

Technology-Related Interruptions and Paper-Based Documents in Back-Office Knowledge Work

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Abstract

This study examines how administrative staff in the back-office aim to maintain the continuity and flow of their tasks that is critical for producing appropriate administrative results in time. Based on an ethnographic study of administrative work, the results suggest that administrative staff in a back-office environment prepare for information technology-related interruptions that may affect the continuity and flow of their tasks. To overcome and tackle these possible interruptions in the workflow, administrators interact through paper-based documents as workarounds to information technology. The study identifies and elaborates three different types of paper-based documents – recipes, proofs, and sketches. The study reveals that different materials, i.e. paper-based documents and information technologies, are closely entwined with each other in back-office work. The study begins to detect important affordances of paper-based documents as administrators attempt to work around the perceived constraints of information technology to maintain the flow and continuity of tasks in administration.

1. Introduction

Knowledge workers in contemporary organizations are active users of different information technologies [1-2]. Recently, a vivid discussion has emerged in organizational literature on the importance of the material properties of those tools that people use to carry out their daily tasks [3-5]. As Leonardi and Barley [4] argue, understanding the material properties of different tools at work matters because the users may not be able to do whatever they want; rather, they “must adapt their practices accordingly” and even develop workarounds to address the constraints of particular material means. Importantly, though, as Feldman and Orlikowski [6] have noted, tools “do not stand alone with certain inherent properties, but their material characteristics and capabilities are relevant

only in relation to specific situated practices”. In short, tools such as different information technologies, and their material properties in office work, matter, but we need to gain more understanding about why and how people use particular tools and their material characteristics in specific situated practices [5].

Besides the increase of modern information technologies, another important recognition in modern offices is that the working days of knowledge workers are full of interruptions [7-11]. Even though interruptions may have positive consequences, such as offer a break from work [7] or facilitate knowledge acquisition efforts [8], one of the key problems that Rennecker and Godwin [9], for instance, have raised is that “interruptions derail the flow of activities directed toward the accomplishment of a task”. Also, Basoglu et al. [10] have found out that frequent interruptions of complex tasks may significantly affect task accuracy and thus performance. Based on the previous literature, they list other possible negative consequences of interruptions, such as impaired task processing or increased time spent on a task. Nevertheless, even though the relationship between information technologies and interruptions has been widely studied [9-10, 21-22, 24-28], more understanding is still required on the entanglements and consequences of the ever tighter liaison between new technology and work interruptions in different contexts [11].

One context where further investigation of the above relationship is particularly justified is the knowledge work in back-offices. The reason is twofold. On one hand, administrative professionals not only increasingly encounter new technology at work [1], but they also face enormous pressures regarding “intensification of work, reduced resources, and increased expectations”, as noted by Szekeres [12]. Therefore, it is important to gain knowledge on whether possible interruptions affect their daily work and if so, how. On the other hand, the nature of their tasks calls more attention to the relationship between technology and interruptions at work. Administrative tasks can be characterized as complex and overwhelmed with details [13-14]. Therefore, an

important, constant challenge of administrators is the question how to retain and retrieve the required knowledge in time, thereby maintaining the continuity of their tasks, to accomplish the required tasks both by the book and the clock [15].

The purpose of this study is to analyze in which ways administrative back-office staff strive to maintain the continuity and flow of their tasks while attempting to accomplish their tasks and produce appropriate administrative results by the book and the clock [13-15]. The focus is on the interactions of administrators with various technologies at work - both information technologies and paper-based materials, and particularly their relationships - through which they aim to carry out their tasks correctly in time. The research is based on an ethnographic study of administrative work in a back-office environment where administrators engage with multiple technologies, such as standard and specific software for administration, as well as with electronic and paper-based documents. Documents are understood here as prescriptive devices that stand in active relationships to their contexts and that dynamically interact with their audience [16].

The results suggest that administrators use different paper-based documents to work around the possible information technology-related interruptions that they may encounter in their daily tasks. Through identification of three different types of paper-based documents – recipes, proofs, and sketches – the study detects important affordances of paper-based documents as administrators attempt to work around the perceived constraints of information technology to maintain the flow and continuity of tasks in administration and to thus meet the requirement to accomplish the administrative tasks in time and with proper procedure.

2. Interruptions in the workflow

Interruptions have been defined by Jett and George [7] as “incidents or occurrences that impede or delay organizational members as they attempt to make progress on work tasks”. Based on an extensive literature review, Jett and George have been able to identify four key types of work interruptions: intrusions, breaks, distractions, and discrepancies; each having different causes and consequences. According to Jett and George [7], an intrusion is “an unexpected encounter initiated by another person that interrupts the flow and continuity of an individual’s work and brings that work to a temporary halt”, while a break is a “planned or spontaneous recess from work on a task that interrupts the task’s flow and continuity”.

Distractions are defined by them as “psychological reactions triggered by external stimuli or secondary activities that interrupt focused concentrations on a primary task” and discrepancies as “perceived inconsistencies between one’s knowledge and expectations and one’s immediate observations that are perceived to be relevant to both the task at hand and personal well-being”.

