LIDA

Libraries in the Digital Age

2010

May 24 – 28 2010, Zadar, Croatia

DIGITAL SCHOLARSHIP: support by digital libraries

&

DIGITAL NATIVES: challenges & innovations in reaching out to digital born generations

Organized by:

University of Zadar, Department of Library and Information Science

Rutgers University, School of Communication, Information and Library Studies

At the:

University of Zadar

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KEYNOTE SPEECHES

The Book is Dead! Long Live the Book! Reflections on E-books: Diversity, Growth, Use

Tefko Saracevic

SCIS, Rutgers U, NJ, USA

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Libraries in the Digital Age 2010

The book is dead!
Long live the book!

Reflections on e-books –
diversity, growth, use

Tefko Saracevic, PhD
http://comminfo.rutgers.edu/~tefko/

Slide 2

Central ideas in the presentation

Old story

- Books are changing – *ho hum*

New story

- Most digitization efforts in libraries are micro, even nano in scale
- Mass book digitization is on industrial scale - causing an industrial scale revolution
- Effecting **BIG** changes in technology, services & use
- And **BIG** changes in libraries

Slide 3

Predictions abound

Book

In Memoriam!

eBook

New birth. New Age. Resurrection!

"Prediction is very difficult, especially about the future."
Niels Bohr (1885-1962)

Slide 4

On disappearance of print books (pBooks)

- Many elegies in newspapers, magazines, blogs
- Lamentations the way we experience books above & beyond reading
  – physicality of books
  – heft, texture, scent

- In books we have a pile up, display, collection
- eBooks: nothing piled up, no texture

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Sample of articles

Will E-books Change the World?
by Terje Hillesund

The future of eBooks? Will print disappear? An end-user perspective

The future of publishing : E-publish or perish

OP-ED CONTRIBUTOR
The End of History (Books)

Science 2.0

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Sample of studies

A Circulation Analysis of Print Books and E-Books in an Academic Research Library

What do faculty and students really think about e-books?
Ian Rowlands, David Nicholas, Hamid R. Jamali and Paul Huntington

Innovation and the Future of e-Books
John W. Warren, RAND Corporation, CA, USA

CASE STUDY

E-books in practice: the librarian's perspective
Rafael BALL

JISC
The Digital Information Seeker
Report of findings from selected OCLC, RIN and JISC user behaviour projects

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Books: a brief look back

Civilizations, cultures

- Since they appeared some 3 millennia ago they were critical for any/all civilizations, cultures that wrote
  - linked to the desire of humans to create lasting records
  - represent human memory, attainment & scholarly record

"our entire collective subjective history – the soul of our societal body – is encoded in print."

Sven Birkert . The Gutenberg elegies – the fate of reading in an electronic age. 1994

Books ...

Technology

- Since they appeared some 3 millennia ago they were connected with & realized by many and very different technologies

a few examples

- gypsum on wood
- clay tablets
- papyrus
- bamboo
- bark (Amati paper)
- oldest printed book (in existence)

and yet, they remained books

And then came
Johannes Gensfleisch zur Laden zum Gutenberg
c. 1398-1468

Put together four skeins of technology

- paper
- ink
- movable type
- printing press

He was not the first to invent printing ... Korea, China were before ... but ...

mass production of books that followed revolutionized first the Western & then the whole world

since then some 100 mill. books published

among the first and most famous were his Bibles

And now from pBooks onto eBooks

- No sculpture, yet, commemorating eBooks
- But eBooks are the fastest & and most massive globally spreading books in book history
  - e.g.

Book sculpture - commemorating invention of modern printing Walk of ideas, Berlin

a virtual fair July, 4 to Aug. 4, 2010 , featuring over 3,000,000 eBooks; org. by World Public Library Michael Hart (Gutenberg Project)

In the grand scheme of things
all interact

eBooks
- Producers - makers of eBooks
- Vendors (aggregators) – putting it all together

eBook readers
- Physical – devices
- Virtual – in a device

eBook users
- Institutional – libraries, schools
- Direct – individuals, groups

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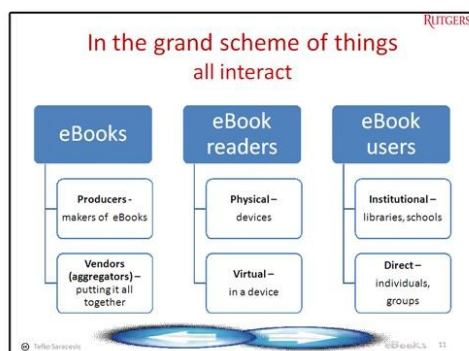
eBook makers, suppliers

Producers

- Concentrate on scanning books
  - and then providing access
- Libraries = micro producers
- Mass producers = industrial scale

Vendors (aggregators)

- Concentrate on putting together many collections of eBooks
  - and then provide unified access, add value - search, link ...
- Book databases

Libraries as producers – first generation

Digitization

- Globally great many libraries digitized books from own collection
- Many are rare, historical, classics
  - opened treasures to public – well received
- But all together small in numbers
- Subsidized

A few examples from many

- British Library
  - 30,000 items, few books,
- Gallica - Bibliothèque nationale de France
  - 1 mill. items, 160,000 books,
    - many are book images or excerpts only
- Croatian Academy of Sciences and Arts
  - several old books

Mass digitization projects – second generation

Pioneered

- Industrial scale of eBook digitization
  - innovative
    - applications of technologies
    - some partnerships with libraries
- Raised many issues & disagreements
- Global

Major projects

- Project Gutenberg
  - first, gave ideas to all
- Million Book Project
  - global cooperation
- Google Books
  - largest; international; many libraries & even countries cooperate
  - cultural controversies
  - copyright lawsuits

Next generation: Interaction in eBooks

Major innovation

- Adding potential for interaction is a giant step in evolution of eBooks
  - using dynamic web vs. static scanned displays
  - makes eBooks into something else – Web 2.0

pBooks vs. eBooks

- Interactive capabilities embedded within eBooks provide clear & even huge advantages over pBooks

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Vendors (aggregators)

What?

- Bring together eBooks from different sources & publishers & make it available to libraries & others
- Some do it via specific software or apps

Who?

- Large, universal ones taking the role of super-bookstores
  - with some interactivity
- Smaller, more specialized, aimed at specific markets, topics
  - particularly libraries & similar institutions
  - many most innovative

Sample of vendors … all online only

Giants with global reach

- Amazon – a super store & bookstore, e- & pBooks
  - many countries have similar
- Google Books – digitized heritage books + current
- iBooks – Apple repeating the music formula to books, some digitized heritage books (e.g. Project Gutenberg) + current

(While we do not call them "vendors" or "aggregators" that is what they are)

Specialized or niche

- ebrary "get the most out of your digital content." Several interactive capabilities for eBooks
- NetLibrary "we've always recognized that there's no such thing as a one-size fits all library." Extensive tools for libraries
- ClassZone – large global text book publisher turned to eBooks. Extensive interactive e-texts for middle & high schools. Geared toward digital natives. Interactive learning: "Textbooks come to life."

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eBook readers — delivery for eyes, could be also ears

Physical

- Devices used to display e-Books & other e-content
  - variety on the market
- Plus: portable, readability in various conditions, long battery life
- Goal: for the technology to seem to disappear
  - concentrate on content

Virtual

- Software for reading eBooks (& other e-content) on a computer & other devices
  - variety on the market
- Used also for acquiring & managing eBooks
- International Digital Publishing Forum (IDPF) tries standardization

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Battle of eReaders on the go

Readers (physical)

Sample of most popular ones:
- Amazon Kindle
- Sony eReader
- Apple iPad
- Proprietary - not compatible
- Coupling device & vending

Proliferation of formats
- Standards needed for interoperability
- Most used/popular:
  - pdf (Adobe)
  - ePub (International Digital Publishing Forum)
- Also:.prc (Kindle), .pdb (Palm), BBeB (Sony – BroadBand eBook)

Ecologically speaking: How green are eReaders vs books?

