

DESIGN COLLABORATION AS ORGANISATIONAL SENSE-MAKING AND SENSE-GIVING

Mustafa Selçuk Çıdık¹

School of the Built Environment and Architecture, London South Bank University, 103 Borough Road, London SE1 0AA, UK

Construction design has largely been pictured as a fragmented effort that is prone to ineffectiveness due to its multi-disciplinary and multi-organizational nature. As a result, design management is traditionally considered to be focused on adjusting and integrating disparate disciplinary contributions with the intention of overcoming consequences of this fragmentation. However, existing empirical work reveals that design in construction does not develop through such adjustment and integration of separately created discipline-specific parts, but rather as a whole through interdisciplinary interactions which present a continuous path of unfolding decisions and activities. This paper will argue that, for the purposes of design management, multidisciplinary construction design can be viewed as an organisational endeavour; thus, suggesting a shift away from management centred upon design outputs to management centred upon design interactions. Based on this argument, interdisciplinary interactions from the practices of a construction design project are analysed using an ‘organisational sense-making’ perspective which is originated in organisational studies. When seen from an organisational sense-making perspective, the problematic issues of disciplinary and organizational fragmentation and integration become reformulated as issues of sense-giving and sense-making among various design stakeholders that are part of the same organisational whole. Under this perspective interdisciplinary interactions are not seen as the means for design integration that imply compromises for discipline-specific design solutions. Rather they are the means for sense-giving and sense-making to continuously redefine the organisational direction, thereby continuously reconfiguring discipline-specific tasks in a consistent and coherent manner. As a result, an organisational sense-making perspective enables conceiving the fragmentation in construction design as a productive force. Ultimately, the paper provides fresh insights into design collaboration and management. It concludes that fragmentation is not something to be ‘resolved’ through simplistic measures of integration, such as design data integration, but it is rather something that needs to be ‘cultivated’ through raising an explicit awareness of the means and processes of sense-giving and sense-making.

Keywords: collaboration, design management, organisational analysis, sensemaking

INTRODUCTION

Design is developed through iterative trials of ideas and potential solutions in the face of unfolding and unpredictable design challenges. Hence, the direction of design process depends on design stakeholders’ perceptions, as well as inferences, regarding the outcomes of these ongoing trials (Dorst 2011). For this reason, the concept of ‘sense-making’ (Klein *et al.*, 2001) has been used in design research to conceive design as the result of the perceptions and inferences of design stakeholders (Krippendorff 1989; Kolko 2010; Johansson-Sköldberg *et al.*, 2013; Manzini 2015). Nevertheless, importantly, design is an inherently social endeavour (Luck 2012), and the perceptions and inferences

¹ selcukcidik@gmail.com

of design stakeholders regarding ‘what is going on’ are not only influenced from their individual backgrounds and sensory/cognitive experiences but also from the immediate and wider organisational environment within which they operate.

For this reason, the present paper will argue that drawing on ‘organisational sense-making’ literature (Maitlis 2005; Weick *et al.*, 2005) is promising particularly for better comprehending design collaboration, and thus for improving overall management of multidisciplinary design in construction, and elsewhere. When seen from an organisational perspective, sense-making is an ongoing intersubjective accomplishment, for which the sense given by the counterparts of interactions become critically determinant (Gioia and Chittipeddi 1991). Ultimately, as will be shown in this paper, the notions of organisational sense-giving and sense-making highlight the productive nature of multiplicity of disciplines and organizations in construction design, instead of picturing organizational and disciplinary fragmentation as a problem that needs to be resolved through simplistic measures of integration, such as design data integration.

