

## **Electronic Records Use Changes Through Temporal Structures and Rhythms**

**Erik A.M. Borglund**

### **Abstract**

Electronic records management is a part of the information management domain. Knowledge about how electronic records are used is important to design e.g. electronic records management systems (ERMS), when records at creation must meet stated and implied needs both present and future. Knowledge about the use of electronic records can result in design implications for information systems managing records. The use of electronic records has been studied, and variations in that use, by applying a temporal lens. The research aims to study how temporal structures in a knowledge intensive and time-critical organization affect the use of electronic records. The Swedish police have been studied, guided by the following research question: "How do different temporal structures in operational police work affect the use of electronic records?" The study uses qualitative research. The research shows that the use of electronic records shifts depending on different temporal structures,

and moves from traditional user, mediated user, "bricoleur", and producer. The shifts and variations in the use of electronic records are important considerations in design, when all these different users' needs must be fulfilled.

**Key words**

Electronic records use, Knowledge intensive work, Police, Temporal structures, Time critical work.

**I. Introduction**

The purpose of this paper is to show how time influences the use of records within a knowledge intensive organization.

Records management is a part of the information management domain (Bouthillier & Shearer, 2002), and records born digitally have given birth to the concepts of electronic records and electronic records management (Duranti, 2001b; Reed, 2005). Electronic records management and studies of both records management and use of records have been one of many major emergent areas of research engagement by the archival science community (Gilliland & McKemmish, 2004). Knowledge about how electronic records are used is important, when records at creation must meet stated and implied needs, both present and future, as records never can be changed, c.f. Reed (2005). Electronic records are managed within different information systems<sup>1</sup>, which implies that the information

---

<sup>1</sup> In this paper the term information system is synonymous with a computer based information system.

systems should also fulfill stated and implied needs for future and present users of electronic records. When it is intended to preserve electronic records for the long term, knowledge of future use complicates systems design even further.

Use of records has been characterized as very difficult to predict, resulting in the concept of "unknown use" (E. Borglund, 2006; E. Borglund & Öberg, 2006). Electronic records are logical entities and not physical (Dollar, 1992), and they need an information system to be understood. This makes it implicitly very difficult to separate the use of an information system managing electronic records from the use of electronic records themselves (E. Borglund, 2005). It also makes design of such information systems very important, if electronic records' requirements should be maintained. Electronic records requirements are, for example, authenticity, and reliability (Reed, 2005); which are essential if electronic records are to be trustworthy (Duranti, 2001b), and support accountability (Meijer, 2001a, 2001b). There is a complex and rather unexplored research field about the use of electronic records. Therefore it is important to gain knowledge about the use of electronic records in order to identify design implications for information systems managing electronic records.

Records are evidence of activities, actions, and transactions (Reed, 2005). And this evidential value makes the record a trustworthy information source in organizations, and implicitly very useful. According to archival theory (Schellenberg, 1998; Shepherd & Yeo, 2003) the purposes of records' use can be divided into two different areas: primary purpose, and secondary purpose. Put simply, the

primary purpose is within the business process where the record is born, and the secondary purposes cover all uses that not are bound to the original business process. But this categorization has its roots in the management of paper-based records. With technology and electronic records it is possible to use records differently, and one could argue, that systems design implications should be governed by the ways electronic records are used, and not based on use of paper-based records. According to the records continuum model, the electronic record most likely shifts in activity throughout its existence (Upward, 2000, 2005).

This paper has focused on one specific kind of organization, namely law enforcement, where the use of electronic records is widespread. The police are characterized as a time-critical and knowledge intensive type of organization where records (both paper-based and electronic) are an important information source (Chen et al., 2002; Chen, Zeng, Atabakhsh, Wyzga, & Schroeder, 2003). Records are also important in police work to keep evidence of activities. In police work, activities must be recorded to fulfill the rule of law and ensure individuals' legal rights. Police work is unique in many ways and one such area is that the police have legal right to restrict citizens' freedom of action. The police also have legal right under certain circumstances to use force against persons and properties. Records are evidence of accountability in the police, an important requirement in a democratic society. But the most important part records plays in police work are to support the core business, i.e. to prevent crimes, investigate crimes, and disclose crimes.

Police work is very dependent on accurate and reliable information (E. Borglund, 2005; E. Borglund & Nuldén, 2006) for instance as a basis to make correct legal and tactical decisions. Sufficient availability of information is necessary for fully functional police work (Chen et al., 2002; Chen et al., 2003). The importance of gathering information from different sources in operational police work has resulted in several research contributions (see e.g. Brahan, Lam, Chan, & Leung, 1998; Oatley & Ewart, 2003; Redmond & Baveja, 2002), but no research has been found which focuses on the role electronic records has in operational police work. Knowledge about how electronic records are used in knowledge intensive and time critical organizations could therefore contribute to the way in which information systems that manage electronic records in such organizations could be designed and developed.

