

Shared Workspaces of the Digital Workplace: From Design for Coordination to Coordination for Flexible Design

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Abstract

The emergence of new digital platforms and social software at work changes workplaces and how people coordinate their work. To date, coordination has only been minimally studied in the context of the social software enabled digital workplace. Through a qualitative analysis, we identify different coordination mechanisms (CM) in various practice areas as envisioned and used with the same collaboration platform by three healthcare workplace teams. The findings illustrate the flexibility of shared workspace designs of the digital workplace where CM cannot be anticipated a priori by researchers and software developers. We end with a discussion of the findings from a sociomaterial perspective to encourage studies that monitor the flexible and complex enactment of temporally emerging shared workspace designs.

1. Introduction

Recently the role of digital platforms for the transformation of work practices has gained increased interest [21, 49] along with renewed attention to the interplay between the social and the technical [5, 12]. Social software has started to spread into workplaces, communication has changed from top-down to more inclusive communication structures [50].

Institutes and hospitals in the public sector have started to replace their old intranets with so-called “social intranets” that have become common in other sectors [70]. In contrast to traditional intranets, social intranets are built around highly integrated *enterprise collaboration platforms* that extend traditional groupware (e.g. email, document library) by the inclusion of social software functionality (e.g. wikis, blogs, activity streams, social profiles). They allow employees to not just consume information but also become authors in the intranet [30, 58, 70]. Social intranets enable users to work in virtual teams, freely connect with each other, and create and share knowledge [30]. They have

become the pivotal power behind the *digital workplace*, an evolving sociotechnical system [70]. The digital workplace can be designed in such a way that evolving work requirements and needs of different organizations, teams and individuals can be flexibly met. In this way, the digital workplace is interpreted and shaped differently and new ways of working in different practice areas emerge [57, 70]. Once the new social intranet with its collaboration platform is introduced, it is typically left open to the users to decide which groupware and social software components to use for which purposes. This ambiguity can be an “asset, not an obstacle” [1:560], as people have creative freedom. Work practices evolve in an evolutionary process as individuals and teams discover means to coordinate their work [39]. Coordination mechanisms (CM), widely described as means to support the management of distributed work and cooperative activities [52], have a long history in Computer Supported Cooperative Work (CSCW) research [16, 18, 29, 52, 56]. However, CM have only minimally been studied in the context of the social software enabled digital workplace [39]. With the phenomenon of user-generated content and the malleability of the digital workplace, people have far more possibilities in terms of the CM they choose to use and how they shape them.

In this paper, we address the need to develop a better understanding of coordination in the digital workplace. For this, we build on a pilot study on the introduction of a social intranet in the Swedish healthcare sector with medical and non-medical professionals. The healthcare context is a local knowledge area and serves as an instance for studying shared workspace designs of the digital workplace. The incorporated collaboration platform offers team sites with a range of functions supporting various work *practice areas*, for example, document management, knowledge sharing, and communication, in a flexible way. The practice areas can be supported through various *coordination mechanisms*, embodied in different *shared workspace designs* [cf. 19, 55].

The digital workplace adds new facets to the study of CM as there is little support for interpretation [9] of

the different functional elements and coordinative artefacts. Moreover, practice areas and their supporting CM might emerge and evolve in a way unanticipated by the designers [47, 70]. According to Robinson [51] and Dittrich et al. [13], software can be designed by software developers to make it more open for ongoing design. In this study, however, we do not focus on the perspective of software designers but aim *to develop a better understanding of the flexibility of shared workspace designs of the digital workplace* from a practice view. Specifically, we seek to examine the variety of different envisioned and applied CM supporting different practice areas in shared workspaces of the digital workplace.

This article is structured as follows: in section 2, we start with the theoretical background on CM; also, we introduce the concepts of *interpretive flexibility* and *sociomateriality* guiding our research and discussion from a theoretical viewpoint. This is followed by sections 4 and 5, where we present the identified CM in different practice areas incorporated in different shared workspace designs. In section 6 we add a preliminary discussion of the findings from a sociomaterial perspective to illustrate that the design of CM and more generally the digital workplace is enacted in practice. In section 7, we end with a conclusion and outlook for future work.