To this end, this paper considers a construction design project at its detailed design stage. The project is analysed from an organisational sense-making perspective through a consideration of its organisational context as well as two events from its practice that exemplify how sense-giving and sense-making are accomplished through interdisciplinary interactions. The discussion of the findings reveal that an organisational sense-making perspective sees disciplinary and organizational fragmentation as something that needs to be ‘cultivated’, as opposed to the traditional understanding that it needs to be ‘resolved’. This provides an alternative managerial framework for multidisciplinary design, which suggests focusing on interdisciplinary interactions rather than design outcomes, hence shifting the attention away from simplistic measures of integration to strategic organisational management. It is concluded that further organisational studies of design must be undertaken to develop practically-relevant and productive understandings of multidisciplinary design and design collaboration in construction, and elsewhere.

Organisational Sense-Making and Design

As stated by Lundgren-Henriksson and Kock (2016: 20) “sense-making focuses on the individual and collective activities of meaning production, which direct action and interaction”. Significant in this statement is the emphasis on the role of sense-making as the determinant of subsequent ‘action and interaction’ because it provides a particular definition of organising. According to Weick *et al.*, (2005), from a sense-making perspective, organising is the response to “an ongoing, unknowable, unpredictable streaming of experience in search of answers to the question ‘what is the story?’ (410). This response involves “turning circumstances into a situation that is comprehended explicitly... and that serves as a springboard into action” (Weick *et al.*, 2005: 409). Hence, according to the authors, in the flux of events, plausible stories animate and gain their validity from subsequent activity; thus, enacting a sense of continuity and coherence over time, which makes the essence of an organisation.

Based on this definition, it can be argued that ‘organisational sense-making’ perspective is well-aligned with the practice of design. This is because central to both is the coherence and consistency achieved in an unknowable environment through an unfolding series of action driven by a judgement of the plausibility of alternative courses of action. Hatchuel *et al.* (2018) emphasise the centrality of ‘unknowability’ of design exploration process claiming that it is the ‘unknowability’ that enables generativity inherent to design. Besides, it is well-established in design research that designers navigate through

unknowability by evaluating the plausibility of potential courses of action with the help of, for example, material design artefacts like drawings (e.g. Ewenstein and Whyte 2009) and/or verbal ‘what if’ conversations (e.g. Bucciarelli 1994). Additionally, in line with organisational sense-making perspective, there is a wide agreement in design research that design process is path-dependent, or in other words, it is continuously unfolding and becoming through a path-dependent series of actions and knowledge accumulation (e.g. Dorst and Cross 2001; Hatchuel and Weil 2009; Dossick and Neff 2011). Consequently, it can be argued that organisational sense-making and the practice of design are conceptually coherent; and therefore, analysis of design practices from an organisational sense-making perspective can yield valuable organisational and managerial insights.

In the case of multidisciplinary design, such an analysis would benefit from a joint consideration of the complementary notions of sense-making and sense-giving, as the two notions can be used as an analytical structure to explain interdisciplinary interactions. According to Gioia and Chittipeddi (1991), sense-giving refers to the attempts for “influencing the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality” (442). Sense-making and sense-giving are not distinct domains like two sides of the same coin but rather one implies the other and cannot exist without it (Rouleau 2005). Therefore, several scholars have pictured sense-giving and sense-making as the two drivers of a constructive process (Currie and Brown 2003) through which people create and maintain an intersubjective world (Balogun and Johnson 2004). Maitlis and Christianson (2014) emphasise that sense-giving is not simply a top-down process as the recipients have their own interpretations, and also that they may be engaging in sense-making processes outside a given organisation which in turn might influence their sense-making in that organisation. Hence, unintended consequences of sense-giving are reported in the literature, for example, in the area of strategic organisational change (Balogun and Johnson 2005). Nevertheless, no matter whether it is intended or not, the collectively created organizational world (i.e. through sense-giving and sense-making) determines the space of meaningful actions and interactions for those who operate in it, thus enabling (encouraging) and disabling (discouraging) certain courses of actions (Weick 1995). It is this aspect of organisational sense-making perspective that makes it useful for organisational and management research, as it provides an explanation of how existing organisational routines and outcomes are created and maintained as well as what would it take to change them.