The importance of gaining knowledge about users is well described in information systems literature, for example in literature about development and design of information systems (Mathiassen, Munk-Madsen, Nielsen, & Stage, 2001). In the Scandinavian School of information systems research there is a tradition of research on user participation in information systems design (c.f. Bjerknes & Bratteteig, 1995; Nielsen & Relsted, 1994). This paper adopts this Scandinavian research tradition, which can be described as a theory and design oriented study of the use of information technology (Dahlbom, 1996).

Time is embedded in electronic records management, as many records are going to be preserved for the long term. Time and temporal structures have received extensive interest from the

information systems research community (Ancona, Goodman, Lawrence, & Tushman, 2001; Ancona, Okhuysen, & Perlow, 2001; Orlikowski & Yates, 2002; Reddy & Dourish, 2002). Time and temporal structure have been presented by Orlikowski & Yates (2002) as components that affect work practice and implicitly affect the way information systems are used. In this paper a temporal lens is applied by using the notion of temporal structure in our investigation and study of electronic records use in operational police work.

The research question that has guided this research has been: "How do different temporal structures in operational police work affect the use of electronic records?"

The purpose of this paper is to increase knowledge about how electronic records are used in knowledge intensive and time critical work practice and thus implicitly to contribute to the research field of electronic records use. The results reported here will be of use in the design of information systems managing electronic records.

This paper is part of a larger ongoing research program about electronic records management in both private and public organizations. The police are a public organization with huge amounts of electronic records which, depending on regulations, need to be preserved forever (E. Borglund, 2005). However, the results are not confined to the police domain alone. They are transferable to other organizations that can also be characterized as knowledge intensive and time critical.

The remainder of this paper is organized as following. Section 2 forms the theoretical framework for this paper. Section 3 presents the applied research method. Section 4 and 5 presents the results from the research, which are discussed in section 6. The paper ends with concluding remarks and outlines for future research in section 7.

## **II. Theoretical framework**

This section provides the theoretical framework for this paper, beginning with a theoretical presentation of temporal structures, followed by a theoretical presentation about electronic records. The section ends with a brief overview about use.

In organizations people understand time differently and form different temporal structures. The temporal structure is a perception of time that a group of people agrees upon, i.e. they share the same temporal structure (Orlikowski & Yates, 2002). People in organizations create those temporal structures in their daily activities, which help them in their tasks, i.e. temporal structures are socially shaped. Organizations themselves also consist of different temporal structures, depending on different work tasks. The shared temporal structure can also change during practice and new temporal structures can evolve. The temporal structure can be changed by rather small changes in the social and organizational environment, like new routines and schedules (Orlikowski & Yates, 2002). The notion of temporal structures is useful for studying time in organizations (c.f. Ancona, Okhuysen et al., 2001; Orlikowski & Yates, 2002). In this paper the notion is only used instrumentally; there is no intention to contribute to the temporal structure theory.

Organizations have a number of different temporal structures and time related rhythms within their practice and main business. In this research temporal structures and time rhythms have been adopted to give a contextual view on the use of electronic records in operational police work, and the rhythms used are transparent in the results section. In operational police work it is possible to use temporal structures to characterize work. The temporal structures adopted in this paper have been influenced by research on mobile technology and police work (Sørensen & Pica, 2005), and by use of IS/IT in emergence response work (Landgren, 2006). The temporal structures are described below.

The ISO standard 15489 defines records management as the: "field of management responsible for the efficient and systematic control of the creation, receipt, maintenance, use and disposition of records, including processes for capturing and maintaining evidence of and information about business activities and transactions in form of records" (International Standards Organization, 2001, p. 3). In this paper the following definition of a record is adopted: "Information created, received, and maintained as evidence and information by an organization or person, in pursuance of legal obligations or in transaction of business." (International Standards Organization, 2001, p. 3). Electronic records are records that are born digital (Dollar, 1992; Duranti, 2001b). The term record implies that there is something that is recorded, i.e. the record itself is physical in some sense. In paper based records the physical and logical structure is integrated; In electronic records they are separated (Dollar, 1992). A record can only be evidence of a transaction if the record is reliable

and authentic (Duranti, 2001a). ISO 15489-1 defines authenticity and reliability as:

An authentic record is one that can be proven a) to be what it purports to be, b) to have been created or sent by the person purported to have created or sent it, and c) to have been created or sent at the time purported

/.../

A reliable record is one whose content can be trusted as a full and accurate representation of the transactions, activities or facts to which they attest and can be dependent upon in the course of subsequent transactions or activities.../ (International Standards Organization, 2001, p. 7)

In this paper the focal interest has been to study electronic records use in police work. The Swedish police have several information systems where records are created, and managed. The Swedish national archives have prescribed that the content in several information systems used by the Swedish police should be preserved forever. Table 1. Presents those systems.

