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capturing records and their context in enterprise information systems

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An Accountability Challenge: Capturing Records and Their Context in Enterprise Information Systems

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Abstract: More than 80 % of all information in an organization is unstructured, created by knowledge workers engaged in peer-to-peer networks of expertise to share knowledge across organizational boundaries. Enterprise Information Systems (EIS) do not integrate unstructured information. At best, they integrate links to unstructured information connected with structured information in their databases. The amount of unstructured information is rising quickly. Ensuring the quality of this unstructured information is difficult. It is often inaccessible, unavailable, incomplete, irrelevant, untimely, inaccurate, and/or incomprehensible. It becomes problematic to reconstruct what has happened in organizations. When used for organizational policies, decisions, products, actions and transactions, structured and unstructured information are called records. They are an entity of information, consisting out of an information object (structured or unstructured) and its metadata. They are important for organizational accountability and business process performance, for without them reconstruction of past happenings and meaningful production become an impossibility. Organization-wide management of records is not a common functionality for EIS, resulting in [1] a fragmentation in the management of records, where structured and unstructured information objects are stored in a variety of systems, unconnected with their metadata; [2] a fragmentation in metadata management, leading to a loss of contextuality because metadata are separated from their information objects; and [3] a declining quality or records, because their provenance, integrity, and preservation are in peril. Organizational accountability is based on records and their context to reconstruct the past. Because records are not controlled by EIS, they can only marginally be used for accountability. The challenge for organizational accountability is to generate trusted records, fixed and contextual information objects inseparately linked with metadata that capture context to regain evidential value and to allow for the reconstruction of the past. The research question of this paper is how to capture records and their context within EIS to regain the evidential value of records to allow for a more robust organizational accountability. To find an answer, we need to pay attention to the concept of context, on how to capture context in metadata, and how to embed and manage records in EIS.

Keywords: Accountability, context, records, metadata, information value chain, enterprise information systems

1. Introduction

1.1 Enterprise Information Systems

In the last decade, not integrated software applications have been exchanged for Enterprise Information Systems (EIS). EIS are systems that integrate key business processes within (and between) organizations into a single software system so that structured data can flow seamlessly through those business processes in real time, improving coordination, efficiency, and decision making (Serova 2012). It concerns structured data from financial and accounting systems, human resource systems, supply chain systems, customer relation systems, product lifecycle management systems, and business intelligence systems. It also manages the organizational logics connected with that structured information as defined in business rules (Srinivasan and Dey 2014). This integration of structured data in EIS has improved documentation of business transactions and increased data quality, although there are several problems that could negate the positive effects of integration (Ziegler and Dittrich 2004). EIS cut organizations horizontally while standardizing business processes (Gosain 2004). They tend to ignore organizational policy, monitoring and governance processes that cut organizations horizontally and vertically, and that provide part of the context of their organizational environment. In configuring business processes in EIS standardized blueprints are often used (Gosain 2004). These blueprints are derived from existing installations, experience in practice, competence, and developing community (Hanseth, Ciborra and Braa 2001). An EIS implementation pressures organizations to conform to these blueprints, because they are, as vendors like to emphasize, 'best practices'. They are not aligned to the existing organizational structures, which subsequently are changed fundamentally to 'fit' the system influencing organizational contexts (Partha-sarathy and Anbazhagan 2007). Implementing these blueprints in EIS has been a challenging task which resulted in many failures, high costs, and very long implementation times (Olson and Kesharwani 2010; Schniederjans and Yadav 2013), as was demonstrated in (exploratory) studies of Robey, Ross and Boudreau (2002) and Zhang et al (2005). A bigger challenge may be the fact that the existing social dynamics do not respond well to those blueprints with (possibly) detrimental effects on [1] the match between organizational

culture and structure, and [2] organizational accountability (Heidelberg 2015).

