

Office Information Systems as a tool for learning: Possibilities & Challenges

Essay in DT8107 Distributed Information Systems

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Abstract

People's ability to learn increases when working together with peers, where the peers act as an information source for the individual. Office Information Systems has been constructed to encourage such communication with synchronous and asynchronous services. By using experiences made within the field of Digital Libraries, more advanced use of metadata can be achieved in these services, opening the possibility for more accurate querying services and exchange of information between user groups and information systems.

1 Introduction

During the last decades the work environment has become more global and competitive. This has pushed forwards development and use of CSCW is the transformation process which many organizations are anticipating in (Schmidt et al. 1992, p.15). The society has moved to become more reliant on education and skills in order to compete. At the same time flexibility to adapt to new and changing environments has been a higher priority. This reflects upon the need for information promoting innovative skills, operational flexibility, and higher productivity. As a tool for achieving these skills Office Information Systems (OIS) are becoming an everyday tool to facilitate and enhance the exchange of information across organizational and professional boundaries (Schmidt et al. 1992, p. 15). In this essay I will be reflecting on basic components of such OIS' and why they are important to work with in order to promote learning.

In chapter 2 I will be looking into the global arena for learning by describing how OIS' can provide services to promote learning. Chapters 3 to 6 will be looking into key areas of challenges when making OIS services containing synchronous and asynchronous information sources; Chapter 3 with retrieval challenges and how metadata can be used to face these, chapter 4 with the problematic issue of anonymity, chapter 5 deals with challenges concerning trusted information sources, and chapter 6

faces challenges as a result of local interpretations. Chapter 7 concludes the basic challenges and sums up ways of dealing with these questions.

I will not go into the debate of the blurred boundary between CSCW and group-ware (Ehrlich 1999), rather describing properties effecting how business is being performed. I will use the term “shared information space” as a synonym for electronic technologies which can record and present information to other individuals than the author. Private conversations and e-mail is therefore not included in this term. In this essay the terms “business” and “enterprise” will be synonyms for “organization”.

2 Global arena for working and learning

2.1 CSCW and the Global arena for working

CSCW is a research area aimed at cooperative work in all its forms drawing upon the whole field of computer science and information technology (Schmidt et al. 1992, p. 5). Efforts are taking place to make CSCW a valuable tool for businesses and organizations in today’s global competitive environment (Schmidt et al. 1992, p. 6). CSCW is used as a design tool in order to make information environments, binding together available resources, and synchronizing efforts.

Today’s organizational world is characterized by geographically fragmented divisions with varied degree of cooperation, dynamic number of involved actors and dynamic tasks being performed (Luff et al. 1998, Ramampiaro et al. 1999, p. 2). The complexity of products and services has increased, which in turn has raised the knowledge requirements for its producers. Together with shorter production lines and stiffer competition, the demand for performing tasks globally and in different time zones, has become the way business is being performed with specially qualified personnel (Ehrlich 1999, p. 1).

IT based mistakes can be reduced by increasing the producer’s knowledge about the customer and his co-workers (Boehm et al. 1989, Boehm 1991). Producers of information systems which actively support learning need to face challenges that the users can encounter when making system requirements. The CSCW community is an active participant in this process of building IT solutions with promotes learning.

A product of the CSCW efforts is Office Information Systems (OIS) which has been developed to cope with such challenges, by recording, indexing and providing information access to its users (Schmidt et al. 1992, p. 11). They provide an arena for indirect and informal communication promoting new possibilities and increased flexibility at knowledge exchange. CSCW should support cooperative work wherever they occur (Schmidt et al. 1992, p. 6), and should be conceived of as resources for competent and responsible workers (Schmidt et al. 1992, pp. 19-20).

2.2 Global arena for learning

Organizations all over the world are stating that the people, the employees, are their most valuable resource (e.g. Deloitte 2004, EC 2004, and Wiig 1997).

Knowledge is a fundamental factor behind an enterprise's success and all its activities.