Beside the systems presented in table 1, the Swedish police also have several other information systems, which can consists of records: for example MS office, Novell groupware, and a national intranet – Intrapolis- (E. Borglund, 2005).

<b>IT-systems which content should be preserved for life</b>	
<b>System</b>	<b>Task</b>
DurTvÅ	Computerized system for managing criminal investigations
RAR	A computerized system for making police reports
VÅS	A national system for managing all legal weapons in Sweden
PASS	A system for managing passports
STORM	A command and control system at the dispatch central. It manages all police activities

Table 1. IT systems with content preservation requirements (retrieved from E. Borglund, 2005)

In the ISO 15489-1 (International Standards Organization, 2001, p. 4) there is a list of several benefits that records give an organization. Some of these benefits are listed below. Records:

- conduct business in an orderly, efficient and accountable manner,
- support and document policy formation and managerial decision making,

- provide consistency, continuity and productivity in management and administration,
- facilitate the effective performance of activities throughout an organization,
- meet legislative and regulatory requirements including archival, audit and oversight activities,
- provide protection and support in litigation including the management of risks associated with the existence of, or lack of, evidence of organizational activity,
- protect the interests of the organization and the rights of employees, clients and present and future stakeholders,
- provide evidence of business, personal and cultural activity,
- maintain corporate, personal or collective memory.

The ISO 15489-1 Standard presents and highlights benefits but rarely indicates how records are used. Yet it is implicit that the benefits may only be achieved by some kind of use, and the benefits of records motivate their use. Pugh (1992) introduced a perspective where there is a difference between direct use and indirect use of records. Direct use happens in situations when someone actively uses a record, for example by reading a record. In indirect use a user gets indirect benefit of others' direct use. The indirect use can characterize a use of the content of records, for example reading an academic thesis, in which the data is based on records. Shepherd & Yeo (2003) have another suggestion to differential use. In their proposal (Shepherd & Yeo, 2003, pp. 155-157) there exist three different purposes for using records:

1. Business purposes
2. Accountability purposes
3. Cultural purposes

Shepherd and Yeo (2003, pp. 155-157) also identify three further underlying values of records which motivate these different purposes for records use. They are:

1. The evidential value of the record
2. The value of the record as an information source
3. The value of the record as an artifact or object.

### **III. Method**

This paper is based on a qualitative study, using the police as representing a type of organization that is knowledge intensive and time critical. The data collection and analysis is an effort of one researcher, a practicing police officer/researcher who has investigated the police practice through extensive observations in the field. The data collected has then been analyzed through the lens of temporal structures, whereby different kinds of use and different roles of users have been identified. In this research four different temporal structures that exist in operational police work have first been identified and applied. In each temporal structure the ways in which electronic records are used has been identified. The use is then analyzed and categorized. An analysis of identified electronic records use categories found in different temporal structures has been done, with the goal of identifying design implications for information systems managing electronic records.

The researcher has 16 years of experience within the police domain, from three main areas of the police. Patrol duty in Stockholm, operational work at the national counter terrorist unit, patrol duty in a smaller Swedish city. For the last 3 years the researcher has been doing full time research and only minor police work, and during that period police practice has been observed both from a practitioner's perspective and from a researcher's perspective. Being a sworn officer returning to practice as a full participant and observer has not introduced any problems or doubts by colleagues. The dual role, officer and researcher, has been that of a reflective practitioner (Schön, 1983). Research notes have been taken parallel to police notes during the shifts. Reflective informal minutes have been compiled after most of the shifts. Alongside this personal reflective practice, 29 interviews have been done with police officers about their information behavior, and the affect information has on police practice.

The notes from the observations and interviews have then been analyzed, categorized, and re-categorized. The vast amount of data collected during this research is to a large extent embedded in the experience of the reflective practitioner (researcher). The process of analysis is therefore not completely visible, as participant observation is both a data collection technique and an analytic tool. It is important to note that the reported findings concerning police officers' use of electronic records in this paper is only one result of this research effort. Other findings from this research are reported elsewhere (E. Borglund & Nuldén, 2006; E. A. M. Borglund & Öberg, 2007; Nuldén & Borglund, 2006).

In this paper a scenario has been used as a technique to assist the process of investigating work-practice (Button & Harper, 1996), and as technique for making work visible (Suchman, 1995) with a goal to understand the use of electronic records in work practice. The data presented as a rich scenario, i.e. a story about police officers and their activities (c.f. Carroll, 2000). The empirical data collected during the extensive observations in the field have in this paper served as the basis to design a scenario. The scenario is fictive, but is based on real situations that have been put together to become a story. The police context is rather complex and a scenario can give the reader a feeling for the temporal structures that exist in police practice.

