

# **Keeping Information Vivid**

The implications of information growth on librarian sense-making

An exploratory case study on the Austrian National Library

IS498 – Dissertation (ISOR)

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## Table of Content

<b>1. Introduction – What you get is what you see</b> .....	1
<b>2. Conceptual Framework – The Eye of the Beholder</b> .....	3
<b>2.1 Where is the system in Information Systems?</b> .....	3
<b>2.2 Technology as a Functional System</b> .....	6
<b>2.3 A no-thing known as Information</b> .....	9
<b>2.4 The Growth of Information</b> .....	11
<b>3. Literature review</b> .....	13
<b>4. Methodology – Three sides of a coin</b> .....	15
<b>4.1 Corpus Construction</b> .....	17
<b>4.2 Data Collection</b> .....	20
<b>4.3 Analysis</b> .....	21
<b>5. Findings - Keeping information vivid</b> .....	22
<b>5.1 The European Digital Library – A short Overview</b> .....	22
<b>5.2 The Austrian National Library – The Case</b> .....	23
<b>5.3 The Provisioning of Informativity</b> .....	24
<b>6. Conclusion – The end is the beginning</b> .....	35
<b>7. Bibliography</b> .....	38
<b>8. Internet Sources</b> .....	44
<b>9. Appendix</b> .....	45

## **1. Introduction – What you get is what you see**

Trying to observe a phenomenon in its entirety, is trying to observe everything which is the same as nothing. The scientific claim of discovering the truth (Glaserfeld 1997; Luhmann 2002), inviting social scientists to solve the case like a detective (Diekmann 2001), is founded on the conception of an objective reality. In this thesis, however, we shall see science as an opportunity to learn in order to contribute to the understanding of a defined and delimited topic or, in other words, to be informed by the phenomenon and to inform others who might be interested. As we will see further below, information, however, does not lie in the phenomenon but in the eye of the beholder (or in the eyes of at least two beholders, as it is the case in communication) instigated by the phenomenon. A scientific researcher is a beholder just like anyone else; he/she does not have a better viewpoint, only a different one.

My viewpoint was based on certain theoretical expectations guiding my empirical work in the field, constantly bouncing back and forth between what I expected and what I observed, until I was able to make sense of the data (Eisenhardt 1989; Weick 1989). For instance, it was during the analysis that I came across the notion of sense-making and consequently recoded the data according to the three dimensions of sense. Expectations are necessary, in order to find something novel and to be surprised, which is the defining characteristic of information (Kallinikos 2006b; 2006a:54). If one does not expect something, nothing will be informative, hence one does not learn (Esposito 2002:78). Therefore, the following discussion about information and communication also applies to the scientific world, thus also to this research paper. In other words, this piece of social science work, that you are reading right now, is neither about the truth out there nor is it about right or wrong. It only claims to be informative and hopes to be viable in the eyes of the reader. What that means, will be discussed, among other things, in this thesis.

The epistemological foundation of this research is called operational constructivism (Luhmann 1996a), the system theoretical version of radical constructivism (Glaserfeld 1997; Hardy 1997; Martinez-Delgado 2002). The basic claim is that reality cannot be separated from the knowledge of reality. Observations of reality are always observations of a specific observer who constructs reality based on his/her internal operations irritated by external events. That does not neglect the existence of a material world but the validity of ontological philosophy. This approach is the thread that leads us from epistemology and theoretical conceptualization to data collection and analysis, a leitmotif that will reappear in every section of this thesis.

The general frame of this research is The Information Growth and Internet Research (TIGAIR) project headed by Jannis Kallinikos. The general focus of the project is to study organizations in information rich environments (Kallinikos 2007a), meaning organizations ordering, managing, and diffusing information as their core “business” in the face of the socio-technological developments outlined further below. Libraries seemed a promising candidate, so one of the goals was to find out if our expectations to gain interesting insights were met. Suffice to say, our expectations were exceeded by far. The research strategy is to conduct five separate case studies (BBC, British Library, Dow Jones, Skype, and EDL) along the dimensions of 1) describing and documenting the information habitat, 2) describing and documenting the diffusion of new work and managerial practices associated with the emerging information habitat, and 3) investigating background structural patterns and changes (Kallinikos 2007a:5) and, as a second step, to compare the studies in a cross-case analysis

The thesis itself is not only a research report but also an opportunity to prove that I learned something during the programme. Hence, the three main sections of the thesis should show that I am capable of discussing conceptual issues within the IS-field, of documenting the decisions made in terms of methodology, and, finally, of interpreting the data by going beyond mere re-narration. Basically, this thesis is a wrapping up of what I learned, thought, and criticized during the MSc ISOR programme at the Information Systems Group, LSE.

I would like to thank all the interviewees for the help and support they gave me in conducting this research. Without their time and interest, this would not have been possible. I also would like to thank the teaching staff of the ISOR programme, you guys made the year worthwhile.

## 2. Conceptual Framework – The Eye of the Beholder

Libraries can be discussed in various ways; as a memory institution (Orr 1977; Hjørland 2000), as an educational institution (Petschar 1997; Baker 2006), or as a cultural institution (EU-Brochure 2006). Seeing libraries as organizations, adds a dozen of more possible approaches to the field (Morgan 1980). Any of these classifications are of course viable and would lead to different theoretical concepts and empirical proceedings. However, since this research is situated within the field of information systems, we will describe a library as an information system, a viewpoint also discussed within the library and information science (LIS) community (Barreau 2001; Bennett 2001; Suleman and Fox 2001; Graham 2005), not because a library *is* an information system, rather because it is a necessary choice of perspective. Broadly spoken, we are interested in the interplay between organization and technology (Lee 2004:11), or, more precisely, in the paradoxical oscillation between the organization of technology and the “technologization” of organization (Baecker 2006), that is also a part of the dynamics of librarianship. Still, first of all, we need to be clear about what we mean by information, on the one hand, and by system, on the other hand, since these concepts “*have fallen into such careless use that they seemingly no longer denote anything different from one another*” (Lee 2004:11).

### Where is the system in Information Systems?

Since the field of Information Systems (IS) is also a sub domain of the social sciences (Willcocks and Mingers 2004), we need to be clear about, how technology can be described as a social phenomenon. This thesis is heavily influenced by the work of Niklas Luhmann and his Theory of Social Systems (Luhmann 1996b; 1998; 2002; 2006). As we move further along, I will try to show why this theory is appropriate for the social study of information systems.

The basic starting point is a philosophy of difference (Heidegger 1969; Esposito 2004); a system is what it is, because it is what it is not at the same time. A system is defined, thus observable, by its difference to its environment, so system theory is, in fact, a system/environment theory (Baecker 1998). We are dealing with a paradoxical basis that cannot be resolved; it can only be hidden, ignored, or even made fun of. Now, communication forms a social system emerging from the paradoxical situation that we cannot say what we think; still we expect to understand each other. Let us take the writing and reading of this

thesis as an example. As I sit at my desk and type these words, I have to consider who is going to read this text. In other words, I am writing something based on the expectations of others who I expect to understand what I am trying to say. In this case, I am of course writing for two markers who will grade this thesis. Consequently, we end up in a cycle of mutual expectations; I expect my markers to expect that I expect that they expect that I expect them to give me good grades. Therefore, the crucial question is; can I write whatever I think? The obvious answer is; no. Generally spoken, communication is not an exchange of thoughts unless we all turn into telepaths<sup>1</sup>. As a consequence, communication is not a way towards complete, mutual understanding (e.g. Habermas 1984). Quite the opposite, communication happens because we *do not* understand each other. If it was possible to understand each other, it would be only a question of time until there was nothing left to talk about (Luhmann 1994). Communication would be only a problem that could be solved and not an irresolvable paradox.

Luhmann calls this paradoxical situation “double contingency”, it occurs when Ego observes another person as another Ego – as “Alter-Ego” (Luhmann 1996b:148-90). At this point, communication turns out to be something very, very unlikely; still, it happens all the time. From this perspective, social systems can be treated as turning the unlikelihood of communication into a very likely occurrence. They are emergent phenomena with their own structures and rules that reduce the infinite complexity of the paradox (Baecker 1999:38) by introducing a system/environment difference of inner and outer complexity. The border of the system is the incline between environmental complexity and reduced system complexity, a difference that actually does not exist by itself (Bateson 2000:458).

Social systems, like all complex systems (social, mental and biological systems), are operationally closed, meaning that they are autonomous, self-referential, and self-organizational. However, the system is defined through its difference to its environment and that difference is observed by the system based on its own structure or expectations. Hence, a system is not only operationally closed, but also structurally coupled to its environment in a selective fashion (Luhmann 1998:92-120).

Therefore, we have to take into account that a complex system is capable of distinguishing itself from its environment. This is referred to as “re-entry”, meaning that the system/environment difference re-enters into the system as the difference of self-reference and external reference (Spencer-Brown 1972) – another paradox; the difference re-enters into

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<sup>1</sup> It is possible to communicate about communication; it is possible to think about thinking. It is, of course, also possible to communicate about thinking and to think about communication, but it is not possible to communicate thoughts and to think communication.

what it differentiates (Luhmann 1998:45). The re-entry closes the system operationally and turns, as second order cybernetics puts it, the trivial (reliable) machine into a non-trivial (unreliable) machine (Foerster 1993) – into a complex system that is unpredictable by any observer, even by the system itself (Luhmann 1997). Consequently, a complex system cannot be controlled from the outside; it can only be irritated, as it is called in system theory. In this sense, irritation is nothing good or bad. It simply means; something happens, but there is no way of telling if or how a system will react. It simply does what it does. Therefore, whenever we talk about self-reference/external reference, we mean the system observing itself and its environment. As a result, this thesis is not about what a library really *is and does*; it is about how a library constructs itself and its environment in reference to its own observations. We will observe how a library observes certain issues based on self-reference and external reference.