Wiig (1997), p. 6

When the number of people involved in a conversation is increasing and the time span of a conversation widens, keeping track of what is being said and done is growing in complexity. The number of resourceful individuals anticipating in the conversation will vary because nobody can attend continuously. Hence people need to be able to pick up the trace and continue on previously recorded conversations.

Writing contributions to a conversation stimulates structuring of personal thought, which is a way to achieve learning. Recorded conversations can be of personal and organizational value when reviewing the history in which a conversation took place; personally as a diary with reflections and thoughts and organizationally by enabling reconstruction of an environment in which choices were made, tasks were executed and the culture where formed.

Learning is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function.

Vygotsky (1978), p. 90¹

CSCW's perspectives on learning are in accordance with the sociocultural learning theory (Prasolva-Førland et al. 2003 p. 2), which is based on the Russian scientist Vygotsky thoughts. According to this theory knowledge is something you first achieve when you communicate with the outside world; Knowledge lies in the society, not in the individual (Galloway 2001). When you learn, you take in knowledge from the society. At the same time you contribute to the society and hence giving back knowledge to the society.

2.3 *Distributed Work*

2.3.1 *New forms of communication and knowledge sharing*

To achieve distributed cooperative work, communication tools need to be provided (Schmidt et al. 1992, p. 13). The Internet and intranets has changed how communication and knowledge sharing is being performed between organizations and within organizations (Jones et al. 2003, Poole et al. 2002 & Pozzebon et al. 2001). Now information can be exchanged between individuals, work groups, departments, organizations and countries at the push of a button. E-mail services, bulletin boards and chat services have become a part of the information space in the everyday work place. Information spaces can be private or public, giving possibilities for privacy and mass publications. Video conferences and meetings can be held in virtual environments with virtual anticipants or as a tool for coordinating work processes, making distributed and virtual group and team efforts possible. Even social interaction and spare time activities are being addressed by using such services, with a potential for sharing of knowledge.

¹ Reprinted in Miller 2002 p. 377.

The use of computer based communication tools is becoming a natural part in people's everyday life. Cultures get tools to communicate throughout their boundaries increasing the possibility of reaching other individual's with a compatible zone of proximal development² for efficient cooperation. These tools give new possibilities, but the organization must be able to take advantage of before they pose as a value adding service. Technical and practical issues must be taken account for in order to provide user requested services, and to build a critical mass of users in order to make the OIS self-efficient (Ehrlich 1999, p. 18). One such possible service is awareness.

2.3.2 Awareness

When performing tasks the need for being formal isn't always present (Capra et al. 2003, Ehrlich 1999, Erickson et al. 2000 & Prasolova-Førland et al. 2003). This can be the case when building knowledge and understanding of problems, scenarios and communicating. Here we find informal and local practices potentially without documentation. These conversations are in general performed ad hoc in a fairly unplanned way (Ramampiaro et al. 1999). Here there is a value of being aware of who you can communicate with synchronously, and who's listening. If you know who to contact, then you can do this directly without going via other forums. Services like Babble and Viras reflect upon this way of communicating where synchronous conversations are essential for the service (Erickson et al. 2000, Prasolova-Førland et al. 2003). In other services synchronous awareness is less of an importance, like with e-mail and bulletin boards. In order to achieve asynchronous awareness storage of conversations, anticipators and time will have to be performed. This raises several issues including how to perform storage, anonymity, trust and interpreting of recorded data. These topics will be discussed further in their own chapters.

2.3.3 Group work and their value for learning

More than ever before organizations of today are dynamic, and need to be continually shifting and transforming. This affects the people in the organization and the way they work (Luff et al. 1998). A popular way of working is by establishing work groups. In contrast to "traditional" work groups, these are not necessarily restricted to one physical location. CSCW systems can support the construction of a common information space among the group members, and provide contextual knowledge of the task at hand (Schmidt et al. 1992, p. 26).

Learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers

Vygotsky (1978), p. 90³

To team up individuals into cooperative groups has long been considered a wise way of educating the public (Bandura 1986). People can perform individual tasks, in addition to have an organization of coworkers which influences the individual directly by anticipating in communication etc., and indirectly by viewing how others work and perform and then replicating or adopting behavior in correlation with the viewed

² See page 5 for definition.