The causes for interruptions may either be external, which refers to events in the environment, or internal, which refers more to personal work or to changes that are self-initiated [17]. Importantly, though, Jett and George [7] mainly discuss causes and consequences of interruptions that are primarily either social or psychological by nature. Technology, however, may cause interruptions in the workflow too [9], forcing individuals to multitask, thus fragmenting their daily work [10]. At worst, switching between tasks, meaning interruption of one task in order to carry out another task, can lead to mistakes and increased processing time [18]. Overall, the traces of technology-related interruptions are widely visible in organizations. For example, despite the widespread enthusiasm on the development of information technology systems in organizations, many of those developments may prove to be unsuccessful and lead to information technology failure [19]. One example of this kind of failure is that an information technology system may not work properly or as expected and intended [20]. As a consequence, these kinds of failures may “impede or delay organizational members as they attempt to make progress on work tasks” [7]. In other words, there may be interruptions in the workflow, and various workarounds are required to overcome the difficulties caused by the technological failures.

Regarding technologies and interruptions in the workflow, the existing literature has already begun to identify the different types of technology-related interruptions. Addas and Pinsonneault [21] propose that information technology use may cause two interruption types, intrusions and feedback interventions. They have studied product development work groups and analyzed the role of information technology in the necessary knowledge integration in this type of work. Addas and Pinsonneault define intrusions as “external, unexpected events that break the continuity of the groups’ work”, while feedback interventions are defined as “external events revealing perceived inconsistencies between performance expectations and actual task performance”. According to them, some examples of information technology-related intrusions are various information requests and receivals, alerts, warnings, announcements, reminders, as well as changes in tools and technologies. The argument of Addas and Pinsonneault is that

interruptions caused by information technology use inhibit knowledge integration and increase the workload of the group. Conversely, feedback interventions may have positive outcomes facilitating knowledge integration by enhancing the group's collective mind. Rennecker and Godwin [9] complement this argument by noting that people need to carefully understand their specific role in the use of information technology. An initiator of communication may experience a delay in the process of a particular task due to restricted access to a needed resource. The nature of the interruption in the workflow is then different than for those who receive the information requests and face the urgent requirements to respond to these despite other ongoing tasks.

Besides the identification of possible causes and consequences of technology-related interruptions at work, the existing literature has also begun to discuss the management of such interruptions. One important stream of this literature has focused on the analysis and development of technological solutions for how users can navigate through and handle these interruptions through, for example, various coordination interface mechanisms [22].

From the perspective of this study, however, a more relevant line of research is the one discussing various material infrastructures – and their mutual relationships – for maintaining the continuity and flow of work tasks. As Star and Ruhleder [23] have emphasized, infrastructures are an essential part of organizing. They emphasize that among the key properties of infrastructures is that they are embedded in various organizational, social, and technological arrangements invisibly supporting the flow and continuity of work tasks. Importantly, they note that infrastructures often only become visible upon a breakdown that may lead to interruptions. Recently, studies on various material infrastructures and their relationships have mostly been conducted in those work contexts (such as healthcare) that in previous years have confronted significant changes in those material infrastructures through which humans act [24-28]. As Russ et al. [25] remark, the introduction of information technology, for instance in the healthcare setting, has meant novel types of challenges in comparison to traditional paper-based documents and records, in the form of e.g. logins, reactive alerts, and computer system downtimes, which may cause interruptions and thus endanger the workflow. Russ et al. have identified several essential characteristics of the information embedded in the material infrastructures of the work context from the perspective of supporting an unbroken workflow. Some key characteristics of information identified by them were, for instance, the reliability, accessibility, and adaptability of that information. This means that

information stored in the work context in different material forms needs to be consistent, up-to-date, accurate, secure, completely available and easily accessible in order to support a continuous workflow. Moreover, Russ et al. note that information needs to be easily adaptable to various work demands to keep up the continuity in the workflow.

Importantly, however, even though the characteristics of information embedded in various material infrastructures are important for maintaining a continuous workflow, another issue that matters is the various material properties of those technological artifacts that people apply to accomplish their tasks in time. As Leonardi and Barley [4] note, it is the material properties of technological artifacts that are the tangible resources that allow or disallow people to do various things with technologies, even to maintain the continuity of the workflow. They emphasize that it is the material “features of particular artifacts that become entangled in the social practices of people's work”. Therefore, as noted by Feldman and Orlikowski [6], our interest ought to be in analyzing which material characteristics of technological artifacts are relevant in specific situated practices and how. In other words, a closer examination of the material properties of various technologies to reveal their constraints and affordances as well as the relationships between various technologies is needed to gain understanding on the practices of maintaining the continuity of the workflow and thereby accomplishing the work tasks.