As a last step, we need to consider communication, in order to bring my argument to a close. Communication is explained as a threefold operation of utterance<sup>2</sup>, information, and (mis)understanding (Luhmann 1996b:191-241). Utterance is a selection out of a structured horizon of potential selections. One can utter what one means in a lot of different ways, but the crucial point is, that it is not an infinite number of potential selections; it is based on the expectation of being understood. Again, those expectations are structured by the social system that is irritated by the utterance. If utterance is about how something is said, then information is about what is being said, hence information is also a selection. However, the utterance is only informative, if Alter-Ego is able to distinguish between utterance and information, if Alter-Ego understands. Now understanding is not meant as a cognitive operation but as a communicative one, because, in turn, understanding also becomes an utterance that is informative for Ego. Therefore, communication only happens, when utterance is understood. As a consequence, we are dealing with a cycle of mutual understanding that takes at least two persons, even if one of them is imagined.

Let me elaborate by giving the following example. Imagine I would have written this thesis in German instead of English. The thesis could be the most remarkable piece of research ever written; still my markers would not understand a single word, since they do not know German. Most probably they would notice that I am trying to say something, but that would not be of any help. For them, the thesis would be mere noise, unable to distinguish between utterance and information. In the end, communication would not emerge and I would earn myself a clear “failed”. As you can see, it takes (at least) two to tango. That is the main

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<sup>2</sup> Sometimes utterance (Mitteilung) is confusingly translated as message (e.g. Leydesdorff 2000).

reason, why Luhmann claimed communication to be the operation of society and not social action, as many other social theories do (e.g. Weber and Winckelmann 1976). Communication refers to mutuality, whereas social action refers to a single actor.

In the end, you, dear reader, might ask yourself, why it was necessary to go through all of these rather abstract and complex concepts. There are three reasons for that. First, I want to introduce a different social theory into the social study of information systems hardly known in the field. Second, it is very important to understand a library as a social system that is, like all organizations, operationally closed and only irritated by environmental developments based on the structure and the observations of the library itself. A library does what it does in order to make sense out of those developments observed by the library. Third, manuscripts, printed books, documents, CDs etc. are not storages of information; they are the media for communication. Just like this thesis, they are written and recorded - in other words uttered - with the expectation of being understood by a specific person or an anonymous public. However, the point is that the communicative process based on mutual observation, as it is the case in face-to-face conversations, is severed by technological means enabling communication to reach longer distances in time and space (Giddens 1996; Bühl 1997; Borgmann 1999; Crang, Crang et al. 1999; Esposito 2004). Those are referred to as “diffusion media” (Luhmann 1998) or “communication technologies” (Esposito 2002) like writing, print books, tele-media (e.g. telephone, television, radio), and the new media (Negroponte 1995; Flusser 2002). Finally, we reached a point where the Theory of Social Systems (communication) and the field of Information Systems (technology) meet.

### **Technology as a Functional System**

Within the scientific field of Information Systems, there is an ongoing debate on the relationship between technology and organization. The discussion basically unfolds along a continuum between technological determinism and social constructivism (Cadili and Whitley 2005; Doherty, Coombs et al. 2006). Technological determinism refers to technology as a neutral, effective, and efficient tool that, if implemented properly, improves the efficiency of work and management. If the implementation fails, it is, so to speak, the fault of the organization or rather of the user not complying with the technology. This view has been heavily criticized as simplistic and as not taking into account the necessity of tinkering and improvisation in order to make technology work within a specific organization (Introna 1997; Ciborra and Hanseth 1998; Ciborra 2000; Ciborra 2002).

At the other end, the social construction of technology (SCOT) denies technology any essence of its own and rather ascribes technological features to the interpretations of locally embedded actors. Hence, technology is the outcome of a negotiation among designers of technology until they reach a state of closure – an agreement (Bijker 2001). This view is criticized for missing the bigger picture of technology having a life of its own (Kallinikos 2004). Basically, the field is discussing which way the arrow should point; technology -> society or society -> technology.

Be as it may, this discussion is still very much entangled in the traditional Cartesian object/subject dichotomy. It is object vs. subject, people vs. things, technology vs. society, Frankenstein vs. Frankenstein's monster. Attempts to find a conceptual alternative between these two viewpoints, subsumed under the term "interpretive flexibility" (Cadili and Whitley 2005; Doherty, Coombs et al. 2006), are still situated within the Cartesian paradigm and hence inherit the core problem. For instance, Cadili and Whitley (2005:167) are still talking about "*the relationship between technology and society.*" Orlikowski, trying to reconceptualise technology, claims technology to have a "*dual nature as objective reality and as socially constructed product*" (Orlikowski 1992:423). Interpretive flexibility describes technology as being capable of sustaining multiple interpretations of actors (e.g. Sahay and Robey 1998). However, the question remains where to put interpretive flexibility? Is it the technology that allows for flexible interpretation or is it the practitioner who is inventive and creative enough to use technology in a way it was not designed for? The first point sees technology being inherently interpretively flexible, the second point sees the user as being interpretively flexible (Orlikowski 2000; Kallinikos 2002; Doherty, Coombs et al. 2006). Interpretive flexibility is still about drawing arrows between technology and the social. Only this time the arrow points into both directions.

Instead of continuing this discussion, we rather propose an approach that goes beyond the Cartesian dichotomy of an object world and a subject actor (Heidegger 1969; Spencer-Brown 1972; Glaserfeld 1997; Esposito 2004; Luhmann 2006) by proposing technology as a functional social system.<sup>3</sup> As Heidegger (1977) stated; technology is not technological; it is not the machinery but a way of seeing the world, as enframing the world (Gestell). With the words of Luhmann, this is done through "functioning simplification" and "containment" (Luhmann 1993; Halfmann 2005; Kallinikos 2006a)<sup>4</sup>. The meaning of technology is to

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<sup>3</sup> I have to admit that this concept is still work in progress but I decided that this thesis might be a good opportunity to introduce the idea.

<sup>4</sup> Kallinikos translates „funktionierende Simplifizierung“ as „functional simplification“, because he deems “functioning simplification” as an awkward translation (Kallinikos 2006a:33 footnote). However, since the term “functional” has a very specific definition within the Theory of Social Systems, we rather stay with the awkward

function or to work orderly which is achieved through tight cause-effect couplings. Containment refers to the necessity of technology to bring certain couplings into a stable relationship while excluding other potential causes and effects. Hence, containment distinguishes between an inside and an outside. Although Luhmann never put it this way, technology could be seen as a social system just the way we described it further above (Kallinikos 2005), the border being called in-order/out-of-order with the basic operation of enframing (Heidegger 1977) informed into the media of causality (inside tight cause-effect couplings, outside loose cause-effect potentialities). Hence, from a social perspective, technology reduces social complexity through functioning simplification based on the expectation that a certain event causes a certain effect (Halfmann 2005:229).

However, for technology to become a functional system of society, just like economics, politics, science, or the mass media (Kallinikos 2006a:31), we need to consider the re-entry of the difference in-order/out-of-order back into the system. Indicators for that can be found in studies on 2<sup>nd</sup>-order technologies, especially since the technological paradigm shift from mechanical machines to computers or electronics (Kallinikos 2005; 2006a). Among other things, computers are used to monitor other technological processes. In a sense, technology observes itself and the work of its operators turns into observing how technology observes itself. In other words, one needs technology to find out whether technology works or not. This shift has been described using terms like alienation, abstraction, datafication or informatization of the work place (Zuboff 1988; Weick 1990; Brown and Duguid 2000; Kallinikos 2001). The phenomenon of, in the true sense of the word, not being in touch with what one actually does was also explained to me in the field:

*“The only thing that’s new and what librarians have to learn is that, particularly in the area of book digitalization, mass digitalization is an industrial process that has nothing to do with the day-to-day librarianship. To create this awareness, to learn, and to accept that, surely was and still is one of the most difficult tasks in the library, because the library or rather the librarians have to let go of the books to see that it is not them who are doing the job.”* (Interview 5: 14)

The re-entry renders technology intransparent to the outside operator but also to itself. The simplification – or we could also call it trivialization (Baecker 2006) – of a complex world through technology paradoxically also increases complexity that, in turn, is again trivialized through technology. Technology becomes the solution for the problem it created.<sup>5</sup>

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but literal translation. Technology functions, meaning it works and is not out of order. On the other hand, every social system is functional.

<sup>5</sup> This phenomenon was observed and referred to as the increasing production of risk (Beck 1986; Luhmann 1993) or as the control illusion (Hanseth and Braa 2000), where more technological control means less control.

To bring this to an end, technology is as social as politics, economics, or science, so it makes no sense to juxtapose technology and society. However, technology is an operationally closed system that only links to its environment through structural coupling. Consequently, technology is also in the environment of other social systems, such as organizations, constantly irritating one another. Technology has its own functionality, but the organization implements it according to its own structure (Luhmann 2000; Drepper 2003; Baecker 2006). This conceptual elaboration basically reflects what was found in the IS-field but described in different words (e.g. Ciborra 2002:103-14). Finally, we can describe a technological artefact as:

*“an "interface" in today's terms - between an "inner" environment, the substance and organization of the artifact itself, and an "outer" environment, the surroundings in which it operates.”* (Simon 1996:6)

In our terminology, the artefact or the computer interface is one possibility of structural coupling through which technology irritates other complex systems or is irritated by them (Kallinikos 2002). The crucial point is that technology does not become part of an organization but is structurally coupled to it. So, technology matters, not as Frankenstein's monster but as a social system being unreducible to the practices of single actors or groups (Kallinikos 2005). As a last thought, it might be necessary to mention that technology has not always been a functional system but its increasing importance for personal and organizational life indicates that it might be on the verge of becoming (Beniger 1986; Borgmann 1999; Devlin 1999; Bijker 2001:20; Kallinikos 2006a).

### **A no-thing known as Information**

In a most general sense, information is necessary for complex systems (e.g. living organisms, social systems) to counter entropy in order to maintain their inner structure (Beniger 1986; Simon 1996). Information occurs if an observed event leads to a change of the observer's structure. Therefore, information is more attuned to learning and less to knowing (Wildavsky 1983:39; Simon 1996:100), a concept that was defined by Bateson (2000:459) as *“a difference which makes a difference”*. This definition of information is usually interpreted as a novelty, news, or surprise (Luhmann 1996b; 1996a; Kallinikos 2006b). Still, a difference is not an entity; it is the border where something ends and something else begins, the in-between that actually does not exist, or, as I call it, a no-thing. As in information, we deal obviously with two differences – with two no-things. The Theory of Social Systems deals with information as two consequent events where the first event (a difference) triggers a change inside the system (another difference) (Luhmann 1996b:102). In terms of a social system, it is

what happens through communication; an utterance is a difference (a selection) that is only informative if it is understood, if the differentiation of information and utterance is achieved.

