

Intertext: On Connecting Text in the Building Process

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Abstract. Actors in the building process are critically dependent on a corpus of written text that draws the distributed work tasks together. This paper introduces, on the basis of a field study, the concepts of corpus, intertext and intertextuality to the analysis of text in cooperative work practice. This paper shows that actors in the building process create intertext (connections) between complementary texts, in a particular situation and for a particular task. This has an integrating effect on the building process. Several types of intertextuality, including the complementary type, the intratextual type and the mediated type, may constitute the intertext of a particular task. By employing the concepts of corpus, intertext and intertextuality with respect to the study of the building process, this paper outlines an approach to the investigation of text in cooperative work.

Keywords: *text, documents, intertext, cooperative work, building process*

Introduction

In this article, we attempt to achieve a better understanding of how cooperative work is accomplished by collaborative actors through the creation and use of mutually constituted texts in document-centric work practices. Previous studies have focused on single documents (e.g. Luff et al. 1992, Xiao et al. 2001), and on collections of documents (e.g. Cabitza and Simone 2007, Christensen and Bjorn 2014, Schmidt and Wagner 2004). Building on this work, we explore how written artifacts partly constitute cooperative work practice. Inspired by work within semiotics (Riffaterre 1980), we introduce the concepts of *corpus*, *intertext*, and *intertextuality* as analytical devices to unpack how text may be said to influence

human action. The study argues that an ensemble of documents used and produced in the building process may form a *corpus* of written texts. On the basis of the corpus, or subsections hereof, the actors may create *intertext* between relevant (complementary) texts in a particular situation, for a particular purpose. The intertext of a particular situation can be constituted by several kinds of *intertextuality*, including the complementary type, the intratextual type, and the mediated type. This has an integrating effect on the cooperative work practice.

The paper echoes Strauss et al (1997), specifically the analysis of the complex and contingent nature of practice. Underscoring the fact that practitioners must establish a connection between the particular situation at hand and the formal nature of text at work. According to the present study, these connections are (partly) made when practitioners create intertext between select documents at work according to the situation at hand. In this manner this study offers insights into the making of connections in practice between the formal corpus of text and the arising contingent situations of practice. That is, it addresses the core issue of the interplay between structure and agency in work practice, where the corpus of texts provides structure to practice and the individual actors creation of intertext displays agency.

The empirical data originate from a study of the building process, more precisely, the planning and construction of a large commercial and residential complex in a suburb of Copenhagen. In the process of the building process, architects, building engineers, general contractors, subcontractors, vendors, craftsmen and builders continuously create and use documents such as for example architectural plans, engineering plans, schedules, calculations, permits and meeting agendas, and more. As such, a building process is a highly document-heavy practice and an excellent vantage point for the study of documents in cooperative work. An understanding of these practices is key to improving computer support of actors working with multiple texts in complex cooperative work settings.

The article is structured in the following manner. First, we will describe related research and introduce the main analytical concepts of the study. Second, we will describe the research setting and methods. Third, we will consider the corpus of written text internal to the practice. Fourth, we will consider the achievement of intertext as well as three types of intertextuality pertinent to the construction of intertext. Finally, some concluding remarks will be provided.

Related research

The study of text in cooperative work has become a central research topic within CSCW. Documents are used extensively in cooperative work for the execution of individual tasks, as well as for the coordination of multiple tasks (Hertzum 1999), and they may be said to manage ‘the flow of information’ (Cabitza and Simone

2007). For this reason, researchers have long been studying the manner in which documents are used and produced in cooperative work practices. It is evident from this research that documents are woven into cooperative work activities as intrinsic components of those activities, rather than as secondary tools where information is passively stored and retrieved (Malone 1983). Recent studies have pointed out that documents are not to be regarded as isolated artefacts, but rather as being intertwined within heterogeneous networks of actors, activities, and other artefacts, inherent to cooperative work practice (Bardram and Bossen 2005, Cabitza and Simone 2007, Christensen and Bjorn 2014, Harper 1998, Schmidt and Wagner 2004).