The scenario is about two uniformed police officers stationed in a police department in Sweden. It has been discussed with both research colleagues and police officers to verify that it is representative of a probable case in reality.

During a group interview with five police officers at a police department in the middle of Sweden, they all agreed that the scenario represented a common day at work on a weekend. They agreed that family disturbance is quite a common police matter, and that the scenario is a good example of different operational police work structures.

#### **IV. The Scenario**

In this paper empirical data from the operational police domain are used. Operational policing is performed by two uniformed police officers, working together in a patrol car. The data is first presented as a rich scenario, i.e. a story about police officers and their activities. The scenario follows a temporal structure representing the temporal structures that have been identified to exist in the operational police domain. The identified temporal structures are similar to those identified by other information systems researcher and their use of categorization of different temporal structures in the emergency service domain. Sørensen and Pica (2005) described operational policing in three temporal phases: waiting, traveling, and engaging. Landgren (2006) has described the work of a fire crew to exist in the following temporal structures: mobilization, intervention, situational adjustment, and incident completion. After the scenario different types of use of electronic records found in each temporal structure will be described.

In this paper the police work have been categorized in the following temporal structures, which are derived from the empirical material together with related research mentioned above: 1. *Assignment free*. Police officers have not been given any specific assignment. They either patrol in the car or work at the police station; 2. *Preparing/mobilization*. Police officers are given an assignment and preparing for that; 3. *Intervention/engaging*. The police officers are engaging in the given assignment; 4. *Debriefing/documentation*. The police officers are finishing the work by making the necessary documentation.

The scenario is about Peter and Susan, two police officers working together as patrolling police officers in a mid-sized Swedish city.

*A. Assignment free*

Susan and Peter are ready for duty at 1500. Fifteen minutes before they formally begin, they enter "Hill-Street" the nickname of the area where patrol officers have their working terminals. They begin to go through the basket with printouts of electronic records of persons arrested and taken into custody. They also read protocols of events that have occurred since the last time they worked. Susan logs into the workstation and reads new intelligence reports. Peter look through web-STORM, which is a light version of the command and control system, to get a picture of what is happening in the district at the moment. Peter also makes a printout of the wanted criminals in the district, and a printout of recently stolen vehicles. At 1500, Susan and Peter sit down with their colleagues for a roll call. The officer in command is presenting new and adequate information about both internal as well as external matters. The roll call ends with a briefing covering the most important information about ongoing criminal activities, tips, and investigations. After the roll call Peter and Susan take a quick cup of coffee with their colleagues before they enter their patrol car and head out. They drive downtown and pass all spots with known high criminality, and they also look for wanted criminals at known locations. A boutique owner stops them and discusses problems with shoplifters, and asks Peter and Susan about how the police can help. Peter and Susan inform the boutique owner about the Project Safe Store, a project that has been a success. They then continue their patrol.

*B. Preparing/mobilization*

After only 40 minutes of driving in the patrol car, the dispatch central calls for an available unit for an ongoing disturbance in a private home. Susan and Peter react to the call, and are heading to the address. Peter asks the dispatch central about who called the police, if the police have ever been at the address before, and if the operator at the dispatch central could see if anyone at the address has some criminal records. The dispatch central reply that it was the neighbor that made the call, and he that heard both a women screaming and probably also a child's voice shouting: No No! The police have never been at the address during the last 13 months, and a man registered on the address has been fined when he drove a car without seatbelts. At the address the man is registered as married to a woman, and they are parents of two children also registered at the address. Once the operator has finished her information Susan stops the patrol car in front of the address, and Susan and Peter leave the vehicle. There was no time for Peter and Susan to discuss any tactical strategies, but they have been working together for many years and work well together.

*C. Intervention/engaging*

When Susan rings the doorbell, no one opens the door so they enter the house shouting: "Police! is somebody here?". Suddenly a woman comes down from the stairs waving with her arms and screaming/crying: "You must take him away, this is more than I accept. He has beaten me for the last time". The woman has blood

dripping from her nose. Behind the woman a man slowly comes down from the stairs, muttering: "Ok ok, tell the cops your story, and lie to them as you always do. Is this really what you want?" Both the man and the woman are noticeably under the influence of alcohol. As recommended in family disturbance situations, the two involved are separated. Susan questions the woman, and Peter questions the man. As an attempt to verify the woman's story, Susan also talks to the children. Once she sees the two boys, she remembers that she has read a tip at police station about a young boy that probably was beaten by his parents. The picture attached to the tip corresponded with one of the boys she now speaks to. The two boys show no sign of injury, but seem to be very afraid of their father. The children say that they have not seen their father beating their mother, but they state that he gets really aggressive when he drinks alcohol. In the middle of the questioning of the children, there is a terrible noise downstairs. Susan runs down and sees Peter almost sitting on the man. The man had been more and more aggressive against Peter, and when Susan came in he rushed over Peter aiming to reach for his wife in the kitchen. Instead of contacting the prosecutor Peter and Susan decide to arrest the man. They put him in the patrol car, report the arrest to the dispatch central and then drive towards the police station.