3. Workarounds

Leonardi and Barley [4] note that the material properties of technological artifacts act as an impulse for the workarounds to address the lack of knowledge or abilities or to do the desired things with technologies in order to, for instance, maintain the workflow and thereby carry out administrative tasks properly and in time. Workarounds, according to Gasser [29], are adhoc strategies used for problem-solving. More particularly, Gasser, who has studied computing, defines that “working around means intentionally using computing in ways for which it was not designed or avoiding its use and relying on an alternative means of accomplishing work”. The existing literature has different views regarding the motives of workarounds. Yang et al. [28], for instance, emphasize that the motive of workarounds is particularly in getting around some particular problem in the work process instead of plain resistance towards, for example, computing. Pollock [30], again, takes a stronger view by emphasizing that the users of a technology are not only shaped by the technology but also its active shapers,

and thus, workarounds may represent attempts to “wrest control back from a technology or an institution”.

Much of the existing literature on workarounds has explored the practices and processes of workarounds within one technology, i.e. information technology. This might be the case because Gasser [27], in his seminal work on workarounds, focused particularly on computing. As a result, he identified three specific forms of workarounds: data adjustment, procedural adjustment, and various alternative or backup systems which may be either manual or automated. Importantly, even though Gasser’s focus was on computing, the above results on the various forms of workarounds, particularly procedural and alternative systems, referred to the existence of multiple parallel technologies and their close relationships in workarounds. As an example of a procedural adjustment, Gasser mentioned acquisition of a handwritten document containing necessary information to be entered into the information systems. In this example the handwritten document worked around the delay in the otherwise computerized ordering procedures. As an example of alternative or backup systems, Gasser mentioned “duplicate records, additional data not kept in the computer systems, notes on computer-based reports, etc.”. Altogether, these examples suggest that the relationships of multiple technologies in the practices and processes of workarounds need further investigation.

One way to proceed in gaining understanding on the workarounds is investigation of the material properties of technological artifacts. As already mentioned, this is because it is the material properties that act as an impulse for the workarounds to address the lack of knowledge or abilities or to do the desired things with technologies. Regarding information technologies and particularly software, Leonardi and Barley [4] note that material properties refer to “features that provide opportunities for or constraints on action”. The existing literature has already begun to analyze and identify the affordances and constraints of both information technologies and paper-based documents in different types of work settings. For instance, Henderson [31] has studied work practices in design engineering in the area of machine building. She found out that paper-based sketches and drawings allow making visual representations that provide flexibility, for instance, in knowledge interpretation and circulation. In contrast, computerized tools for making engineering drawings proved inflexible in practice, causing, for instance, communication breakdowns in the work processes. Saleem et al. [22] in turn have studied paper use with electronic records in the area of healthcare work. Their results reveal

several paper-based workarounds associated with electronic medical records. They found out, for example, that paper-based documents allowed either actual or perceived efficiency of the work processes. Furthermore, paper-based documents allowed ease of use in comparison to electronic devices. All in all, these studies begin to suggest that paper-based documents may act as important workarounds to information technology. The relationships of these different technologies in various contexts and situated practices, however, need further examination.

4. Research setting and methods

4.1. Research setting

The context of this study is the back-office administrative department in a university. At the time of the research, autumn 2009, the university was undergoing a critical transition period. It prepared for a merger with two other universities, which took place at the beginning of 2010. From the perspective of administration, the forthcoming merger meant, for instance, an intensification of preparations to apply electronic systems more extensively in administrative work.

In the department in focus, the study examines the work of those university administrators who deal most importantly with human resources, finance, bookkeeping and academic administration. These are the administrators who process different kinds of bills, applications, and contracts which pour onto their desks mainly from academic service staff from various university departments and disciplines. Even though the content of the different back-office tasks that the administrators in this study carry out may vary even to great extent, the nature of their administrative tasks can be characterized as complex and overwhelmed with details [13-14]. As Wagenaar [13] in his study on administrative work has noted, one of the key tasks and challenges in everyday administrative work situations is to “act on the situation at hand” and “turn the partial descriptions of such situations, as exemplified in formal rules and procedures, into concrete practical activities with acceptable and predictable outcomes”. In this kind of a setting, where the administrators face various kinds of complex demands from multiple sources, another important challenge for them is the question how to retain and retrieve the required knowledge in time to accomplish the required tasks both by the book and the clock [14].

In carrying out their detailed and complex tasks, the administrators dealt both with various information technology tools and paper-based documents. The

workstation of each administrator was equipped with a networked desktop computer and either a landline telephone or a standard mobile phone. All the administrators used standard Microsoft Office programs, such as Outlook, Word, and Excel, and some were also utilizing the PowerPoint program. Moreover, many of the administrators interacted with more specialized office programs designed for bookkeeping, finance, archiving, or personnel management purposes.