³ Reprinted in Miller 2002, p. 377.

actions. This means sharing a common work space and socializing will influence the individuals, with an indirect goal of bringing out more of the individuals potentials.

Multiple individuals working together in a conscious way in the same production process or in different but connected production processes
Marx (1867)⁴

Of the many cues that influence behavior, at any point in time, none is more common than the actions of others.

Bandura (1986), p. 45⁵

In order to achieve this, more than a shared information space needs to be shared (Schmidt et al. 1992, p. 20). The anticipants have to contribute actively and there need to be interpretations and discussions resolving issues. This effect is achievable in what sociocultural theory describes as the zone of proximal development.

The zone of proximal development defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state.

Vygotsky (1978), pp. 86-87⁶

According to sociocultural theory this effect is achieved when two or more people interact, where they co-construct a conversation, event, or activity (Miller 2002, p. 393). This explains why an individual manages to act upon more difficult tasks in cooperation with others than they would have individually. If we look at the animal kingdom we see this all the time where small individuals manages to take down larger prey when working as a group. We also see this in the educational sector where team projects in general ends up with better results than they would have as individuals. This can explain why group work has become more widely used. It is a key reason for why this has become a popular way of performing business.

Under practical circumstances this type of conversations and discussions are more difficult to achieve in organizations do to the number of individuals involved. With less anticipates each individual will potentially be a central actor, making the user more active and therefore could learn more. This gives an answer to why groups with “many” anticipants can end up in formal or informal sub groups with less individuals. Erickson et al. describes the Organizational Knowledge Spaces as a place where individuals and groups can store and retrieve such knowledge (Erickson et al. 2000, p. 79).

There needs to be a way for members of the larger organization, in which the knowledge community is embedded, to browse its discourse bases and discover useful knowledge. This is not just a benefit for those seeking knowledge—it also provides increased visibility and payoffs for those who do the work of producing, adapting, and distilling knowledge.

Erickson & Kellogg 2000, p. 79

⁴ Reprinted in Schmidt et al. 1992, p. 7

⁵ Reprinted in Standridge (2002).

⁶ Reprinted in Miller 2002, p. 378.

These conversations can take place synchronous, in real time, or asynchronous, where conversations are stored before the recipient can view the message.

2.4 Synchronous

Digital conversation may be synchronous or asynchronous, and its audience intimate or vast. Its persistence opens the door to a variety of new uses and practices: persistent conversations may be searched, browsed, replayed, annotated, visualized, restructured, and recontextualized, with what are likely to be profound impacts on personal, social, and institutional practices.

Erickson & Kellogg 2000, p. 68

When anticipating in synchronous conversation, the anticipants are communicating in real time, with the possibility to ask questions, interrupt, and make comments as the conversation takes place (Erickson et al. 2000). This is done with a degree of awareness of the anticipants when making the conversation. Some technologies allow visualization of its anticipants, allowing the users to observe who they are making conversations with, and to be able to react to their responses, and dissolve misunderstandings, inline with traditional face to face conversations, like in video conferences and Viras (Prasolova-Førland et al. 2003). By using this as a shared information source, the user can “walk” over to the individual with expertise and ask her a question and then (potentially) hold the conversation until she gets a suitable answer. The actors can play an active part, forming the conversation as it evolves, like informal conversations over lunch etc. and the use of IRC. Conversations can be more formal, like we often can see at open meetings where mass communication can be carried out. Synchronous conversations has the potential of being directed at one-to-one, to many-to-many, formal, informal, and all the stages in between. What we lack is the possibility to go back, and view the conversation at a later time. We thus need to use asynchronous tools, possibly as a supplement when we want to store and be able to retrieve conversations.