- In terms of *manufacture* – use of fossil fuels, water, minerals:
  - to produce one eReader requires extraction of 15 kg of minerals, 300 liters of water
  - one book from recycled paper = half a kilo minerals and 8 liters of water
- Also considerations of *transportation, use & disposition*

- Taking all together the impact of one eReader = about 40-50 books
- When it comes to global warming = about 100 books
- Most ecologically virtuous way to read a book starts with walking to your local library

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Battle of eReaders for reading on your device - computer, mobile …

eReaders (virtual)
- Adobe Digital Editions – reads pdf, ePub
- Mobipocket Reader Desktop - combines a bookstore with reader
- LexCycle Stanza – app for iPhone, iPod, iTouch; good for mobile devices; also a bookstore

Software
- Mostly independent of hardware; incompatible
- Some combined with bookstores
- Adding interactive capabilities – browsing, searching
- "Reading revolutionized"

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eBook users   User categories

Institutional
- Libraries, schools, museums, organizations, agencies …
  - free eBooks and/or with subscription/license
- Integrating with
  - other p & eResources – essential part of collection
  - other services

Direct
- Individuals
- Groups
  - children, adults, students, scholars, professionals …
- Combined
  - groups from institutions, universities – e.g. courses, research projects, scholarship …

Libraries and eBooks

Digitized old(er) books
- Support tradition, culture
  - enlarge collection
  - attract interest for "buried" treasures
  - provide resources for education, scholarship
- Major political point for justifying subsidy
- Many libraries have a large number

Newly published
- Support modernity
  - current demands
- Why buy or license?
  - provide innovative services
  - possible for multi locations
  - circulate as other books
  - go with digital natives
  - for some no alternative

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eBook advantages for libraries

Operations
- Can't be stolen, lost, mis-shelved
- Automatic circulation
- No additional space
- Management easier
  - software often included
- Easy collection of statistics - valuation

Access
- 24/7 from anyplace
  - but often restricted to own users (university, city)
- High demand books easily managed
- Merges with other services
- pBook= single concurrent user; eBook = many

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Advantage: Integrated collection & services

eBooks

- Combine with other resources – audio books, music, video, software …
- Seamlessly connect with MARC records
- Both increase use

Services

- eBooks circulated as other books
- Popular with users
- Example of Washington DC Public Library
- Powered by OverDrive – "digital media service," with a free Media Console for users to download & manage

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eBook disadvantages for libraries

Economics

- Lots of $$$, €€€ …
- Funding a challenge
- Technology investments still high
- New competencies, (re)education needed

Balancing

- With print collection
  - still the major part for all libraries
- Still a good proportion of users are not there yet

Mind-set changes needed & hard to achieve

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Digital scholarship & eBooks

Digitized old(er) books

- Changed, broadened access
  - particularly old heritage & classics
- Opened new education & research areas
  - e.g. in digital humanities

New generation of eBooks

- Fast update as needed
  - cooperative autorship
- Aligns with digital scholarship
- "Journalization" in use of eBooks
  - sections as needed

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Publishers & eBooks

Seeking adjustments

- Publishers struggling & searching for new models
  - inventory-free print-on-demand attractive (print isn't dead yet)
  - distributing eBooks though vendors
    - profits??
  - authors looking for larger share of profit
    - samoizdat versions attractive

Scholarly publishers

- Example of Springer Verlag – covers many scholarly disciplines
  - integrating p- & eBook & journal publishing
  - aggregating from large libraries & societies
  - varying access & studying use

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eBook use metrics - making sense is a complex process

Importance

- To indicate various parameters of use, users, collection
- For policy, negotiation, valuation, justification
- Not yet standardized
  - various aggregators provide different data "Comparing Bananas with Grapes"

Example of metrics

- Downloads, views
  - sections, whole units
- Visits, sessions, searches
- Title reach (been used)
  - age of titles reached
- Cost per use
- Contrast to pBook use
- Turnaways

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eBook use studies in universities

Growth findings

- Number of studies show significant increase in eBook use over time
  - gain of eBooks over pBooks
  - varies by discipline, but trend the same

Effecting use

- Cataloging eBooks & having them in OPACs increases use
- Students use more than faculty
- Non-awareness linked to non-use

Users do not know or care for term or concept "digital library" for them it is a library that, as always, has books - these ones a bit different

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Digital natives and eBooks

Digital

- Part of their universe
  - young predominate, but not only young
- Changing patterns how people read
  - & search for information
  - implication for libraries
- But information literacy still low

Devices

- Becoming better & ubiquitous
- Integrated with life
- eBooks are just books
  - to be read anywhere

Conclusions
eBooks are succeeding because (part I)

Mass digitization projects

- Several high profile projects made available great amount of classic & heritage books
  - some current too
- Raised availability & public interest

Commerce

- A number of companies (some old, some new) entered into eBook business
  - an industry is emerging
  - with competition, innovation, markets
- Changing the landscape

Research also bore fruit in applications

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eBooks are succeeding because (part II)

Scale, innovation

- Industry: producing
  - growing list of current titles
  - interactive capabilities
- Libraries: inclusion in OPACs, new services
- Publishers: reorienting
  - p & eBooks together, or eBooks alone

Technology

- eReader hardware & software better
  - evolving continuously
- Wild west in formats is cooling
- Costs are down
- Apps are better & easier

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eBooks are succeeding because (part III)

Social acceptance

- Innovation reached from early adapters to early majority – passing in the mainstream
- Cycle maturing:

Technology → Society

But there are also social issues – a dark side

- Predicated on easy availability of technology, but
- **Digital divide** is real
  - with this, exclusion may be even growing
  - leaving out many
  - with what effects?

URLs used in the presentation

Name	URL
Amazon	http://www.amazon.com/
The British Library	http://www.bl.uk/
ClassZone	http://www.classzone.com/cz/index.htm
Croatian Academy of Sciences & Arts	http://info.hazu.hr/home
ebrary	http://www.ebrary.com/corp/
Gallica	http://gallica.bnf.fr/
Google Books	http://books.google.com/
The Gutenberg Elegies	http://archives.obs-us.com/obs/english/books/nn/bdbirk.htm
iBooks	http://www.apple.com/ipad/features/ibooks.html
International Digital Publishing Forum	http://www.idpf.org/
Lexcycle Stanza	http://www.lexcycle.com/
Million Book Project	http://www.archive.org/details/millionbooks
Overdrive	http://www.overdrive.com/
Project Gutenberg	http://www.gutenberg.org/wiki/Main_Page
Universal Digital Library	http://www.ulib.org/
World eBook Fair	http://worldebookfair.org/index.htm
World Public Library	http://worldlibrary.net/
Wordle	http://www.wordle.net/

The end: Lecture in Wordle

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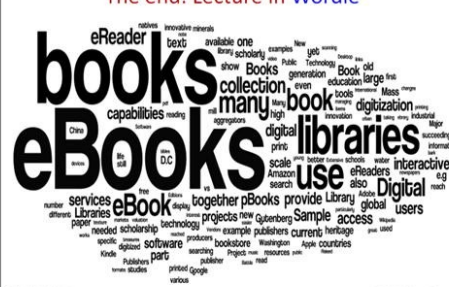
Book: wood, gypsum

18th dynasty in ancient Egypt, circa 1550 B.C.

Word of Khakheperraseneb a literary discourse concerning personal and social chaos.

back

Book: clay tablet

600's B.C. Royal Library at Niniveh in Babylonia.

back

Papyrus – scrolls

New Testament papyrus manuscripts dated to 125 A.D., containing a portion of John 18:31-33.

back

Chinese bamboo books

date back to 500 B.C.

back

Amati paper (fig bark) – Maya, pre-Columbian

called Dresden Codex ~ 14 century

back

First (credited) printed book, Diamond Sutra China 868 AD - woodblocks

back

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Gutenberg Bible (1450's)
same page
British Library   Bayerische Statsbibliothek
back

ONLINE GALLERY
TURNING THE PAGES
Leaf through our great books and magnify the details
back

Gallica
back

Missale zagrabiense (1511)
one of the oldest Croatian printed books
back

Project Gutenberg
1971 - ;pioneered mass digitization of books; volunteers participate
• some 100,000 free eBooks for download
  – out of copyright, or reproduction granted
  – most older, majority in English, but also in 60 other languages; big number of downloads

Downloaded Books	
2010-04-22	115015
last 7 days	539743
last 30 days	2890648

back

Million Book Project
2002- ; 1.7 mill. books; scanning in China & India morphed into Universal Digital Library
back

Slide 1

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Google books

2004 – ; partners from 10 countries; lawsuits in 3 countries; over 10 mill. books & counting

Google books

back

Slide 2

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example of multiple capabilities:

ebrary   Knowledge Unbound.

- A commercial database
  - over 43,000 scholarly eBooks, & other e-resources from over 435 publishers
  - 2,700 subscribers (mostly libraries)
    - individuals can subscribe as well
  - idea is to aggregate & then distribute books directly to users through libraries or individually, and
    - provide software for managing & tools for finding books, searching within books, creating own bookshelves etc.
    - so libraries do not have to invest in additional management tools
    - tutorial Quickstart provides examples

eBooks 50

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ebrary interface:
example of search, display & link tools

- InfoTools links to other resources
- If selected *El Niño* from a text it will show:
  - define – show a dictionary definition
  - explain – show encyclopedia,
  - locate – maps
  - who – biography, Wikipedia
  - search – all kinds of sources incl. images, video
  - create note – note taking

back   eBooks 51

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Netlibrary (OCLC to EBSCO)

NetLibrary

Products & Services

back

Slide 5

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Division of Houghton Mifflin Harcourt a large global education publisher

- text, self-check quizzes, flashcards, online workbooks, links to more information ... more

ClassZone Book Finder

1 Select Your Subject
- Language Arts
- Math
- Science
- Social Studies
- World Languages

2 Select Your State

3 Find Your Book

Slide 6

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ClassZone example of an interactive biology text for high school

Online Book

back   eBooks

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Amazon Kindle
eReader connected with Amazon ebookstore...