#### *D. Debriefing/documentation*

When Peter and Susan arrive with the man at the police station, a superior officer who decides to put the man in a cell, judges their arrest. Peter and Susan have to report the arrest to the prosecutor, make a preliminary hearing with the man, report the crime, and write

down the interrogation made with the woman and the children. They also have to report the situation to the social services as they suspect that there are children under 18 years old that are treated badly by their father. Peter and Susan contact the dispatch central to say that they now are stuck at the station, while reporting the case. They then both log in to their work terminals for a long session of debriefing. It takes almost 3 hours before they are finished. Finally they have time to take a break and they eat their dinner in the lunchroom at the station.

#### **V. Types of electronic records use**

In this section, different types of electronic records use are presented. The uses are derived both from the scenario above and also from the extended data collected during field studies. In the different temporal structures, police officers use electronic records as an important source of information and knowledge, much depending on the trustworthiness embedded in records (c.f. E. Borglund, 2005). In the following subsection the different electronic records use is presented, in relation to the temporal structures adopted in this paper.

##### *A. Assignment free*

Police officers use information systems to search for and retrieve electronic records and the information found in electronic records for a business purpose. They want to become informed and updated about activities, both within the police and out in the surrounding community. In so doing, they increase their knowledge and they aim

to become more experienced police officers. Much information derived from electronic records is communicated between police officers during roll calls and other situations. Police officers use the police information systems and IT environment as the main tool to access, search, retrieve and use electronic records.

#### *B. Preparing/mobilization*

Police officers that are physically outside the police station cannot search, retrieve, or use electronic records as direct users can. They currently have no access to any mobile information system solution. They have to be assisted by others, i.e. the dispatch central, and by colleagues at the police station. The police officers often do not have much time, to ask others to search and retrieve electronic records in this temporal structure. The police officers are dependent on other colleague's interpretation, information selection of electronic records. That is, the staff at the dispatch central do not always know what kind of information in the electronic records is of importance to the police officers. This results in a situation where they retrieve and use bits and pieces of electronic records, i.e. information fragments that can assist them in different tactical decisions. The available search time is often the time it takes to drive from the dispatch call to the address.

#### *C. Intervention/engaging*

In this temporal structure, the police work is time critical. The police officers have to rely on their experience and information already gathered. Mobile access is not available to them. Very seldom is there

time to ask someone else to search for specific information. They use information already derived from electronic records in their action, if necessary. Both their own actions and decisions taken by superior officers at the dispatch central are starting points for a record of their activities. The police officers' action is recorded in the command and control system. For example, knowledge about criminal individuals behavior or background can be the basis for operational decisions, information sometime previously found in electronic records and now remembered by the acting police officers.

*D. Debriefing/documentation*

Police officers use information systems to create electronic records when they debrief and document their work. Legislation requires that normally every action a police officer takes must be documented in some way. The police officers often document their actions themselves in a memorandum. If a crime has been committed, a report has to be made. Possible interrogations also have to be documented correctly in the form of a report, or a minute. All these documents are electronic records of police business activities, and are now managed electronically in the Swedish police. These electronic records that have just been created are now usable by others in the temporal structures presented above. Police officers can also add new electronic records to a collection of existing electronic records, for instance about a larger investigation. Very often existing electronic records serve as a source of information in the debriefing situation. For example, information about when the call arrived at the dispatch central can be found in the command and control system, which is needed to write a correct police report.

The police also create electronic records that are sent to other organizations such as fire departments, social services and hospitals. When sent to other organizations a printout of the electronic record is used. In the debriefing/documentation temporal structure the police officers are more like electronic records producers than electronic records users.

*E. Summary*

From the presentation above, a cyclic use of electronic records can be seen (figure 1). First of all, figure 1 is describing a normal relationship between the different temporal structures. In many situations police work can vary from this cyclic order, but the figure serves its purpose for the following description. Very simply, the first police officer begins to be a direct user of electronic records in the first temporal structure. In the second temporal structure the police officer is an indirect user of electronic records, and in the third temporal structure the officer only uses information already gathered. In the fourth temporal structure the police officer is both a direct user and a direct producer of electronic records.