METHODOLOGY

The perspective of organisational sense-making (Maitlis 2005; Weick *et al.*, 2005) can provide a useful conceptual ground to comprehend the process, potential and outcomes of design collaboration, thus providing an alternative managerial framework for multidisciplinary design. According to this perspective, multidisciplinary design is a process of (reality) construction by professionally fragmented entities that engage in sense-giving and sense-making activities through interdisciplinary design interactions. This implies that the effectiveness of design collaboration relies on the effectiveness of the means and processes of sense-giving and sense-making. In return, such an understanding of design collaboration enables a new perspective for managerial evaluation and possible managerial interventions, which will be demonstrated through the analysis of the findings from a construction design project.

Empirical data are collected from a construction design project as part of a larger research. The project was in the UK, and it was at its detailed design stage. The author observed 23 meetings (each 1 - 1.5 hours long) over a period of ten months including

design coordination meetings, one-off design coordination workshops as well as clash detection and information model coordination meetings. Audio and video recordings were not allowed. The observational data were recorded in the field notes, and the reflections on these were supported by five semi-structured interviews and several informal communications with the participants of the observed meetings. The analysis aimed to establish the effectiveness of sense-giving and sense-making means and processes. Hence, particular attention is paid to the agreements and disagreements among multiple design stakeholders during their interactions as well as the unfolding actions resulted from these agreements and disagreements. Following from Cipolla and Reynoso (2017), two different levels of organising that affect sense-giving and sense-making are jointly considered for such an analysis. These are (i) wider organizational context, and (ii) practice-level situations of interdisciplinary interactions. A joint consideration of these two levels enhances the rigour of the analysis by including the effects of both contextual and situational aspects of the observed phenomena. The results of the analysis are then discussed to develop insights into multidisciplinary design collaboration and management.

FINDINGS

This section is divided into two parts reflecting the findings related to two levels of organising in the studied project. First part presents an overview of the wider organizational context in order to set the interpretive background of the analysis. Second part presents two events from the practice of interdisciplinary interactions and their respective brief analyses.

Organisational Context of the Project

This was a ‘design - and - build’ educational building project, and therefore, the main contractor had the main financial and design risks of the project. Design was first developed to the level of detail needed for appointing the main sub-contractors with design responsibility (i.e. the construction proposals were prepared, and the design was developed to RIBA Stage D - design development) under the coordination of the main contractor. This initial period of design development mainly involved mechanical and electrical engineering (M&E) consultant, the structural engineering consultant, and the architect. The researcher started to observe the project after M&E sub-contractor was appointed to take over the design and installation of M&E works for the project. However, even after M&E sub-contractor was appointed, M&E consultant stayed on board as a consultant for the client.

The design saw a significant change after RIBA Stage D, during which most of the fundamental decisions regarding building systems and main areas of the design had already been made. The client asked to increase the indoor space in the building, and this had serious implications on the design. M&E sub-contractor that was appointed after initial design struggled to navigate through the existing design to further develop the M&E design, particularly after this significant design change which required alterations to the initially established design strategies. Therefore, issues related to the further development of M&E design occupied a substantial amount of the time during the observed interdisciplinary design meetings. These issues were mainly about clarification requests from M&E sub-contractor regarding the thinking behind the initial design as well as complications that arose due to the late design change, which were unexpected to the entire design team.

Event 1:

