does not adequately address the complexity and specific kind of coordination between projects and the organisations (ie. the hierarchy of the headquarter).

Furthermore, Mintzberg's *"mutual adjustment"* appears to assume an equal power base. This presents another underestimation of the complexity of coordination. Also, Mintzberg's conceptualization of standardization would require a less complicated pattern of institutions and more stable organization. Gittell's position appears to be that collective human agency can exercise relational coordination free of any pre- or coexisting norms and this falls short of appreciating the full complexity of design-build projects. Hemphill may recognize the complex nature of negotiation and compromise in practice, but removes it from considerations regarding structure.

We content, that there is a need to expand the concept of coordination in order to capture the complexity that characterizes a complex institutionalized design-build organization. A definition of coordination positioned in a complex institutional context would be: coordination is the interactions and structures that bring together related, yet potentially spatially, socially and temporally separated, work elements.

Fundamental to our definition of coordination is the understanding that coordination occurs through agency and structure, thus expanding Okhuysen and Bechky (2009; 908) review summarizing definitions of coordination into three common elements: people work collectively, the work is interdependent; and a goal, task, or piece of work is achieved. And also appreciation a shift in focus to the combination of process and structure, or coordinating and coordination, expanding Jarzabskowski *et al* (2012) and other one sided views. Our notion of agency is oriented towards negotiation and mutual adjustment, in an expanded version that includes relational coordinating and adaptive capacity, while structure is oriented towards material means such as routines, standards, and IT. As such we end up with a composite concept for agency and structure respectively. Agency is characterised by networking or interaction in dynamic webs, while structures are constituted both materially and immaterially.

Based on this definition we may consider a number of new coordinating mechanisms that relates to institutional work and institutional logics and we propose the following two mechanisms: the internal building of an institutional logic or an institution in the making; and external building of institutions by establishing relations between a two or more institutional logics or institutions. A decoupled mutual adjustment concept would fit with the external blending of logics/institutions and could also encompass a view of the role of mutual respect. IT artefacts (CAD and project management software) can introduce concerted rhythm to work processes and act as a shared meaning artefact which would at a time contribute to internal consolidation of a logics as well as work as cross logic integrative mechanism.. Standardisation of output, skills, norms would be instrumental for internal building for an institutional logic, but

would in may project context collide with the fragmented multi logic constellation. Further conceptualisation of institution building coordination can be done. The building of complex institutional logics is institutional work and requires a consideration of how the role of organisational managers and leaders is connected to coordination. The relationship between coordination and management is often unclear in the reviewed contributions, most explicitly when Mintzberg (1986) proposes direct control as a coordination mechanism, and when Gittell (2008) definescoordination as the management of interaction. Rather than suggesting and aiming at definitional purism we tend to accept this unclear relation, which also refer to our understanding of coordination as occasionally inbuilt in other entities such as routines, structures and IT. However, we contend that a conscious distinction between coordination and management/leadership may be useful in order to clarify their definitions respectively. But it is beyond the scope of this paper to develop a new definition of management and leadership, perhaps we could extend a call for future research to consider this study.

CONCLUSION

Our review of four pieces of literature on coordination showed that the complexity of coordination has been downplayed either by a too narrow focus on either structures or agency. One article acknowledged the interplay between structure and agency, but downplayed the complexity of coordination by only considering IT as structure in relation to agency. Our main contribution here is a new definition of coordination that is rooted in current institutional theory and acknowledges the complexity of a complex institutional organisation such as a design-build organisation. It understands coordination as related to internal building of (new) institutions or maintaining them as well as bonding two or more institutions to each other. We extended our definition to develop these two new coordination mechanisms that include both the internal building of a particular institutional logic/ institution and the building of a constellation of institutions constituted by a number of institutional logics/institutions.

REFERENCES

Apelgren S., Richter A and Koch C (2005). *"Snublestensanalyse i byggeriet"*. BYG- DTU. Lyngby. (Stumbling stones in construction).

Apelgren S., Richter A and Koch C (2005). "Snublestensanalyse i byggeriet". BYG- DTU. Lyngby. (Stumbling stones in construction).

Bryman A. (2008). *"Social Research Methods"*. 3rd Ed. Oxford University Press. Oxford,

Burrell, G., & Morgan, G. (1979) *"Sociological Paradigms and Organizational Analysis"*, Heinemann, London.

De Saram D.D., Ahmed S. M. (2001) Construction coordination activities: what is important and what consumes time? *"Journal of Management Engineering"*, ASCE **17**(4), 202–13.