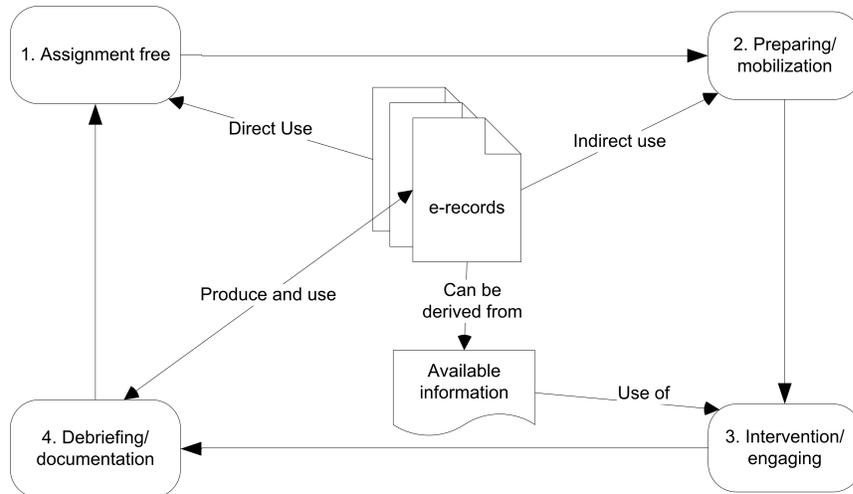


Figure 1. Temporal structure cycle

## VI. Discussion

The variations in use of electronic records change depending on different temporal structures. In this paper four temporal structures have been used, in which four characteristic users have been identified. They are named based on their characteristics and are presented below.

### A. Traditional user

Police officers acting in the first temporal structure *Assignment free* can be conceptualized as traditional users, who are interacting with an information system to search, to retrieve, and to use electronic records. The police officers are educated and well trained in using the information systems they must handle in their work. They use different information systems as tools to perform their work, in which

creation, search and retrieval of electronic records are natural parts. They use electronic records as sources of knowledge and to become informed. The evidential values embedded in records give police officers access to what can be defined as trustworthy information. The characteristics of a user in this study best correspond with a direct use according to Pugh's (1992, pp. 12-13) categorization of use.

#### *B. Mediated user*

In the temporal structure *Preparing/mobilization*, the police officers cannot actively use the information systems, because they have no IT-artifact that enables such use in their police vehicle. The officers have to rely on others to retrieve information from electronic records. The police officers are interested in specific information, some of which may be found in electronic records. They ask for that specific information using the radio or mobile phones. They are no longer direct users of electronic records traditional sense. They are better described as mediated users, who must have help from others to access information in the records. Very seldom do they ask for whole electronic records, more often they ask for specific parts of electronic records. It is specific information that the police officers want, e.g. whether a person at an address owns a weapon. There is a risk that information is misunderstood, when it is mediated. This categorization of users use records in an indirect way, in contrast to the category termed "Traditional user" above.

Even if in the near future police officers are given mobile access to electronic records, the use in this temporal structure will most likely

still be different to those in the other temporal structures. Police officers on their way to a crime scene are under time pressure and they aim to retrieve important information, the essence of a record, to support their business.

#### *C. Bricoleur*

In the temporal structure *Intervention/engaging* the police officers use their experience and the knowledge they have gathered. Time and the situation make an active use of electronic records impossible. The police officers have to rely on the knowledge they have gathered, sometimes from electronic records. The user in this temporal structure can be described as a bricoleur. A bricoleur is described as person that solves situations with the tools available at the moment. The opposite abstraction is the engineer, who develops the optimal tool for every situation (c.f. Lévi-Strauss, 1971).

#### *D. Producer*

In *Debriefing/documentation*, the last temporal structure, the police officers produce electronic records as a result of their work. They are now creating electronic records that document their work activities, electronic records that others can then use. But in their work with creating electronic records they also use other electronic records as sources of information. They are using electronic records as the means for producing new electronic records. When the Swedish police nowadays only use computers and information systems to make reports, all records are born digital, i.e. electronic records. The

electronic records are based on notes taken by the police officers during the assignment, but also from other electronic records.

## **VII. Concluding Remarks**

In this paper the following research question has guided the research: "How do different temporal structures in operational police work affect the use of electronic records?" In this paper four temporal structures have been used to describe the operational police domain, and to investigate how electronic records are used in each temporal structure. A change in the use of electronic records depending on temporal structures has been found: four different types of electronic records users have been found:

1. The Traditional user, an individual interacting with an information system
2. The Mediated user, who is interacting with information systems with help from others.
3. The Bricoleur uses information already gathered from electronic records in their work.
4. The Producer uses information systems to produce new electronic records, sometime based on existing electronic records.