1.2 Organizational Accountability

In the last decades, the collapse of public companies has had far reaching consequences for equity and debt holders, employees, suppliers, customers, and creditors. Investigations of debacles as Enron, WorldCom, Barings Bank, Parmalat, etc., have uncovered serious fraud and reckless and illegitimate financial and management practices, oftentimes combined with ingenious creative accounting. These debacles have prompted demands for greater organizational accountability, the organizational acknowledgement of responsibility for policies, decisions, products, actions, and transactions, and the obligation to report and be answerable for resulting consequences (Wearing 2005; Van Bussel 2012a). Accountability is currently most often associated with the working of a system of controls and with methods and instruments to strengthen such controls (Philp 2009). One of the key objectives of accountability is to curb or constrain opportunistic behaviour of employees by collecting and asking for evidence for organizational happenings. Accountability can be considered as a social relation between an accountee and an accountor (or, as a representative of this accountor, a 'forum') 'in which the actor has an obligation to explain and to justify his or her conduct' (Bovens 2007: 450). Organizations are not machines, and social relationships between members of an organization cannot be captured strictly in procedures, processes, and expectations. Accountability is rooted in social dynamics and in the accessibility of information that has captured discussions, negotiations and debates in collaborative spaces that may of may not adhere to previously designed procedures, responsibilities, and systems. This social dynamics is a very important part of the contextual environment that defines organizational actions and transactions (Painter-Morland 2007; O'Kelley and Dubnick 2015; Heidelberg 2015). Organizations need to establish an internal accountability function to safeguard evidence of its behaviour. Within this function, organizational governance is organized as an accountability agent. This function operates systems of control designed to ensure that organizational objectives (e.g., accountability) are met. While organizational accountability is oriented towards external accountors, organizational governance has an internal focus (Porter 2009). Within organizational governance, information governance establishes opportunities, rules, and authorizations for information management (Kooper, Maes and Lindgreen 2011).

1.3 Unstructured Information

More than 80 % of all information in an organization is unstructured (text, images, sound, video, or combinations thereof), created by knowledge workers engaged in peer-to-peer networks of expertise to share knowledge across organizational boundaries (Van Bussel 2012b). EIS do not integrate unstructured information. At best, they integrate links to (transaction-oriented) unstructured information connected with structured information in their databases. For that reason, they often work together with (enterprise) document (or content) management systems, but these systems are not under their control (Alalwan and Weistroffer 2012; Grahlmann et al 2012). The amount of unstructured information is rising quickly now that organizations use cloud technologies for enabling information and communication technology systems to streamline business processes with collaboration technologies, information sharing, corporate blogs, wikis, forums, community platforms and idea management systems (McAfee 2006). Ensuring the quality of this (transaction-oriented) unstructured information is extremely difficult. It is often inaccessible, unavailable, incomplete, irrelevant, untimely, inaccurate, and/or incomprehensible (Redman 2004). Their data lineage and contextual environment are mostly unknown (Buneman, Khanna and Tan 2001; Eppler 2006; Groth 2007).

2. Research

2.1 The problem

The fact that (transaction-oriented) unstructured information is badly managed, does not meet quite common quality requirements, and is almost non-contextual generates problems for organizational accountability. It becomes problematic to reconstruct what has happened in organizations. When used for organizational policies, decisions, products, actions and transactions, structured and unstructured information are called records. They are an entity of information, consisting out of an information object (structured or unstructured) and its metadata (Van Bussel 2012c). They are extremely important for organization accountability and business process performance, for without them reconstruction of past happenings and meaningful production become an impossibility (Van Bussel 2012abc; Smallwood 2013). Records have two dimensions that make them indispensable for organizational accountability. The first one is 'fixity'. They are recorded for *later* consultation and used repeatedly for the reconstruction of *past* happenings (Levy 2001). They can be used as evidence, because they are, or can be reconstructed as 'immutable mobiles' (Latour 1990). To be used

as evidence, records also need contextuality, hence, its second dimension: context, captured in the metadata inseparately bound to the information objects (Marco 2000; Inmon, O'Neil and Fryman 2007). To comprehend those records (and, thus, the organizational context that brought them into existence), information about the social dynamics and the environment that created, processed, used, stored, and managed them, is of the utmost importance (Van Bussel 2012c). Organization-wide management of records is not a common functionality for EIS (Serova 2012), resulting in [1] a fragmentation in the management of records, where structured and unstructured information objects are stored in a variety of systems, unconnected with their metadata; [2] a fragmentation in metadata management, leading to a loss of contextuality because metadata are separated from their information objects; and [3] a declining quality or records, because their provenance, integrity, and preservation (records have a longer lifespan than the configurations in which they are created or managed) are in peril (Boudrez, Dekeyser and Dumortier 2005; Groth 2007).