The fact that multiple texts used in conjunction can act as key constitutive elements of cooperative work, implies that actors must align and combine several texts as part of their everyday activities. For example, in the context of healthcare, Schmidt et al. (Schmidt et al. 2007) found that multiple written artefacts are to be aligned and read together in order to give an adequate picture of a given patient's trajectory and to support workflow. Texts are often arranged in a systematic manner. This is what Schmidt & Wagner (2004), in the context of architectural work, call "ordering systems", i.e. complexes of interrelated practices and artifacts. Relatedly, Bardram and Bossen (2005) discuss how cooperative actors achieve coordination through the use of a wide range of interrelated non-digital artefacts, such as whiteboards, work schedules, examination sheets, care records, post-it notes and etc. Zhou et al (2011) cast collections of artefacts in terms of 'assemblages', i.e. "*a complex system that includes boundary objects, the practices around these objects (including organizational policies), work processes and coordination mechanisms within these objects, and special functions for designated groups.*" (Zhou et al. 2011, p.3354). Relatedly, Christensen & Bjørn (2014) have also studied how collections of documents shape work practice in their study of 'documentscapes' in global interactions. According to their study, documents may be said to form a documentscape, when each document depends upon the wider ensemble for meaning, as well as utility. Documents in the documentscape take their meaning from their position in an ensemble of documents, used or produced in series or in parallel. The concept of documentscape highlights how intertextuality may draw the distributed use of documents together and provide structure and integration to highly distributed cooperative work practice.

In sum, previous studies have established that documents may be key constitute elements of cooperative work practice, and that in many instances actors combine and align heterogeneous yet complementary texts as part of their practice. Very important contributions have been made in this area. However, few CSCW studies draw explicit inspiration from literary theory (an exception is Christensen & Bjørn 2014), and very few use concepts originating in that field. This is quite a conundrum. Given the fact that literary theory (and semiotics in

general) is potentially well placed to give a new view and new insights into exactly how documents become such powerful instigators and are constitutive of cooperative work practice (Harper 1998). In his seminal work on documents in organizational life Harper (1998, p.25) draws attention to this fact by stating that: “*Literary theory may appear well removed from our concern with documents in organizational life. But in fact it does have a lot to say on this topic. The semiotic view emphasises that there is no such thing as a ‘free standing text’ [...] rather each text is linked in one way or another to each and every other text in a system [...].*” The introduction of Riffaterre’s literary theory concepts to CSCW may be said to follow Harper’s suggestion (although he does not directly point to Riffaterre’s work).

The notion of documents related to one another in systematic ways is important, and there is good reason for considering semiotics and literary theory in CSCW. We will now turn to presenting the proposed analytical concepts.

Analytical concepts

As mentioned, we will rely on the influential French scholar of literary theory and semiotics Michael Riffaterre in an attempt to invigorate a CSCW analysis of documents in cooperative work. His work is part of the tradition of semiotics where names such as Saussure, Bakhtin & Volosinov, and Kristeva loom large. In the seminal work of Saussure (1974), followed by Bakhtin & Volosinov (1986) and, subsequently, Kristeva (1986), texts or documents are to be treated semiotically; that is, language is a system of signs in which one sign implies the presence or absence of another sign (Saussure 1974). This means that no document is “isolated”. Rather, each document is linked to each and every other document through intertextuality, that is, through a practice of “presence and anticipated presence (absence).” The most crucial aspect of language, from this perspective, is that all language responds to previous utterances and to existing patterns of meaning and criteria of evaluation, but it also anticipates and seeks to promote future responses (Harper 1998). One cannot create or even understand an utterance or a written work, such as a document, as if it was detached in meaning, unconnected to previous or future utterances or written works (Bakhtin and Volosinov 1986, p.72). This is the legacy that Riffaterre builds on and is a part of.

Before we venture any further, it should be made clear that Riffaterre was concerned with building a theory of literature focusing on the semiotics of, for example, novels, short stories and poems. He was not a scholar of cooperative work and interested in documents in the building process. Nevertheless, his work may turn out to be very useful to us in CSCW, if used carefully.

According to Riffaterre (1980), the reader routinely establishes *intertext* between texts, in order to make them meaningful. A text may be almost meaningless, unless connected to other texts by the actor, during his or her

process of reading or writing. This presupposes a *corpus* of known texts (i.e. a body of texts familiar to the reader), as well as various forms of *intertextuality*, by which intertext may be created.

The concepts of *corpus*, *intertext* and *intertextuality* in a CSCW context are described here:

- *Corpus* refers to the ensemble of texts available to the collaborative actors - central to their work practice.
- *Intertext* is the meaning achieved by the actor by combining several texts from the corpus in accord with the demands of a given situation. Intertext may be said to be a 'situational property' as it is always created as part of performing a task in a given situation with specific circumstances. The concept of intertext is central to the analysis.
- *Intertextuality* refers to the various ways that intertext may be achieved. That is, the meaningful combination of several heterogeneous documents from the corpus in relation to a particular work task. There are, at least, three different kinds of intertextuality, namely, the complementary type, the mediated type, and the intratextual type.