2.5 Asynchronous

When a meeting is held, the anticipants can record the conversation as audio, video or text. This way the conversation is stored and can be retrievable at a later period of time. The recording can also be distributed on asynchronous communication lines, like recorded TV and radio. When making conversation, you then don't see directly the audience and how they react, and therefore loose the possibility of continuous feedback. Within the IT industry we see this in shared information spaces where conversations are stored on servers and where conversations can be added potentially without geographical or timely restrictions. You can form the conversation, but the conversation is less dynamic.

With asynchronous conversation storage, anticipants and others can catch up with the current communication process after they have taken place. In global environments nobody can be online and anticipating all through the “working day” (Schmidt et al. 1992, p. 8). With asynchronous information spaces you can go back, and check earlier

conversations to prove previous facts conducted by your selves or others. This way of performing conversation comes with challenges which will be discussed in the chapters to come.

In short, the persistent trace left by textual conversation is a rich source of socially salient information (awareness), and its power is enhanced because participants know that the representation is shared and thus that everyone is privy to the same set of cues (accountability)

Erickson & Kellogg (2000), p. 72

2.6 Vocabulary indexing tools

When the number of individuals involved in a conversation increase, the more likely it becomes that other ways of describing a phenomenon will be, increasing the value of thesauruses by providing mappings of synonym words. Thesauruses and ontology can be used as tools to bridge the gaps between organizations and organizational groups, and thus increases the overall value of the system (Schmidt et al. 1992). Thesauri are one of the most common used controlled vocabulary indexing tools as part of Knowledge Organization Systems and are key metadata components in the growth of the Semantic Web (Semantic Grid) (Facet 2004). Development of such tools has shown to be costly, though with a great potential for knowledge distribution between cultures.

3 Using metadata

As groupware has become more popular, the need for storing earlier conversations has become a subject of large interest. But how should this be done? Distinguishing between subjects can be difficult, and require context knowledge.

Earlier and first generation OIS services provided searching capabilities where the documents were stored as plain text with formatting added with specific contents. The Babble project reflects on this by storing information about the author, the name, and time where stored along side with the documents (Erickson et al. 2000). This made it possible to go back and recover earlier conversations, with a simple query service which can browse the document and its metadata.

By using metadata posts for each document, more detailed queries can be performed increasing the querying tools resource base to achieve the sort after result. These metadata posts can contain information about time and date, localization, participants, author, subject, sub-subjects etc. Within the area of Digital Libraries (DL's), the use of metadata has been a topic of discussion for years. Open standards have been developed and services that use them is being used in scientific and in other services (e.g. EUN 2003, DWEL 2003). By standardizing metadata they have shown that it is possible to exchange information across organizations without losing properties from the native system. That said there are still large problematic issues which require more research in order to obtain full compatibility between general standards and how the standards are being used in practice (Council of the European Union 2003, Heath & Karampiperis 2004).

There are great similarities in the types of metadata that has to be stored in the OIS systems and DL's, though there are basic differences, some of which will be the topic in the coming chapters. In short the quality assurance aspect of DL's is not as vital, and there is a greater need for anonymous records and storage of organizationally confidential information. This places the OIS conversation storage facilities within a traditional area of archive rather than DL. Both can be viewed as vital sources for information, where the DL offers publicly available documents, reliable, static knowledge, while the other services provide a more dynamic, ever changing, continuously updated business specific information source potentially without the quality sealed properties of the DL.

Here the culture of the organization is stored, with their policies, standards, and how they are used to be viewed. Metadata can also be stored and used to e.g. link the organizations employees, making it possible to use existing data about the individual when putting together work groups. Statoil has just shown how they plan to introduce such a system (Dagbladet 2004). This is though a highly controversial move with several questions still remaining to be addressed in terms of privacy, how it shall and could be used, and organizational and country legislation. By using metadata to label ongoing and past conversation, other groups will receive a tool for more accurately determine the contents of existing data, and how it was developed in order to avoid misunderstandings and wrong interpretations.

By using an open, standardized structure of the OIS and its metadata, the organization will gain applicational freedom by being able to change between information systems. This way you avoid binding the organizations choices to one vendor today and in the future. This way of dealing with application dependencies has been a hot topic within the DL community for many years in order to be able to exchange information between different DL's (Smith 2004).