2. Theoretical background

2.1 Coordination mechanisms

In the literature, there have been considerable efforts in understanding the ways paper-based and computer-based CM are constructed and used in shared workspaces. While there has been a shift in the understanding and study of CM, CM can be understood as a dyad of artefact and protocol. The artefact is “a permanent symbolic construct in which the protocol is objectified.” [56:166], i.e. the artefact as any kind of information structure [9] conveys through its protocol how it is used. Examples of CM are checklists, shared calendars, indexes, or plans [18, 29, 56]. The behavior of CM can be modified considering changing work conditions and coordination needs [39]. Recent ethnographic field studies on CM and related awareness mechanisms [24] have been conducted in the hospital context [e.g. 7, 8, 11]. The studies reveal the ways artefacts are manipulated and representations change “bring[ing] to mind” diverse meanings [9:232]. Limited attention has been on the study of CM in the area of newer forms of the digital workplace with enterprise collaboration platforms [39]. Enterprise collaboration platforms begin life as empty shells with no content in them and

prescriptions on the artefacts’ protocols [39]. We adhere to Bannon and Bødker’s [2] claim that they are also a product of human activity and as such may constantly change.

One stream of CM research has focused on the *flexibility of CM* yielding a variety of different approaches to its exploration and understanding. Cabitza and Simone [10] provide an overview about three approaches to flexibility as explained in the following.

1: The *handling of exceptions*: Attempts have been made to anticipate exceptions, and to make use of negotiations spaces where involved actors can find solutions for exceptional situations. 2: The *role of modularity*: Modularity is achieved by modelling CM through building blocks and a set of rules allowing for a flexible definition of CM as they are applied and executed. This would require the IT capability to offer components that can be added to the CM at run time. 3: The *formulation of alternative models for the representation of coordination*: Here the focus is on modelling for process description by using graphs and their nodes and links, be it activities, documents or conversations.

While all three approaches provide a local and detailed look into single CM, they may not be helpful in studying the richness and flexibility of shared workspace designs. In the setting of the digital workplace it is not about deviating from the CM application and expecting and handling exceptions. Instead, there are endless purposes of use where the route to design evolves through the exploration of and interaction with the platform and without defined process steps [64]. Similarly, we don’t place emphasis on modularity, in terms of software engineering and how components can be attached or extended, or process modelling. What we are interested in is the multiplicity of shared workspace designs of the digital workplace where CM may be considered as traces of design activity [46] in less formalizable areas [10:490].

2.2 The notions of interpretive flexibility and sociomateriality

As digital workplace interpretations and designs change with the ongoing collection of work practice experiences, different workplace teams not only start with different needs towards the digital workplace and corresponding functional support of the enterprise collaboration platform to coordinate their work, but also adjust them over time. Enterprise collaboration platforms are malleable and their affordances offer *interpretive flexibility* [14] so that individuals and workplace teams can select and use pre-designed and user-designed CM to coordinate their work in endless practice areas such as project organization and knowledge