Kindle 2   Kindle DX

• 450,000 books, magazines, newspapers, audio
• download from Amazon
• holds up to 1,500 books

Sony eReader
access to Sony eReaders, Google Books, local libraries, self-publishing

Apple iPad & eBooks
access to iBooks, magazines, newspapers, audio ...
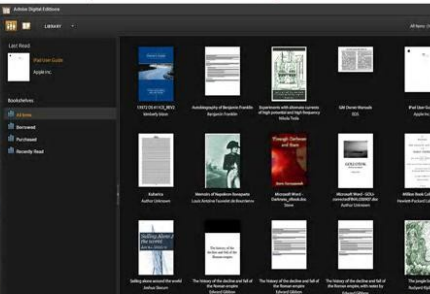
iBookstore

iBook reader
connects highlighted words to a dictionary & Wikipedia; VoiceOver reads text

My eBooks on Adobe Digital Editions

My eBooks on Mobipocket Reader Desktop
(from their bookstore)

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Lexcycle Stanza

eReader

Plus library

Multiple capabilities

Also eReader for Windows -beta version, works really poorly

Stanza's Online Catalog

Access to over 100,000 books

Own books, documents can be added

Sample of eBooks at Washington, D.C. Public Library – available to D.C. residents only

eBook aggregator adjusts to specific libraries, schools … partners with publishers

example of a large scholarly publisher

"SpringerLink is one of the world's leading interactive databases for high-quality STM journals, book series, books, reference works and the Online Archives Collection"

Ally reading her book at a soccer game where her sister was a goalie (score 3:3)

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Toward Participatory Digital Libraries

Gary Marchionini

SCILS, Chapel Hill, NC, USA

The substantial work done to define digital libraries in the 1990s and to build and operate digital libraries in the first decade of the 21st century touches the work of librarians in all kinds of institutions. Research and practice continue to advance in institutional contexts but this talk will focus on the relationships between these libraries and the digital lives of individual patrons. The early work in DLs included some attention to personal digital libraries, but two contemporary forces give rise to renewed attention to the challenges of personal data management and preservation. First, the broad array of data streams and associated devices that individuals use on a daily basis mitigates monolithic or single-strategy solutions. Personal web-connected mobile devices and burgeoning sensors in the environment join the diverse platforms people use in the workplace to generate multiple data streams and social exchanges. The diversity and volume of these multiple streams have driven the current moves toward cloud-based computation and storage. Second, the maturation of two generations who have become dependent on digital information services has raised the issue of data persistence beyond the bounds of libraries, archives, and data centers. Personal digital assets range from family photographs to personal health records. Everyone has experienced data loss at some point and as more of our personal lives are spent in cyberspace and our personal external memories emerge and persist in digital form, there is growing attention given to managing our personal digital assets in perpetuity. This talk will discuss the challenges and some possible ways that institutional digital libraries can work with the private sector and individuals to help people manage personal digital libraries over time.

The Digital Future is Now: What the Humanities can Learn from eScience

Christine Borgman
Professor & Presidential Chair in Information Studies
University of California, Los Angeles

As the digital humanities mature, their scholarship is taking on many characteristics of the sciences, becoming more data-intensive, information-intensive, distributed, multi-disciplinary, and collaborative. While few scholars in the humanities or arts would wish to be characterized as emulating scientists, they do envy the comparatively rich technical and resource infrastructure of the sciences. The interests of all scholars in the university align with respect to access to data, library resources, and computing infrastructure. However, the scholarly interests of the sciences and humanities diverge regarding research practices, sources of evidence, and degrees of control over those sources. This talk will explore the common and competing interests of disciplines for scholarship in the digital age, concluding with a call to action for the humanities.

GUEST OF HONOR

An Afternoon with a Guest of Honor - Edward A. Fox

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Virginia Tech, VI, US

Dr. Edward A. Fox holds a Ph.D. and M.S. in Computer Science from Cornell University, and a B.S. from M.I.T. Since 1983 he has been at Virginia Polytechnic Institute and State University (VPI&SU or Virginia Tech), where he serves as Professor of Computer Science. He directs the Digital Library Research Laboratory and the Networked Digital Library of Theses and Dissertations. He has been (co)PI on over 100 research and development projects. In addition to his courses at Virginia Tech, Dr. Fox has taught over 72 tutorials in more than 25 countries. He has given more than 60 keynote/banquet/international invited/distinguished speaker presentations, about 145 refereed conference/workshop papers, and over 250 additional presentations.

For the Association for Computing Machinery he was founder and co-editor-in-chief for the ACM Journal of Educational Resources in Computing, is a member of the editorial boards for ACM Transactions on Information Systems and ACM Journal on Computing and Cultural Heritage, and was General Chair for the ACM/IEEE Joint Conference on Digital Libraries '2001. Earlier, he served 1988-91 as a member of the Publications Board and as editor-in-chief of ACM Press Database Products (responsible for the broad area of electronic publishing including online, CD-ROM, hypertext, interactive multimedia, and developing a digital library). He also served from 1987-95 as vice chair and then chair of the Special Interest Group on Information Retrieval, from 1992-94 as founder and chairman of the Steering Committee for the ACM Multimedia series of conferences, and from 1995-1998 as founder and chairman of the Steering Committee for the ACM Digital Libraries series of conferences. He served as Program Chair for ACM DL'99, ACM DL'96, and ACM SIGIR'95 - and co-chair for CIKM 2006 and ICADL 2005. He was lead guest editor for Communications of the ACM special issues July 1989, April 1991, April 1995, April 1998, and May 2001.

In the 1980s he was project director for the Virginia Disc series of CD-ROMs as well as for VPI&SU work on interactive digital video. He was editor for the Morgan Kaufmann

Publishers book series on Multimedia Information and Systems. He also serves on the editorial boards of Information Processing and Management, Journal of Educational Multimedia and Hypermedia, Journal of Universal Computer Science, and Multimedia Tools and Applications. He served as Chairman of the IEEE-CS Technical Committee on Digital Libraries. He has co-authored/edited 13 books, 95 journal/magazine articles, 41 book chapters, and many reports. These are in the areas of digital libraries, information storage and retrieval, hypertext/hypermedia/multimedia, computing education, computational linguistics, CD-ROM and optical disc technology, electronic publishing, and expert systems.

INVITED SPEAKERS

Library FAIL: Digital Expectations, Legacy Institutions

Frances Jacobson Harris [1,2]
[1]University Laboratory High School,
[2]University of Illinois at Urbana-Champaign, Urbana-Champaign, USA

INTRODUCTION

What does it really mean to be a digital native? As the conference website notes, "digital natives" and "digital immigrants" are not binary constructs but reflect a continuum of user types. Indeed, individual interests and skills, socio-economic background, and cultural factors are often better indicators of placement on the continuum than is age. However, age may be the single biggest driver of expectations and assumptions about technology simply because digital technology has always been part of the landscape of most young people's lives. The very ubiquity of digital technology in today's world means that its existence alone ceases to be the defining factor. Instead, it is the *activity* – what young people are doing with the technology – that defines the experience. So when we speak of digital natives, our focus should really be on young people's *activities* and *relationships*, rather than on individual tools or products – with an eye toward how digital technology might influence or shape those activities.

What are these activities and habits that digital technology so nimbly enables? For young people, digital tools support two of the primary tasks of adolescent development: personal identity formulation and social identity formulation. The tools not only connect young users to information, but also allow them to interact within larger and more public communities, create and share their own content, and otherwise participate in the human experience in ways not previously available to them.

The current popularity of social network site Facebook can certainly be attributed to its ability to host all these activities within a single platform.

Figure A

In this example of a Facebook profile (Figure A), my student substitutes a photograph of actor James Dean for his own. The siblings he names are actually friends rather than members of his biological family – or one could say they are members of his *chosen* family of the moment. The profile parameters provide spaces for him to share information about his religious affiliation, political views, and sexual orientation.
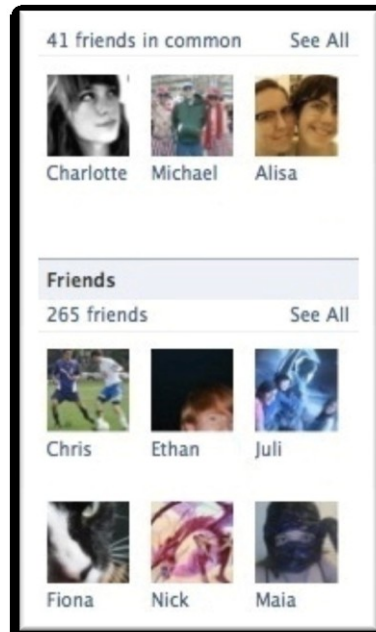
Figure B

Facebook also allows Jared's friend (me) to see which friends we have in common and which friends we do not (Figure B). This information enables each of us to enlarge our own personal community networks, if and to what extent we wish.

