

SHORT

ARTICLES

FROM

CLOSED

DOORS

TO OPEN

GATES

Triptych
of Strážky
After the middle
of the
15th century
O 1590-1592
Slovak National
Gallery



Introduction

This article describes a framework that could help in the discussion of digital libraries and the future of academic, public and research libraries. We try to reconsider what opportunities technological changes have created and determine the role of information ecology. The updated results of our three research projects are framed within information ecology based on insights into users of academic libraries and the academic information environment. We search for the resources of information ecology of digital libraries in network relationships, discovery services, users' information behaviour, preferences and relevance assessment, but also in knowledge about perceptions of the academic environment. The power is not the digital library itself, but the information use features. New opportunities emerge from integration of library services, technologies, scholarship and culture. The added value is based on new services and contribution of digital libraries to students' learning, users' experience, research productivity, teaching, or preservation and presentation of cultural heritage.

1 Information ecology and digital libraries

The concept of *information ecology* emerged from information management and informa-

tion behaviour studies. It is based on complex relationships between people and technologies while using information in communities and organizations. Information ecology was determined by Davenport and Prusak (1997) as making information meaningful. Information ecology as a metaphor comprises especially integration of diverse types of information. Another concept of information ecologies (Nardi and O'Day 1999) is based on relationships between information technologies and people in transforming information into knowledge. Information ecologies represent procedures, goals, and values of communities supported by technologies. Information ecologies are places where people use tools and in social relations help each other in information activities.

Digital scholarship, e-learning and e-research change the models of information production and use (Borgman 2007, Lynch 2008, Van de Sompel 2004). These models synthesize information seeking with information retrieval and digital libraries. Users' behaviour in digital libraries supported by sophisticated interface interactions leads to ecological knowledge augmentation manifested by digital library interactions, e.g. discussions, annotations, comments.

Digital libraries are multi-dimensional systems which are often modelled on principles of re-

Slovakia

Jela
Steinerová

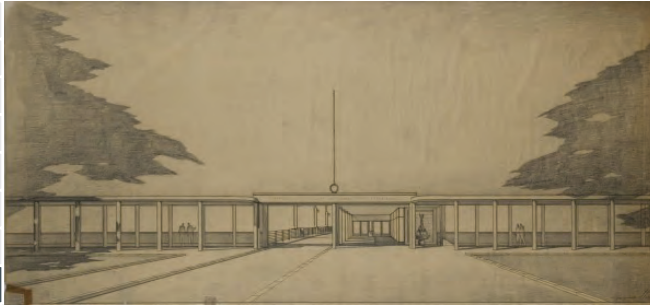
First acquisitions
Karol Vaculíckearly
50s
Slovak National Gallery



150

Uncommon
Culture

The power is not the digital library itself, but the information use features. The added value is based on new services and contribution of digital libraries to students' learning, users' experience, research productivity, teaching, or preservation and presentation of cultural heritage



Miloš Emil Belluš
Iron-concrete spa bridge
in Priešťany
1930 - 1932
Slovak National Gallery

use and sharing. However, technological solutions covering interoperability are just one part of the complex picture. That is why we search for a holistic approach to these systems through information ecology. We agree with the definition of digital libraries as interactive information environments summarized by the Digital Libraries Manifesto (Candela et al. 2006) and further determine three principles of information ecology of digital libraries: 1) information systems are similar to natural organisms, 2) integration of external and internal knowledge represents ecological balance, 3) ecological information management is based on re-use of information objects, services and products. As examples we can mention tools of knowledge organization that cover concept maps, topic maps, intelligent thesauri or ontologies. Information ecology of digital libraries means especially cleaning filters that support sense-making and information use. Good examples of digital repositories and collaboratories include Humane Genome, e-Horizon, European DRIVER, MIT courseware CogPrints (psychology and cognitive sciences), or PubMedCentral (medicine) etc.