4.2. Ethnographic approach

This study is based on an ethnographic research approach [32]. The main method here for doing ethnography was participant listening [33]. According to Forsay [33], participant listening is not only a valid but also an important way of producing ethnographic data, which often, however, may remain undervalued in comparison with participant observation. Following the chosen approach, the primary way of collecting data in the study was to focus on what we hear in the field through engaged listening, either in formal interviews or casual conversations. With regard to interviews, we conducted 14 in-depth interviews in total during a five month period between September 2009 and January 2010. These interviews included both administrators in the back-office administrative department of the university as well as their coworkers in the administrative service center, to which some of the administrative back-service tasks had been outsourced. Moreover, five interviews were made outside the context of administrative work with two executives in private companies and with three independent professionals: a journalist, a consultant, and an architect. The reason for carrying out the interviews with non-administrators was that this kind of zooming out of a certain context may crystallize the specificities of the studied context [34].

It is important to mention here that the original aim of the ethnographic study was to explore mundane materials, specifically paper, in administrative office work. Therefore, in collecting empirical material and in the interview situations the focus was on paper and paper documents as material in an administrative office environment. The administrators were asked such questions as ‘what kinds of papers do you use in your work; what do you do with paper at work; how do you use different paper documents at work; why do you use paper documents, for instance, in comparison to computers, software programs or digital files’.

In the interview situations, we also took photographs of the interviewees’ offices. The aim in this was not so much to gather images [35] of administrative offices for further analysis, but rather in

the photographing in itself. Namely, it soon became evident that taking photographs helped us to zoom in [34] on some specific artifacts in administrative offices, such as binders, folders, or paper piles, and then to ask specific questions concerning these artifacts and the practices related with them. The camera then provided us with an additional way of conducting interviews and to engage in participant listening [33] at the research site. Moreover, besides the interviews, we had numerous casual conversations in the institute relating to people’s experiences and accounts concerning administrative processes.

To analyze the research material, we carefully read through the interview transcripts and fieldnotes several times in order to first gain an understanding of what administrators do in offices. This first round of analysis resulted in the identification of several paper-related practices in administrative back-office work [36]. Importantly, however, in relation to these paper-based practices, it often seemed that the interviewees felt a strong need to defend their paper files and piles and explain their resistance to rely purely on digital documentation. Therefore, in the second round of analysis we specifically focused on those situations when administrators talked about their paper use in comparison or relation to information technology. The aim was to gain understanding on the possible problems of information technology that administrators tried to solve through using paper. This resulted in an emergent understanding that administrators fear that information technology may somehow interrupt the administrative workflow. Administrators implicitly spoke about paper documents as workarounds to possible technology-related interruptions in the administrative workflow. Therefore, we then proceeded to examine the type and purpose of the paper documents more carefully to gain more detailed knowledge on the essentials of such possible interruptions. As a result, we identified three different types of paper documents and their relationships with possible technology-related interruptions in administrative back-office work.

5. Three types of paper-based documents

The results of this study suggest that administrative staff in a back-office environment prepare for information technology-related interruptions that could affect the continuity and flow of their tasks. The administrators fear that interruptions in the workflow may take place if they do not gain access to the relevant information in time, the information that they have is either inadequate or faulty, or the information cannot be easily put in a proper form. To overcome and

tackle these possible interruptions, administrators interact with paper-based documents as workarounds to information technology. There are at least three different types of paper-based documents – recipes, proofs, and sketches – that act as important workarounds to information technology in administration.

5.1. Recipes to secure access to information

The first type of paper-based documents in administration can be termed as recipes. According to the definition of Baden-Fuller and Morgan [37], recipes “lie between principles – general theory – and templates – exact and exhaustive rules”, and “demonstrate or give advice about how to do something so that the results will come out right”. Here, this means that recipes are based on formal, often legal rules and regulations that are locally interpreted and complemented according to either general administrative or organizational principles. Paper-based recipes then seem to respond to the constant challenge faced by administrators at their daily work as described by Wagenaar [13] and Cook and Wagenaar [14], i.e. of how to do things right and produce appropriate administrative results according to the formal rules and procedures. These often are complex and full of detailed information but still not complete, and only partially described and exemplified.

In this study, administrators in the university back-office talked about paper-based recipes as workarounds to information technology in administrative situations consisting of two challenging elements. One dealt with the question of access to the necessary information on the formal administrative guidelines, while the other was related to the question of completeness of information on the prescribed administrative processes. Importantly, the issues of information access and completeness seemed to be closely intertwined as recipes were applied as workarounds to information technology. This can be illustrated by two exemplary situations described by the administrators.

First, regarding access to the necessary information, the administrators talked about the difficulty of searching and finding the required information in large electronic document sets. An administrator gives an example of searching information from a paper-back book in comparison to a website: “The government budget [as a paper-back book] is much more convenient [than the website]. ... Particularly when you search after a particular piece of information, [the book] is much easier.... [Using the] computer, you either scroll things [by the information] and then you have to go backwards or you stop too early. [But], if

you scan through the book, you are pretty much on the right page. I think that it is faster.”