By introducing the concept of *corpus* to the study of cooperative work, we become analytically sensitive to the body of text distributed among the many different actors involved in cooperative work. The concept of *intertext* allows us to consider how the individual actors achieve meaning by integrating and combining several texts in a particular situation, and the concept of *intertextuality* draws attention to the various ways intertext can be achieved.¹

Note that, the concepts are interconnected in a systematic manner (e.g. the concept of *intertext* relies on the concepts of *corpus* and *intertextuality* as auxiliary concepts, and *vice versa*). This, in effect, potentially allows the empirical analysis to also have these same systematic virtues. That is, this set of concepts originating in the field of semiotics may help us conceptualise the individual's act of creating meaning using documents, and the system or structure of the documents influencing this act, in one and the same analysis.

¹ There are, of course, more relationships to work practice than the textual relationships focused on in this article (e.g. relationships of materiality, equipment, technologies). However, accounting for these in detail, are outside the scope of this paper.

Methods

The empirical material was generated through fieldwork, including interviews and observations of work practice. During the course of nine months, fieldwork at two building sites, as well as architectural offices, was carried out. Additionally, and central to the study, texts such as, for example, architectural plans, engineering plans, schedules, calculations, permits and meeting agendas, and minutes were collected and studied. The entire corpus of text used in the performance of a specific construction task was collected and studied. Written artefacts were studied by, for example, following their lifecycle (Harper 2000) with an optic on how individual texts were used in conjunction.

Twelve in-depth interviews on the practices of e.g. combining text with text in the building process were carried out. In general, during data generation and analysis, particular attention was paid to how different actors involved in the building process use the many texts in conjunction with each other, rather than one text at a time. One of the building projects studied was the development of a commercial and residential complex, a multi-storey project, in concrete, brick, glass and steel, situated in a suburb of Copenhagen, Denmark. It was a, relatively, large project totalling 7,700 m² (82,882 ft²), 4,900 m² (52,743 ft²), was distributed across 45 apartments in seven buildings (see figure 1), and 2,800 m² (30,139 ft²) was designated as commercial space. In this paper the focus is on the construction stage, more precisely, on the work done by the building engineer and craftsmen of the subcontractor at the stage of erecting the concrete carcass of the apartment buildings on the site. We will now turn to introducing the building process including the network of actors involved in order to provide some context for our analysis.

The network of actors and the building process

The building process studied here involves the creation of a unique structure, rather than mass-produced entity. Such projects almost always start with a client approaching an architect with the intent to acquire a new building. Briefly put, the building project that follows is planned and worked out step-by-step, phase-by-phase. Gradually the project takes shape, the requirements (e.g. size, materials, functions etc.) of the proposed building are put down on paper as written text and the first conceptual design sketches are drawn up. The number of people involved increases, sketches become scale drawings, and architectural plans become the basis for applications to the authorities. After an initial building permit has been issued, tenders are invited from contractors, and commission is awarded to a general contractor. The general contractor then hires the various subcontractors and the aim of putting up the building is within reach once the final architectural

plans have been made and the subcontractors with their craftsmen, builders and workers has been coordinated on the building site.



Figure 1: A building engineer studying a construction plan during the erection of a concrete carcass of an apartment building.

For each new building project a network of actors is created or configured. The network is a diverse ensemble from many different professions, working for many different companies (see table 1). Some such as the client and the main architects are with the project from start to finish, while others such as the various subcontractors are associated with the project only for the duration of their allotted tasks.

We may interject that large building projects are performed in a fast-track manner, which implies that design and construction overlap in a temporal sense (Sabbagh 1989). For example, the physical construction of a building's foundation may be well underway before the design of the building's roof is finalised. That is to say that much design work is very much concurrent with the construction of the building.² However, the design of a specific building element generally precedes its construction. For example, the design of a roof is most often finalised before it is physically constructed.

² This is mainly grounded in a desire to save time by virtue of *not* having to wait until the whole building has been designed before commencing with its construction (Sabbagh 1989).

Client	Architects	General Contractor	Authorities
Initiates the process	Responsible for overall design	Moderates the design of the working plans	Building permit and regulations
Contracts architect and general contractor	Coordinates the design process	Plans the construction process	Environmental assessments
Formulates building program with architect	Formulates building program with client	Hires subcontractors and retains architect	
Users	Consultants	Subcontractors	Vendors
Contributes to requirements	Specialists for statics, lightning, building services and more.	Retain the craftsmen that actually construct the building.	Provides building material and fabricate components
			Design building components

Table.1: The ensemble of actors involved in a large building project.