management [22, 39]. The concept of *interpretive flexibility* has its origin in the social construction of technology (SCOT), a prominent theoretical approach in science and technology studies [54]. In SCOT, it is assumed that technology emerges from the social interaction where social groups dominate the conclusions of technologies [46, 54]. Pinch and Bijker [46] propose that a technology artefact has more than one meaning. For studying the interpretations of the technology artefact, the social setting needs to be considered; the artefact is “different things to different actors” [35:24]. While interpretive flexibility has been used to explain how different meanings are constructed, it has been criticized for black boxing information systems (IS) and not unveiling how the materiality of IS is always implicated in its social constructions [33]. In this study we agree with Orlikowski [41:409] who broadens the view of interpretive flexibility defining it as “an attribute of the relationship between humans and technology and hence it is influenced by characteristics of the material artefact [...], characteristics of the human agents [...] and characteristics of the context [...]”. We discuss our findings from a *sociomaterial perspective* in response to a dominating deterministic technological perspective in the IS literature [1] and as a starting point for future studies investigating the shaping of the digital workplace. We adopt the view that the social and the material are constitutively entangled in everyday life [42]. From a sociomaterial perspective, entities, people, and technologies neither have given, determinate boundaries and properties [12] nor influence each other through impacts or interactions [43]. Instead, they are viewed as composite and shifting assemblages, where materiality is intrinsic to everyday activities and relations [43]. In this way, coordination does not play out without the use of the material and likewise the enterprise collaboration platform and related functionality are embedded within its larger social context. Shared workspace designs are not given a priori but are temporally emergent and enacted. In line with Doolin and McLeod, workspaces with their tools and coordinative artefacts at hand are “interpretively flexible in that [different actors can] appropriate [them] differently as part of their local practices.” [15:583].

3. Research approach

The research approach is qualitative and builds on empirical data from a joint R&D project in the Swedish healthcare sector. Preliminary findings shed light on emerging challenges related to the digital workplace (e.g. conflicting interests), as reported on in a research-in-progress paper [63]. In his paper we focus on the flexibility of shared workspace designs.

3.1 Study background, data collection and analysis

The empirical study was conducted on the introduction of a new social intranet in a hospital setting. The social intranet should be based on the EpiServer portal, linking to a variety of different applications and systems, including the enterprise collaboration platform *Alfresco*. In this paper, we focus on three workplace teams and stakeholder groups, respectively: the *emergency department team* (ED), the *medical library team* (ML) and the *hospital management team* (HM). Participants were selected to represent different categories of employees, performing various work tasks in both office and non-office settings.

Table 1: Data collection activities

Activities and sources	Participants (stakeholders)
13 project workshops & working meetings	6 resident physicians, 4 information specialists (incl. library manager) & 2 hospital management representatives (communication manager & controller)
Field notes and meeting notes	Researchers
Project documentation	Project manager, project leaders, consults (Approx. 100 p)
Online diary (logbook)	Emergency department & medical library
Online activities in Alfresco: statistics (e.g., recent activity, logins time & date) & manual compilation (blog posts, comments, docs, discussions)	Emergency department, medical library & hospital management

Data collection and estimations of the amount of data are specified in Table 1. The primary data sources include workshops, working meetings and continuous observations by the researcher (second author), the secondary data source constitutes formal project documentation. Due to limitations in the administration tool, it was not possible to obtain log files to the desired extent during the pilot study. However, the participants were asked to keep a logbook (a wiki on the team site) to document reflections, questions or problems that occurred during the pilot study. For the purpose of this paper, we have reread and interpreted the data. We descriptively coded [53] and analyzed all data using deductive content analysis with the concept of CM [cf. 55, 56] and practice areas [57] based on previous knowledge [17]. Using Atlas.ti the project data was coded independently by the authors. In Vivo codes for CM and an a-priori defined coding scheme for enterprise collaboration platform practice areas based on [22, 57, 69] were used. The individual coding process was amended iteratively by joint review processes for specified data subsets. The intercoder-reliability [36] was high at all times. The percent agreement between the three coders averages a value of .85; coding con-

flicts were resolved in discussions. In some review rounds, the practice area coding scheme was slightly adjusted (e.g. by merging codes) based on the workplace teams' described needs and uses of the platform. In this study, we first capture a static picture of shared workspace designs, covering CM in different practice areas, and then add a preliminary discussion of the findings adopting a sociomaterial lens [cf. 42, 43].

3.2 Stakeholder analysis

Emergency Department (ED). The team consists of emergency resident physicians. They represent several medical areas and work with different professionals across departmental boundaries and clinics. They have little prior experiences in enterprise collaboration platform use and have not yet started to use Alfresco. Consequently, they do not have an active Alfresco team site. However, they generally expect to improve their work with Alfresco. They use social software in their private lives and have already many ideas for how the platform can potentially improve their work. Among others, they have a need for better support for discussion and document management. Through a variety of available and envisioned features, e.g. shared calendars, document libraries/folders, or chat, they expect to coordinate their work among different practice areas. At the time of the study, the emergency resident physicians were setting up their first team site and exploring its functionality and capabilities.