2.2 The question

Organizational accountability is (for a large part) based on records and their context to reconstruct the past (Barata and Cain 2001). Public and private authorities are making increasing demands for the trustworthiness and contextuality of these records. Because records are not controlled by EIS, they can only marginally be used for accountability. Their evidential value is problematic, because of their (only nearly existing) dimensions of fixity and context. The challenge for organizational accountability is to generate trusted records, fixed and contextual information objects inseparately linked with metadata that capture a records' context to regain their evidential value and to allow for the reconstruction of past organizational happenings. That is why EIS should be concerned with the management of records and their context. The research question of this paper is how to capture records and their context within EIS to regain the evidential value of records to allow for a more robust organizational accountability. To find an answer, we need to pay attention to the concept of context, on how to capture context in metadata, and how to embed and manage records in EIS.

2.3 The methodology

For this research, an interpretive research approach was followed, based on Orlikowski and Baroudi (1991). In this approach, a non-deterministic perspective is necessary in order to explore phenomena without imposing an *a priori* understanding. The research for this paper is based on:

1. An analysis of scientific literature, based on the literature review methodology of Okoli and Shabram (2010). 1123 conference papers, journal articles, working papers and books, collected and analyzed in a research project about the relationships between organizational accountability, digital archiving and enterprise information management (2008-2015), were used. These items were collected using key word search in Google Scholar, Microsoft Academic Search, EBSCO, Emerald Insight, and Paperity, a multidisciplinary aggregator of open access journals and papers. The key words used in this search (mostly in combination) were: 'EIS', 'IT', 'Context', 'Contextual Analysis', 'accountability', 'organizational accountability', 'metadata', 'records', 'records management', 'content management' and 'document management'.
2. An analysis of the application descriptions of 17 case studies, organized and analyzed for the research reported in Van Bussel and Ector (2009) about digital archiving, organizational accountability and governance in public organizations. These case studies were organized according to the case study methodology, designed by Yin (2003), supplemented with Benbasat, Goldstein and Mead (1987) for their method of action research.
3. An analysis of 10 Dutch (municipal) case management systems, especially for their capture and management of records and their context. These case management systems are used for management of unstructured information and its metadata. The systems were audited for records management functionalities against Dutch standard NEN 2082: 2008 nl and for metadata functionalities against International standard ISO 23081: 2009, the Dutch GEMMA case type catalogue standard, and the detailed metadata schedule defined in Van Bussel and Ector (2009). The systems analysed are: Zaaksysteem.nl, JOIN, Verseon, Single Point, CiVision, Mozard, PowerBrowser eSuite, InProces, OneGov, and SBA.
4. In-depth, semi-structured interviews with five information management, ICT, and archival science specialists about the findings of the analysis of literature, case studies, and case management systems.

3. Findings

3.1 The concept of context

According to Penco (1999), the concept of context may be viewed as a 'family-resemblance concept'. The concept has been studied in many scientific disciplines, including (but not limited to) anthropology, philosophy, contextual and social psychology, social-linguistics, artificial intelligence, robotics, situational semantics, sociology, mathematics, and organizational science (for an overview, Van Bussel and Ector 2009: 249-304). Context has been attributed with many definitions, interpretations, and frameworks that can be divided into four classifications. There are interpretations that use context [1] for defining and operating robotic activities in the ((very) near) future, like oracles (Devlin 1991), [2] for creating a situational environment for a user when using information, [3] for adapting sofware applications to the personal context of the user, and [4] for sensemaking of social situations (and its information).

This last interpretation of context is the subject of this paper. For this interpretation of context there are some characteristics that are agreed upon in literature: [1] context is (in a phenomenological view) a complex social reality that (in a positivist view) will be captured as a simplified metadata construct that is a mere representation of that social reality, [2] it encapsulates objects and situations to allow for sensemaking, [3] it needs accurate documentation and definition, [4] it is in the past, and [5] it is necessary for the tracking and reconstruction of business processes, policies, decisions, products, actions, and transactions (Penco 1999; Groth 2007; Self, Armenakis and Schraeder 2007).

Knowledge of the (environment of the) policies, decisions, products, actions or transactions for which the records were generated is necessary for extracting meaning out of records. This knowledge applies to the existing juridical system, the organizational structure, the business processes of the organization, the procedures by which records are generated, the records collections to which the records belong, the defining characteristics of records, and the social dynamics in which the records were created (Duranti 1997).