Figure C

Jared can use his photo gallery to design and showcase a variety of images he has created (Figure C).
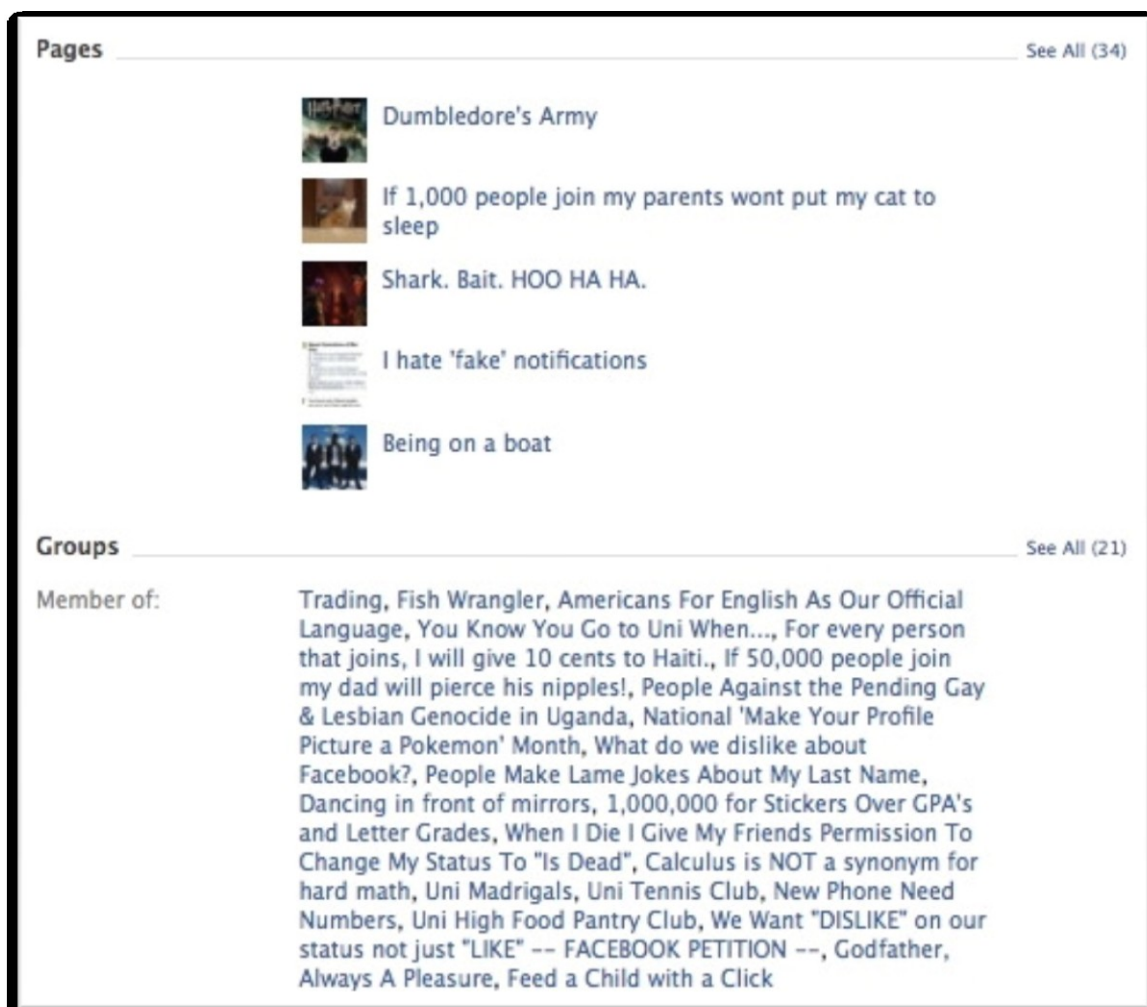
Figure D

Finally, Facebook allows users to join (and create) groups and fan pages, demonstrating their appreciation of an infinitely wide variety of causes, interests, and shared sentiments (Figure D).

What then happens when digital natives encounter existing library service structures that either ignore interests and needs like these, or may even operate in opposition to them? Some culture clash is inevitable. I observe conflict – or library "fail" – in two general areas:

- Information infrastructure. Traditional catalogs, databases, and other "library" information services do not look or behave like Google and Amazon. Even next generation catalogs, with federated searching, faceted search results, and other value-added features, are problematic for a user group that is accustomed to the affordances and sheer accessibility of a search tool like Google.

- Institutional policy. In spite of (or perhaps because of) the rapid pace of development in digital technology, institutional policy often prevents or prescribes its use, particularly by young people. As a result, there exists a huge disconnect between how young people use digital tools in their personal lives and how they use the tools inside the highly regulated institutions they are required to inhabit. In many schools and libraries, software filters block not only "inappropriate" content, but routinely prohibit access to Web 2.0 tools ranging from blogs and wikis to social network and video sharing sites - all resources that young people favor and routinely use on their own. An unintended consequence of such restrictions is that opportunities for librarians to

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teach searching and evaluation skills, as well as safe and responsible use of digital tools, is limited or even nonexistent.

I will address each of these areas in more detail and then briefly discuss the next steps – how libraries and librarians can turn that "fail" into successful models of services and collections for today's users.

FAIL: INFORMATION INFRASTRUCTURE

Library information retrieval systems are necessarily complex because the information world is complex. To function properly, they must be thoughtful, comprehensive, and – above all – consistent. Elaborate, profession-wide decision-making structures have evolved to govern cataloging practices. A sizeable portion of this governance is devoted to subject access, an especially problematic area of information retrieval since it relies on the vagaries of human linguistic interpretation. Good subject access is especially important for young people, who are more likely to search by subject than by known item. However, because of its inherent difficulty, I believe that subject searching has always been the weakest component of our information retrieval systems. For example, in our attempts at precision and clarity, carefully crafted subject headings can end up as awkward, overly hierarchical, and even archaic phrases that no young person would ever voluntarily utter. Here are some examples from Library of Congress Subject Headings, some (fortunately) no longer in use:

> Afro-American women in motion pictures
> Cookery (Apples) -- Juvenile literature
> Poor teenagers -- United States -- History -- Twentieth century
> Prostitutes' customers

At the same time, Library of Congress Subject Headings can be idiomatic and colloquial:

> Empty nesters
> Road rage
> Rednecks

It is no wonder that lay users (the *intended* users) of library catalogs find them confusing. Not only is the vocabulary daunting, but today's information seekers are accustomed to many more points of subject access than the handful of headings typically supplied by traditional information retrieval systems. Here is our local catalog record for a book called Ranma 1/2, an example of Japanese manga (comics) that has a rather complex plotline:

Ranma is a character who has been cursed. When he is splashed with cold water, he turns into a girl; when he is splashed with hot water, he turns back into a boy. The subject headings assigned to this book number exactly two: *Graphic novels -- Japan* and *Comic books, strips, etc. -- Japan*. Contrast the above catalog record with the one below, the record for the same book on LibraryThing, a social network catalog that can include standardized subject headings as well as tags supplied by users:

Not only do the tags include the genre names supplied by the conventional library catalog, but user-generated additional terms like *gender* and *shounen* (manga written for a male

audience) provide a much richer description of the book's contents. The tag cloud gives some indication of which terms users find most salient, and the record even includes a list of recommended titles that are similarly tagged.

I won't spend too much more time on this subject because so many of you here are already engaged in this type of work. The best thing I can say is to keep working on it – digital natives, *all* of us, need these improvements!

FAIL: INSTITUTIONAL POLICY

Now I would like to address another barrier often experienced by today's younger users of digital library services, a barrier that is relatively immune to technological solutions. I am speaking of the emotion-laden concerns about new modes of information and communication technology that can have a disproportionate influence on institutional policy. Something about the online revolution and, more recently, the advent of Web 2.0 tools and their ability to create connections among users, as well as between users and information, provokes feelings of fear and uncertainty. The nature of the resulting discourse distracts policy-makers and makes it difficult to think with clarity about the use of digital media by young people.

A major challenge of the changing digital landscape is its presentation as a profoundly different environment, one that at first appears to be so alien it can even be construed as an entirely new entity. Here is a concrete example. Virtually every school library in America provides a core collection of recreational magazine titles as part of its mission to promote reading and literacy. The disconnect occurs when the same kind of free-choice reading material is accessed on the Web. Many schools routinely restrict Web access to material defined as "educational." In such settings, the student who can freely pick up an issue of *ESPN: The Magazine* or *Hot Rod* from the library shelves is prohibited from going to the ESPN or Hot Rod websites on the library's computers. And the student who checks out a Harry Potter book is prohibited from perusing J.K. Rowling's website or contributing stories to the Harry Potter thread on a fan fiction website. Whether wittingly or unwittingly, the school's mission of promoting reading and literacy is somehow interpreted differently when the Web is the medium of delivery.