During one of the design coordination meetings (DCM), the representative of the M&E sub-contractor stated that the revised ventilation calculations, which were based on the revised design and occupancy rates, revealed that on one of the floors few doors needed to have transfer grilles to satisfy the ventilation requirements. The representative of the architect rejected this as soon as it was proposed. Following the rejection, the representative of the M&E sub-contractor provided the results of the ventilation calculations together with the story of the changing occupancy rates due to the revised design. After this explanation, the representative of the architect still insisted that having grilles on the doors in that area was not an option. The representative of the M&E sub-contractor accepted his objection, and stated that they would think about something else. After a short silence, the representative of the architect stated that the wall between those doors would be painted to the same colour as the doors, and therefore they would not want to have grey transfer grilles on the doors. The representative of the architect concluded that he would have a look at the issue, and think about it until the following DCM. In the following meeting, the representative of the architect stated that the actual number of the doors that needed to be equipped with grilles was much more than he anticipated. He stated again that the grilles were not visually good and asked other members of the team whether it was possible to omit them. One of the alternative ideas appeared as undercutting the doors. During the discussion of this option the representative of the architect stated that they needed to communicate the size of undercutting to the manufacturer, and also to make sure that the doors had not been produced and packaged yet. The representative of the M&E consultant added that the original intent was not having that many transfer door grilles on the doors at that area as part of the ventilation strategy. In parallel with the discussion of undercutting the doors, the representative of the architect asked the colour range of grilles, and even the option of painting the grilles on the site was discussed as a potential solution. However, the latter proposition then was found non-viable thinking about the long-term maintenance requirements. Finally, the parties decided to have another look at the occupancy rates and the assumptions that underpin them.

In this event the M&E sub-contractor engages in sense-giving that goes beyond the statement of problem to the statement of a potential solution: adding transfer grilles to several doors. This whole initial sense-giving is constructed on the backdrop of the increase in the occupancy rates due to the design change, which has already been known as causing several disruptions to design development. Arguably it is for this reason that initially the proposed solution of using transfer grilles went unchallenged and the negotiation revolved around minor amendments to the solution proposed by the M&E sub-contractor. In other words, the reality that has been constructed in the project suggested that complications are unavoidable due to the design change and design stakeholders made sense of these as 'normal' problems that needed to be accommodated in a way or other. This determined the organisational dynamics as the sense that was initially made largely determined further sense-giving by various stakeholders; and thus, leading the designers to consider even reorganising the supply of the doors or grilles by undercutting them or painting them on the site respectively. It is only after substantial amount of time and negotiations that a wider perspective was adopted and the underpinning occupancy rates were decided to be scrutinised.

Event 2:

During a DCM towards the end of the observation period, one of the representatives of the M&E sub-contractor raised the point that there were no services designed to feed the video pod in the atrium area. He argued that it was neglected in the initial design that was handed to them, and that it was not mentioned in the service strategy of the building which was part of the construction proposals. He started to ask about the design intent of this pod and its mechanical and electrical service requirements. The discussion revealed that the pod was originally designed by the architect to create an interactive experience for the students. It was planned to be a small, self-contained structure with a large screen and a bench in it. Upon this initial information, the representative of the M&E sub-contractor inferred that it needed to be ventilated and equipped with a power outlet. Nevertheless, the M&E consultant stated that the name 'video pod' sounded like it required a special acoustics performance that needed to be satisfied but she could not remember, and therefore, she asked for this issue to be included as an agenda item for the following DCM. In the following DCM, the representative of the M&E consultant stated that she could not find any information regarding the acoustics needs of the pod, and she therefore needed to contact the acoustics specialist to ask whether any particular acoustics requirements were assigned for this pod. However, it was known from previous experience that the acoustics specialist had completed her job in the project long ago and was unwilling to devote further effort to this project. On the other hand, acoustics requirements of the pod became an issue mainly because of its ventilation requirement. The only way to ventilate the space was to install an independent fan in the pod and this would cause noise. Furthermore, the opening required to fit the fan would cause the noise in the atrium to enter the pod. After a discussion around acoustics implication of potential ventilation solutions, it was decided to contact the client to understand what exactly the pod would be used for to understand whether there were special acoustics requirements for the pod. In the following DCM, the representative of the M&E consultant stated that she contacted the representatives of the client and learned that the space was planned to have an interactive space between the educational institution and students but no specific activities for the pod were known at that moment. She further stated that she proposed to change the name of the space from 'video pod' to 'diary pod', and this was accepted by the client. She stated that changing the name of the space to 'diary pod' surely eliminated the possible high acoustics requirements of the space and therefore it was fine to proceed with an individual fan for the ventilation of the space.