Importantly, though, the question was not only about finding the information. Instead, the administrators needed to make sure that the information was complete and up-to-date and to make appropriate interpretations of it concerning the administrative situation at hand, too. This might have required contacting the responsible authorities or management and saving the collected additional information as hand-written notes in the margins of the paper-based documents for similar cases in the future. It is then these notes act as recipes in complex administrative situations. As an administrator says: “In the book, I can make notes and highlight [important points] to emphasize that I need to do that in this way and that I have checked this information from government authorities and I can add exceptions too. I make these kinds of notes a lot as I use the book.”

Another administrator continues: “You do not necessarily find what you are searching after at a website. This happened to me last time when we were balancing the books. I tried to find information on the exact classification of various accounts of the State Treasury, and I did find it but not for the year [that I needed]. I contacted the State Treasury, and they just gave me the name of the website where I should be able to find it. But, it was not there. Instead, there was a link to information from the previous year. ... Updating the website [can be] easily forgotten.”

The second example given by the administrators emphasizes the incompleteness of the existing formal guidelines and the constant requirement to be alert as to completing the guidelines to suit the appropriate administrative cases and to keeping these completed guidelines as recipes for similar kinds of future cases. Put differently, the administrators often described situations where the existing formal orders were not detailed enough and they would have to collect information from different sources on how to carry out the administrative task at hand. When they had solved the case, they would make careful notes on it and save them in paper format for similar kinds of cases in the future. Many of the administrators had a collection of these kinds of recipes, which they had organized in folders and stored on office shelves near their computers. A quote from an administrator illustrates the situation: “In case there is a more special case, I print it out, make my notes and put it in a safe place. Next time, when I have to clarify [a similar kind of a case] I have it [my notes how to do it] written down.”

Importantly, making notes in electronic documents is technically possible, but in practice there can be some major obstacles to making them. As one administrator notes: “I know how to use information

technologies rather well. Nevertheless, the original receipts have a formal, legal status. Therefore, you cannot make any permanent notes in them.”

The two examples described above suggest that administrators use paper-based documents as recipes to secure access to the necessary information in time. Importantly, the information contained in the paper-based recipes is complex and difficult to otherwise gain access to since it has been collected from different sources and then put together. Moreover, the recipes are not necessarily needed daily, but instead, they are for rare, specific cases. In these situations, paper-based recipes act as workarounds to information technology and allow administrators to avoid possible interruptions in the workflow of administrative processes, which would manifest as delays due to the requirements of collecting information from different sources.

5.2. Proofs to correct mistakes

The second type of paper-based documents in administration was proofs. Proofs are important documents since they act as a piece of evidence both for the administrators themselves as well as for their colleagues to show that the administrators have carried out their tasks correctly; both in terms of time and procedure [15]. Importantly, the proofs are not necessarily actively processed by the administrators, but their primary importance seems to be in their availability ‘on hold’. Only in problematic situations that might endanger the administrative workflow the proofs are laid out and referred to. Such problematic situations were often related to existing or perceived failures in information technology, particularly in cases of document transfer or transformation.

Regarding the question of document transfer it is important first to understand that administrative work often consists of distinct but further related tasks [13]. Carrying out these kinds of tasks requires coordination and intense involvement with others. In this study, the close relatedness of tasks manifested in a form that some of the administrative tasks concerning, for instance, the billing were first carried out in the university back-office, after which the bills were forwarded to the service center for completion. More particularly, the payment orders were transferred to the service center electronically, and in some cases even supported by the physical transfer of paper-based documents too. The transfer of documents sometimes created confusing situations entailing suspected document loss and thus potential interruptions in the administrative processes. For these reasons, the administrative staff took copies of the documents that they had processed and sent forward and kept them as

proofs of the tasks carried out. An administrative manager says: “Now, when electronic archiving has proceeded to a stage when we do not need to take paper copies in our own files any more, I have noticed that some people still take copies because of our service center. Some people feel that documents have gotten lost and therefore not been processed. So, they want to make sure that they have a copy [of the document] in case the matter should remain uncompleted.”

Besides document transfer, another critical situation from the perspective of potential interruptions in the administrative processes concerns document transformation from paper-based into digital format. The transition to the electronic billing system in the university has led to a practice of scanning paper-based bills into the electronic system. This is because even today some bills arrive in paper format for various reasons. Moreover, receipts are often paper-based too. The scanning of the bills and receipts, however, is vulnerable to mistakes, and for these reasons the administration saves and keeps the original paper-based bills as proofs for some time. An administrative manager continues: “We had to keep the paper bills for a while in case some ambiguities would emerge. Something could have gone wrong in the scanning process; the side had turned upside down [for instance] and you could not find the document. In those cases, you needed to find the [paper] documents and do the scanning again.”

The existence of paper-based proofs can be interpreted to reflect the lack of trust in information technology in an organization. The manager of the service center tries to summarize the sense of uncertainty related to information technology in administration: “When you print out the bill and put that paper in an envelope you can be pretty sure that it [leaves the office] and goes at least somewhere. But, when [the bill] gets into that cyber space, the role of the IT systems gets emphasized ...the bills just don’t always get transferred in the system. There are some kinds of failures [in the system] and you get a notice of a system error so that you have to do some procedures to make the transfer again. ... But it is important to get that impulse that there is an error in the system. Electronic [systems] bring along a lot of sense of uncertainty, since you cannot see [it concretely] what you send.”