In the school setting, the stakes rise even higher when discussion turns to Web 2.0, an environment in which users interact with the medium, create new content, and engage directly with other users. Blogs, wikis, and all types of social network services may be blocked, without regard to their actual content or proposed function in the education setting. School administrators may simply not understand what the tools are and how they can be used in school settings. Many rely heavily on the judgment of technology managers who have (not unjustifiable) concerns about safety and security issues or, in some cases, the loss of central control that Web 2.0 tools imply. To ensure safety and to protect young people from exposure to pornography and truly abhorrent content, schools and libraries generally employ filtering software (and, in fact, are generally mandated by law to do so). But filtering software is expensive to purchase, requires sophisticated network administration skills to install and maintain, and is well-known for both underblocking and overblocking information – especially if system administrators install it with a heavy hand.

It is my belief that by creating a walled digital environment in schools and libraries, we abdicate our responsibility to teach young people how to evaluate, contextualize, and utilize a wide range of content, content that they are certain to encounter with or without our assistance. I would also go so far as to argue that in today's digital world, engaging students in conversations about *ethical* use of information and communication technologies must be considered one of the core responsibilities of our profession. Education blogger David Truss half-jokingly suggests that we post the following sign on the front doors of our schools:

WARNING

WE FILTER WEBSITES AT SCHOOL!

* STUDENTS WILL NOT KNOW WHAT TO DO WHEN THEY ARE AT HOME AND THEY COME ACROSS MALICIOUS OR INAPPROPRIATE WEBSITES.

* SEARCHES MAY CONFUSE AND OVERWHELM STUDENTS AT HOME AS THEY WILL BE IN UNFAMILIAR TERRITORY.

* WHILE AT SCHOOL STUDENTS WILL NOT BE ABLE TO USE MANY INTERESTING AND EXCITING WEBSITES THAT THEY CAN USE AT HOME.

* AT SCHOOL WE WILL NOT BE ABLE TO HELP STUDENTS WHO HAVE ISSUES WITH SOCIAL SOFTWARE SITES LIKE FACEBOOK.

* BECAUSE WE FILTER WEBSITES AT SCHOOL WE CAN NOT PREPARE YOUR CHILD TO BE NET SAVVY, THAT RESPONSIBILITY NOW RESTS FIRMLY ON YOUR SHOULDERS. GOOD LUCK!

"Filters filter learning!" ~ David Truss http://pairadimes.davidtruss.com/warning-we-filter-websites-at-school

(http://pairadimes.davidtruss.com/warning-we-filter-websites-at-school/)

It is naïve and dangerous to assume that all individuals under a certain age are naturally adept at searching the Web and making sense of what they find. In fact, researchers have found much evidence to indicate that young people are *not* so proficient at these skills (see additional readings, below), certainly enough to expose the notion of "digital native" as an artifact of modern mythology. My generally bright students certainly struggle with understanding the difference between the free web and the deep web, and with identifying authorship, purpose, and audience. Howard Rheingold is blunt in his assessment of *all* current web users' skills at evaluating web content, fearing for the ultimate viability of the medium itself:

> Unless a great many people learn the basics of online crap detection and begin applying their critical faculties en masse and very soon, I fear for the future of the Internet as a useful source of credible news, medical advice, financial information, educational resources, scholarly and scientific research. (http://www.sfgate.com/cgi-bin/blogs/rheingold/detail?entry_id=42805)

On a more subtle level, the roles of *context* and *intent* of information cannot be underestimated. For example, a riot may be the subject of a mainstream news article, a pundit's blog, a local newspaper editorial, a video taken by a passerby, and Twitter messages that emanate from a variety of origins. Any one of these sources might be considered credible or useful in some way – or not – depending on a user's interests and purpose. Unlike a traditional library, the Web has no fiction section, no non-fiction section, no biography section. Visual and contextual cues that do exist can be misleading or confusing. A search on "abortion" may lead to an advocacy organization's website, a medical website, or a church website. Finally, purveyors of questionable content employ an arsenal of tactics to make their wares palatable, marketable, and ultimately acceptable to significant numbers of people, including (and maybe especially) young people.

Do our schools and libraries offer the support and instruction young people need to decode this barrage of undifferentiated information? Unfortunately, when it comes to web content, institutional focus (especially in the United States) tends to be on safety-related

issues. We are very concerned about pornography and sexual predation. But the Web is seductive in many other ways as well. An obvious example is the ease with which young people can be sucked into habits of consumerism. Preteens find it hard to resist sites like Gaia Online (http://www.gaiaonline.com), Club Penguin (http://www.clubpenguin.com), and FooPets (http://www.foopets.com). These sites, like their counterparts on commercial television, are essentially product-driven. Unlike their television counterparts, these services offer interactive membership in living virtual communities (accompanied by investments of both time and money). Even young people without credit cards can participate in the optional, but very tempting, fee-based features that are available. Using credit service Kwedit (http://kwedit.com), teenagers "play now and pay later," paying off debts for virtual goods with cash at a local 7-Eleven store or simply passing payment requests onto a parent. As they build a record of paying their debts on time, participants build a better "Kwedit score," allowing them to "promise" (borrow) more – just as real credit card accounts function. It troubles me that we do not focus more of our educational efforts on the impact of this kind of web interaction.

NEXT STEPS

How can libraries and librarians address the areas of disconnect I have described? In terms of information infrastructure, the robust research and development efforts that are in progress need to be accompanied by shifts in views of what is "best" for users. As an example, while controlled vocabulary-based systems might deliver more precise results sets, novice users (of any age) generally find them awkward to use, even obtuse, and will avoid them, especially when other, more facile alternatives are available. I have seen my students use Amazon (http://www.amazon.com) or Google Books (http://books.google.com) to identify potential book titles on a subject of interest, which they then search for in our catalog. With few exceptions, catalogs do not extend a search in the way such commercial products do – by suggesting titles based on what the user has already searched or on what others have selected when conducting similar searches.

In terms of policy, we first need to acknowledge the role digital media plays in the lives of young users – which is where I think the construct of the digital native is most germane. Here is what a few of my students had to say about how they use Facebook to communicate and to create community:

> "It's [Facebook] become the most common way I communicate w/ friends out of school. Not for any inherent merit in the technology, but just because that's what my friends use."

> "I think I'm friends with everyone in my class, and I have 50 or so out of the 60ish on my friends list."

> "Facebook is often used for school purposes, and i think alot of adults dont really understand this. The last time I forgot an assignment at school, i simply went on facebook, figured who was online that i knew had the assignment. Chatted with them. And within a few minutes they had scanned the assignment and sent it to my email and I printed it. the whole exchange took maybe 4 minutes from the time I got on the computer to the time the assignment was printing. It is very convenient."

Secondly, we need to take down (or at least reconfigure) the virtual walls we have built around the institutions young people inhabit. We need to recognize our role (and responsibility!) in teaching students how to manage their digital footprints. Schools and libraries are perfect places in which to learn how to safeguard privacy, how to behave with integrity online, how to manage information and communication technologies, and how to

assess information in all its guises. Because out-of-school use of digital information undoubtedly comprises a huge portion of young people's information intake, we should bring out-of-school information problems into the classroom. Here are some examples:

> Students follow the same news story as it is covered by different media outlets, including blogs and Twitter.
> Students critique and compare music-reviewing sites. They look for evidence of professionalism and conflict of interes

> Students compare and contrast different online financial services, tracking the stock market advice given by each. Or students evaluate differences in how these services profile individual companies, then compare this information to the companies' own online promotional material.

> Students analyze the differences between sites like eBay and Craigslist.com. They conduct price and service comparisons across sites, as well as with standard online retail outlets.
> Students compare the information on a disease in different types of sources: consumer-oriented websites, websites designed for medical professionals, and postings on web forums.

As important as it is to improve the technical infrastructure of library information systems, adapting and updating policies is even more critical if libraries are to have a meaningful role in the lives of future generations. The best information retrieval technology in the world is useless if entire classes of information are prohibited and professional assistance is not available to help young users become intelligent and responsible users of information and communication technologies. Libraries must expend equal energy creating a library *ecosystem* that embraces the best in social media, data mining research, and the unique human attributes that a true public service can offer. Current circumstances have permanently altered the nature of a career once focused primarily on information organization and retrieval activities. Today's librarians must also act as ethicists, counselors, and activity coordinators if they are to successfully serve their digital native clientele. Libraries will remain relevant, even vibrant, if we focus not on the technology itself, but on the activities that engage our users.

ADDITIONAL READING

Bell, Mary Ann. 2007. The elephant in the room: School districts nationwide are voluntarily filtering the filters – and no one is talking about it. *School Library Journal* 53 (1): 40-42.

Flanagin, Andrew J., and Miriam J. Metzger. 2008. Digital media and youth: Unparalleled opportunity and unprecedented responsibility. In *Digital media, youth, and credibility*, ed. Miriam J. Metzger and Andrew J. Flanagin. John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning. Cambridge, Mass.: MIT Press, 5-27.