In information theory (Shannon 1993) information is only handled as one difference that is the selection of a message out of a pre-selected number of messages based on the design of the communication channel between sender and receiver. The information value of the message sent derives from the number of messages it was selected from. The unit of measurement is a bit (binary digit) that basically differentiates between two states; 0 or 1, yes or no, dot and dash (Borgmann 1999). Shannon's model is a basic input-output model; what comes in is supposed to come out as efficiently and undisturbed as possible. However, the expectations of the receiver are completely left out of the model. For instance, the receiver might be unaware that the signal he receives is mere noise, but the signal could still be informative as long as it confirms his expectations, as long as he understands and distinguishes between noise and information according to his/her own terms (Baecker 1999:37). The receiver might not understand what the sender intended but still be informed. Remember the example of writing this thesis in German instead of in English? In that case, though my markers might not understand a word, they might see it as a prank. They would still mark my thesis "failed", but maybe with a smile on their faces. My point, however, is that understanding a message is not up to the producer of the message. So, finally we come full circle to where we started from in the very beginning of this chapter when we proposed that information lies in the eye of the beholder. Information is based on the expectations of the observer. If one does not expect anything, how should one be surprised (Esposito 2002:264)? After all, an observation of an event or of an utterance does not "carry" the same information for everyone (Kallinikos 2006b:101)<sup>6</sup>.

Therefore, whenever we talk about information, we have to state for whom or, in other words, we have to refer to a system (system-reference). In the end, also the repetition of a statement might be informative; although the statement itself is not new, the fact that it was said twice may be informative in the eye of a beholder (comp. Borgmann 1999:133). One might end up asking oneself, why this message was repeated. Furthermore, even the absence of a statement or a signal might be informative for somebody who expects it. For instance, not

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<sup>6</sup> Consequently, it comes as no surprise that communication about information depends on the viewpoint taken. For instance, from an economical perspective, information comes with a price of course (Devlin 1999:32; Shapiro and Varian 1999), an approach that leads to the paradoxical situation of how much to pay for something one does not know whether it is the information one needs or not (Picot, Reichwald et al. 1998). In organization studies, a similar paradox is described by the question; why is information gathered and how much information is enough in order to make an informed decision (Feldman and March 1981; Wildavsky 1983; March 1991; Weick 1995)?

submitting my thesis will have dire consequences for me (Bateson 2000:458). In a nutshell, information is not a thing but rather a no-thing; it is not what changes, it is the change.

These conceptual considerations might seem very or maybe even too abstract, but they are deemed necessary because of the following reasons. First, it is imperative to have a clear picture about the difference between data and information, two terms that are often confused (Lee 2004:10). In our terminology, it is data that is conveyed via a signal and is measurable in bits<sup>7</sup>. Therefore, we propose that whenever information is treated like a thing that can be gathered, stored, or quantified, it is data.<sup>8</sup> Second, libraries are not repositories for information (e.g. Young 1996) but provide, as we will elaborate further down, access to informativity. Accordingly, books and other communication technologies do not convey information (Esposito 2002:339) but offer the potential to be informed based on the structure of the communication technology (Brown and Duguid 2000:189) and the knowledge of the library user (Hjørland 2000:32).

### **The Growth of Information**

The Theory of Information Growth, elaborated by Jannis Kallinikos (2006b; 2006a; 2007a), addresses basically all the above discussed concepts and brings them all together. By comparison, the way some concepts are presented in this thesis might appear different, but they are highly compatible, at least from my perspective.

Information has always been growing but we are witnesses of a qualitative jump onto a new level of communication related to the paradigm shift from industrial to computational technology (see in LIS: Young 1996). We may expect the impact of this jump to be as far-reaching as developments ascribed to the invention of the printing press and the mass production of print media (Luhmann 1998; Borgmann 1999; Shapiro and Varian 1999:95; Esposito 2002; Flusser 2002). Our behaviour and communication leave traces that are easily stored in databases (Bowker 2005) to be ordered, organized, and manipulated, hence forming a basis upon which information can be generated through 2<sup>nd</sup>-order technologies (Kallinikos 2007a). Technological innovations, the diffusion of digital devices into the consumer market, and, of course, the rise of the Internet exponentially increase the production and storage of data. The world is becoming an ever noisier place. It comes as no surprise that the big players of today's business world are providers of information-services bringing order to that noise. The Googles and YouTubes are clear indicators for the socio-economic importance of

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<sup>7</sup> For information measured in bits see Lyman and Varian (2003) and Gantz, Reinsel et al. (2007).

<sup>8</sup> In this sense it is also more appropriate to speak about data-overload (Esposito 2002:343-44) instead of information-overload (Borgmann 1999:213).

keeping information alive. However, managing the informativeness of information comes with a price. Technologically generated information out of data is again stored as data so that new information can be generated. The disposability of information calls for constant updating of the databases to maintain informativeness. This virtuous cycle of technological data and information generates a systemic self-referentiality that is beyond the control of any single entity (Kallinikos 2006a:19). This phenomenon is referred to as the double-bind of information where “*ordering information and improving control and inspectability of available sources [...] amount to producing new information*” (Kallinikos 2007a:2). As we said before, technology is the solution for the problem it creates.

Still, since we conceptualized information as an unquantifiable no-thing, how does information grow and not only data? Going back to the difference between data and information let us answer the question with the following example; imagine two databases containing specific sets of data. Now, if we connected those two databases, we would not come up with more data. However, the potential for information would increase because of the possibility for comparisons across the databases. Now think of hundreds or thousands of interrelated databases; updating only one of them changes the whole constellation. Therefore, the potential for information does not only lie in the data but also in the connections between them. The interoperability of ICT, based on bits (Negroponte 1995) and the growing standardization of services and sources (Bowker and Star 1999), is in principle limitless and only bounded by legal, organizational, and institutional arrangements that are negotiable.<sup>9</sup> So, in fact, what is meant by information growth is the growing difference between potential information and actual information that is produced or rather selected mostly by technological means (Kallinikos 2007b).

All these developments taken together “*establish a new socio-economic environment in which information-based operations and services acquire crucial importance*” (Kallinikos 2007a:1), an encompassing ecology we refer to as the information habitat (Kallinikos 2006a:94-101), into which organizational (but also personal) activities immerse. Basically, the TIGAIR-project studies the relationship between the environmental habitat and the organizational strategies responding to but also feeding back into the information habitat.

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<sup>9</sup> For instance, ChoicePoint is a commercial business collecting all kinds of data about the US-American population and selling it to the highest bidder, e.g. the US-government not allowed to collect these kinds of data itself. “In 2002 ChoicePoint was able to help authorities solve a serial rapist case in Philadelphia and Fort Collins after producing a list of 6 potential suspects by data mining their DNA and personal records databases” (BizNiche Ltd. Co. 2007).

### 3. Literature review

Basically, we can position this research, seen from a library- and information science (LIS) perspective, within the topic of digital libraries (Kuny and Cleveland 1996; Raitt 2000). For the sake of simplicity, alternative terms like “hybrid library” (Rusbridge 1998; Oppenheim and Smithson 1999) or “ubiquitous library” (LiLi 2006) as well as the difference between “e-Lib” and “d-Lib” (Rusbridge 1998:180; Brown and Duguid 2000) will be subsumed under the discussion on digital libraries as they are focusing only on different aspects.

The LIS-field obviously observes and discusses a process of change of librarianship ascribed to the rise of the Internet (Davis and Lagoze 2000); this includes changing user behaviour (Peterson Bishop, Neumann et al. 2000), the increasing importance of documentation and preservation of online communication, especially in science and research, (Ercegovac 1997), and comparisons with new information service providers of which Google is the most prominent one (Schwartz 2000; Bearman 2006; Bjorner 2006; LiLi 2006).

An indicator for the ongoing discussion is the lack for a standard definition of digital libraries (Meyyappan, Chowdhury et al. 2000). Schwartz (2000), for instance, discovered 64 different definitions of digital libraries that vary from very strict characterizations;

*“Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities.”* (ibidem: 385)

to very loose ones;

*“A digital library is a distributed electronic collection that covers virtually all fields of human endeavor including art, music, medicine, science, movies, videos, books, product literature, newspapers, brochures, and catalogs.”* (ibidem: 385)

If we compare these definitions with a traditional definition of a library as, for instance, presented by Oppenheim and Smithson (1999); *“The traditional library is defined as a specific place with a finite collection of tangible information and it is geographically constrained”* (ibidem:99), we may come to the conclusion that either the library does not change a lot or it changes tremendously. Either a library simply includes digital works into their collections and offers corresponding services or it leaves “the place” behind (Oppenheim and Smithson 1999:99) offering any document any time to anyone in any place (Covi and Kling 1996:672) – a library without walls (Lee 2000; Schwartz 2000). Which one to pick depends very much on the focus in terms of *what* is changing. *“Technological progress has changed how libraries do their work, not why”* (Kuny and Cleveland 1996:1). In this thesis,

we follow an alternative path. We do not ask primarily *how* and *why* but rather *what*. What makes a library a library irrespective of any technological developments? This approach will help to elaborate the function of a library that makes the social system distinguishable, hence observable, from its environment (Baker 2006). If a library does not achieve that function, it is not a library anymore.

A second very important issue is the relationship between librarianship and ICT. Digital libraries are often positioned somewhere between these two domains (Oppenheim and Smithson 1999; Hjørland 2000; Schwartz 2000; Barreau 2001; Graham 2005). The discussion unfolds along three major dimensions; digitalization and preservation of digital media, accessibility for library users, and interoperability of librarian cataloguing. The first point refers to the difficulties of not only digitalizing analogue media but also to keep the digital content retrievable at any time (Petschar 2002). Libraries have to think in long terms. Decisions made during digitalization (e.g. file structure) have a huge influence on the preservation policy and vice versa. That is because digital documents are unable to “*care for themselves*” (Russell, Weinberger et al. 1999:277), for digital media requires the appropriate hard- and software in order to be accessible. All solutions discussed (emulation, migration, and keeping the original technological artefacts) do have considerable advantages and disadvantages (Russell, Weinberger et al. 1999; Bennett 2001).