Several digitization projects within the Slovak National Library and the University Library include both mass digitization of the Slovak publications and specialized projects of cultural heritage (e.g. cultural portal within e-Cul-

ture covering major Slovak cultural institutes like the Slovak National Gallery, Slovak Film Institute, Slovak National Archives, etc.).

Critical components of information ecology are tools for eliminating information overload and disorder. At the micro-level we determine such components as individual cognitive, affective, sensomotoric skills as part of information styles and relevance assessment. At macro-level information ecology includes management of information sources, systems, and environments. Ethical, legal and security awareness, values and standards are challenges for information ecology as well. For the efficiency of digital libraries the following questions are important:

- How to organize digital information environments to make information use more efficient?
- How to provide contexts for sense making?

Ecological models of digital libraries can help find innovative solutions.

2 Case studies: projects on information behaviour, relevance and information ecology

2.1. Study of human information behaviour of library users

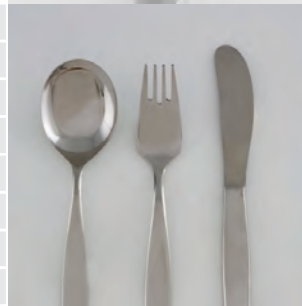


Askold Žáčko
Baroque
1981
Optical glass,
cut,
60 x 26 x 26 cm
UP DK 960
Slovak
National Gallery

Vlasta Hegerová
Fashion Design
1967
Paper, drawing
by felt-tip pen
and Indian ink,
30 x 21 cm
UP O 19
Slovak
National Gallery



Ján Čalovka
Cutlery (Brussels)
1958
Stainless steel, 16-19 cm
UP T 6
Slovak National Gallery



Since 2002 we have been studying users of information and library services in Slovakia. We applied large-scale questionnaire surveys in academic libraries. Our original concepts were applied to other similar surveys of reading and information literacy in Slovakia. Findings confirm that library users appreciate easy access and well-organized forms of information (Steinerová and Šušol 2005). Two user types were derived from data analyses. The type S manifests pragmatic ways of information seeking, appreciates low cost and speed of electronic publishing. The type A is characterized by analytic, deeper information processing and reviewing processes. Two information styles derived from our data analyses of students' information behaviour were determined, namely the *pragmatic* and the *analytic* styles. The pragmatic information style emerges as a pattern of information seeking of students in the electronic environment. Typical preferences of this style are easy access, social networking, immediacy, and visualization. This style dominates information use in digital libraries. More details are reported in our final report and in a monograph on information behaviour (Steinerová 2005).

Results suggest that students often use quick online reading, visual information and social networking. Users changed into creators, sharers and consumers of information in mobile and networked environments

(Dempsey 2009). Digital libraries “invade” people’s everyday life, education, learning, and business.

2.2. Study of information use and relevance

Results of the second project on information use (2005-2007) pointed to emerging patterns of relevance in the electronic environment. We applied a variety of data gathering methods within qualitative research methodology. Relevance behaviour of 21 doctoral students was analyzed through phenomenographic interviews. Relevance assessment is characterized by preferences of flexibility, interactivity and collaborative use. Specific strategies are connected with multiple criteria of relevance as constructing meaning and making sense in contexts.

A model of relevance in a digital environment builds on non-linearity, flexibility of navigation, high-level visualization, and collective information processing. Results were visualized in concept maps (Novak and Canas 2008). We also used concept maps to represent the collective discourse (Steinerová 2008). We found concept maps as efficient tools not only for representation of research results, but also for students' learning.