Harris, Frances Jacobson. 2009. Challenges to teaching evaluation of online information: A view from LM_NET. *School Library Media Research*, 12. http://www.ala.org/ala/mgrps/divs/aasl/aaslpubsandjournals/slmrb/slmrcontents/volume1 2/harris.cfm.

Harris, Frances Jacobson. 2008. Challenges to teaching credibility assessment in contemporary schooling. In *Digital media, youth, and credibility*, ed. Miriam J. Metzger

and Andrew J. Flanagin. John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning. Cambridge, Mass.: MIT Press, 155-179.

Ito, Mizuko, et al. 2010. *Hanging out, messing around, and geeking out: Kids living and learning with new media*. Cambridge, MA: MIT Press.

Metzger, Miriam. 2007. Making sense of credibility on the Web: Models for evaluating online information and recommendations for future research. *Journal of the American Society for Information Science and Technology* 58 (13): 2078-2091.

Palfrey, John, and Urs Gasser. 2008. *Born digital: Understanding the first generation of digital natives*. New York: Basic Books.

Rheingold, Howard. 2009. Crap detection 101. City Brights blog. SFGate. *San Francisco Chronicle*. 30 June. http://www.sfgate.com/cgi-bin/blogs/rheingold/detail?entry_id=42805.

Rowlands, Ian, David Nicholas, Peter Williams, Paul Huntington, Maggie Fieldhouse, Barrie Gunter, Richard Withey, Hamid R. Jamali, Tom Dobrowolski, Carol Tenopir. 2008. The Google generation: the information behaviour of the researcher of the future *Aslib Proceedings: New Information Perspectives* 60 (4): 290-310.

Sutton, Lynn. 2006. *Access denied: How Internet filters impact student learning in high schools*. Youngstown, NY: Cambria Press.

Vaidhyanathan, Siva. 2008. Generational myth: Not all young people are tech-savvy. *Chronicle of Higher Education*, 19 September, B7.

The Problematic of Natives and Immigrants

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The terms "digital natives" and "digital immigrants" have become popular, pervasive, and comfortable terms for characterizing people's take up and engagement with the digital environment. While the labels characterize and polarize groups of people in terms of the historical development of digital technologies, there has been little examination and critique of the use of these conceptions. Through the lens of available research, and drawing on a range of theoretical perspectives from education, cultural studies and information science, this paper provides a critical reflection on the meaning and use of these labels, and suggests that such labelling is somewhat stereotypical, exaggerational and romanticized, and does not reflect the richness and diversity of those these labels wish to portray.

Digital Natives Meet Digital Libraries: Discovering their Behaviors and Preferences for Information Seeking

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ABSTRACT

This paper reports findings from the Institute of Museum and Library Services (IMLS) OCLC, and Rutgers University funded *Seeking Synchronicity: Evaluating Virtual Reference Services from User, Non-User, and Librarian Perspectives* grant project (IMLS, 2005-2008) and from the results of an analysis of twelve user behaviour studies analyzed in the Joint Information Systems Committee (JISC)-funded report, *The Digital Information Seeker: Report of the Findings from Selected OCLC, RIN, and JISC User Behaviour Projects* (2010). Both of these large, international projects seek to understand how digital library users, including Digital Natives, Millennials, and older adults are finding and using electronic information. Results indicate that there are generational differences and that library use instruction as well as discovery tools and other information retrieval systems need to be tailored to meet these changing needs.

Keywords: Virtual Reference Services, Digital Reference, User Studies, User Behaviours

1.0 INTRODUCTION

How do Digital Natives (Prensky, 2006) and other members of the Millennial Generation approach their information needs, digital reference services, and online resources? How can digital libraries better serve this young population which seems to be radically different from previous generations, especially in their information-seeking behaviors and preferences? The findings from the Institute of Museum and Library Services (IMLS) OCLC, and Rutgers University funded *Seeking Synchronicity: Evaluating Virtual Reference Services from User, Non-User, and Librarian Perspectives* (2005-2008) and the results from an analysis of twelve user behaviour studies reported in the Joint Information Systems Committee (JISC)-funded report, *The Digital Information Seeker: Report of the Findings from Selected OCLC, RIN, and JISC User Behaviour Projects* (2010) provide answers to these questions.

2.0 SEEKING SYNCHRONICITY PROJECT RESULTS

Seeking Synchronicity included focus group interviews, online surveys, and interviews with users and non-users of virtual reference services (VRS) that revealed differences in Millennial information seeking in comparison to older adults (see also Connaway & Radford, in press, 2010; Connaway, Radford, Dickey, Williams, & Confer, 2008; Radford & Connaway, 2007). In addition, transcript analysis uncovered behavioural differences in the

live chat environment between Millennials and older adults and in librarian interactions with the different user groups.

Millennials approach technology, information seeking, libraries, librarians, and print resources very differently than previous generations. Results of focus group interviews, online surveys, and phone interviews show that they tend to value information delivery, want direct answers (especially specific answers to their information queries as opposed to help in locating the answers), and are impatient and results oriented. In addition, they resist instruction in VRS encounters, are more receptive to instruction in face-to-face (FtF) environments. Transcript analysis found that Millennials use more chat language and texting shortcuts than older adults. They are also more deferential to librarians, using polite language (such as please and thank-you) more often than adults and tend to end abruptly, leaving the interaction without a closing statement (such as thank-you or good-bye) more frequently.

The youngest members of the Millennial generation, are referred to here as "screenagers" (Rushkoff, 1996) because have an insatiable appetite for screens, moving text, and images. Across the different methods of data collection the screenagers were consistent in stating that they prefer Google and search engines to browse the web, ask friends, and to find information themselves. They said they never used phone reference for homework help, were unaware that libraries offer telephone reference, and said they would *never* email a librarian. Their preferred modes of communication are mobile and digital: texting, cell phones, and instant messaging (IM). These individuals report that their primary use of IM is for socializing purposes. They are unaware of VRS, fear chat librarians would ignore them, or that they would not understand or care about their questions. They also are not confident that librarians have the subject knowledge needed to answer their questions. Privacy and security concerns also were identified by the groups.

Nearly half of adults and three-quarters of the Millennial VRS users found chat to be the least intimidating mode of reference while the Millennial VRS non-users believe that email is the least intimidating mode of reference service. A larger majority of the Millennial non-user online survey respondents stated that remote access to information is important compared to the adult VRS non-user online survey respondents. The Millennial VRS non-user online survey respondents value librarian friendliness and politeness more than the adult VRS non-user respondents. In addition, more Millennials believed that the library is convenient than the adults.

Both the VRS non-user online survey respondents and telephone interview participants were unaware of the existence of VRS. The VRS non-user online survey respondents also said they did not choose VRS because they were concerned that the questions might annoy the librarian, did not believe the librarian can help them, and were satisfied with other sources of information. They thought they might try VRS if they could get information quickly at anytime of the day or night. The VRS non-user telephone interview participants, including greater proportions of Millennials, said they did not choose VRS because they used the Web and some specifically mentioned using Google including a much greater proportion of Millennials.

When asked to describe a successful reference experience, VRS non-users who participated in online surveys and phone interviews said that they valued accuracy, correct answers, convenience, and delivery of the information were most often mentioned. These respondents also highly valued librarians who are knowledgeable, have a positive attitude, and good communication skills. Millennials value convenience and online access to sources and services), value friendly librarians, and tend to be concerned that the questions may be

annoying to the librarian. Adults are concerned that chat may be too complicated and that their typing skills are not adequate to participate in chat.

3.0 DIGITAL INFORMATION SEEKER PROJECT RESULTS

The *Digital Information Seeker* project undertook an analysis and summarization of twelve major studies conducted within the last five years in the UK and the USA, including *Seeking Synchronicity*. These studies identified people's information-seeking behaviours, which are influenced by specific demographic characteristics, such as age, and the context and situation of the information need; their perceptions of libraries and information resources, including online catalogues; and their use and perceived value of e-journals and e-books. Both quantitative and qualitative research techniques were used in the studies, which provided rich data sets.

The study participants primarily included students, researchers and university faculty who had high levels of confidence in assessing their expertise in using databases and other digital discovery systems. However, the analysis revealed the need for greater prevalence of information literacy education across the groups and of system design and development based on users' assumptions and behaviours. Since information literacy has not kept pace with digital literacy levels, there is an identifiable need for training, support, and improved systems to better accommodate individual's information-seeking behaviours and practices.

Google and other search engines are highly used and are often the first source for searching for information and key word searches dominate. The majority of the findings indicate that individuals are aware of the differences between authoritative research literature and internet content. One study reported that some students preferred library catalogues to search engines for academic assignments.

E-journals are very important to the research process and access to digital content is preferred and sometimes, expected and access to journal backfiles can be difficult. As reported in the *Seeking Synchronicity* study, speed and convenience are important to users, regardless of age, experience, academic discipline, or context of the information need and people "**value human resources** in the information seeking. Researchers particularly appreciate **desktop access to scholarly content** and users also appreciate the **convenience of electronic access over the physical library**" (*Digital Information Seekers*, p. 4). Libraries are still primarily associated with collections of books and not associated with providing electronic sources.