Accessibility mostly refers to the interaction between the library and the library user. ICT does not only enable multi-dimensional search functionalities through the library’s repository but also new meeting points for face-to-screen interaction and new possibilities for collaboration. This is another novel issue for the field of librarianship that requires, like all the three points discussed here, quite some technical knowledge. The discussion covers a wide range from usability in terms of screen- and interface design (Thong 2002) and the enhancement of the readability of texts on screen (Greene, Marchionini et al. 2000), the design of systems to improve the relevance of results of user enquiries (Marcum 2001; Tuominen, Talja et al. 2003), to new tools for especially scientific users in terms of collaborative research and user behaviour (Peterson Bishop 1999; Wilensky 2000; Bollen, Sompel et al. 2005).

The final point mainly discusses concerns regarding the interoperability between, formerly quite independent, librarian standards of classification and metadata (Petschar 1997; Suleman and Fox 2001; Woldering 2004). Metadata standards play a key role in the future development of librarianship (Baker 2006), since they build the basis for search, retrieval,

delivery, rights management, and preservation (Russell, Weinberger et al. 1999). So, all three issues are highly interrelated.

As a summary, the field of digital libraries is a very heterogeneous and wide-ranging topic in the face of technical, legal, managerial, and economical challenges. Some are old and based on a consensus, but some are very new calling for the library to renegotiate its role as a guardian of knowledge and provider of information (Young 1996).

#### **4. Methodology – Three sides of a coin**

The research presented in this thesis is an exploratory first step into the field of digital libraries with the long-term aim of analysing the emergence of new organizational structures completely immersed into the information environment, clearly positioned within the qualitative research paradigm (Bauer and Gaskell 2000; Flick 2006).

The overall research strategy is basically a case study (Benbasat, Goldstein et al. 1987; Eisenhardt 1989; Yin 2003) in three phases; the results of phase one, exploration, are reported in this thesis. The Austrian National Library (ANL), a member of various EDL related projects, was selected as the case for the first step. The choice was made merely out of pragmatical reasons, since I knew that I would spend the time for data collection and analysis in Austria. Phase two is the actual case study focusing on the European Digital Library (EDL) that will be incorporated into a PhD thesis. The final research design will mostly be based on the findings of the exploration phase. In phase three, a cross-case analysis will be conducted with the other case studies of the TIGAIR-project. The exploratory study is based on approximately six months of research beginning in March 2007, starting with the conceptual elaborations within the TIGAIR-Group, the selection of the librarian domain as a promising candidate for studying information rich environments, the authoring of a research design, and establishing contact to the Austrian National Library. Finally, data elicitation and analysis was conducted in July and August.

The general aim of the exploration was simply to see how libraries observe and respond to the contemporary developments of ICT and the Internet in order to get a sketchy overview of what is actually going on in the field. As a result, the capability to make informed decisions regarding the next phase of the research was increased. Plainly spoken, the main purpose of the exploration was doing it, to establish connections and to improve my interactional skills regarding the relevant issues of librarianship (Collins, Evans et al. 2006). It

was necessary to start learning the “language” of librarianship. Furthermore, the EDL was the second major focus of interest. However, during the fieldwork it became clear that the EDL as an organizational entity was just about to be founded, so there was not much to tell me in this respect. Consequently, only an insufficient amount of data could be collected regarding the observations of the Austrian National Library about the EDL. For instance, only two out of six interviewees were actively involved in EDL related projects. But that’s life and I had to adapt to the situation found in the field. Therefore, I concentrated my efforts on understanding what the Austrian National Library is about and how it changes in order to remain the Austrian National Library. In more abstract terms, the ANL was supposed to be the system reference from the very beginning anyway, but the external reference is not mostly about the EDL, as planned, but about other issues presented to me. This is of course not a waste of time. Quite the opposite, to understand the concerns of contemporary librarianship helps to move on in a more focused fashion in the second phase, when the system reference is switched from a national library to the EDL.

As we already discussed in the conceptual part, we observe an observer in terms of the observer’s self-reference and external reference. This approach led to a set of preliminary research questions that reflect the different point of views a library may observe based on its own structure. Hence, we define a library, like all organizations, as a social system (Orr 1977; Luhmann 2000). The core question that guided me during the field studies was; what makes a library a library irrespective of technological change? Now, this question aims at the two sides of the system/environment difference that makes a library observable in comparison to its environment. Since the system reference is the library, we ask for a self-description of a library – the inside of the border. We could have asked, for instance, library-users or ICT-experts the very same question and most probably we would have received quite different answers. But the question also refers to the environment, the information habitat, of the library that is a co-founding aspect of what a library is. How can there be an inside, if there is no outside? However, the outside aspect is based on the library’s observation, so we are not dealing with library users directly but how the library observes its users. In other words, external reference is the library’s construction of the outside world; “The User” is not a collective of individuals but a construction of ascribed expectations. In a sentence, we are dealing with two sides of the coin – two aspects of one question. A library is what it is, because it is also what it is not.

Based on this approach the second set of research questions gains a completely different meaning. Those ask for the change of libraries due to developments of ICT and the

Internet; 1) How does the library change in order to remain a library?; 2) Why is it necessary to change? These questions also aim at the difference of self-reference and external reference. However during the fieldwork it became clear, that the first question puts more stress on the inside of the library and the second question more on the outside.

To come to an end, the research strategy is to observe how the ANL observes itself (self-reference) and its relevant environment (external reference) but also the feeding back of this difference into the system (circular reference) (Pfeffer 2004). Coming back to the example of the library user, the research question is not only about the library and the library's construction of the library user, but also about the library's expectations of what "The User" expects from a library. Hence, we are facing three aspects of one single research question – three sides of a coin. Obviously, we have a clear top-down approach in terms of methodology. We started from an abstract concept of Information Growth and a philosophy of difference; we derived a set of research questions and, finally, we will find the same approach when it comes to data-collection and analysis.

### **Corpus Construction**

Bauer and Gaskell (2000:19-37) propose an alternative way for conducting qualitative research that does not use concepts misleadingly named like or even derived from research methods based on a quantitative rationale. Originally a linguistic methodology, corpus construction offers strategies and principles for qualitative research that are separate from but functionally equivalent to quantitative research designs. The principle problem corpus construction addresses is that qualitative research studies phenomena of unknown or unknowable populations like situations, communication, actions, observations, and the like. Consequently, it does not make any sense to aim for representativity but for the variety of a phenomenon until saturation of the related categories is reached. This paradox of studying the variety of an unknown population of phenomena is unfolded by differentiating the so called social space along two dimensions of known and unknown variety. Basically, corpus construction is a cyclical procedure of selection, analysis, and re-selection until saturation is achieved, meaning that the increase of known variety does not increase the variety of the unknown phenomenon. The long-term research effort follows these recommendations, although corpus construction was not conceptualized for a case study strategy. However, with some minor modifications, it fits quite neatly.

The exploratory phase of the case study can be seen as the first steps of selection and analysis. The selection according to known variety was replaced by theoretical considerations.

Librarianship seemed to be a valid domain to study in terms of information growth, therefore, according to a single case study strategy, the EDL was selected as a promising case. Hence, the member organisations of the EDL, which are mostly national libraries at the moment, became the unit of analysis. Therefore, the research on the EDL will be conducted until selecting further member organisations for analysis does not bring up any new insights. As already mentioned, the first selection - the Austrian National Library (ANL) - was purely based on pragmatic considerations.

Corpus construction principles are also used for collecting and organizing data into, so called, corpora. The principles are relevance, heterogeneity, and synchronicity and will be used to illustrate the field work at the Austrian National Library.

### Relevance and Selection

Relevance reminds the researcher to stay focused and collect data that is relevant for the research question. That might sound trivial, but indeed one can get lost quite easily in the field coming out with data that one did not go in for in the first place. Relevance, however, also applies to the selection of interviewees. The first 3 interviewees were recommended to me by a superior employee of the Austrian National Library who granted me access to the organization after an introductory presentation of the research plan in a face-to-face meeting. However, 3 interviews are not enough for an exploratory study of this scope, so the first 3 interviewees were able to recommend another 3 employees. All in all, 6 semi-structured interviews were conducted with employees of the ANL, all related to the broad topic of digitalization of libraries in various ways. In addition to interviewing, documents were collected, partly provided or recommended by the ANL partly found elsewhere (e.g. texts of law).

### Homogeneity

Homogeneity refers to the construction of the collected data as corpora according to the medium of the data. So for instance, interviews, imagery, sound, music, and documents are kept separate for comparison, also known as data triangulation (Yin 2003). However, since various documents were collected, it is more appropriate to build corpora according to the communication the data was originally thought for. Hence, the data was organized into following four corpora used for data triangulation and comparison:

#### 1) interviews

Social scientific interviews are a communicative system based on the mutual expectations of interviewer and interviewee. Therefore, the interviews recorded are not objective facts but expressions of the interviewee's belief of what the interviewer might have wanted to hear. An interview is the outcome of a specific communicative situation produced for scientific work. In other words, in scientific interviews one does not find information but rather information is constructed for a scientific purpose.

- 6 semi-structured interviews
- notes taken after the interview

#### 2) public self-descriptions

This corpus contains documents produced for an unspecific audience by the Austrian National Library.

- website of the ANL including project specific sub-domains:
  - i. [www.onb.ac.at](http://www.onb.ac.at)
  - ii. [anno.onb.ac.at](http://anno.onb.ac.at)
  - iii. [alex.onb.ac.at](http://alex.onb.ac.at)
- annual reports<sup>10</sup>  
available on [www.onb.ac.at/about/publ/jahresbericht.htm](http://www.onb.ac.at/about/publ/jahresbericht.htm)
  - i. 2004
  - ii. 2005
- report on the strategic goals of the Austrian National Library 2007-2011

#### 3) documents for library experts (librarians and policy makers)

These documents, also produced by the ANL, were either given to me or publicly available. The target audience was the librarian community and related professions.