One could define context, as Van Bussel and Ector (2009: 276) proposed, as a (social) system's state and behaviour over time. The state of a system consists of all data to explain the current system's condition, including all relevant historical data needed to comprehend that current condition. Every change in the state of a system over time is what we call the behaviour of the system. For organizational accountability, information about the state of the system at a specific moment in time (records), and the changes that have occurred in that system's state (the system's behaviour) in a specific time frame (including logfiles, different versions of business rules, process schedules, software systems security and maintenance, metadata schedules, versions of records, etc.) are needed as evidence for an organization's policies, decisions, products, actions, and transactions. In short, the context of records documents social situations in metadata to allow a reconstruction of the past (Duranti 1997). Figure 1 tries to visualize this definition of context.

3.2 Metadata as context mirrors

The context of information objects (the social dynamics of a system's state and behaviour) is captured in metadata. These metadata try to generate an image of the specific action or transaction the record is part of, the changes therein over time, the processing and use of the record, and its management. Records are an encapsulation of information objects and metadata generated in organizational happenings. Metadata create a mirror of the organizational context in a specific timeframe. This mirror contains (in a simplified way) all the defined and captured contextual information about the organizational environment, the organization itself, the business process the action or transaction was part of, and is inseparately connected with the information objects generated within that action or transaction. Records reconstruct (or 'mirror) a specific action or transaction in the past. They are part of a historical series of records of similar actions and transactions. Records need to be accessible for organizational accountability for as long as the organizational retention schedules permit. The metadata 'mirror' the complex social dynamics that produce information objects. In the end, this allows for a (simplified) reconstruction of the past (Van Bussel and Ector 2009). Figure 2 models the capturing of context in metadata about the organizational environment, the organization, and the business process that generates records. These metadata should be defined in metadata schedules. The most extensive of these schedules had been defined by Van Bussel and Ector (2009: 379-407). A more simplified metadata schedule is defined in ISO 23081: 2006. In Dutch case management systems pre-defined metadata schedules (case type catalogues) contain all known metadata about the organizational environment, the organization, business processes, and records management. Specific metadata about the way actions or transactions are

processed are added by case workers or the system itself. It can be combined with all known metadata schedules.