The networks of actors found in the building process differ from other organizations of work such as manufacturing or services that may enjoy far more extended longevity. That is, the concrete configuration of actors (i.e. client, architects, general contractor, subcontractors, vendors etc.) is specific to the particular building project and dissolves as the project ends. However, a number of arrangements counteract these ‘transient’ tendencies of the network. First of all, the major players in the business may have worked together on various projects in the past. For instance the architect and the general contractors may be familiar with one another from prior engagements. Furthermore, it is not uncommon that for example the general contractor relies on a small group of trusted subcontractors when recruiting for a project. For example, in the project studied here the general contractors and a large part of the group of subcontractors had worked together on a previous project. Secondly, the various actors are all part of the construction industry at large, and although they may meet as strangers in relation to a specific project, they bring with them rather precise expectations of the manner in which the project ought to be carried out (Kreiner 1976, p.83). The actors, then, are part of the same work domain, i.e. the building process, and as such they are familiar with the norms and practices that are part and parcel of it. Consequently, roles and responsibilities for example may merely have to be aligned anew for every project, rather than ‘invented’ from a clean slate.

Moreover, the norms and practices of the building process are ‘inscribed’ into the written artifacts used and produced by the actors, and it is up to the individual actors to use these written artifacts (often in conjunction with one another) according to the situation at hand. This is the focus in this paper.

We shall now turn to describe the body of text available to the cooperative work ensemble, and subsequently we will turn to the creation of intertext.

The corpus of text in the building process

As mentioned above, in the building process architects, contractors, craftsmen, vendors, and consultants continuously create, use, and revise texts and documents, such as architectural plans, engineering plans, schedules, calculations, permits and meeting agendas and minutes. In this respect, the building process is a highly document-heavy practice. As individual texts and documents are created, they may undergo integration with past, present and, potential future documents, each document being authored, co-authored, read, commented, embellished and altered by the various members of the network across time, place and organizations.

It may be argued, that the relations between the texts are a part of what brings the grand endeavourer of the building process together, by enabling connections between what was, otherwise, disparate actors, times and places.³

What we, employing a concept from Riffaterre (1980), dub 'the corpus of text' is in this context the body of written texts available to the cooperative network of actors. The texts of the corpus are related in multiple ways with criss-crossing references and integrations across temporal, spatial, and organizational divides and boundaries. Furthermore, the corpus is dynamic in nature, as the body of text develops and accumulates, over time, during the course of the building process. For example, at the start of a building process, the corpus may consist of, relatively, few documents, such as a building programme created by the client and the architect, i.e. some initial design sketches, descriptions of the desired nature and scope of the building, and associated calculations. As the building project proceeds to the tendering stage, the corpus grows in volume as more descriptions, architectural plans, engineering plans, permits, meeting agendas and minutes, offers, correspondence, contracts and time schedules are added. As the project enters the construction phase, the volume of the corpus increases ten-fold, as highly detailed architectural plans and engineering plans, to be used by the men and women constructing the building, are introduced in great numbers, as are many more time schedules, meeting agenda and minutes, further permits, calculations, environmental assessments, and more. Finally, as the building project draws to a close, architectural plans and descriptions of the building 'as built' are added to the corpus. In this manner, the volume of the corpus expands, over time (Christensen 2013).

The corpus of text for a specific construction task

As mentioned above, the focus in this paper is on the construction stage, more precisely, on the building engineer and craftsmen practice of erecting the concrete

³ Note that, coordination through the material field of work also plays an important role, by facilitating integration of the cooperative work tasks. This mode of coordination has been dubbed *stigmery* (Christensen 2014).

In the preparation of the actual construction work, the architects forward their architectural plans of the building to an offsite manufacturing facility, endowed with the responsibility of manufacturing the building elements, primarily concrete elements, such as decks and walls.

Fabrication in a factory environment enables the elements to have a consistent quality of strength, durability, and finish, and eliminates the need for onsite formwork. The external wall elements provide the building with horizontal stability and make up the horizontal part of the buildings concrete carcass. As far as the decks are concerned, these horizontal surfaces serve to support the structural loads of the building's mass, as well as the anticipated loads created by people, furniture and equipment. On the basis of the architectural plans, the actors who are responsible for casting the elements at the offsite plant create their own set of plans, depicting each building element and its placement (see Figure 2).