Medical Library (ML). The team has already created and established an active team site in Alfresco. The team site was set up in 2011 and different practice areas emerged. As a consequence, the team represents experienced enterprise collaboration platform users. The decision for the introduction of Alfresco was made based on the increasing need for better support for document management (e.g. searchability, version management), and structuring everyday work to streamline and ensure a uniform approach to work tasks. The team consist of four employees who alternate their work between two different physical locations and the digital library. The team site is used daily, where the main components used are the wiki, blog and document library. Through the start page, the team members reach practical information, such as a current schedule or links to checklists.

Hospital Management (HM). The hospital management team includes nine people (CEO, three area managers, medical director, finance manager, HR manager, communications manager, and planning manager). The communication manager has the overall responsibility for the team site. The motivation to use Alfresco was to handle all important documents via one team site. Although the team has already set up

their own team site, it is only semi-active. The team has little experiences in enterprise collaboration platform use. There is only one power user, the other team members make little use of the platform. The existing team site is primarily used as a document archive, and to store documents for future meetings. So far, there is a need for additional support for case management. The team expects to register cases before meetings, present the current agenda and related documentation during meetings, and generate after meeting minutes with corresponding status information for archiving.

4. Practice areas and their coordination mechanisms in shared workspaces

From the empirical data, six practice areas have been identified. These areas are described below, with examples and illustrative quotes.

Document Management. This practice area is "concerned with the distribution, storage and retrieval of documents" [65:530]. The processing of documents includes collaboration to a large extent [60]. With enterprise collaboration platforms, features of collaborative handling and management (e.g. collaborative creation, editing and systematizing) of traditional digital and social business documents (SBD) becomes key. SBD are user-generated semi-structured information and consist of more than a single instance; they constitute an amalgamation of objects of different social content [27:365]. In this way, a wiki entry with text, pictures and comments or a blog entry with text and links represent SBD, for example. With document management, the participating workplace teams want to work on documents collaboratively and improve the retrieval of documents through common ways of categorizing and structuring documents. One member of the ML team expresses the need for better document management: *"I've added Browzine material under Technology\Apps\Browzine". Anna immediately looked under 'Journals', as the app contains our scholarly journals[...] I'd probably have searched under 'Web' because it's not just an app now. But I'd probably put all apps under web too because our Appo-Tek [app library] is web-based"*.

Team Organization. This practice area deals with the long-term management of an organizational unit and covers typical work such as shared schedules, meeting support and documentation [57]. It includes providing the group members with essential group information (e.g. other team members' events). In enterprise collaboration platforms, there are multiple ways for organizing teams, e.g. through the built-in calendar or via shared wiki entries. Team organization is typically the baseline for other practice areas, such as co-

operation and collaboration as well as workflow management. The need for shared schedules was considered essential in all groups for the organization and coordination of their daily work.

Discussion. This practice area concerns the treatment of a topic-specific question in an open and usually informal debate [37]. Typical places to initiate discussions in enterprise collaboration platforms are the forum, or chat. Discussion topics in this study range from medical issues, education information to research councils.

Information and Knowledge Management. This practice area relates to the “management of information and knowledge itself [and includes the management of] information quality, metadata design and management, information audit [...] information architecture design” [67:23]. Enterprise collaboration platforms can both support and frustrate information and knowledge sharing [23]. Through their openness they enable users to join information and knowledge conversations, but they also facilitate selectivity in what you want to share [40]. The participating workplace teams have not only the desire to exchange information and knowledge, but also to save, structure and easily reach it: *“everything is collected and sorted by date so it’s easy to get an overview and update if you’ve been sick or absent”*. The ED team described the need to be able to quickly and easily obtain important but short-lived, local information that only applies to the group without having to log in or go through an administrator: *“what we really need is a bulletin board to push quick news, for example if we are missing staff on Saturday or about drug info”*.