In brief, then, administrators keep paper-based documents as proofs easily available to clarify possible problems, ambiguities, or even errors potentially emerging in document transformation or transfer in order to overcome interruptions in the workflow.

5.3. Sketches to avoid distractions

Finally, aside from recipes and proofs, the third type of paper-based documents that administrators apply at their daily tasks were sketches. In essence, sketches serve as tools for both thinking and communication [31]. Typically, we best associate sketches with creative work where conceptual design is required. Some examples could be, for example, the work of architects, designers, and engineers. Although administrative work can be considered as bureaucratic [38], requiring abilities to both follow, apply, and interpret formal rules and procedures, it too may contain situations where creative thinking and drawing sketches are required. Some examples could be administrative tasks that are complex and cross boundaries beyond organizational entities such as departments [39]. As thinking devices, sketches help to catch ideas and pose questions for further development. The manager of the administrative service center gives an example of the use of paper documents as sketches serving as thinking devices: "This piece of paper seems simple, but it contains many different work stages. I started from the basic [information] and then gained an important idea. If I had only kept staring at the computer screen and looking at the document, I most likely would not have reached the idea which I did with the help of using a piece of paper. ... I do not know how this works for others but I have experienced the same many times before. ... For these reasons, paper [as a material] is invaluable to me."

An essential element of sketching, besides writing, as described by the manager of the service center above, but also drawing. We are used to seeing architects' drawings for buildings, and engineers' for technologies. However, the pictures that administrators draw entail processes. A fundamental dimension of sketches is that they are in process, which means that they retain an element of incompleteness [40]. In essence, people start out a sketch from somewhere, add something to the sketch, make some modifications to it, perhaps even erase something from the sketch, before adding something else to it again. The manager of the service center discusses the role of paper for sketching purposes: "Paper is an extremely creative material. The reason why I take printouts is that I like to make [different] marks that I cannot make on the computer. The computer restricts my creativity. How could I connect this creativity to the computer?"

The manager continues: "It sort of makes things simple, the paper and the pen. You focus on the topic. It is not about the equipment. There are all sorts of software for drawing and other fancy gadgets. But, all of a sudden it happens that the tools become more

important. They take your thoughts away [from the topic]. I at least like to have that blank piece of paper and start building from scratch. ... If a consultant comes and applies some [technological] tools, it just turns you off. Or, then your eyes are only on how the program functions."

The manager of the service center claims that paper keeps his attention on the subject matter better than any other, more sophisticated technologies, which may cause interruptions in the creative thinking processes. The comments of the administrative manager then suggest that the use of more elaborated technologies for sketching might not be unproblematic for the reason that information technologies can be too rigid or inflexible [31]. Moreover, information technologies may prove either too fascinating or complex and thus distract attention from the administrative tasks themselves. To avoid and overcome these kinds of interruptions in the workflow, administrators take advantage of paper-based sketches particularly in the creative phases of their work. Paper-based sketches then act as thinking devices for administrators' information and assist in putting the information into proper form. Due to their simplicity, sketches help administrators to keep their attention focused on the subject matter.

6. Discussion and conclusions

The results of this study suggest that administrators prepare for potential information technology-related interruptions. Such interruptions cause concern for administrators since they may break the flow and continuity of administrative tasks, thus leading to problems in the accomplishment of the tasks by the book and the clock. To avoid and tackle interruptions of this kind, administrators use three different types of paper-based documents – recipes, proofs, and sketches – as workarounds to information technology. The identified paper-based documents seem to offer important affordances for administrators to work around the perceived constraints of information technology in administration. Regarding the specific forms of workarounds identified by Gasser [29], recipes and proofs seem to act particularly as backup systems, and sketches as alternative systems in relation to computing.

The results suggest that in the case of recipes their specific affordance in administration lies in easy access to the complex, detailed information that is necessary particularly in the completion of rare administrative tasks. In comparison to those electronic documents that have a legally formal status, hand-written notes are doable in printouts and can therefore act as important

recipes for administrators. The type of technology-related interruptions that recipes aim to harness is delays. Recipes help in storing and retrieving information effectively in situations when the information is complex and possibly difficult to collect from different sources.

Besides recipes, paper-based proofs clearly act as backup systems too. Similarly to recipes, the specific affordance of proofs lies in their ability to store and retrieve information. Moreover, they allow preventing information deficiencies and correcting mistakes. The type of technology-related interruptions that they aim to harness is twofold. On one hand, they help to overcome delays in administrative processes through the retrieval of electronic documents that may be missing. On the other hand, they help to tackle information discrepancies, namely, in Jett and George's words [7], "perceived inconsistencies between one's knowledge and expectations and one's immediate observations that are perceived to be relevant to the task at hand", which may originate in the interface of paper-based and electronic documents in the document transformation process.