Each element, then, is given a unique identity (ID) number. After the manufacturing, each concrete element is spray painted with the ID number and loaded onto trucks by factory workers, according to a loading list (see Figure 3), to be transported to the building site. The load order is also indicated by colour coding of the deck layout plan. For example, orange for load N° 1 to arrive on February 2nd at 6:45 am, and blue for load N° 2 to arrive on February 2nd at 9.30 am. Also visible are the ID numbers of individual building elements (see Figure 2).

Element ID

Tinglev Elementfabrik A/S

Sag nr.: 133199

Sag nr.: STIGAGERGRUNDEN BYGN. 7

Kunde: MT HJUGAARD A/S

SDR. STATIONSVEJ 28P, 2. TV.

SLAGELSE 4200 SLAGELSE SLAGELSE

Height

Length

Square metre

Weight

Truckload no.

Læsseliste 1

Dato 23/11-07 12:18, side 1

Etage 2.SAL BYGNING 7

Sagsbehandler: BJO

18 FEB. 2008

Element Nr.	Type	Dim. mm	Højde mm	Længde mm	Brutto Kvm	Netto Kvm	VOB Kvm	TE Kvm	Vægt kg	Akk. vægt kg	Læs Nr.
1	B25/2400	180	2.725	228	0,60	0,60	0,60	0,60	262	262	1
2	B25/2400	180	2.740	2.172	6,00	5,90	6,00	6,00	2.563	2825	1
2A	B25/2400	180	2.740	4.640	12,70	12,20	12,70	12,70	5.270	8095	1
3	B25/2400	180	2.740	2.328	6,40	6,40	6,40	6,40	2.742	10837	1
4	B25/2400	180	2.740	392	1,10	1,10	1,10	1,10	458	11295	1
5	B25/2400	180	2.740	2.028	5,60	5,60	5,60	5,60	2.394	13689	1
6	B25/2400	180	2.740	1.844	5,10	5,10	5,10	5,10	2.176	15865	1
7	B25/2400	180	2.740	2.068	5,70	5,70	5,70	5,70	2.440	18305	1
8	B25/2400	180	2.740	2.448	6,70	6,70	6,70	6,70	2.895	21200	1
9	B25/2400	180	2.740	1.120	3,10	3,10	3,10	3,10	1.324	22524	1
10	B25/2400	180	2.725	352	1,00	1,00	1,00	1,00	708	23232	1

Ant. elem 11

Hejeste Element: 2740

Figure 3: Excerpt of loading list with element ID number, type, dimensions, weight, and designated truckload.

The ID number is present, then, on the engineering plans, the concrete elements and the loading list. This cross-reference serves the purpose of ensuring that the building elements arrive at the site in the exact order that they are to be used during the construction efforts. As the elements arrive on site (see Figure 4), the crew starts to offload the elements and hoist them into position. In this process, the engineering plans, the building element ID number, and the loading list are used. In addition, a set of detail drawings is used, depicting the details of the binding irons that secure the building elements to each other. Furthermore, the process is guided by descriptions, stipulating construction techniques, the overall time schedule and the plan for the layout of the building site, according to several rules, regulations, ordinances, recommendations, and industry standards.

In this manner a subset of the large document corpus, what we may call a task specific corpus (with fuzzy boundaries), may be identified as supporting the cooperative work ensembles efforts of designing, manufacturing, transporting and installing building elements for a particular part of a building.



Figure 4: Building elements arrive on site. Note the spray-painted ID numbers on the concrete elements.

As aforementioned, making the relations between the texts are a part of what brings the distributed endeavour of the building process together, by enabling connections between what would, otherwise, be disparate actors, times and places. However, accounting for the document corpus is only half of the story, it denotes the distributions of documents among cooperative actors and suggests interrelations. But, how do the relevant relations occur? This is where the other half of the story becomes relevant. The other half of the story pertains to semantics. This perspective helps explain how the document corpus becomes meaningful as a corpus or, more precisely, as *intertext*. It allows us to shift focus from considering the totality of documents among members of a cooperative work ensemble, or subset thereof, towards considering the perspective of the individual actor making sense of what is read. Let us elaborate. We will start by taking a look at a useful distinction, namely, that between *corpus* and *intertext*.