Workflow Management. This practice area covers “the [management of the] sequence of tasks and who performs them, the information flow to support the tasks” [Giga Group, as cited in 38]. It can include the automation of tasks of a workflow process and also the manual determination of what tasks are performed by whom and how in office and non-office environments

[38]. The Emergency Resident Physicians require, for example, links to and the display of job relevant memos and procedures.

Cooperation and Collaboration. This practice area is typical for enterprise collaboration platforms. Collaboration refers to the mutual contribution of users to achieve a common goal. Enterprise collaboration platforms provide the functionality that allow people to work together. It goes beyond mere communication and encompasses a well-defined relationship of working together on the same task. Cooperation is similar to collaboration as people work together. However, their relationships are less well defined, and tasks are distributed and handled independently of each other [66]. From our empirical data, we identified checklists that are created in the Alfresco wiki to complete common tasks, for example. This practice area overlaps with the area “workflow management” to some extent, as working on workflows may require people to cooperate or even collaborate. Also, aspects of the area “document management”, such as collaborative editing of documents, imply collaboration.

Since the individual workplace teams from this study have their individual coordination needs, they expect and use different CM in different practice areas. Table 2 shows the CM that could be identified in this study. The table is not intended to be comprehensive and prescriptive. Instead it shows key examples of CM identified from the empirical data. The artefacts of CM stipulating and mediating the articulation of cooperative work [56] can be pre-implemented (e.g. tags) or designed by the users (collaboratively) from scratch (e.g. agenda, lists, SOP). As part of the pilot study we identified that all artefacts of the listed CM are realizable with Alfresco. They can occur in various practice areas and often in different platform components (e.g. blog, wiki, forum). The coordination artefacts provide clues of the shared workspace designs; however, they need to be studied in relation to their protocols, i.e. it is necessary to account for the ways the CM are used.

Table 2: Identified CM expected and used in different practice areas

CM	Description	Example
Descriptive metadata	Supports collaborative work by contextualizing content on an individual and collective level & therefore also provides awareness & grounded vocabulary. It allows the browsing of personal & public categorized information. [34, 68]	The HM team uses Alfresco to manage documents. They would like to tag documents with team site users’ names to assign responsibilities.
Shared calendar	Offers temporal coordination when shared within a collaborating community of practice & can be instrumental in synchronizing local activities. [3, 55]	To coordinate their work, the ED team desires a shared calendar to disseminate individual & common events.
Folder structure	Information can be saved & organized/structured via folder hierarchies supporting information navigation & search. A folder itself can act as a symbolic coordination artefact, where the creation of its name is malleable by the users. [48]	The ML team uses the document library in which folder trees are used to organize documents into different topics.
Chat	Typically useful in ad-hoc situations to coordinate group work activities. Synchronous interaction takes place in real time. [44, 61]	The ED team wants to use the chat for synchronous coordination (e.g. exchange quick work-related questions, form & organize ad-hoc teams).