Finally, paper-based sketches act as alternative systems to information technology. Their particular affordance lies in flexibility of use in creative processes [31] due to the simplicity of their material properties in comparison to software programs designed particularly for drawing. The technology-related interruptions that paper-based sketches tackle resemble distractions, which according to Jett and George [7] are "psychological reactions triggered by external stimuli or secondary activities that interrupt focused concentrations on a primary task".

It is important to remind here that the preliminary aim of this study was to explore the use of paper-based documents in administration. The analysis of the empirical material pointed out the importance of paper-based documents as workarounds to avoid and tackle information technology-related interruptions. The identified paper-based documents, i.e. recipes, proofs and sketches, were found to contain affordances in specific situated administrative practices, such as note making, electronic document transfer, scanning, and sketching. Overall, the results refer to a co-existence of multiple technologies in administrative knowledge infrastructures in the processes and practices of maintaining a continuous workflow.

7. References

- [1] U. Eriksson-Zetterquist, K. Lindberg, and A. Styhre, "When the Good Times Are Over: Professionals Encountering New Technology", *Human Relations*, vol. 62, no.8, 2009, pp. 1145-1170.
- [2] S.R. Barley, D.E. Meyerson, and S. Grodal, "E-mail as a Source and Symbol of Stress", *Organization Science*, vol. 22, no. 4, 2011, pp. 887-906.
- [3] W.J. Orlikowski and S.V. Scott, "Sociomateriality: Challenging the Separation of Technology, Work and Organization", *The Academy of Management Annals*, vol. 2, no. 1, 2008, pp. 433-474.
- [4] P.M. Leonardi and S.R. Barley, "Materiality and Change: Challenges to Building Better Theory about Technology and Organizing", *Information and Organization*, vol. 18, no. 3, 2008, pp. 159-176.
- [5] P.M. Leonardi and S.R. Barley, "What's Under Construction Here? Social Action, Materiality, and Power in Constructivist Studies of Technology and Organizing", *The Academy of Management Annals*, vol. 4, no. 1, 2010, pp. 1-51.
- [6] M.S. Feldman and W.J. Orlikowski, "Theorizing Practice and Practicing Theory", *Organization Science*, vol. 22, no. 5, 2011, pp. 1240-1253.
- [7] Q.R. Jett and J.M. George, "Work Interrupted: A Closer look at the Role of Interruptions in Organizational Life", *Academy of Management Review*, vol. 28, no. 3, 2003, pp. 494-507.
- [8] M.E. Zellmer-Bruhn, "Interruptive Events and Team Knowledge Acquisition", *Management Science*, vol. 49, no 4, 2003, pp. 514-528.
- [9] J. Rennecker, and L. Godwin, "Delays and Interruptions: A Self-Perpetuating Paradox of Communication Technology Use", *Information and Organization*, vol. 15, 2005, pp. 247-266.
- [10] K.A. Basoglu, M.A. Fuller and J.T. Sweeney, "Investigating the Effects of Computer Mediated Interruptions: An Analysis of Task Characteristics and Interruption Frequency on Financial performance", *International Journal of Accounting Information Systems*, vol 10, 2009, pp. 177-189.
- [11] J. Wajcman and E. Rose, "Constant Connectivity: Rethinking Interruptions at Work", *Organization Studies*, vol. 32, no. 7, 2011, pp. 941-961.
- [12] J. Szekeres, "General Staff Experiences in the Corporate University", *Journal of Higher Education Policy and Management*, vol. 28, no. 2, 2006, pp. 133-145.
- [13] H. Wagenaar, "'Knowing' the Rules: Administrative Work as Practice", *Public Administration Review*, vol. 64, no. 6, 2004, pp. 643-655.
- [14] S.D.N. Cook and H. Wagenaar, "Navigating the Eternally Unfolding Present: Toward an Epistemology of Practice", *The American Review of Public Administration* vol. 42, no 1, 2012, pp. 3-38.
- [15] H. Rämö, "Doing Things Right and Doing the Right Things: Time and Timing in Projects", *International Journal of Project Management*, vol. 20, no. 7, 2002, pp. 569-574.
- [16] C. Osterlund and K. Crowston, "What Characterize Documents that Bridge Boundaries Compared to Documents that Do Not? An Exploratory Study of Documentation in FLOSS Teams", *Proceedings of the 44th Hawaii International Conference on System Sciences*, 2011, pp. 1-10.
- [17] G. Mark, V.M. Gonzalez, and J. Harris, "No Task Left Behind? Examining the Nature of Fragmented Work",