Intertext

We must be careful to avoid confusion between the *corpus* and the *intertext*. As mentioned above, the *intertext* is the meaning achieved by the actor by combining several texts from the corpus in accordance with the demands of a given situation. Intertext is an activity concept. In reading the individual document at hand the situated actor is attentive to the wordings, phrasings, illustrations, and categories that are (only) meaningful in unison with other texts. This intertext has loose and flexible limits, as it is partly a situational property, a modality of perception associated with the situation of the reader. In reading the individual document the actor is perceptible to the wordings, phrasings, illustrations that the document at hand will not suffice to explain. It is partly in creating the intertext between relevant texts (i.e. assessing what the other relevant texts are) that the actor displays his competences and skills as an accomplished actor in the building process.

Consider, for example, the foreman on the building site, reading an engineering plan for the layout of the deck elements (e.g. Figure 2). Directing the mounting of these building elements requires the creation of an intertext, including the layout of the decks, the loading list and the spray-painted ID codes on the concrete building elements. These texts complement each other. Each text cannot stand alone. It is by virtue of the complementary intertext between these texts that they become useful in this situation. The layout speaks of the spatial placement of the uniquely identifiable building elements, the loading list reveals the order in which they will arrive onsite, and the spray-painted ID numbers on the concrete slabs afford the identification of the individual building elements. This intertext is part of what the foreman needs to create, in order to be able to direct the crew and to mount the building elements in the correct order and in a timely manner. In addition to this immediate intertext, a property of the work task, a larger intertext

might be created, that also includes the time schedule for the construction work, as well as, building technique standards, safety standards and more. However, the economy of practice suggests that no more intertext is created than the immediate situation calls for. That is, the intertext need not be more complete, extensive or consistent than required by the practical demands of the situation. This general phenomenon relates to what Schutz (1970) refers to as ‘the problem of relevance’, and what Bourdieu (1992) has called the ‘economy of logic’.

We may say that the intertext is a situational property. That is, related to a particular actor, performing a particular task, for a particular purpose, in a particular context. In contrast, the text corpus of the building process, merely, refers to a collection of texts. Note that realising a workable intertext, based on the corpus of written text pertinent to the situation, is *not* a given, rather it is an achievement on the part of the competent actor. Occasionally texts are misread, misaligned or misjudged or simply incoherent, according to criteria internal to the construction process. For example, for the construction purpose at hand, there may be a lack of correspondence on some aspects between the descriptions of the materials to be used, what is depicted on the architectural plans, and the descriptions of construction techniques called for. This is not uncommon.

Part of the competences of an accomplished actor in the building process is to be able to create intertext, achieve adequate coherence, based on the (imperfect) corpus for the purposes of the situation at hand. The actors are striving for usefulness or adequacy in relation to a particular situation or context. It is important to emphasize that when we are talking of intertext between documents central to the building process we are aware that these creations need not be more complete, extensive or consistent than required by the practical demands of the situation.

In sum, for the competent cooperative actor creating intertext is a practical endeavour, for practical purposes, with constraints and possibilities associated with the situation and the corpus at hand. No more logic or consistency across documents, than are required by the needs of the practice, are mobilized as the foreman creates the intertext between what he deems to be the corpus of relevant documents for the construction task at hand. The foreman created intertext between the plan for the layout of the deck, the loading list, and the ID numbers that are spray-painted onto concrete slabs. He did so, in order to ‘know what to do next’. Creating intertext is a question of making intertextual relations between texts for a specific purpose while employing various types of intertextuality. Various types of intertextuality will be more closely reviewed, in what follows.

Intertextuality

There are, at least, three types of intertextuality at play in forming intertext, namely, the complementary type, the intratextual type, and the mediated type.

The complementary type of intertextuality is, perhaps, the most intuitively recognizable one of the three types, as it refers to how documents complement each other in order to make up the syntagm, i.e. the meaningful whole (Riffaterre 1980). As indicated above, in reading the individual document, the foreman is perceptible to the wordings, phrasings, illustrations that the document at hand will not suffice to explain. What to the layman reader of the document may appear as obscurities or incompleteness and even ungrammaticalities are, to the competent actor, traces left by the absent intertext, completeness to be completed elsewhere, by virtue of, for example, the complementary type of intertextuality.

As indicated, in reading a document, such as for example in Figure 2, in the course of construction work the competent actors *complements* the document at hand with other relevant texts, hence, the complementary type of intertextuality. However, there are other types of intertextuality creating intertext between the various documents of the corpus as they are read in various circumstances and situations.