Shared schedule / timeline	Serves as a work & time plan: “[A schedule] can be used to coordinate the work as it reflects the work of other, distributed in time and space, and all involved staff [...] can coordinate their part of the work according to this”. [3:221, 18]	The ML team uses Alfresco for day-to-day work. Through the start page, the current shared schedule is reached.
Pinboard/ blog message	Local & time-bound textual descriptions relevant to the respective work group team. Messages are published in reverse chronological order & can include coordinative interactions & support awareness, such as requests for personnel, or work status news. [cf. 64]	The ML team uses the blog for local & time-bound news. The ED team desires to design a message board where everyone can post (e.g. staff requests or drug information).
Theme index	Constitutes scripted coordination by providing location references of information objects. In this way, users are pointed towards spaces (e.g. forums) in which they can discuss specific topics (e.g. medical issues, scientific articles). [3, 16, 55]	Theme indices are relevant to the ED team to coordinate discussions. Via appropriate indices they wish to structure & refer to various categories or popular topics.
Links & cross-references	A link / cross-reference can link to other enterprise collaboration platform content entities & CM (e.g. common repositories, indices to available personnel) in its “organizational context in which the given cooperative work arrangement is embedded” [55:124]. In this way, it reduces the search effort by pointing to information relevant to the completion & coordination of work.	For links, the workplace teams have different areas of application to coordinate their work. For example, the ED team desires to use links in the wiki to refer to relevant sections & related documents.
Comment	Can be attached to documents as written annotation to convey coordinative interactions. It may be useful in various situations, e.g. to report on the individual work status or assign tasks & actions for document editing. [16, 55]	The ML team uses the comment function in the blog component for workplace team discussions.
Memo	A written record that can be used to perform a specific activity & remind an action to do; serves implicit task allocations. [6, 28]	The ED team desires to link to memos via the document library.
Standard Operating Procedure	Textual descriptions applied to instruct people to carry out routine operations. Typically includes the necessary activities & steps in a process. [3, 45] (Standard Operating Procedures, abbrev. SOP)	SOP could be used in medical work to provide a standard treatment. The ED team desires to point to SOP via the document library.
Checklist	Supports organizing tasks that require the completion of a set of actions. Through checking off items people can coordinate their own work & work with others. [3, 55]	For the ML team, Alfresco is a starting point for daily work, e.g. use of wiki pages to show checklists for common tasks.
List	Written text that can show to-do items similar to a checklist or plan, or a collection of items that belong to each other by any means (e.g. production items, required equipment for certain tasks or patients waiting for treatment). [3, 55, 59]	The HM team uses an excel file for case management. In future, they desire to create & maintain a case list providing a complete overview of all cases, ordering them into groups & showing different corresponding needs.
Agenda	Shows an action repository to coordinate work, e.g. exchanging hospital & patient information in a prescribed order in joint meetings. [59]	The HM team desires to present agendas on the start page to coordinate meetings and link related material to the agenda.
Version Control	Useful when digital documents need to be edited collaboratively. A version of a digital document corresponds to a time in the development of the artefact & coordinates work by typically including a version number, the person who worked on the artefact & the development state (checked in, checked out). [4, 25]	This CM is used by the ML team to avoid duplicate publishing & parallel versions of a document.

5. Shared workspace designs

In the last step, the identified CM could be mapped onto the identified practice areas. As enterprise collaboration platforms afford interpretive flexibility [14, 39], multiple purposes of use can be realized and envisioned. Figure 1 constitutes a snapshot of three different shared workspace designs as summarized below.

The *Emergency Department* (ED) team sees the potential to use Alfresco in most of the identified practice areas and requires a variety of different CM across these areas. This is little surprising due to their experience with social software in their private lives and first exploration of Alfresco’s IT capabilities. With emer-

gency resident physicians from different medical areas and departments and with different expertise, they have a high need to store and share information and knowledge. For this, they expect support through the CM pinboard, theme index, links, and chat. The latter is also expected to be used to organize the geographically dispersed team and discuss e.g. medical issues or scientific articles. Of the three workplace teams, only ED is expecting to use the chat for synchronous communication with quick answers and responses. Generally, the envisioned shared workspace includes a high degree of interaction between the members of this workplace team. They see the need to make use of CM that help coordinate their work both in office and non-office work environments. Because they have no team site in use yet, it can be expected that their shared

workspace will be designed in alternative ways as use experiences are collected. Therefore, reality may differ from initial expectations. Further, constraints such as patient confidentiality may shape their actual workspace design. As with ED, the shared workspace of the *Medical Library* (ML) team covers a range of different practice areas. The team has, however, less CM in place and desired to coordinate their work. Except for the practice area “discussion” there is little direct interaction in the shared workspace. However, all ML team members purposefully use the different CM in place to coordinate their work. Routines have emerged especially in the practice areas cooperation and collaboration where they use checklists for common tasks often related to the e-library, databases, and article orders, and information and knowledge management where they regularly create blog messages with local news required for their daily work. While document management has become a key practice area as initially expected, there is no shared agreement yet about the folder structure and how documents are tagged. The shared workspace of the *Hospital Management* (HM) team currently uses their workspace for document management including pre-designed coordination artefacts of Alfresco. Planned user-designed artefacts, such as a case list providing a complete overview of all cases or meeting agendas, mainly support the coordination of offline work (e.g. to coordinate face-to-face meetings). Yet, with only one power user, the workspace meets primarily self-coordinating purposes at present.