4 Anonymity

Organization's shared information spaces have shown that their most valuable asset is their knowledge of past experiences where the outcomes have been less good (Wiig 1997). This is a valuable information source since the users of the service can reflect upon these data and thus try to avoid the same errors their co-workers have experienced. At the shared information spaces you can locate information about how the action actually should be performed in order to achieve the desired outcome inline with the organizational policies. With this past experience being a foundation of the organization and its culture, it is important to be able to relocate past correspondence. This stands in vast contrast to the DL where stored information is mostly presented in the form of how things are and how they should be done.

An participants name will give the conversation more weight for its users, like Erickson and Kellogg observed in their accounting studies (Erickson et al. 2000, p. 65). Not all people want everyone to know about their mistakes. This can give the author a bad name when faced with coworkers and other people with an influence. This is a danger to their working environment. At the same time this is the individuals "all the others" need to address in order to learn from already experienced events. By not being able to contact the author, this is a lost resource for the organization as a

whole. This is a physiological, cultural and organizational hard task to find a middle way between privacy and the good for the organization.

Some anonymity can be positive as well for the organization. In an anonymous communication channel people can speak their heart without, or with reduced boundaries for what they say (Ehrlich 1999, p. 16). The conversation therefore runs more freely where people can speak their minds, allowing this to be a good source for receiving honest opinions.

5 Trusted information

5.1 Synchronous

In business it is important to be able to thrust individuals who you are working with, though the degree of thrust might vary from task to task. In case of the bulletin boards and other organizationally available communication channels, the weight on fast replies can be valued higher than the absolutely best and correct answer (Ramampiaro et al. 1999). Here discussions between users can be used as a forum for defining what is right and wrong within the subject at hand and for the whole organization. Within organizations this information source, along with other typically archive-based information, are of a more dynamic nature, where what's right and wrong vary and evolve with the organization over time. This makes this information source a valuable asset in order to locate the philosophy and people making up the organization, building a uniform basis for which products and services are being produced. What's right for some can be wrong for others. Studies suggest that formal communication is used to coordinate routine tasks whereas brief, informal communication such as spontaneous hallway conversations can help establish trust, promote social relationships and provide background information about the work environment (Ehrlich 1999).

5.2 Asynchronous

On the other hand DL's are designed to be trustworthy environments for quickly finding quality resources (DLESE 2004). They contain information of a more publicly available nature, where organizational coloring is less used, which makes it a more neutral source for information. Their organizationally oriented scope and depth of information is very limited.

When collecting information from asynchronous archives, there is again a question of thrust. With a simple information storage service, like Babble, only the strict conversation and metadata is stored without any interpretations of the conversation's content (Erickson et al. 2000, p. 72). When increasing the amount of metadata, the issue of thrust becomes more operant. You need to thrust the individuals who label the conversation for retrieval. By having this, you authenticate the worth of the conversation, and gain properties we associate with libraries. In the same process we take one more step away from "Internet based bulletin boards" where conversations are carried out without much control.

5.3 External sources

The question of “trusted” information sources for what’s “right” and “wrong” is of special interest when using information from all external sources, particularly in cases with foreign information services or different primary user group. Here cultural differences and vocabularies are challenges which require local in-depth knowledge and understanding to determine the documents original contents (Cordis 2004). Local interpretations will here play a vital role in respect to how the information source should and could be used.

6 Local interpretation

When performing synchronous conversations misunderstandings can be resolved as the conversation takes place (Schmidt et al. 1992, pp. 22-23). In order to enable exchange of knowledge from stored information, there will be a need to exchange more than the shared and distributed information objects. Organizations bring together people with potentially widely different experiences and perspectives organized in some form of group. In order not to distort the contents of the object, both author and receiver need to have a common information space which goes beyond their individual personal information spaces (Schmidt et al. 1992, p. 21). Within groups of individuals there will be a need to negotiate and establish this common information space (Schmidt et al. 1992, p. 22). But since individual groups work to establish such an information space individually with its participants, less attention is given to external parties, with local dialects forming with different interpretations of for instance key terms (Schmidt et al. 1992, p. 21). As a result organizations could end up with more than one definition of these terms making them not perfectly collaborative systems (Schmidt et al. 1992, p. 27).