Dewulf, G. & Kadefors, A. (2012). Collaboration in public construction—contractual incentives, partnering schemes and trust. *"Engineering Project Organization Journal"*, **2** (4), 240-250.

Gittell, J. (2008) Impact of relational coordination on job satisfaction of quality outcomes: a study of nursing homes. Human Resource Management Journal, 18(2).

Greenwood, R., Oliver, C., Sahlin, K. and Suddaby, R.(eds)(2008). *"Handbook of Organizational Institutionalism"*, London: Sage.

Greenwood R, Raynard M, Kodeih F, Micellota E and Lounsbury M (2011) Institutional complexity and organizational responses. *"The Academy of Management Annals"* **5**(1): 1–55.

Guo G., Larsen G.D., Whyte J. (2013). Digital interaction patterns on construction projects: A study of Dynamic approval processes. *"Proceedings CIB W 78"*. Beijing.

Hart C. (2009) *"Doing a Literature Review –Releasing the Social Science Research Imagination"*. Sage. Los Angeles.

Hemphill, L. M. (2009). *"Building Bridges: A Study of Coordination in Projects"*. University of Michigan. Ann Arbor.

Hossain, L. (2009). Communication and coordination in construction projects. *"Construction Management and Economics"*, **27** (1), 25-39.

Jarzabkowski P., Lê J., and Feldman M. (2012): Creating Coordinating Mechanisms in Practice. *"Organization Science"* **23**(4), 907–927

Jalali S and Wohlin C (2012). Systematic literature studies: database searches vs. backward snowballing. *"Proceedings of the ACM-IEEE international symposium on Empirical software engineering and measurement"*. ACM New York. Pp 29-38.

Jha K.N. (2004) *"Factors for success of a construction project: An empirical Study"*. Ph.D. Thesis. Indian Institute of Technology. Mumbai.

Jones, C. & Lichtenstein, B. B. (2008) Temporary Inter-organisational Projects – How Temporal and Social Embeddedness Enhance Coordination and Manage Uncertainty. In *"The Oxford Handbook of Inter-Organizational Relations"* (2008) Ed. Cropper, S., Ebers, M., Huxham, C., and Ring, P. S., Oxford University Press. Oxford

Kadefors, A. (1995). Institutions in Building Projects: Implications for Flexibility and Change. *"Scandinavian Journal of Management"*, **11** (4), 395-408.

Koch C. and M.Bendixen (2005). Multiple Perspectives on Organizing: projects between tyranny and perforation. *"Building Research and Information"*. **33**(6), 536-546.

Lawrence T.B., R. Suddaby, and B. Leca, eds. (2009). *"Institutional Work: Actors and Agency in Institutional Studies of Organizations"*. Cambridge: Cambridge University Press.

Lounsbury M, Boxenbaum E.ed. (2013a). Institutional Logics in *"Action"*, Part A & B (Research in the Sociology of Organizations, **39**, Emerald. London.

Maclure M (2005) Clarity bordering on stupidity, *"Journal of Education Policy"*. 20 (4), 393–416

Melin, U., & Axelsson, K. (2005). Understanding Organizational Coordination and Information Systems - Mintzberg's Coordination Mechanisms Revisited and Evaluated. *Conference London School of Economics.*

Mintzberg, H. (1979): The Structuring of Organizations. Prentice Hall. Upper Saddle River.

Mintzberg, H. (1983) *"Structure in Fives: Designing Effective Organizations"*. Prentice Hall. London.

Mintzberg, H. (1989) Mintzberg on Management. Free Press. New York.Mintzberg, H. (2013). *Managing.* Kindle ebook.

Okhuysen, G. A., B. A. Bechky. 2009. Coordination in organizations: An integrative perspective. *"Academy of Management Annals"*. **3**(1) 463–502.

Smets, M. & Jarzabkowski, P. (2013) Reconstructing institutional complexity in practice: A relational model of institutional work and complexity. *"Human Relations"* **66**(10) 1279–1309

Suddaby, R. and Greenwood R. (2009) Methodological issues in Researching Institutional change. In Bryman and Buchanan (eds).”Handbook of Organizational Research Methods”. Sage. London. 176-195

Thornton, P. H., Ocasio, W., & Lounsbury, M. (2012). *“The Institutional Logics Perspective”*. Oxford University Press.

Urup, L. (2014). Navigating an octopus by the stars: leading a design-build organization by complex constellations of institutional logics. EGOS 2014, Conference Paper.