- "cultural report" 2005 for governmental policy makers and members of parliament
- 5 presentations given at various conferences and meetings
- 1 course package on the basics of librarianship

#### 4) law texts

- Federal Museum Act (Bundesmuseen-Gesetz)
- Austrian Media Law (Österreichisches Mediengesetz)
- University Law (Universitätsgesetz)
- Researchorganization Act (Forschungsorganisationsgesetz)

### Synchronicity

Phenomena of interest for qualitative research change over time, sometimes quite rapidly. Correspondingly, corpora are supposed to be built according to the time cycle of the

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<sup>10</sup> The annual report 2006 was not available online last time checked (25<sup>th</sup> August 2007).

phenomenon.<sup>11</sup> In the case of the ANL, we captured momentary observations of various kinds within one time cycle. The data collected represents memories of the past, present opinions, and future prospects. In opposition to a longitudinal study, change is constructed in a specific moment in time and not by comparison of data collected in different time cycles. The study also helped to decide the question of synchronicity in terms of the case study on the EDL. The formation and structuring of the EDL is about to begin and the respective committees are already meeting. Therefore, it will be necessary to conduct two phases of data collection and analysis to capture the emergence of the social system EDL over time. The first phase will commence in 2008, the second about two years later.

### **Data Collection**

The main corpus of data was collected via semi-structured, qualitative interviewing. Six employees of the ANL were contacted by e-mail and by telephone to be invited for an interview. Fortunately, all six agreed. The interviews were held in German, took between one and two hours, were recorded on a digital tape recorder and transcribed completely. A German informed consent form was created containing a short description of the research and the assurance that the interview will be made anonymous and kept confidential, as well as an explanation of the rights to stop the recording or the interview at any time, to receive a copy of the recording, and to have the recording deleted if the interviewer is asked to. Two copies of the form were signed by both parties, one copy for the interviewee and one copy for the researcher for quality control and documentation reasons. Up until the submission of the thesis, no interviewee asserted his/her rights.

The aim of the interview was to bring the interviewee to oscillate between self-reference and external reference by asking questions of difference and circularity, a therapeutic method known as circular questioning introduced into the social sciences by Thomas Pfeffer (2004). In the IS field, a similar approach was also applied by Lanzara (1991). For instance, questions did not only refer to a definition of a library, but to the difference between library and archive, or library and the Internet. Also questions of change, due to technological developments and the rise of the Internet, are basically aiming at a difference – the temporal difference before/after. Finally, circular questions were formulated by asking for expected expectations; “What do you think, is expected from a library today?” As already discussed above, asking questions is not a way to uncover facts but an irritation for

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<sup>11</sup> For instance, public opinions can change drastically due to an event. Therefore, the data collected before and after the event should be treated as separate corpora that in turn can be compared.

the social system “interview” being beyond the control of a single person<sup>12</sup>. Given these considerations of self-, external, and circular reference, a topic guide was developed with three major blocks; 1) the Austrian National Library (ANL), 2) the European Digital Library (EDL), and 3) closing questions (see Appendix for the generic topic guide). The formulation of the questions were adapted to the flow of the interview to keep up the conversational character of the situation. For instance, the whole EDL topic could not be applied in all interviews.

In opposition to interviewing, collecting documents is not “producing” genuine data for this specific thesis. Therefore, the principle approach of referentiality was no guide for collecting but for organizing the documents. On the one hand, collection of documents relied on the recommendations of the interviewees. On the other hand, publicly available documents were sought produced by the ANL communicating self-referential observations. As the analysis of the data helped to develop some core categories, additional documents were collected to check the categories. For instance, analyzing the ANL’s selection criteria of its collection policy was supported by the relevant texts of law.

### **Analysis**

The method of analysis needed to fit into the peculiarities of this case study. It must have been possible to 1) use a pre-existing theoretical framework as a research focus, 2) define research questions derived from the theory before conducting the research, 3) help reducing the huge amount of collected data to save time, and 4) be flexible enough to be used in a pilot study. The method of “Thematic Coding” applies to all four points. It is a modified version of the Grounded Theory coding rationale (Glaser and Strauss 1998; Strauss 1998) developed by Uwe Flick (Flick 2006). Thematic coding proved to be a very flexible tool that allowed the constant shifting of perspective between concept and data during the interpretation.

The rationale relies on a stepwise procedure applied to one data collection unit (transcript or document) at a time. First, a central theme is to be found followed by a short description. As the second step, the unit is analyzed according to open and selective coding procedures (Strauss 1998) in order to construct a thematic map. This procedure is followed for each data collection unit, constantly cross-checking with the developed categories. Thus, a thematic structure is emerging, evaluated, and modified, if necessary. For more detail, parts of the units

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<sup>12</sup> In this sense, my favourite question was the “Retrolibrary-Mindgame” question, as I came to name it after the collection phase; “Imagine the Austrian National Library would stop with all the digitalization efforts and all the online projects tomorrow. What would happen?”

(e.g. paragraphs) can be analysed more thoroughly. As a result, the thematic map is presented in a narrative style in the following chapter.

## **5. Findings - Keeping information vivid**

### **The European Digital Library – A short Overview**

As already described above, the case of the whole research project is the European Digital Library (EDL), studying the challenges and changes within the world of libraries by taking the Austrian National Library (ANL) as an example is the exploratory step.

The story of EDL begins outside the libraries with the introduction of Google's Print project in Dec. 2004, later renamed into Google Book Search in Nov. 2005 ([books.google.com](http://books.google.com)), to "goggle-ize" the repositories of by now 13 libraries<sup>13</sup>, meaning digitalization, indexation through the Google search engine, full text searchability of the content as well as differentiated access to the content depending on copyright issues. This initiative caused a lot of turmoil in terms of copyright infringement lawsuits (Lessig 2006) and the future role of libraries (Bjorner 2006) but also in the European political arena (Bearman 2006). In January 2005 the President of the French National Library, Jean-Noel Jeanneney (2005), expressed his concern about the Googleization of the world's knowledge and the consequences of preferring the Anglo-American cultural heritage. Various communiqués and declarations were formulated by leading European politicians and national libraries addressing the EU-Commission to take action by building a European Digital Library. In June 2005 the EU launched the i2010-Initiative of promoting Europe's transformation into an "information society" for the advancement of Europe's competitiveness in the global arena and for the improvement of the quality of life of its citizens. The European Digital Library became a flagship project of the i2010-Initiative with the aim of digitalizing six million analogue items until 2010, granting online access and search functionalities, and preserving digitalized as well as "born-digital" content (Reding 2005; EU-Brochure 2006; Reding 2006).

The platform, upon which the EDL is going to be built, is The European Library (TEL), a web portal ([www.theeuropeanlibrary.org](http://www.theeuropeanlibrary.org)) operational since 17<sup>th</sup> March 2005, run by the Conference of European National Librarians (CENL) and hosted by the Koninklijke

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<sup>13</sup> List from Mai 2007: Stanford University, Harvard University, University of Michigan, New York Public Library, Oxford University, University of California, University of Wisconsin – Madison, Princeton University, University of Texas at Austin, University of Virginia, Universidad Complutense de Madrid, Biblioteca de Catalunya, and Bayerische Staatsbibliothek.

Bibliothek in The Hague (Collier 2004). It is a network of 23 European national libraries making the catalogues of more than 250 collections searchable via a multilingual web interface (Bjorner 2006). However, TEL has some major disadvantages making it difficult to use. For instance, based on its decentralized infrastructure it is not possible to search through all collections at once, search results are not ranked according to relevance, and the amount of digitalized content directly accessible via TEL is minimal.

The general strategy of the EU to make the EDL a reality is to fund various projects dealing with certain aspects of the EDL. For instance, the EDL-Project ([www.edlproject.eu](http://www.edlproject.eu)), not to be confused with the general initiative of building the EDL, deals with the enlargement of TEL by nine new member libraries as well as with the enhancement of multilinguality features of the TEL-portal, the development of a European Metadata Registry, and the preparation of the EDL by installing digitalization roadmaps, organizing workshops, and the like. Another central project that might be very interesting for the next phase of this research is the EDLnet. Launched in summer 2007, it is the meeting point for 38 participating organizations to decide on the organizational structure of the EDL. Within two years, the EDLnet will process questions of human and political interoperability (organizational structure, governance, business model), technical and semantical interoperability (information architecture, metadata-schemes), and usability. Suffice to say, building the EDL is a very complex and time consuming effort. Therefore, we will not go into more detail for we would go way beyond the scope of this thesis.

### **The Austrian National Library – The Case**

The Austrian National Library (ANL) has a long standing tradition within the library community tightly coupled to the rise and fall of the Habsburg dynasty and the Austro-Hungarian Monarchy, its roots going back to 14<sup>th</sup> century. In the beginning as the Imperial Court Library and, from 1920 on, as the Austrian National Library, the collection policy still takes into account the Historical Austria<sup>14</sup>, depending on the theme of the collection. Today, the ANL is not only a library, granting access to various media, but also an archive and a museum. It holds manuscripts from Antiquity, the Middle Ages and the modern era, music texts, incunabula and old prints, historical maps, portraits and other pictorial documents, posters, ex-libris and pamphlets. Three museums preserve and exhibit “*the world's greatest papyrus collection, [...] a unique holding of historic globes of the earth, and an impressive collection on the international language Esperanto*” (ANL website). In addition, the ANL

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<sup>14</sup> The term “Historical Austria“ refers to areas that were once part of the Habsburg Monarchy.

educates in cooperation with the University of Vienna future librarians in an MSc programme and offers various courses and seminars regarding a wide range of librarian and information related topics. The ANL regards itself as “*a centre of information and research set up to provide services, the country's excellent bank of memories and as a multilevel centre of education and culture*” (ANL website).