A new model of relevance was derived (relevance 2.0). It is based especially on contexts which include semantic relations and social aspects - linking of users (who, where, when





Panels of the Madonna Altar from Spišské Podhradie
1593 – 1594
Spiš Region
(long-term loan from the Spiš Diocese)
O 1029-1032
Slovak National Gallery

Slovak National Gallery



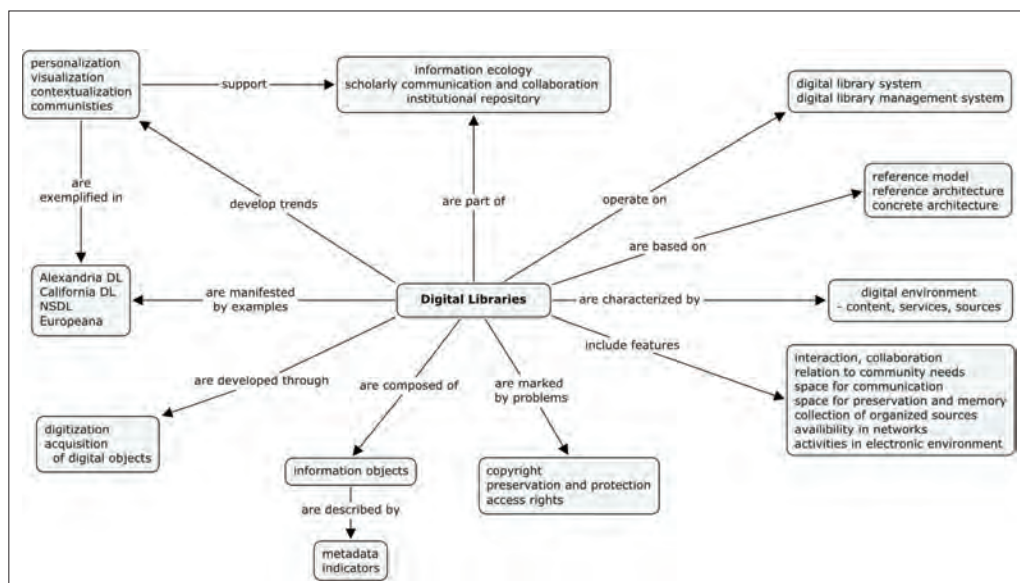
and for which purpose uses information). Detailed results are reported in a comprehensive report (Steinerová, Grešková, Šušol 2007) and elsewhere (Steinerová 2008, 2010).

2.3. Information ecology project

In the third project (2010–2011) we continued in concept mapping as part of the textbook Information Strategies in the Electronic Environment (Steinerová, Grešková, Ilavská 2010). The research methodology combined quantitative and qualitative methods, especially questionnaires, interviews, and concept mapping. Several concept maps visualize the con-

tent of the textbook as part of an explanatory dictionary on CD-ROM (Steinerová, Grešková, Ilavská, Lányiová, 2010) and can help students learn and assess relevance.

As an example we can mention the concept map explaining the topic of digital libraries (fig. 1). Digital libraries are explained in contexts of information ecology and the digital environment. Information objects are parts of digital libraries and components based on the DL Manifesto are included. The maps can be used not only for education, but also for development of complex interfaces, knowledge organization, and visualization of context.



Concept map Digital libraries

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Nativity of Hlohovec”
(originally from
St. Martin’s Cathedral in Bratislava)
Slovak National Gallery.



Concept maps show the most important topics and links between them that create information ecological structures of digital libraries for education and research. We also used concept mapping for knowledge organization in a digital repository of final theses in Library and Information Science. Most frequent keywords revealed changing topics in the last 10 years. We also realized two further surveys:

structured interviews with information managers and officers in Slovak universities, and a questionnaire survey of the university digital repositories. First results show that most Slovak universities started building digital repositories, but the common strategy is missing. Opinions of 17 academic information managers from Slovakia and Czech Republic (Brno, Prague) were categorized into six categories:

Portál Memoria slovacca, pamäť Slovenska, je prístupným bodom ku digitalizovanému kultúrnemu a vedeckému dedičstvu, ktoré uchováva Slovenská národná knižnica a ďalšie pamäťové inštitúcie.