The Mediated user presents a challenge for systems design. Even if the police officers in this domain of the research get mobile access to electronic records, the information must be very easily retrieved. They should be able to search and find the wanted information quickly, when they are most likely under time pressure and the police

vehicle is being driven at high speeds. In a knowledge intensive and time critical work environment like the police service, electronic records are an important and trustworthy source of knowledge. Therefore it is important to take into consideration the variation in how electronic records are used when designing new information systems that must support such work. Even if electronic records are not primarily meant to act as an information source for this work, the evidential value of electronic records makes them very useful for just that. It is noticeable that both the user characteristics shift based on the temporal structures, but also the characteristics of the use change. Pugh's (1992, pp. 12-13) two categories of records use, direct and indirect use, both have applicability in this paper. Without direct access to the information technology that enables direct use of a record, it is difficult to be a direct user. In the future where the technology advances enable secure access to records directly from mobile terminals, police officers might become direct users of electronic records throughout their entire work process. Today they are only direct users when they are categorized as Traditional User or Producer.

This paper does not claim that this categorization of different types of use of electronic records is general, but the research indicates that temporal structures in an organization affect the ways in which electronic records are used. The electronic records systems should be designed to meet these different use situations. The differences in electronic records use affects the design of the record management system. Records may never be changed or altered and must at creation meet future requirements in order to maintain their evidential value (see e.g. Reed, 2005). Therefore the system

managing electronic records must also fulfill different users' requirements.

Awareness that use of electronic records can shift depending on temporal structures in an organization, can contribute to a more user-focused design of electronic records and electronic records management systems. In this paper where the use of electronic records has been in focus, a research tradition well established in information systems research (c.f. Dahlbom, 1996) has been followed. This is still only an emerging research engagement within archival science (Gilliland & McKemmish, 2004). This paper contributes to the attempts to establish a new kind of research tradition in archival science, where the focal interest is on how records, both paper based and electronic, are used.

This research should be followed by studies in other organizations and comparisons of whether and how the use of electronic records shifts dependent on temporal structures. This research could also be followed up by further analyzing the variations of electronic records use in each temporal structure to identify design implications for records management systems within the Swedish police.

### **Acknowledgment**

Thanks are due to the European Union and the regional funds together with the County administrative board of Västernorrland, for enabling this research project.

## References

- Ancona, Deborah G., Paul S. Goodman, Barbara S. Lawrence, and Michael L. Tushman. "Time: A New Research Lens." In: *Academy of Management Review*, 2001, v.26, n. 4, pp. 645-63.
- Ancona, Deborah G., Gerardo A. Okhuysen, and Leslie A. Perlow. "Taking Time to Integrate Temporal Research." In: *Academy of Management Review*, 2001, v. 26, n. 4, pp. 512-29
- Bjerknes, Gro and Bratteteig, Tone. "User Participation and Democracy: A Discussion of Scandinavian Research". In: *Scandinavian Journal of Information Systems*, 1995, v. 7, n. 1, pp. 73-98
- Borglund, Erik. "Operational use of electronic records in police work". In: *Information Research*, 2005, v.10, n. 4, [Electronic version, available at: <http://Informationr.net/ir/10-4/paper236.html>]
- Borglund, Erik. *A predictive model for attaining quality in recordkeeping*. Sundsvall: Mid Sweden University, 2006, (Licentiate thesis, n.12, Mid Sweden University), ISBN 91-85317-23-3.
- Borglund, Erik., & Nuldén Urban. "Bits and Pieces of Information in Police Practice". In: *29th Information Systems Research Seminar in Scandinavia*, Helsingör, 2006.
- Borglund, Erik and Öberg, Lena-Maria. "Operational Use of Records". In: *IRIS29*, 12-15 Aug, Helsingør, Denmark, 2006.
- Borglund, Erik A.M, and Lena-Maria Öberg. "Scenario Planning and Personas as Aid to Reduce Uncertainty of Future Users." In: *The 30th Information Systems Research Seminar in Scandinavia (IRIS30)*, Tampere 11-14 Aug, 2007.
- Bouthillier, France and Shearer, Kathleen. "Understanding knowledge management and information management: the need for an empirical perspective". In: *Information Research*, 2002, v.8, n.1, [Electronic version, available at: <http://informationr.net/ir/8-1/paper141.html>]
- Brahan, John W., et al. "AICAMS: artificial intelligence crime analysis and management system". In: *Knowledge-Based Systems*, 1998, v.11, n. 5-6, pp. 355-61

Button, Graham and Harper, Richard. "The relevance of 'work-practice' for design". In: *Computer Supported Cooperative Work (CSCW)*, 1996, v.4, n. 4, pp. 263-80.

Carroll, John M. *Making use : scenario-based design of human-computer interactions*. Cambridge, Mass.: MIT Press, 2000, ISBN 0-262-03279-1.

Chen, Hsinchun, et al. "COPLINK Connect: information and knowledge management for law enforcement". In: *Decision Support Systems*, 2002, v. 34, n. 3, pp. 271- 85.

Chen, Hsinchun, et al. "COPLINK Managing Law Enforcement Data and Knowledge". In: *Communications of the ACM*, 2003, v. 46, n.1, pp. 28-34.

Dahlbom, Bo. "The new Informatics". In: *Scandinavian Journal of Information Systems*, 1996, v. 8, n. 2, pp. 29-48.