According to the latest statistical figures available, the ANL's repository contained more than 7.7 million items including roughly 3.4 million books and periodicals in 2006. Besides the approximately 40 000 copies p.a. received from any publication, analogue and digital, released in Austria – so called obligatory items – the ANL also actively increases its collection by acquiring material related to the Historical Austria and to the humanities, which is the ANL's traditional focus as a research library. Since the 1990ies, the ANL has been engaged in digitalizing content and catalogues, in archiving digitalized and born-digital media, and offering web-based services such as online catalogues and databases, with about 7 million search requests in 2006 (2.8 million in 2005), and ANNO (Austrian Newspapers Online; [anno.onb.ac.at](http://anno.onb.ac.at)), offering image scans of newspapers published in Historical Austria between beginning of the 18<sup>th</sup> century and the 1930ies, with roughly 192,000 visits in 2005 (see also Petschar 2002). The ANL is also involved in various national and international partnerships and organizations within the domain of digital libraries, for instance, the DELOS Network of Excellence on Digital Libraries ([www.delos.info](http://www.delos.info)) and TEL, and is also coordinating a workpackage within the EDL-Project.

Given these observations and considerations, we can say that the Austrian National Library is very well aware of the challenges we described in the conceptual part of the thesis although the terms used may differ appropriately. We will support this statement in the following part of the analysis.

### **The Provisioning of Informativity**

In this chapter we will discuss the central operation of the modern library<sup>15</sup>. It is, as I call it, the provisioning<sup>16</sup> of informativity that has a slightly different meaning than information. First of all, we have to separate the analytical level of operational functionality from the organizational level, where concepts are not that clear cut anymore. Hence, provisioning informativity is not the only thing a library, as an organizational system, does nor does it

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<sup>15</sup> The interpretations and stories presented in this section of the thesis are all based on the data collected in the field. The external sources referred to are simply pointing at further discussions found elsewhere.

<sup>16</sup> For lack of a better translation of the German term “Zurverfügungstellung”, I use provisioning, meaning the process of providing something.

mean that non-librarian organizations do not have libraries or archives. The goal is to find a category that differentiates a library from a bank or from a football club. That category is the boundary that needs to be maintained in order for a library to be observed as a library.

In the librarian domain, informativity has to be understood on two levels. The first level is basically the content stored – the books or the CDs themselves. However, if nobody uses them they remain mere data without being informative. At this level, data and potential information is the same. The business of libraries is to increase the potentiality of the books, CDs, and the like by implementing a second level of informativity where data and potential information are separated. This is basically established through documentation, indexing, and cataloguing. It is still the same data (same books, CDs, etc.) but the likelihood for finding what one is looking for is increased, meaning that the potentiality for being informed is increased. It even increases the likelihood to find something one did not know it might be of any interest. Let me give you an example; imagine you have thousands of books stacked to the roof of your basement without any order. Finding something in this mess is a question of pure chance. Now, imagine you put those books on shelves in a thematic order. The books are still the same, but the likelihood of finding something interesting is increased immensely, simply because the items are organized. Libraries transform the “pure chance” of being informed into an organized and more likely structure.

This issue was explained to me in various ways by all interviewees as “accessibility-creation” (Zugänglichmachung), as “provisioning” (Zurverfügungstellung) in a meaning-full way so that *“texts can still be read [...] So that it makes sense, that we have been keeping those texts for over 400 years”* (Interviewee 03: 2). In other words: *“Yes, the issue of accessibility-creation is a very central one. You don’t simply bunker the things somewhere, but you think about how to structure them [library items] in a way that makes sense, so that the things can be found and used”* (Interviewee 02: 5). During the analysis, however, the question of what the library is actually providing remained open for quite a while. Clearly, provisioning is for the library user, but why is a library being used? As I was told, they come to educate themselves (library as an educational institution) or to do “memory-work” (library as a memory institution) or, in more abstract terms, library users use the library to be informed. Actually, we could also say that a library is maintaining the communicative potentiality of the items stored. A book is a communication technology mediating an utterance that is to be understood by a reader which is the same as being informed. If a certain book is not findable or readable, it simply does not exist from a social perspective. Hence, libraries organize the content also based on “The User”.

Still, why not call it the provisioning of information? Obviously, the library is not “informing” the user, meaning that the library is not Ego or Alter-Ego within the communicative process. It mediates between the producer and the user of an item without becoming a “communicator” itself. Plainly put, it does not matter in which library one finds a certain book. A library is neither teaching like a school nor informing the public like a TV news channel. It “*builds the basis for that [to be informed]. That means that there always has to be more than one can process at a time. There has to be a reservoir or a pool, so that there are still things one can discover*” (Interviewee 04:11). Hence, I very much doubt that the librarian operation is specifically for education, remembrance, or research, but it can build the basis for that. It offers potential information for being actualised by the user. It enables differences (selections) to make a difference for “*as broad a circle of interested clients as possible*” (ADL website). Basically, this is what is addressed by the term informativity; the difference between potential and actual information. The library offers services and tools for the user to inform himself/herself, to actualize potentially available information. Still, improving the means of actualizing information (e.g. through technology), be it for internal or external purposes, also increases the potentiality of information. For instance, migrating and integrating various analogue catalogues into a single computer database allows for multi-dimensional search functionalities across formerly separately organized content. As a consequence, one might find a specific book more easily than before. But on the other hand, one might also find more related books, articles, and the like than before. In other words, the more information is potentially available, the more one needs to select. The more sophisticated the selective mechanisms, the more potential information, so that “*users find things they have not even thought of*” (Interviewee 02:13). Consequently, not only the content of the items (e.g. the books) but also the structuring of the items (e.g. the catalogue) is informative, it is capable to surprise the user. “*The information that is more interesting is the information I was not looking for*” (Interviewee 01:14).

So far we treated the library in a very analytical and abstract way, more like a conceptual ideal type. However, when referring to existing organizational systems, things turn out to be messier of course. As already mentioned before, the ANL is not only a library, but also an archive, a museum as well as an educational and research centre. Leaving museum, education and research aside, let us consider the archive aspect a bit more closely as it is very much related to the idea of the library. Although the archival operation is also the provisioning of informativity it is more focused on the documentation of a certain topic. Traditionally, libraries collect publications whereas archives collect documents. From an

analytical perspective, we can distinguish between a publication, as a mass-produced item for an anonymous public where the library owns only one copy of many, and a document, as a uniquely-produced item not being produced for the public domain. However, as I was shown one of the archives of the ANL, I also noticed published books and other mass-produced media being part of the collection. Therefore, the difference between a library and an archive is not *what* they are collecting but *why* they are collecting. A library keeps publications available for its users, an archive documents certain topics. Anyway, the terms library and archive can be and are used interchangeably as it was explained to me by Interviewee 06 (interview notes). This applies especially for national libraries, since it is their obligation to document the “publication-output” of the respective nation state. In addition,

*“those traditional boundaries, especially between libraries and archives, because of the new developments in the electronical area, how shall I put it, brake in, become blurry. [...] Archives also have to deal with the long-term archiving of digital administrative information, for instance, and the electronic file. They have to think about how to make this accessible sometime; how can we preserve this and how do we present ourselves on the Internet et cetera”* (Interviewee 02:5-6).

At this point, we arrived at the core of the analysis. Libraries/archives are still doing what they are doing, but due to environmental developments, the *how* is in a process of transformation. The ANL still has to make sense in the digital domain; it still has to maintain the provisioning of informativity in the face of the Internet. *“The libraries will only remain, if they can integrate those virtual spaces into their work routines and we are doing that here [in the ANL]”* (Interviewee 04:8). Given these considerations, we need to discuss the sense-making of the provisioning of informativity within the ANL in relation to its environment, because *“the challenge is not to produce the content - that’s just a question of money - but to provide it in way that makes sense, because it helps no one, if I start digitalizing and then I sit on a heap of millions of images and begin to think what I should do with that”* (Interviewee 01:12). For this purpose, I will introduce the three dimensions of sense - temporal, factual, and social - defined in the Theory of Social Systems (Luhmann 1996b:92-147) for further analysis.

### Temporal Dimension

The temporal dimension basically addresses the difference before/after. Time is a sense-making, complex system’s interpretation of its life world according to the difference between past and future. How does the ANL make sense along this dimension on the two levels of informativity?

On the level of the library items the ANL is preserving sometimes quite fragile content for future generations. This is done, for instance, through restoration or digitalization of analogue content like newspapers. On the second level of the catalogue, we find the open logic of the card index catalogue that allows, based on alphabetic ordering, to include an infinite number of items into the catalogue, which is the defining character of a modern library. *“It is only in the beginning of the 20<sup>th</sup> century that card index catalogues appear. [...] Those catalogues have the advantage that they are open, infinite, because they have an alphabetic classification criterion. This distinguishes them from all other catalogues”* (Interviewee 04:4).

The necessity to change the way libraries catalogued their repositories emerged out of the explosion of mass-printed media in relation to other societal developments. Today, we have a similar qualitative leap in mass-communication (see chapter 2100056) due to the rise of computational technology and the Internet that is braking down the boundary between content and catalogue from a preservatory point of view. This is observable in the change of semantics; the two levels are now termed data and metadata. Digitalized and digital born data as well as metadata are sharing the same media and hence need to be preserved the same way. Still, the same logic of infinite openness towards the future (e.g. books not written yet) and the past (e.g. all the books ever written) applies to database catalogues as well.

Therefore, the ANL is provisioning informativity from a temporal point of view by maintaining the openness of its classification system and by preserving the content. However, technological developments became highly relevant for the librarian domain as a whole. Maintaining informativity through computer technology and digitalization comes with a price. *“The [time span between the] leaps of technology, where one [the ANL] has to follow, are becoming shorter and shorter. [...] One has to create completely new types of metadata, like technical metadata, et cetera”* (Interviewee 02:3). Librarianship is becoming more *“technologically driven”* (Interviewee 05:3) and irritated by events occurring outside the library. This has a huge impact on the preservation of content and catalogue since digital media needs the proper soft- and hardware in order to be accessible at all times. Issues like data migration, emulation of hard- and software environments, or back-up of data become part of librarian communication. The ANL is storing its back-up tapes in the fallback high-secure bunker of the Austrian Federal Computing Centre, designed to remain operational even in case of a catastrophe. Also the, in librarian terms, relatively short life-cycle of storage media needs to be taken into account. In addition to the traditional library work on analogue media, which is still the main part of the daily routines, the ANL also has to follow technological

developments in its environment. Therefore, the catalogue does not only need to be infinitely open for future content but for future technologies as well. This issue can be found, for instance, in the discussion on metadata standards. Metadata schemes, like METS<sup>17</sup>, need to be open enough for the catalogues to cope not only with the explosion of digital media but also with technological developments and challenges of interoperability.