"In some cases, the studies reviewed included findings which seem to contradict one another, and for which evidence may be mixed:

- There is evidence for both broad and narrow **range of tools used for scholarly research**.
- There is evidence both in favour and against **formal training in electronic searching**.
- There are mixed conclusions on the question of whether **recommendations, provided by recommender systems, and social media** are having an impact on information seeking.

In a few cases, the above findings from the studies under review offered evidence that runs counter to popular perceptions of the current information scene.

- Many popular media claims about the 'Google generation' may not be supported by all the evidence.

- In choosing among search engines, some evidence indicates that speed may not be the most important evaluative factor.
- The studies that addressed library OPACs provide little support for the advanced search options which are still popular in these systems" (Digital Information Seekers, p. 4-5).

Implications for Libraries

"Implications for libraries which are shared by multiple studies include the following:

- The library serves many constituencies, with *different needs and behaviours*.
- Library systems must do better at providing seamless access to resources.
- Librarians must increasingly consider a greater variety of digital formats and content.
- More digital resources of all kinds are better.
- Library systems and content must be prepared for changing user behaviours.
- Library systems need to look and function more like search engines, i.e., Google and Yahoo, and Web services, i.e., Amazon.com, since these are familiar to users who are comfortable and confident in using them.
- High-quality metadata is becoming more important for discovery of appropriate resources.
- The library must advertise its brand, its value, and its resources better within the community" (Digital Information Seekers, p. 5).

4.0 FUTURE RESEARCH

There is a need for additional research to study if age is a primary factor in information-seeking behaviours, or if it is one of many factors, including context and situation, that contribute to how people get information. Are there Digital Natives and Digital Immigrants (Prensky, 2001), or are there instead other ways to characterize differences in how people adopt and use information technology? White (2008), for example, offers a different model, one that contrasts the behaviors of Digital Residents (who have an ongoing, developing presence online) to that of Digital Visitors (who log on to the virtual environment to perform a specific task or to acquire specific information, and then log off). More research in the study of the roles of social networking, mobile technology, and text messaging in information seeking also would help us better understand how people get their information and why they make these choices.

REFERENCES

Connaway, L.S., & Dickey, T.J. (2010). Towards a profile of the researcher of today: The digital information seeker: Report of findings from selected OCLC, RIN, and JISC user behavior projects. Retrieved May 7, 2010 from http://www.jisc.ac.uk/media/documents/publications/reports/2010/digitalinformationseekerreport.pdf.

Connaway, L. S., & Radford, M. L. (in press, 2010). Virtual reference service quality: Critical components for adults and the net-generation. Libri, 60 (2).

Connaway, L. S., Radford, M. L., Dickey, T. J., Williams, J. D., & Confer, P. C. (2008). Sense-making and synchronicity: Information-seeking behaviors of Millennials and Baby Boomers. Libri, 58, 123-135.

Institute for Museums and Library Services Research Grant. (2005-2008). "Seeking synchronicity: Evaluating virtual reference services from user, non-user, and librarian

perspectives." M. L. Radford, & L. S. Connaway, co-principal investigators. Retrieved May 7, 2010 from http://www.oclc.org/research/activities/synchronicity/default.htm.

JISC. (2010, March). Digital information seekers: How academic libraries can support the use of digital resources. Retrieved May 7, 2010, from http://www.jisc.ac.uk/publications/briefingpapers/2010/bpdigitalinfoseekerv1.aspx.

Prensky, M. (2006). Listen to the Natives, *Educational Leadership* 63, 4, 8-13.

Prensky, M. (2001). Digital Natives, Digital Immigrants, *On the Horizon* 9, 5. http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf (accessed May 7, 2010).

Radford, M. L., & Connaway, L. S. (2007). "Screenagers" and live chat reference: Living up to the promise. Scan, 26(1), 31-39.

Rushkoff, D. (1996). Playing the future: What we can learn from digital kids. New York: Harper Collins.

White, D. (2008, April 23). Not "natives" & "immigrants" but "visitors" & "residents." TALL Blog: Online Education with the University of Oxford. Retrieved May 7, 2010 from   http://tallblog.conted.ox.ac.uk/index.php/2008/07/23/not-natives-immigrants-but-visitors-residents/.

PART I: DIGITAL SCHOLARSHIP: SUPPORT BY DIGITAL LIBRARIES

Digital Libraries as Knowledge Place for Humanities Scholars: a Case Study in Italy

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ABSTRACT

The vision of digital library as co-laboratory (Licklieder, 1965; Borgman, 2007) has been inspiring a case study promoted by the University of Parma and financed by the Fondazione Rinascimento Digitale (Italy).

The case study describes the community of humanities scholars in Italy. The peculiarity of this community is that it aggregates different disciplines and the collaboration both inside the humanities community and also with cultural institutions and publishers seems to be difficult (Tammaro, 2006 and 2007). The research gap is in the apparent different approach to digital library taken by cultural institutions and by scholars of different humanities sectors:

- cultural institutions provide bibliographic tools and portals for the identification and location of digital collections of images;
- humanities scholars need not only to identify and locate collections but re-use collections for functionalities such as text analysis, statistics, authorship studies.

The aim of this research has been to promote a serious debate on the issue of how a digital library as knowledge space could activate a virtuous circle where technologies that change the way of working in the humanities can found a prepared soil for an effective cultural growth of digital humanities. The research question wondered if the model of digital library as knowledge space could be an important shift in the way scholars work and if the digital library could drive a cultural shift in humanities community.

The objectives of the research have been:

- to investigate the Italian scholars model of digital library,
- to collect the expectations about digital library,
- to define the features of the ideal virtual space that can optimise the digital library,
- and to analyse the active role that scholars can have collaborating with digital library development in Italy.

The investigators were scholars selected from different humanities sectors: from History, Philology, Education, Philosophy and Art. The methodology of the case study has involved more than 150 scholars, who have been interviewed and/or have participated to focus groups.

The findings have been analysed using the CBA (*Concerns Based Adoption Model*, cfr. Hall, Loucks, 1977 and 1979). This model, which has been used also in other innovation process, has been useful for understanding the different behaviour of different disciplines scholars and also of different scholars inside the same discipline. Following this model the different perceptions and expectations of digital library are correlated to the different level of adoption of digital libraries.

New features of digital libraries as knowledge space, as collaboration, sharing resources and creating new resources are generally not requested. The community of philologists peculiarity of this work is that it focuses o this particular aspect and aims.

Researchers and Librarians Hand in Hand: The Digital Library as Integrated Part of Emerging Digital Research Environments. The Approach of the Bavarian State Library (BSB)

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ABSTRACT

The BSB is a universal and research library of worldwide importance not only due to the quantity of its collection but also due to the uniqueness of its inventory of handwritings, incunabula and historical printings as well as its special collections. The BSB holds at the moment more than 10 million volumes and more than 50.000 current periodicals in analogue and digital form from the 8th up to the 21st century. The library is referred to the number of old manuscripts between all the libraries worldwide the number 4 and together with the British Library it has the biggest and most important collection of incunabula in the world. In the field of special collections should be mentioned in particular its splendid collections of old maps and music manuscripts and prints as well as its extraordinary worthy collection of books (handwritings and prints) from the middle and far east and last but not least its impressive collection of antique Hebrew books, one of the most precious in the world.

On that background it seems clear that in the library's policy of building a digital library at the moment a strong emphasis lies on retro-digitization. The organizational-technical backbone of the last one is the *Munich Digitization Centre (Münchner Digitalisierungszentrum - MDZ)*. Organizationally it is a division of the acquisition and cataloguing department of the library. The MDZ originally was founded as one of Germany's two national digital library competence centers. Today it is the leading digitization center with the most sophisticating scanning facility in the German speaking world (e.g. usage of scan-robots). The strategy is to digitize the complete holding which is out of copyright, within the next five - seven years and to make it accessible free of charge via the internet. BSB pursues this strategy through own mass digitization projects and through a 2007 stipulated public-private partnership with Google into the Google Book Search initiative. In the meantime the MDZ has successfully terminated more than 100 very heterogeneous projects. It has got a very reach and deep experience in all the fields of retro-digitization. The growth of digital objects in the library archive (included the items coming from Google) has reached 182 TB by December 2009 which is the biggest digital archive of all German libraries.

From the beginning on the complete digitization workflow was designed as a semi-automated, computerbased production process. It starts – in the case of "digitization on demand", when a single user asks a digital copy of a determined volume - with an via internet available online ordering tool and terminates with the last step, the pushing of the digital master copy in the long term archival storage. The software tool used for the handling of the digitization process is *ZEND (= Zentrale Erfassungs- und Nachweisdatenbank)* which is based on an Open-Source Software and was developed by our own. ZEND has a modular structure and supports also the production of the web versions of the digital copies for the various subject based information portals (ViFa) of the library as well as the handling and the storage of the bibliographic, technical, administrative and structural metadata. In a close cooperation with the library own Institute of book preservation and restoration (IBR) the MDZ is focused also on a very serious quality control policy. There is the principal that every

scan is done only one time by respecting high quality standards and consequently paying attention on the conservation needs of the original be scanned.