- Archív literatúry a umenia Slovenskej národnej knižnice
- Prezeranie v celej databáze digitálnej knižnice
- SCHK - Projekt Kniha.SK
- Slovenské národné literárne múzeum v Martine
- Staré tlače (1477-1830)
- Bibliografia dejín knižnej kultúry



Ivica Vidrová
Decorative Plate
1970
Red clay (high content of ferrous oxide),
spun, shaped, painted, diameter 39 cm
UP DK 543
Slovak National Gallery



Eugénia Lugsová
1973
Porcelain, modelled, h.13
UP DK 677
Slovak National Gallery



values, problems, tools, community, ecological elements, and information literacy. In the category of values open education and research are regarded as benefits of the academic information environment. In the category of problems especially information overload and lack of integration of sources and systems were mentioned. Low level of managerial communication and information inequity are embedded in problematic communication and cooperation. As for the tools more integration and electronic communication tools were required, but also finding strategic partners and creation of information strategies. In the category of community people form the critical factor. The community should be strengthened by motivating leadership, common goals and the university culture. Ecological elements were expressed metaphorically as cleaning, finding consistency of information worlds, or alchemy. The subjects put emphasis on creativity and innovation of people (students, teachers, researchers). For the improvement of information literacy the most important issues included interest, motivation, terminology and available technological tools. Ecological information literacy was elaborated in detail in another work (Steinerová 2010). Finally we presented a three-dimensional model of ecological information strategies with semantic, collaborative, and visual ecological filters (Steinerová 2011). First results of the project were presented at the international

conference on Information Ecology and Libraries in October 2011 in Bratislava (Steinerová (ed.) 2011). A comprehensive final publication summarized detailed results of the research project (Steinerová et al. 2012).

Conclusions

Practical implications of information ecology call for building meaningful conceptual structures in digital libraries. *Ecological features* can support discovery of new information and learning. Information ecology of digital libraries emphasizes connections of information services with creative use of information objects. Visual features of new tools of knowledge organization in digital libraries can enhance smart features of information use, e.g. tag clouds aid users in relevance decisions. *Object re-uses and mash-ups* can be examples of ecological information use.

Educational implications of information ecology are involved in concept-based learning and user-centred information literacy. Information ecology can support sense making and relevance construction as part of information literacy. Concept mapping can disclose not only explicit, but also implicit meanings of information. Interactive interfaces can support emotional perception and derivation of meanings. Organization of our personal knowledge can be further applied to building personal ontologies. For example, concept maps are

Ondrej Šteberl
Way to the Field
1968

Oil, canvas, 97 x 132 cm
N 252
Slovak National Gallery



Mária Bartuszová
Shell I

1980 a?? 1989
Cast, plaster, diameter 60 cm
P 2658
Slovak National Gallery



ecological in eliminating cognitive load and showing contexts.

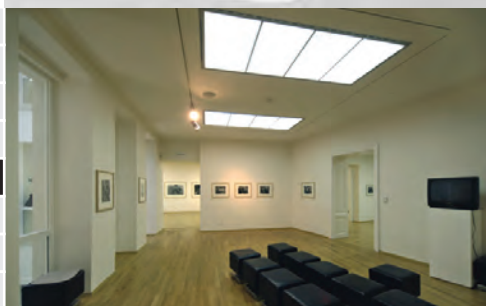
We regard the information ecology as a concept/model that is productive for rethinking the boundaries of academic and cultural digital libraries. It is a special mixture of related resources and services integrated by primary library functions and services. Information habits of students in the electronic environment prove that simplicity, immediacy and images are part of ecological models of digital libraries. The framework of guided inquiry can help support information navigation, personalization and visualization.

For the future we can foresee social searching

and semantic / contextual searching which will lead to the ecological management of the information environment. Concept mapping and knowledge mapping represent a strong potential for new configuration tools, dynamic end-user interfaces, and for tailoring behaviour of digital collections to user behaviour. These ecological tools and models can enhance knowledge creation and sharing in universities and libraries. Information ecology of digital libraries can help better integrate information needs with the new concept of science 2.0 determined as the inclusion of intelligent technologies to cognitive and social (collaborative and networked) processes.



Virgin Mary
from the Annunciation Group
from Veľký Biel
Ca. 1480
Bratislava / Vienna
Slovak National Gallery



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