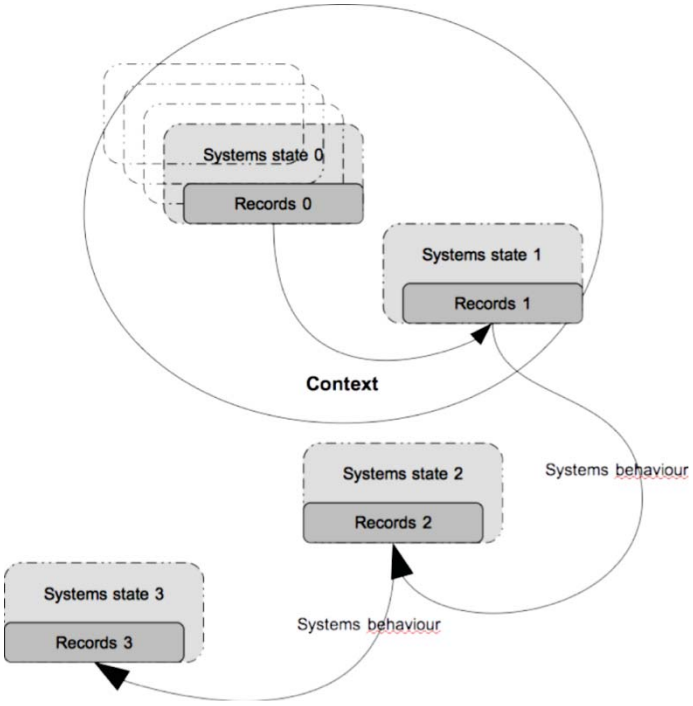

Figure 1: Context as systems state and systems behaviour over time

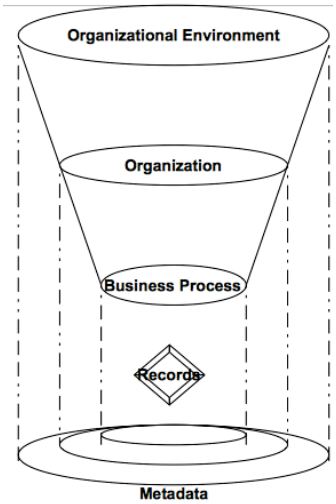

Figure 2: Context of records represented in metadata

3.3 The information value chain

Until a few years ago, information management was deemed a matter of organizations exploiting their own ICTs. Organizations captured their records in a digital infrastructure which did not cross the borders of the organizational infrastructure. Although complex, the organizational context was relatively limited in scope. This changed with the ongoing integration of business processes between different organizations, stimulated by the sharing of data and records through (for instance) social media (McAfee 2006). It became difficult to ascertain which of the integrated business process owners and/or organizations was responsible for, for instance, a breach of privacy, a security problem, misappropriation of funds, fraud, or legal liability. This hampered organizational accountability, especially when EIS could not appropriately capture the context of records. Capturing that context has become even more challenging with the emergence (and consequent acceleration) of big data (especially data analytics) and cloud computing, which are dynamically changing ICT environments.

Information management organizes the information value chain to identify, control and manage records and ICTs in and between organizations. This chain ensures that the informational and evidential value of records is utilized in and between business processes by safeguarding four dimensions of information: quality, context, relevance, and survival (Van Bussel 2012bc). The information value chain is a business process model that includes all information management processes: generation or receipt, identification, capture, storage, processing, distribution, structuring, publication, (re-) use, appraisal, selection, disposal, retention, security, auditing and preservation. The information value chain is instrumental in [1] providing proper control of the performance of business processes; [2] providing and managing records as 'immutable mobiles'; [3] realizing the governance and compliance efforts of organizations; [4] providing legal readiness; and [5] capturing organizational context (Van de Pas et al 2016). All information management processes in the information value chain are managing records and are gathering metadata to provide context (Van Bussel and Ector 2009).

4. Discussion

For EIS to play their role in organizational accountability, it is necessary that all records, if necessary across organizational boundaries, are recognized, identified, controlled, and managed (Van de Pas et al 2016). The identification process of the information value chain is very important. It means identifying all records in all business processes and defining metadata for all constituent relations, organizational characteristics, organizational and business process values, possible uses and users, environmental relations, retention, disposal, and preservation value, and its position within the social dynamics of organizational actions and transactions.

The information processes in the information value chain are used to manage records, to gather context about records, and to safeguard their evidential value. EIS should develop into systems that integrate predefined case type catalogues that define all known metadata about organization types and business process types and that allow for indefinite attachment of system or case worker metadata according to detailed metadata schedules based on the identification of records. EIS should configure the processes of the information value chain and needs to integrate all records in its databases or create inseparable connections with records in content or document management systems. EIS should control those connections and should check the quality of records continuously. That way EIS could [1] strengthen the evidential value of records; [2] safeguarding meaningful information access to all records, and [3] strengthen a more robust organizational accountability. Centralizing records management within the organization would allow EIS to end the organization-wide fragmentation in the management of records (Van Bussel 2012abc).

5. Conclusion and future research

Configuring the information value chain in EIS with the objective of managing and capturing records to contextualize policies, decisions, products, actions, and transactions over time would allow for a (simplified) reconstruction of the past. That would be extremely beneficial for organizational accountability for which 'images' of the past are an absolute necessity. That way, organizations can solve their accountability challenge better than they do now. Not being accountable leads to loss of trust, economic value and/or public support. In this paper one possible way to reach this objective was discussed: enable EIS to capture and manage records to reconstruct the organizational past, be it in a simplified way. EIS could act just like Dutch case management systems, with a standardized set of predefined metadata in a case type catalogue and extensive possibilities to define additional specific metadata schedules. In Van Bussel et al (2001), it was shown that integrating the concept of a record keeping system within ICTs improved business process perfomance and accountability. Integrating records (as an encapsulation of information objects and metadata) into EIS could turn them into record keeping systems and allow them to improve both organizational performance and accountability.

Future research is needed. Social dynamics in organizations can only be captured when formalized in records. The complexity of social dynamics is still eluding us, because personal behaviour of employees is mostly informal. It is possible to reconstruct it in a simplified way using metadata, but it will not always be enough for organizational accountability. Future research should concentrate on the challenge of finding ways to capture informal behaviour in accountability spaces defined by social dynamics.

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