In more abstract terms, the temporal dimension of provisioning informativity was explained to me as “traceability” (Nachvollziehbarkeit)<sup>18</sup>, meaning “*that the content, existing in a certain form, is traceable across multiple generations, [...] so that one can refer to something. [...] If it is only a momentary rendition and I have a look at it the next day and it’s not there anymore, I have a problem*” (Interviewee 04:11-12). In other words, the ANL is obliged to keep every item it collected and never throw anything away based on the prospective possibilities of being used anytime. Hence, the ANL needs to control the authenticity, integrity, functionality, and uninterrupted accessibility of content and catalogue. This is a very different interpretation of time as opposed to the Internet as a whole. The Internet is also provisioning informativity. However, if something is deleted from the Internet it is gone in the sense of not being potentially informative. Of course it could still be stored somewhere on somebody’s hard disk but it is not communicative anymore. In this sense, the Internet does neither have a future nor a past, it is always actual. Accordingly, search engines do deliver a momentary rendition based on a search query.

To come to an end, simply digitalizing books does not make a (digital) library. From this perspective, it comes as no surprise that the Internet Archive ([www.archive.org](http://www.archive.org)), an initiative preventing “*the Internet and other “born-digital” materials from disappearing into the past*”<sup>19</sup>, was officially recognized as a library by the State of California in May 2007 (McCoy 2007). From the functional perspective of this thesis, the Internet Archive is a library – it allows for the tracing back of the Internet into the past.

### Factual Dimension

In opposition to the horizon of past and future, the factual dimension<sup>20</sup> distinguishes between inside and outside. In communicative terms this is basically the topic of the communication – the this/not-that difference.

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<sup>17</sup> The Metadata Encoding and Transmission Standard is for the description of digital collections of objects based on XML.

<sup>18</sup> “Nachvollziehbarkeit“ means the ability to trace but also to comprehend something.

<sup>19</sup> Quote from [www.archive.org/about/about.php](http://www.archive.org/about/about.php), last access date: 28<sup>th</sup> Aug. 2007.

<sup>20</sup> Rather misleadingly, this dimension is sometimes translated as the “material dimension” (e.g. Brans and Rossbach 1997), but materiality or rather things as well as spatiality are only a small aspect of this dimension of

In the analysis of the ADL, the factual dimension can be elaborated through the observation of the selection criteria of items worth being preserved by the library. Collection policy is, in fact, a selection policy which is another basis for provisioning informativity. As already described before, the “informativeness” of information derives from the horizon of potential information the actual information was selected from. We cannot talk about everything; we talk about this and not about something else. Correspondingly, a library cannot collect everything. Therefore, the question is; what comes in and what stays out? In the factual sense, catalogues are not infinitely open – libraries collect publications and not, for instance, refrigerators.

The ANL selects according to two major areas. The first focuses more on the librarian aspect that is the collection of publications within the domain of humanities. In this area, the decisive criterion is based on the expected (scientific) user interests. In this sense, the ANL is more like a research library coupled to the study of humanities in cooperation with other research libraries like the University of Vienna Library. The second, more archival aspect is of course the documentation of the Austrian cultural “output”, which is not based on user interests but on federal legislation. According to the Austrian Media Law (1981) the ANL receives an obligatory copy of every print work published in Austria. In 2000, other forms of publications that can be seen as technical advancements of print media were included (e.g. interactive CD-ROMs). Other media, like musical records and cinematographic items, are explicitly excluded from submission. According to the Researchorganization Act, the ANL also documents and acquires so called “Austriaca”, foreign publications related to Austrian history and culture or released in areas that had belonged to the Austro-Hungarian Empire. The selection is done by the ANL itself and is seen as part of the research library aspect of the ANL.

Clearly, the Austrian legislation reflects the traditional mission of the ANL to collect printed publications and their technical successors. However, we have to distinguish between offline and online digital media. Offline digital publications still fit into the paper-based world and can be treated just like books. What about the online world? On the Internet basically everybody can publish whatever he/she wants, so the traditional paradigm of the print world where publishers play a key role in preselecting content worth being published and hence worth being archived, does not apply. So, how is the Internet to be documented? The ANL was about to finish a pilot project on Webarchiving, so these issues are still open. However, what can be said at this moment is that the Internet is going to be harvested for Austrian

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sense-making. Hence, reducing the factual dimension to mere things is a very simplified view (Luhmann 1996b:115).

domains and data related to Austria once a year. The result will be indexed by automated procedures. In addition, the ANL will focus on specific topics of public interest, be it events, persons, and the like. *“An example would be the European Championship [Football] next year [2008]. That’s a kind of event we might consider. It would make sense to harvest that area selectively and to describe it, because that happens probably once in 20 years”* (Interviewee 01:8).

Now, there are two points that need to be elaborated in relation to the factual dimension in relation to the two levels of informativity. First, the selection policy is not unfolded along the factual dimension. For instance, deciding what to digitalize and make accessible online and what not, is based on preservatory considerations (time dimension) and on user-interests and copyright issues (social dimension). A certain book is not selected for acquisition because the library deems it to be of high quality but rather because it is worth being archived and made accessible based on the legal obligations of the ANL and the construction of the average user or a scientific research community. Generally spoken, content is not selected because of the content itself as it is observed by the library. *“Every local rag, that is published by somebody, comes onto our shelves and is catalogued the same way and it is up to the competency of the user to separate the crap from the substantial material”* (Interviewee 01:13).

On the second level, the library offers, what was often called, “(pre)structuring”. That is basically the core task of librarianship; organizing, processing, and indexing the selected material according to formal and subject criteria. That applies for the offline as well as for the online world. In this sense, the catalogue works, because it is not infinitely open in a factual sense. In other words, it is not important what the library selects but rather that it selects. Imagine searching for information about a certain topic and you get as a result *“100,000 titles, thereof 25,000 books and 17,000 articles and now look through all of that. That does not work. There you have the selection, the processing and the communicating of the structured content. That will [still] be the decisive matter for the information to become vivid”* (Interviewee 04:5). Coming back to the issue of archiving the Web, the sheer amount of data that needs to be selected, processed, and communicated allows for nothings else than automated procedures. *“It has to be clear, that the [harvested] content is ten times or hundred times more than what is existing in the library and that’s every year and it is increasing. So who is supposed to process that?”* (Interviewee 04:7). Computationally created and manipulated technological data is a problem that can only be solved by more technology. In addition to legal, social, and economic limits, also technical limits have to be considered. For

instance, it is technically impossible to archive web-forms. All these issues are still being discussed, so the ANL is in a learning process *“how to select out of this wave of digital data, the data that is representative for 2007, for example”* (Interviewee 01:6).

In addition, technology has also become an issue in terms of documenting new types of library items. *“Now, there are, because of various types of media, completely different metadata types that we have to consider. How do I describe, in technical terms, digital audio documents and video documents?”* (Interviewee 02:9). Consequently, the content is not only indexed according to formal (e.g. Author, Title) and subject classifications (e.g. Keywords) but also technical classifications.

As a summary, we can describe this dimension with the term “clearness” (Übersichtlichkeit<sup>21</sup>). Libraries are

*“clearly arranged spaces for the human mind and that creates trust. The Internet is an unclear space where you never know how deep this knowledge space is. It all has its pros and cons, because, on the one hand, I always get the feeling on the Internet that I always find something. The question, however, is what or rather; did I really look for what I found?”* (Interviewee 04:8).

The Internet, one could say, is provisioning informativity because it does not select, because there are no inherent selection criteria of what goes online and what does not except for technological reasons. Search engines also structure data on the internet but, since they are structuring everything that is online, a search query does not result into clearness but into access. Libraries organize the selected content according to internal procedures whereas search engines are, among other things, gatekeepers offering potentially relevant entry points into the Internet based on a technological rationale of algorithmic calculations. In this sense, Google bringing analogue books into the online world is very different compared to the librarian approach. *“The Google [Book Search] project has very often been criticized regarding journals that they digitalize here 3 volumes, there 2 volumes. Google is not interested, based on their understanding, to offer a complete overview of a certain journal and to see to completeness and clearness”* (Interviewee 03:4). Given the argument stated above, Google Book Search is about granting direct access to every book and to make a profit. Libraries, however, are about clearness of material they are obliged to collect or that is deemed informative for the user.

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<sup>21</sup> “Übersichtlichkeit“ refers to a state of clarity, when something is clearly arranged and easy to overview.

## Social Dimension

The social dimension refers to the difference between Ego and Alter-Ego (see chapter 0) not to be confused with the factual dimension. The dimension emerges from Ego's observation that besides the Ego-perspective there are other Alter-perspectives. In our case, the ANL is the Ego-perspective (self-reference) that is irritated by environmental events (extern reference) relevant for its internal structure (circular reference). We already discussed the role of legislation in connection with the selection criteria, so we can focus on the construction of the user or rather on the observations of user expectations made by the ANL which is key to the provisioning of informativity. After all, a library makes only sense, if the books stored are also read which implies accessibility and findability.

On the level of the catalogue, the user simply needs to be able to find what he/she is looking for. Today, findability at the ANL is provided through an online portal providing search functionality across all the catalogues of the ANL. From 1992 on indexing of new items was only done electronically. The retroconversion of the older catalogues was achieved in a stepwise procedure starting with the scanning of the index cards, followed by the capturing of the content of the cards by hand or by OCR technology, and finally by integrating nominal and subject catalogues. The next step is to make the catalogue compatible with search engine technology. Why is that necessary? In today's world, the library user is also an internet user.

*“They [the internet generation] search in Google and in search engines and on portals they know. That means, the libraries have to learn to bring themselves into these workflows, on the one hand, into the day-to-day workflows of the average user - into search engines and similar things - and also into the workflows of scientific users. The libraries have to come to the user. We cannot expect like in earlier times that the users come to us and we tell them how they can use us. That is definitely something that is expected from us” (Interviewee 02:19).*

The Internet is an undeniable aspect of communication and society, search engines being its gatekeepers. If you do not score a high rank in Google you do not exist as a communicative person on the Internet, because *“nobody looks on page 15 in Google”* (Interviewee 03:12). From this perspective, search engines and libraries meet in this dimension of sense. Search engine technology is becoming relevant for libraries not because they perform better in providing informativity but because users use them to search for information.