Figure 1 presents information on which workplace team has what kind of CM needs or uses in which of the practice areas.

		PRACTICE AREAS								
		Document Management			Team Organisation		Discussion	Information and Knowledge Management	Workflow Management	Cooperation and Collaboration
CM	Descriptive metadata (e.g. tags)	ED	ML	HM						
	Shared calendar				ED					
	Folder structure	ED	ML							
	Chat				ED	ED	ED			
	Shared schedule / timeline				ED	ML	HM			
	Pinboard/ blog message							ED	ML	
	Theme index					ED	ED			
	Links & cross-references	ED		HM				ED	ML	
	Comment					ED	ML			
	Memo								ED	
	Standard Operating Procedures (SOP)								ED	
	Checklist									ML
	List							HM		
	Agenda									HM
Version control		ML		HM						

(Emergency Department (ED), Medical Library (ML), Hospital Management (HM))

Figure 1: Practice areas and their CM of different workplace teams

Although Figure 1 incorporates workplace teams that have different status of enterprise collaboration platform use (non-use, semi-active use, active use), it exemplifies that workplace teams have creative freedom in terms of how they design and shape their shared workspaces: they can engage in different work-relevant practice areas and support them through various CM.

Because enterprise collaboration platforms are designed through use [39], it can be assumed that the shared workspace designs will be subject to change. This applies both to needs and actual uses. Over time, Alfresco users will gain competences in platform use and collect experiences so they can make sense of the spaces through appropriate practice areas and supporting CM [cf. 9]. The summary of the three workspace designs allude to the relational property of interpretive flexibility considering the material artifact and human agents and the context in which they are embedded including different work practices, types of work and constellations. In the following, we discuss the findings from a sociomaterial perspective.

6. Discussion: a sociomaterial perspective

Hauptmann and Steger [26], Jarrahi and Sawyer [31] and Ulmer and Pallud [62] have identified the potential of sociomateriality to study enterprise social software (ESS), where the latter view the appropriation of ESS to be “tightly bounded to users’ sociomaterial context and experience”. [62:11]. Following them, we consider a sociomaterial lens particularly helpful in studying the dynamics and interpretive flexibility [14] inherent in shared workspace designs of the digital workplace. In line with this lens, shared workspace designs are enacted in practice and well illustrate that “technology is not valuable, meaningful, or consequential by itself; it only becomes so when people actually engage with it in practice” [20:1246]. As members of the digital workplace have different evolving needs and uses of CM in different practice areas, we see the necessity to capture not only the variety of different CM in different practice areas but also how the shaping of the digital workplace plays out. There might be pre-implemented coordination artefacts in enterprise collaboration platforms, e.g. a chat, blog messages, or descriptive metadata, but there are no predefined ways of how they are being appropriated and used [57]. According to Orlikowski and Scott [43], the relations between humans and technologies are neither pre-given nor fixed but enacted in practice and therefore temporally emergent. In this way, coordinative protocols, encompassing a set of explicit conventions and procedures, stipulating and mediating the articulation of cooperative and distributed work and objectified in the

coordination artefact [48, 56], emerge and together with their artefacts in use reflect the sociomaterial entanglements.