In this event, the name of a building element (i.e. video pod) played a significant role in sense making of design stakeholders, and thus determined the direction of interdisciplinary interactions. This was partly because the design of the element was neglected, and there was not much cue to draw upon at the time it was noticed. Based on the name 'video pod', various design stakeholders gave sense regarding the potential functions and service needs of the element triggering further sense-making activities, and leading to a certain framing of the issue in hand. Interestingly, the resolution is achieved through a reconsideration of the initial cue at hand, the name of the element. According to the design stakeholders, the new name of the element that is approved by the client relaxed the functional and service requirements of the element by enabling a novel story and reality about the element. Overall, organisation of the work to tackle the issue reflected the particular framing of the issue, which was constructed gradually through sense-giving and sense-making based on the contextual and immediate cues at hand.

DISCUSSION

Design collaboration is under-theorised and the term is being used to mean different things by different studies in construction management research. Additionally, design management in construction predominantly assumes that organisational and professional fragmentation in the industry is problematic, and hence, the current focus of multidisciplinary design management is on integrating various parts of design produced by different design stakeholders. Nevertheless, the practice of design suggests that design develops through inextricably intertwined day-to-day interdisciplinary interactions, which present a continuous path of unfolding decisions and activities. Therefore, new perspectives are required to focus on 'cultivating' the fragmentation, rather than 'resolving' it, and this requires building design collaboration and management theories upon the unfolding interactions of design stakeholders.

Organisational sense-making perspective provides an adequate lens for such an endeavour, and suggests that multidisciplinary design collaboration can be seen as organisational sense-giving and sense-making through which a joint reality is constructed among design stakeholders. Hence, in the following, first design collaboration will be unpacked from an organisational sense-making perspective. Then, the implications of adopting such a perspective for design management and technology will be discussed.

Design collaboration as organisational sense-making and sense-giving

Organisational sense-making perspective provides a useful vocabulary and lens to comprehend design as the result of inextricably intertwined interdisciplinary interactions, thus enabling practically relevant theories of multidisciplinary design and design collaboration. As the analyses suggest, when this perspective is adopted, disagreements in practice are not understood as competing technical and/or aesthetic priorities or concerns of various design stakeholders. Rather, they either refer to missing/forgotten parts in the shared past (i.e. shared story) of design stakeholders which needs to be constructed through sense-giving and sense-making; or different interpretations of the previously constructed story of design (i.e. shared past) that needs to be reconstructed, again through sense-giving and sense-making. However, this can be a very challenging task because the developing (story of) design is fixed in different material forms (i.e. drawings, calculations) and design decisions (e.g. calling an element 'video pod') which limit the subsequent sense-giving and sense-making activities. Hence, problematic situations arise when design stakeholders deal with missing or different stories about certain aspects of the design especially when these are combined with conflicting or missing sense-making cues (i.e. in the form of material design objects and/or previous design decisions made by various design stakeholders).

Overall, adopting an organisational sense-making perspective enables a novel interpretation of interdisciplinary design interactions that is in line with the practice of designing. Thus, it enables a novel avenue for building practically-relevant theory on design collaboration. Different in this perspective is the emphasis on the productive force of organisational and professional fragmentation inherent in the construction design. As discussed above, when seen from an organisational sense-making perspective, disagreements and struggles are not about adversary beliefs and stances strictly held by design stakeholders but they are rather about the difficulties regarding sense-making and the organisational inefficiencies that result from them. Importantly, under this perspective, design is not accomplished through creative problem solving of designers. Rather, it is accomplished through jointly constructing a reality, or in other words a shared story of design, as well as the ability of navigating in this story through a skilful

use of various sense-giving and sense-making means and processes. It is in this sense that this perspective sees organisational and professional fragmentation in construction design as a productive force. Hence, it suggests moving away from the fragmentation-integration dichotomy, which problematises fragmentation and leads to simplistic measures of integration in order to enable design collaboration.