From the library's perspective, this is a question of establishing findability on the Internet. However, this does not mean that the interaction between library and user will only occur online sometime in the future. Digitalization of the library does not necessarily mean deanalogy or delocalization but

*“especially because of the Internet and because of digitalization, and we see that here [at the ANL], we are getting more readers, when we are making more available on the Internet, because these are not things that cancel each other out but two knowledge spheres that complement one another” (Interviewee 04:8).*

Hence, online findability is becoming a very, probably even the most important aspect of user expectations but it will not be the only one. Users will still come to the library since it is not only a place with books to read but also a place to work, an issue that was considered during the last rebuilding of the ANL. Consequently, it is possible to observe a splitting of user expectations into two categories; first, the classical user who comes to the library and, second, the “Internetgeneration” that wants to have access to any relevant information at a mouse click.

Another important aspect is the issue of direct online accessibility to digital library items which brings us to the level of content. This is another meeting point between librarianship, search engines and book digitalization initiatives like Google Book Search or the Open Archive Initiative (OAI). Massive digitalization is limited by copyright issues and financial boundaries. In the case of the ANL, that means that only publications older than 70 years are made available online. The biggest challenge of the ANL, however, is to reach a critical mass of online available content in order for the service to become attractive and that costs a lot of money. Therefore, public-private-partnerships are an alternative way to get the job done. For instance, Google offers a free copy of every digitalized item to the library the original item belongs to. However, within legal and financial limitations the decision what to digitalize is based, besides reasons of preservation, on expected user interests. For instance, the idea behind the ANNO (Austrian Newspapers Online) project was that

*“a lot of people enjoy reading newspapers and everybody is capable of reading newspapers. If I offer the image of newspaper pages in a digital form, people, especially older people, who are not really familiar with Boolean Operators, will be able to flip through the newspaper and to read it. [...] We were pretty sure that this is going to be a success” (Interviewee 03:9).*

In a nutshell, computational technology is observed as a way to improve the service for the user. However, the user does not really differentiate between services offered by, for instance, Amazon and a library. Because of the Internet, the library observes new players as part of its relevant environment in terms of user interaction.

*“What the reader demands from a library, has changed massively, because the reader does not really make a difference. If he sees a service provided by anyone on the Internet, he also expects that from the library. [...] The whole surrounding of the library are not [only] other libraries but shopping malls, supermarkets, telecom*

*companies, call centres. Those are the things the user compares and the service he expects” (Interviewee 03:16).*

Consequently, the ANL is planning to build services similar to the ones offered by the Amazoogle of the Internet, like for instance recommender and annotation systems on top of the digitalization efforts. As a summary, we are dealing with issues of relevance. After all, in the social dimension, the ANL makes sense of the provisioning of informativity by providing services but also content that is relevant for the user. That is one of the major arguments why these changes are necessary from a librarian point of view. *“For us, the digitalization of the ANL is primarily a service offered. It is simply a technological change that is taking place”* (Interviewee 04:1).

## **6. Conclusion – The end is the beginning**

We observed the ANL as a social system with the functional operation termed provisioning of informativity. The function unfolds along three dimensions of sense-making described as traceability (temporal), clearness (factual), and relevance (social). These findings result from an analysis of the impact on or rather irritation of the ANL ascribed to information growth and the operational closure of technology. We also elaborated how the ANL responds to these environmental developments based on its internal structure. The ANL is changing in order to remain the ANL. A library is still provisioning informativity but needs to reconsider issues like preservation, selection, cataloguing, structuring, findability, and accessibility. At the bottom line, it is dealing with the difference between potential and actual information, two sides of the form we call informativity that feed-back into one another. The ANL is increasing the informativity of its repository through the various strategies explained in the analysis; it is doing more with what it already has. That includes digitalization of content with the aim of making it searchable and available online, modifying its catalogue to comply with search engines, and building new services for its users, hence informativity is not merely increased by the acquisition of new content or data. All these strategies reflect the function of the library that needs to be maintained in the face of a new explosion of information in relation to binary based communication technologies. However, the same strategies that enable the ANL to cope with and therefore reduce will also contribute to and therefore increase the environmental self-propelling growth of information. For instance, the substitution of the paper-based card catalogue by scanned images of the cards made available online does not

seem to make a big difference. After all, the same data that was on the card is now on the digital equivalent of the card. It improves the user's ability to be informed by the catalogue - to actualize information – in order for the user to find what he/she is looking for. However, the same catalogue, that was informative only for the limited number of users that could physically access the catalogue at the same time, is, in its digital form, informative for a practically unlimited number of users who can access the catalogue online. That alone is an increase in potential information based on the increase of actual information - same data more informativity. The problem is the solution is the problem.

In the next step of the research project, the emergence of the EDL will be studied in reference to the core research question based on the findings of this exploratory study: How does the EDL organize the provisioning of informativity in terms of traceability, clearness, and relevance? The expectation is that the EDL will provide all three dimensions in different ways than a traditional national library. As a consequence, it will be necessary to study more thoroughly the issues of interoperability and standardization. I have to admit that I was confused by all the different meta-standard schemes and classification regulations that are discussed in the librarian community. In this sense, I failed to improve my interactional expertise (Collins, Evans et al. 2006).

The last point I want to mention, is the question concerning the measurement of information that concerns the whole TIGAIR group. Quantitative research projects on information growth simply count bits (Lyman and Varian 2003; Gantz, Reinsel et al. 2007). According to this rationale, a 12 megapixel digital camera produces three times more information than a 4 megapixel digital camera (Kallinikos 2007a). In comparison, I hardly managed to produce 500 kilobyte of information in this thesis. Next time I will paste some high resolution images into my writings to increase their information value. In our terminology, that is the study of the growth of data and not of information. As an alternative approach, I would propose to go one step further by considering the librarian science categorization of entities I came across during my field studies (Umlauf 2006). It is a hierarchical structure of:

1. work – a distinct intellectual or artistic creation
2. expression - the intellectual or artistic realization of a work in the form of alphanumeric, musical, or choreographic notation, sound, image, object, movement, etc., or any combinations of such forms
3. manifestation – the physical embodiment of an expression of a work
4. item - a single exemplare of a manifestation

Let me give you an example; Giuseppe Verdi's *Aida* (the work) was performed by the Vienna and the London Philharmonics (two expressions) and recorded on CD (one manifestation for each expression) and I own two copies of each CD (two items for each expression).

From my perspective, measuring information as bits remains somewhere between the item and the manifestation level. However, I propose to count expressions or works instead of manifestations or items. Measured in bits, two items (two copies of the same CD) would account for twice as much information. However, listening to both CDs would not make any difference, hence it would not be informative. The same applies to the manifestation level. Importing the music from the CD onto my iPod (two manifestations) would not make any difference either. However, on the level of expression, the performance of different orchestras playing the same work does make a difference. In this sense, counting expressions would be a better indicator for information than counting items.

Applying the example of a novel, we come to a different conclusion. A novel (the work) is released as a book (expression) printed as paperback and hardcover (manifestation) and I own a copy of each (item). As you can see, there are no real possibilities for variations along the chain hence we can count works instead of expressions. Obviously, it depends on the "genre" of the data or the media allowing for more variations. A similar approach can be found in Goodman's classification of cultural artefacts as sketch, script, and score introduced into the IS domain by Kallinikos (2002) allowing for various degrees of interpretation. Be as it may, these are simply ideas that might come handy in the next phases of the research.

So this is the end of a year's journey of studying and doing research as an MSc student at the LSE. I hope you enjoyed the wrapping up of that in this thesis.

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## 8. Internet Sources

### Austrian National Library

<http://www.onb.ac.at>

<http://anno.onb.ac.at>

<http://alex.onb.ac.at>

### European Digital Library

<http://www.edlproject.eu/>

[http://ec.europa.eu/information\\_society/activities/digital\\_libraries/index\\_en.htm](http://ec.europa.eu/information_society/activities/digital_libraries/index_en.htm)

[http://europa.eu.int/information\\_society/activities/digital\\_libraries/doc/brochures/dl\\_brochure\\_2006.pdf](http://europa.eu.int/information_society/activities/digital_libraries/doc/brochures/dl_brochure_2006.pdf)

[http://ec.europa.eu/information\\_society/activities/digital\\_libraries/doc/fact\\_sheet/fact\\_sheet.pdf](http://ec.europa.eu/information_society/activities/digital_libraries/doc/fact_sheet/fact_sheet.pdf)

<http://www.theeuropeanlibrary.org>

### Other Websites

<http://www.delos.info>

<http://www.archive.org>

<http://www.gutenberg.org>

<http://www.cenl.org>

<http://www.diglib.org>

<http://www.ifla.org.sg>

<http://books.google.com>

## 9. Appendix

### Generic Interview Topic Guide (English Version)

#### 1. Introduction

- What is your current position in the organization? What is your job about?

#### 2. Austrian National Library (internal/external reference)

- How has the library changed over the last ten years due to the involvement of ICT and the rise of the Internet?
- In what ways did the work of librarians change? How does it impact your day-to-day work?
- Imagine the Austrian National Library would stop working on the topics mentioned. What would happen?
- How do you measure the amount, variety, and usage of digital and/or online content?

#### 3. EDL (external reference)

- What is the EDL project all about? How did it come up? What is the current status of the project? What is the goal of the project?
- How is the Austrian National Library involved in the project?
- How is the EDL going to be organized? How are the libraries going to collaborate in order to make the EDL a reality?
- Why is the EDL necessary?

#### 4. Circular Questions

- What is expected from a library today? What has changed and what has remained?
- How does the Austrian National Library know it is doing a good job?

#### 5. Function of a Library

- In a sentence, what makes a library a library irrespective of technological developments? How does a library differ from e.g. an archive or a museum, or even the Internet?

Research Ethics Review Checklist

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