Figure 5: This document was created by superimposing several plans for building services onto an architectural plan of a building under construction. Note that, this plan belongs to a project which is different from the one previously described.

The intratextual type of intertextuality is, perhaps, less evident in our example above. The intratextual type refers to instances where a text is superimposed upon another text. Perhaps, the most clear example of this is to be found in building services engineering, where the plans for the building services shafts, ventilation, sanitation, and electrical wiring are superimposed upon each other and onto a plan of the building, in order to bring about a collective overview (see Figure 5). This intratextual assembly is the pivotal point of several coordination meetings, where specialists responsible, respectively, for the ventilation, electrical installations, and sanitation meet and coordinate their respective tasks. One objective of these meetings is to ensure that there are no ‘collisions’ between the various building services and that they, in fact, will fit into the designated service shafts designed for the purpose

In this manner, intratextual constructs may be very useful in the building process. We have now described two types of intertextuality, common to the building process. A third remains to be described.

Imagine a situation where establishing intertextuality between two texts requires, or is mediated by, the shadowy presence of a third text – this is the mediated type of intertextuality. In the building process the shadowy presence of laws, regulations and industry standards may play the mediating role of inducing a meaningful intertextual relationship between two texts. We may argue that, for instance, intertextuality between architectural plans, on the one hand, and a layout for a construction site, on the other hand, is mediated by the shadowy presence of several laws, regulations and ordinances. For example, during winter, the layout of the building site and the plan for what is to be built are mediated by the “Directions on Construction During Winter” published by The National Housing & Building Agency, as well as other regulations, such as for example DS 409, “DIF standard for safe construction”. DS 410, “DIF standard for loads on structures”. DS 411, “DIF standard for concrete structures”, DS 482, “Execution of concrete structures”. DS / EN 206-1 and EN 2426, “Concrete Technology”. AT Announcement No. 25, “Protection of concrete against overturning during and after installation”. BSR 2, “Building & Construction: Industry Guidance on installation of concrete”. Precast Association: “Transport and installation of concrete”.

These three distinctions should help check any tendency, perhaps all too common, to settle for unfocused notions of influence from text to text. Influence from text to text, as in inheritance, is best understood as a ‘vertical’ phenomenon often between texts of the same kind - think of an old version of a given text influencing the subsequent creation of a new version. In contrast, the creation of intertext by various techniques of intertextuality is best described as a ‘lateral’ phenomenon, in the sense that, there is simultaneity, a mutual solidarity between texts, so that in certain situations the text can function as an artefact by its

engagement with other texts - each text contributing by its comparable otherness. It is diverse texts, rather than uniform ones, that allow for the creation of intertext, in our case.

Concluding remarks

In this study we have found that an ensemble of documents used and produced in the building process, may form a *corpus* of written texts. On the basis of the corpus, or subsections hereof, the actors may create *intertext* between relevant (complementary) texts in a particular situation, for a particular purpose. The intertext of a particular situation can be constituted by several kinds of *intertextuality*, including the complementary type, the intratextual type, and the mediated type. In this manner the building process is (partly) organized through written text.

As noted, the study addresses the core CSCW challenge of characterizing how written artifacts partly exert pressure on human action. It is (partly) at the movement of the creation of intertext that a corpus of texts imprints its norms on the cooperative actor. It is the movement where the (combined) meaning of the texts is produced and influence action. There is nothing mysterious about this. But we need to be able to account for this emergence of combined textual meaning in action. The concept of intertext allows us to pinpoint this moment. For example, recall how the foreman created intertext between the plan for the layout of the deck, the loading list, and the ID numbers that are spray-painted onto concrete slabs. He did so, in order to ‘know what to do next’. Garfinkel (1967), points out that the question of “what to do next?”, is the practical problem of organizational life par excellence.

Relatedly, the ‘routine’ of practice may, partly, stem from the systematic interweaving of text. At one level of abstraction practice within, for example, the building process, is contingent as lines of action vary from one instance to the next – tasks will have a different locations, durations, scope, and etc. Furthermore, the nature of the building-in-the-making will differ from one day to the next, as construction work progresses and the building changes. However, on another level of abstraction, these variations may be considered everyday or normal, and there is nothing ad hoc in the way they are handled. On the contrary, they are dealt with consistently, relying on a tested and tried corpus of text as the basis for the creation of intertext, according to the situation at hand. It is no surprise that the next instance of constructing a concrete deck (on another building) may follow the same *modus operandi* as we have already seen above, employing the same types of text (i.e. deck plan, loading list, and ID tags). The use of text may create regularity and routine across specific instances of action. The corpus of text or variations of it is repeated across situations and even building projects.