Rather, the perspective on organizations that views them as a mixture of collaboration and conflict, overt and covert, appears to be more illuminating and have greater explanatory potential than the traditional ‘rationalistic’ account

Schmidt et al. 1992, p. 27

This affects the individuals who are using the shared information space, especially if they know that others outside their working group will be directly or indirectly evaluating their conversations without their local knowledge of how to interpret these. When querying for information this is important in order to retrieve information from what is considered to be a reliable source within your or other groups. This continues the discussions above by requiring more deep understanding of the objects contents, the general subject and targeting user groups. The potential close relations between the individual and the group in which the conversation has been taken place, makes viewing and interpreting the conversation from another group’s perspective can distort the conversation’s message. According to sociocultural theory:

The children and their cultural surroundings are interconnected. Looking at children ignoring their cultural context will leave us with a distorted picture of the child.

Miller (2002), p. 373

When viewing data you have to view the surrounding in which they have been taken place. The users must be aware of the challenges when accessing information from another information source or targeting user group than their native. Different individuals will look at information from their society. Background information suitable for that specific culture must be provided if the information can be delivered in the way authors intended (Schmidt et al. 1992, p. 22). When viewing a conversation from a distance, for instance by individuals after the conversation or when the authors are absent, looking at the recorded conversation the context can be interpreted in different way than what the understandings of the authors (Schmidt et al. 1992, p. 22), because the “newcomer” or foreigner has not anticipated in the negotiation and establishment of the information space in which the information where made.

A way to deal with these problems is active use of metadata, and record enough of this information space in order for the newcomer to understand the settings in which the conversation took place. By having sufficient amounts of metadata available, we can work to make mappings of interpretations between groups, making a conversation a more valid source for information for all groups. This requires a representation of the problem domain as a whole as well as a representation, in some form, of the mappings between perspectives on that problem domain (Schmidt et al. 1992, p. 26).

In such systems obtaining anonymity is challenging, because you tell a lot about you even if your identity is in absents. Each time a conversation is being recorded it will therefore be a challenge to label it in a way that not only describes the conversations contents, but also how the contents should be interpreted and under which circumstances it was made. This therefore stands as a vast contrast to presupposition that information is innocent and neutral, like some information system designers assume (Schmidt et al. 1992, p. 27). If this where the case we would have avoided the interpretation problems described in the previous chapter.

Metadata can be used to automatize the interpretation process by build thesauri and ontology tools which can be used as basic components when mapping terms between groups. Existing projects has shown how this is possible, though it is a challenging process to build in terms of time, efforts and costs (Facet 2004, Weaver et al. 2004).

7 Conclusion

As the organizational world has developed, the use of work groups has become a common way of performing tasks, increasing the need for storage and retrieval of conversations and other sharing of information. Storage facilities can offer the potential of being a vital source for information about the organization, its employees, its culture and training aids.

People’s ability to learn increases when working together with peers, where the peers act as an information source for the individual. Knowledge sharing is a complex and difficult task to achieve. Human factors will be a major determining issue if an OIS will be self-sustainable within the organization (Divitini et al. 2004). Issues including awareness, thrust and anonymity will need to be addressed.

When designing an OIS facility for an organization, we have to bridge the gap between human requirements and needs, and what is technically possible. All of these aspects need to be addressed at an early stage in order to gain focus on properties which will determine if the service will be used and have a potential of achieving its goals.

As a supplement to the synchronous services, asynchronous services can be of vital importance for the individual and organization. For retrieval purposes a framework of metadata can be developed to bridge the gap between user groups and to locate the desired information source.

Sharing of knowledge and experiences between the CSCW and DL communities could give benefits to both communities. Both communities can gain knowledge and insight of technical issues, like metadata and standardization, and human factors, like how people learn, how they act and why.

So, let us work together and share a common information space!

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