- Conference on Human Factors in Computer Systems (CHI) 2005, pp. 321-330, Portland, Oregon, USA: ACM Press.
- [18] J.-M. Cellier and H. Eyrolle, "Interference Between Switched Tasks", *Ergonomics*, vol. 35, no. 1, 1992, pp. 25-36.
 - [19] S. Goldfinch, "Pessimism, Computer Failure, and Information Systems Development in the Public Sector", *Public Administration Review*, 2007, pp. 917-929.
 - [20] M. Wilson and D. Howcroft, "Re-conceptualising Failure: Social Shaping Meets IS Research", *European Journal of Information Systems*, vol. 11, no. 4, 2002, pp. 236-250.
 - [21] S. Addas and A. Pinsonneault, "IT Use and the Interruption of NPD Knowledge Work", *Proceedings of the 43rd Hawaii International Conference on System Sciences*, 2010, pp. 1-10.
 - [22] D.C. McFarlane and K.A. Latorella, "The Scope and Importance of Human Interruption in Human-Computer Interaction Design", *Human-Computer Interaction*, vol. 17, 2002, pp. 1-61.
 - [23] S.L. Star and K. Ruhleder, "Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces", *Information Systems Research*, vol. 7, no. 1, 1996, pp. 111-134.
 - [24] B. Azad and N. King, "Enacting Computer Workaround Practices Within a Medication Dispensing System", *European Journal of Information Systems* vol. 17, 2008, pp. 264-278.
 - [25] A.L. Russ, J.J. Saleem, C.F. Justice, H. Woodward-Hagg, P.A. Woodbridge, and B.N. Doebbeling, "Electronic Health Information in Use: Characteristics that Support Employee Workflow and Patient Care", *Health Informatics Journal*, vol. 16, no. 4, 2010, pp. 287-305.
 - [26] J.J. Saleem, A.L. Russ, C.F. Justice, H. Hagg, P.A. Woodbridge, and B. N. Doebbeling, "Paper Use with the Electronic Medical Record: An Important Supplement or Negative Circumvention", *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 2008, pp. 773-777.
 - [27] J.J. Saleem, M. Flanagan, L.G. Militello, N. Arbuckle, A. L. Russ, A. L. Burgo-Black, and B. N. Doebbeling, "Paper Persistence and Computer-based Workarounds with the Electronic Health Record in Primary Care", *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 2011, pp. 660-664.
 - [28] Z. Yang, B.-Y. Ng, A. Kankanhalli, and J.W.L. Yip, "Workaround in the Use of IS in Healthcare: A Case Study of an Electronic Medication Administration System", *International Journal of Human-Computer Studies*, vol. 70, 2012, pp. 43-65.
 - [29] L. Gasser, "The Integration of Computing and Routine Work", *ACM Transactions on Office Information Systems*, vol. 4, no. 3, 1986, pp. 205-225.
 - [30] N. Pollock, "When is a Work-Around? Conflict and Negotiation in Computer Systems Development", *Science, Technology & Human Values*, vol. 30, no. 4, pp. 496-514.
 - [31] K. Henderson, "Flexible Sketches and Inflexible Data Bases: Visual Communication, Conscriptioin Devices, and Boundary Objects in Design Engineering", *Science, Technology, & Human Values*, vol. 16, no., 4, 1991, pp. 448-473.
 - [32] S. Ybema, D. Yanow, H. Wels, and F. Kamsteeg, "Studying Everyday Organizational Life", In: S. Ybema, D. Yanow, H. Wels, F. Kamsteeg (eds.), *Organizational Ethnography*, 2009, pp. 1-20. London: Sage Publications.
 - [33] M.G. Forsey, "Ethnography as Participant Listening", *Ethnography*, vol. 11, no. 4, 2010, pp. 558-572.
 - [34] D. Nicolini, "Zooming In and Zooming Out: A Package of Method and Theory to Study Work Practices", In: S. Ybema, D. Yanow, H. Wels, and F. Kamsteeg (eds.), *Organizational Ethnography*, 2009, pp. 120-138. London: Sage Publications.
 - [35] D. Harper, "Framing Photographic Ethnography: A Case Study", *Ethnography*, vol. 4, no. 2, 2003, pp. 241-266.
 - [36] S. Yli-Kauhala, M. Pantzar, and S. Toyoki, "Mundane Materials at Work: Paper in Practice", In: E. Shove, N. Spurling (eds.), *Sustainable Practices: Social Theory and Climate Change*, 2013, pp. 69-85. London: Routledge.
 - [37] C. Baden-Fuller and M.S. Morgan, "Business Models as Models", *Long Range Planning*, vol. 43, no. 2-3, 2010, pp. 156-171.
 - [38] M. Korczynski, "Back-Office Service Work: Bureaucracy Challenged?", *Work, Employment and Society*, vol. 18, no. 1, 2004, pp. 97-114.
 - [39] J.A. Collinson, "Just 'Non-academics'? Research Administrators and Contested Occupational Identity", *Work, Employment and Society*, vol. 20, no. 2, 2006, pp. 267-288.
 - [40] B. Ewenstein and J. Whyte, "Knowledge Practices in Design: The Role of Visual Representations as 'Epistemic Objects'", *Organization Studies*, vol. 30, no. 1, 2009, pp. 7-30.