Dollar, Charles M. *Archival theory and information technologies: the impact of information technologies in archival principles and methods*. Macerata: Univ. of Macerata, 1992, ISBN 88-7663-201-8.

Duranti, Luciana. "Concepts, Principles, and Methods for the Management of Electronic Records". In: *The Information Society*, 2001, v. 17, pp. 271-79.

Duranti, Luciana. "The impact of digital technology on archival science". In: *Archival Science*, 2001, v. 1, n. 1, pp. 39-55.

Gilliland, Anne and McKemish, Sue. "Building an Infrastructure for Archival Research". In: *Archival Science*, 2004, v. 4, n. 3-4, pp. 149-97.

International Standards Organization. *ISO 15489-1. Information and Documentation and Records Management Part 1: General*. Geneva: International Standards Organization, 2001.

Landgren, Jonas. "Making Action Visible in Time-critical Work". In: *Conference on Human Factors in Computing Systems (CHI2006)*, Montréal, Québec, April 22-27, 2006.

Lévi-Strauss, Claude. *Det vilda tänkandet*. Stockholm: Bonnier, 1971.

Mathiassen, Lars, et al. *Objektorienterad analys och design*, (Translation. Torkel Franzén, 2. Ed.). Lund: Studentlitteratur, 2001, ISBN 91-44-01796-0.

Meijer, Albert. "Accountability in an Information Age: Opportunities and Risks for Records Management." In: *Archival Science*, 2001, v. 1, n. 4, pp. 361-72.

Meijer, Albert. "Electronic Records Management and Public Accountability: Beyond an Instrumental Approach." In: *The Information Society*, 2001, v.17, n. 4, pp. 259-70.

Nielsen, Jørn Flohr and Relsted, Niels Jørgen. "A New Agenda for User Participation: Reconsidering the Old Scandinavian Prescription". In: *Scandinavian Journal of Information Systems*, 1994, v. 6, n. 2, pp. 3-20.

Nuldén, Urban, and Erik Borglund. "Personas in Uniform: Police Officers as Users of Information Technology." In: *ECIS 2006, 12-14 July, Gothenburg, 2006*.

Oatley, Giles C. and Ewart, Brian W. "Crimes analysis software: 'pins in maps', clustering and Bayes net prediction". In: *Expert Systems with Applications*, 2003, v. 25, n. 4, pp. 569-88.

Orlikowski, Wanda J. and Yates, JoAnne. "It's About Time: Temporal Structuring in Organizations". In: *Organization Science*, 2002, v. 13, n. 6, pp. 684-700.

Pugh, Mary, Jo. *Providing Reference Services for Archives and Manuscripts*. Chicago: The Society of American Archivists, 1992, ISBN 0-931828-82-1.

Reddy, Madhu, and Paul Dourish. "A Finger on the Pulse: Temporal Rhythms and Information Seeking in Medical Work". In: *The 2002 ACM conference on Computer supported cooperative work*, 2002, pp. 344-353.

Redmond, Michael, and Baveja, Alok. "A data-driven software tool for enabling cooperative information sharing among police departments". In: *European Journal of Operational Research*, 2002, v. 141, n. 3, pp. 660-678.

Reed, Barbara. "Records". In: Sue McKemmish, et al. (eds.). *Archives: Recordkeeping in Society*. Wagga Wagga: Charles Sturt University, Centre for Information Studies, 2005, pp. 101-130. ISBN 1-876938 84-6.

Schellenberg, Theodor, R. *Modern archives: Principles and techniques*. (Repr. ed.). Chicago: SAA, 1998, (Original work published 1956), ISBN 0-931828-49-X.

Schön, Donald A. *The reflective practitioner: how professionals think in action*. New York: Basic Books, 1983, ISBN 0-465-06874-X.

Shepherd, Elisabeth, and Yeo, Geoffrey. *Managing records a handbook of principles and practice*. London: Facet Publishing, 2003, ISBN 1-85604-370-3.

Suchman, Lucy. "Making Work Visible". In: *Communications of the ACM*, 1995, v. 39, n. 9, pp. 56-64.

Sørensen, Carsten and Pica, Daniel. "Tales from the police: Rhythms of interaction with mobile technologies". In: *Information and Organizations*, 2005, v. 15, n. 2, pp. 125-49.

Upward, Frank. "Modeling the continuum as paradigm shift in recordkeeping and archiving processes, and beyond - a personal reflection". In: *Records Management Journal*, 2000, v. 10 n. 3, pp. 115-139.

Upward, Frank. "The records continuum". In: Sue McKemmish, et al. (eds.). *Archives: Recordkeeping in Society*. Wagga Wagga: Charles Sturt University, Centre for Information Studies, 2005, pp. 197-222. ISBN 1-876938 84-6.