The term 'routine' as it is employed here, is not used in an effort to create a deterministic impression of the actors' actions in the building process. Of course, individual judgment and choice play significant roles. Practitioners must wield and apply a wide repertoire of skills and routines to work with widely varying circumstances. In light of this, we may suggest that practitioners in, for example, the building process do not 'standardise' the application of their routines so much as they standardise the 'toolkit' (e.g. texts), from which they draw. The particular concrete application of a toolkit (e.g. a corpus of text) requires an on-the-spot professional judgment, a capability that may be thought as essential in any situation with a measure of uncertainty. In the building process, judgment is a skill that is cultivated in education, training and apprenticeship (Christensen 2013).

While there are always actions that are not in accord with the norms of a given practice, the effects of norms inscribed in written artifacts such as forms, templates and guidelines is to nudge most activity towards a generally homogeneous set. More generally, the view of documents in cooperative work presented in this study shows the interplay between structure and agency, between written artifacts and human action. Of course there is individual judgement in relation to the use of the documents, but there is also a set of norms for their use, and not following the norm would be considered a 'mistake' something that may be excused in the novice but expected by the master practitioner (Williams 1999).

In regard to this papers place in the CSCW literature we may say that it is obvious that other studies have also focused on the interweaving of multiple text in cooperative work. As mentioned above, for example Schmidt & Wagner (2004) have coined the concept of *ordering systems*, Zhou et al (2011) have worked with *assemblies*, and recently Christensen & Bjørn (2014) have introduced the notion of *documentscapes*. These are significant studies. One might ask: What is the value of yet another way of talking about texts and their interrelations?

First, the study explicitly address the interplay between structure and agency in work practice i.e. the case shows that the corpus of texts provides structure⁴ to practice and the individual actors creation of intertext displays agency. Again, this echoes Strauss et al (1997), specifically the analysis of the complex and contingent nature of practice. Underscoring the fact that practitioners must establish a connection between the formal nature of texts at work on the one hand and on the other hand the particular situation at hand. Second, the study opens up the possibility of explicitly designing and evaluating computer support for the creation of intertext by cooperative actors. Let us elaborate a little on the latter.

Briefly told computers have no situational awareness, at least not in terms of a sophisticated contextual understanding, they cannot create intertext proper. Recall that intertext is party a modality of perception, a situational property, associated with the situation of the reader (Riffaterre 1980). It is by no means given what

⁴ The corpus of text or variations of it is repeated across situations and even building projects.

constitutes relevant texts in a particular situation (Ellingsen and Monteiro 2003). Furthermore, it is by no means given how to define a situation in the process of creating intertext. We are fully attentive to the fact that some classes of computer technology are referred to in terms of ‘context aware computing’ or ‘location based computing’. The literature is bursting with interesting contributions of this order (Bricon-Souf and Newman 2007). However, the kind of context awareness that for example sensors in computational devices can produce does not amount to the kind of complex assessment of situations that for example a trained building engineer can achieve.

In principle, then, computers cannot create intertext *per se*. That is, computers and their sensors are only able to produce ‘thin descriptions’ of a situation and consequently have no, for the purposes of creating intertext, useful situational awareness. Intertext is as mentioned a situational property and without the faculties to create a ‘thick’ situational understanding computational technology falls short of having the ability to create intertext.

Fortunately, this realization is not in vain or unproductive. It leaves us with the opportunity to clearly focus on the achievement of an orderly corpus of written text, by computational or other means, designed to support the actor’s achievement of intertext by various types of intertextuality. The rationale being that the purpose of an orderly corpus, an ordering that computers may be part of, is (partly) to support the actor’s creation of intertext by various types of intertextuality.

In terms of future workplace studies, the concepts of *corpus*, *intertext* and *intertextuality* may be employed to analyse the use of text in other cases. For example, if we leave the building process and change the domain to health care, and zoom in on the work of physicians in hospitals. One hypothesis could be that when physicians in a hospital write a patients discharge letter, they are creating intertext based on a corpus of written text, that includes the various parts of the patients record as well as the nurses’ reports. The discharge letter is from this perspective the product of the physician’s creation of intertext. This view may be pursued and empirically verified in future studies. At least that is an option now open by virtue of the concepts introduced in this study. The rationale for doing additional studies in other domains along the lines of this study would be to highlight and in turn inform the design of computer support for the creation of intertext.

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