For example, a blog used by the workplace teams might entail blog messages being added over time to coordinate work across different practice areas. The Medical Library team uses the blog to provide the team site members with local and time-bound news and thereby supports its information and knowledge management. These blog messages may be intended to make the workplace team members aware of clinical information relevant to their cooperative work, for instance, and also trigger further coordinative actions (e.g. adding comments to the blog messages in order to assign tasks and their responsibilities building on the shared information). The way the blog messages are framed, including text and probably other CM, such as links to documents, the audience that is targeted (e.g. only certain workplace team members) and actually reached, the way they support intended and unintended practice areas etc. become constitutively entangled in everyday practices.

Another example is the CM of a folder structure used by the Medical Library team on its platform team site to support document management. By naming folders and building a hierarchy of folders, documents can be organized into different topics. The way the folder structure is created represents individual and shared workplace team members' beliefs about and perceptions of their work as well as workplace procedures. The folder structure itself as a coordinative artefact provides orientation to how everyday activities are coordinated by pointing to places documents can be saved and found [80]. As workplace team members interact with the system and with an increasing number of documents in it, folders are being renamed and new folders are typically being created that extend the folder structure. However, as we described in section 4, one difficulty currently perceived by the Medical Library team is the creation of a folder structure that is logical to all. Some documents might be saved in folders, where other workplace team members do not expect them. As a consequence, they might be saved twice in different folders resulting in duplicate content. The workplace team has thought about adding tags to the documents to improve searchability. Establishing a common coordinative protocol for how to design and use the folder structure takes time because different people have different meanings and because they are inextricably intertwined with the material [42].

CM can also be user-designed, i.e. designed from scratch by the actors themselves [55]. One user-designed CM identified in the shared workspace analysis is a list. The Hospital Management team has not created a list in the enterprise collaboration platform

yet but wants to create one that replaces the case management list saved in an excel file and used for daily work. Although the workplace team has a general aim with this desired list, which is to provide a complete overview of all cases, group them and show different associated needs, the artefact still has to be built and a protocol defined. The definition of an artefact and corresponding protocol requires negotiating new ways of doing things and inscribing purposes and patterns of enterprise collaboration platform use. Redefinitions will typically be required to meet changing organizational requirements [55]. The social software functions (e.g. wikis, blogs) particularly enable the workplace team members to develop creativity, create user-designed content and express themselves [26]. (Joint) design decisions may encompass social software experiences and the design and use arrangements of the existing excel case list, among others.

7. Conclusion and outlook

In this paper, we illustrate the flexibility inherent in the digital workplace by identifying different needs and uses of CM in different practice areas embodied in shared workspace designs of the digital workplace. Software designers cannot know in advance how their enterprise collaboration platforms will be shaped and designed once they are introduced and in use. We have shown three different shared workspace designs with the same enterprise collaboration platform. Pre-implemented CM can be used and shaped to fit individual needs, and CM can be designed from scratch. Current research on CM have typically focused on studying a priori known CM and their malleability. In this paper we show that with the latest developments of the digital workplace researchers cannot know a priori which CM will be used, as this can be different for different teams.

Because reality is not predetermined and we expect workspace designs to be emerging in practice, we discuss our findings from a sociomaterial perspective, acknowledging that the social and material are inseparable in practice (a distinction is for analytical purposes only). We encourage researchers to rethink the coordination artefact-protocol-dyad and adopt a more entangled view of them, "human action is not just dependent on materiality and material artefacts, but is constituted by them" [15:572]. We advocate future studies of longitudinal nature to monitor the complex enactment of shared workspace designs over time, where practice areas can be reinforced. This research has the limitation that needs and uses of shared workspace designs were not studied separately, and that the data set only allowed us to capture a static picture of our phenomenon of interest. Future studies could distinguish be-

tween desired practice areas and their CM and those teams are already engaging in. Studying also larger, more experienced teams can potentially yield further insights. Upcoming research could also investigate how practice areas unfold in the digital workplace to examine how users of enterprise collaboration platforms design and make use of its available social software functionality within a constellation of social practices and thereby shape new practices (e.g. by linking up with the concept of socio-material bricolage [32]). Also, it should be considered that employees might be engaging in different shared workspace designs.

8. References

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