Organisational sense-making perspective for enabling design management

Adopting an organisational sense-making perspective has also implications for the technologies and approaches for facilitating and managing multidisciplinary construction design. In terms of design management, most importantly, this perspective suggests a practice-based, interventionist management approach that shifts the focus away from integrating design outputs to facilitating interdisciplinary design interactions. Although previous descriptive studies of design similarly suggested a focus on design interactions for effective management of design, these have fallen short in providing a conceptual and/or theoretical basis to undertake systematic analyses to build theory on design management. Organisational sense-making perspective can fill this gap by enabling a new level of granularity to understand the complex and iterative interdisciplinary interactions, thus enabling comparable analyses of design practices as well as theory building.

A managerial focus on facilitating interdisciplinary design interactions suggest that the inherent fragmentation in the construction industry is not something that needs to be 'resolved' through measures of integration that tend to be simplistic due to the temporary nature of construction teams. Rather, it is something that needs to be 'cultivated' through establishing an awareness of (i) design collaboration as an unfolding process of sense-giving and sense-making; and (ii) means and process of sense-giving and sense-making. Therefore, when an organisational sense-making perspective is adopted, a major issue in design management becomes establishing the organisational capability of identifying and using the adequate sense-giving and sense-making means and processes in addition to creative problem-solving tools and processes. Previous empirical and theoretical work on organisational studies can provide a fruitful starting point to think about how such a capability can be established at various level of organising including project-, firm-, and industry-levels.

Finally, an organisational sense-making perspective on design has also implications for support technology development for multidisciplinary design. According to this, the primary concern of these technologies must be facilitating sense-giving and sense-making processes during interdisciplinary interactions, rather than supporting creative problem-solving and/or integrating different parts of design developed by various design stakeholders. Currently, the focus of design collaboration and management software is based on the traditional view of design collaboration, and thus, aiming to eliminate the fragmentation through technological measures, such as digital data integration. However, previous empirical work revealed that (i) in many cases this alone does not deliver the expected benefits; and (ii) in cases where the social aspects of technology implementation are overlooked, such measures can even be harmful for multidisciplinary design collaboration (Dossick and Neff 2009; Çıdık *et al.*, 2017). As this paper exposes, simplistic integration measures, such as the integration of digital design data and/or design outputs through digital technologies, are based on inadequate understandings of fragmentation and collaboration in construction design. Therefore, technology developers for construction design must work with construction management researchers in order to develop technologies that are based on a more practically-relevant and productive understanding of fragmentation. Such technologies should primarily help

cultivating the fragmentation to improve design collaboration rather than resolving it through simplistic measures of integration.

CONCLUSIONS

Professional and organizational fragmentation in construction design have widely been pictured as problematic. As a result, majority of research and practice on design collaboration and design management focus on adjusting and integrating disparate disciplinary contributions with the intention of overcoming consequences of this fragmentation. However, the practice of design suggests that design is developed through ongoing interdisciplinary interactions that continuously configure discipline-specific work. Therefore, the present paper proposed adopting organisational sense-making perspective to capture this continuous co-construction process. Such a perspective suggests that design collaboration can be seen as organisational sense-giving and sense-making, and thus, implying that fragmentation is not inherently a negative thing, but can be seen as a productive force that needs to be 'cultivated' rather than a problem that needs to be 'resolved'. This shift in the understanding of 'fragmentation' introduces a new mind-set and priorities for design management and technology, through which current challenges of multidisciplinary design in construction, and elsewhere, can be addressed. More research should adopt this perspective to develop theory on design collaboration by theorising the means and processes of sense-giving and sense-making in multidisciplinary design. Also, the practice of design collaboration and design management should focus on cultivating fragmentation as an organisational capability rather than focusing on resolving it through simplistic technological and/or structural measures.

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