As central state and archive library for Bavaria the State Library is also responsible for preserving digital media from different provenance. To achieve this goal the BSB has built up the *Library Archiving and Access System (BABS)* which integrates technical solutions for the long-term preservation of digitized as well as born-digital objects. The BSB is herewith one of the frontrunner in the field of digital preservation in the world. The MDZ preserves the original image files to guarantee their integrity, authenticity and availability over the long run, to ensure protection of investment and in order to allow the re-use of the digital objects in the sense of cross media publishing. The long-term preservation of the digital objects is carried out in close cooperation with the Leibniz Supercomputing Centre (Leibniz Rechenzentrum, LRZ, Munich). In a current project the MDZ checks and improves the trustworthiness and scalability of its digital archive.

Based on these wide range of activities and deep experiences in dealing with the general argument "digital library" and a strong international-cooperative input the paper will be focused especially on

- conception and building up of researcher friendly "virtual libraries/subject based portals" as integrated parts of digital research environments
- user group adequate presentation of and access to data as the core challenge of the acceptance of digital library services and, last but not least,
- necessity and development of a pragmatic digital archiving approach as a solution for libraries and researchers.

Predictors of Faculty Dependence on Academic Libraries for Research

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INTRODUCTION

In the digital world, with its incessant flow of information and challenges to resource preservation, researchers assert it is crucial to understand the needs and wants of faculty to ensure libraries' futures as partners in scholarship and research (Case, 2008, Jones & Kayongo, 2008, Markgraf, 2002). Ithaka has been conducting a series of surveys designed to examine the attitudes and behaviors of United States higher education faculty since 2000. The data collected in the last of the series in fall of 2006 and published through Inter-University Consortium for Political and Social Research (ICPSR) is used as the basis for analysis in this study. The study uses multiple regression analysis to examine how the size of the academic institution, libraries' importance as a starting point or "gateway" for research, and importance of electronic resources influence faculty dependence on libraries for research.

METHODS AND DATA

A total of 44,218 participants was selected from a list of faculty members in United States via every nth selection. The questionnaire response rate was 9.4% with 4,152 responses analyzed for this study. The instrument contains 194 variables. Variables: size of institution, library is a starting point or "gateway" for research and seven additional, independent, continuous variables relating to importance of electronic resources, which were converted into one mean composite variable, were used for the study. The seven indicator variables (online catalogs, databases of academic journals, abstracting and indexing databases, e-books, freely available online materials from your discipline, wikipedia/blogs/other interactive sites and free web based resources) were tested for reliability using Chronbach's Alpha index. This was found to be relatively high at .758 and all 7 variables were retained. Furthermore, all variables used in computing the importance of electronic resources variable are examples of important electronic resources used in library research as seen in literature (Prochaska 2009, Bristow and Buechley 1995, Albitz 2005, Maron and Smith, 2009). To determine whether the seven variables measured were related to the construct of importance of electronic resources a reliability test using principal component analysis was conducted and all communalities were found to be strong. Study equation used was:

$$\hat{Y}_{Dependence} = \beta_0 + \beta_1 X_{Size} + \beta_2 X_{gateway} + \beta_3 X_{e-resource}$$
.

FINDINGS

The overall model with the three independent variables (size of institution, importance of library as starting point for research or "gateway" and importance of electronic resources) is a significant predictor of dependence on libraries for research, with an F value of 308.042 (p< 0.01) and R square of 0.182 (p<0.01). The model explains 18.2 % of the variance of faculty dependence on library research. All three independent variables are significant predictors. The importance of electronic resources (β=0.110) is significant (t=3.383, p<0.01), which

corresponds with Pearson's Coefficient between dependence on library for research and importance of electronic resources (r=0.081, p<0.01). Size of institution (β=0.216) is also significant (t=7.999, p<0.01) and has a positive correlation with the outcome variable (r=0.101, p<0.01). Library is a starting point or "gateway" for research (β=0.680) is the most significant predictor of faculty dependence on libraries for research (t=28.866, p<0.01) with the largest Pearson's correlation coefficient (r=0.410, p<0.01). The results suggest libraries can justify their investment in developing library interfaces and gateways and should continue to do so as that appears to have the strongest impact on faculty dependence on libraries for research. Additionally, continued investment in electronic resources is crucial to increasing library role in research process in academia.

REFERENCES

Albitz, R. (2005). From celluloid to digital: Electronic Resources for Film Studies. *Journal of Library Administration*, 43(3/4), 55-63.

Bristow, A., & Buechley, M. (1995). Academic reference service over e-mail: An update. *College & Research Libraries News*, 56(7), 459.

Case, M. (2008). Partners in knowledge creation: An expanded role for research libraries in the digital future. *Journal of Library Administration*, 48(2),141-156.

Jones, S., & Kayongo, J. (2008). Identifying student and faculty needs through LibQUAL+[TM]: An analysis of qualitative survey comments. *College & Research Libraries*, 69(6), 493-509.

Maron, N., & Smith, K. (2009). Current models of digital scholarly communication: Results of an investigation conducted by Ithaka Strategic Services for the Association of Research Libraries. *Journal of Electronic Publishing*, 12(1), 4-4.

Prochaska, A. (2009). Digital special collections: The big picture. *RBM: A Journal of Rare Books, Manuscripts, & Cultural Heritage*, 10(1), 13-24.

Information Searching Behaviour of Young Slovenian Researchers

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ABSTRACT

The paper presents results of a preliminary study analyzing information searching behaviour of young researchers, postgraduate students of University of Ljubljana, Slovenia. In the study three e-journal databases (Science Direct, Proquest Direct and Ebsco Host) were used as examples of large interdisciplinary databases. The study included 21 researchers who used the systems to look for information for their own real research needs. Their sessions were digitally recorded and afterwards analysed by the research team. The experimental situation was not ideal for studying information behaviour, since data originated from a previous study looking at user friendliness of these IR systems. However, data also allowed additional analysis, namely studying of approaches to searching, satisfaction with search outcome, influence with the outcome on further work, etc. In detail, the study looked for patterns in the approach to query formulation and reformulation, number of steps in search formulation, use of auxiliary functions such as indexes, search history or help, handling of hits, actions in case of 0 hits, etc. It also analysed relations between search outcome and satisfaction (or dissatisfaction) with the system, duration of each session and its dependence of the above factors, influence of previous experience with a respective system on its use, or experience with the first system on the work with the second one. This preliminary study is a part of a larger study aiming to discover information searching patterns of today's young Slovenian researchers who, technically, still belong to the so called digital immigrants generation, but may already express some of the characteristics of the so called digital natives.

1 INTRODUCTION

In recent years we have seen intensive debates over the differences between different generations of users of digital technology. Even though it is becoming increasingly clear that users of information and communication technology can not be simply divided into 'natives' and 'immigrants' and that the picture is in fact much more complex, we are still faced with certain changes in scientific communication and ways researchers look for information.

Our previous work (Vilar and Zumer 2008 a and b), which looked at young Slovenian researchers and their preferences regarding user friendliness, gave us an indication that a deeper insight into their searching behaviour might reveal some interesting patterns. Some of the participants in our previous study expressed characteristics resembling those associated with digital natives (preference of simpler searching interfaces resembling web search engines, annoyance with numerous options on the screen, etc.). In this study our goal was to investigate the behaviour of our respondents in regard to their approaches to searching, decision-making during the search process, working with search results and overall satisfaction with the process and its outcomes.

2 BACKGROUND

Prensky's (2001 a and b) initial concept of differentiation of users of digital devices has in recent times developed to a wide area of digital concepts, incorporating the so-called digital homeless, digital genders (such as digital females vs. digital males), digital homes, etc. (Guenther, 2007), homo sapiens digital, digital wisdom (Prensky, 2009), digital dissidents (Synovate, 2007). Our reanalysis of recordings gathered for a different purpose was a consequence of our desire to see whether also people who officially do not belong to the digital natives generation express some of their traits. The starting point were the general

characteristics which are usually discussed in regard to digital natives: young people today are a homogenous group, have a lot of experience with digital technology and differ to a great extent from previous generations.

In their review of research literature of the last 30 years researchers (Information Behaviour, 2008, Williams and Rowlands, 2007) have put together a list of general beliefs describing behaviour and preferences of the net generation. They:

- show a preference for visual information over text,
- want a variety of learning experiences,
- have shifted decisively to digital forms of communication,
- 'multitask',
- are impatient and have zero tolerance for delay,
- find their peers more credible as a source of information than authority figures,
- need to feel constantly connected to the web,
- learn by doing rather than knowing,
- prefer quick information in the form of easily digested short chunks rather than full text,
- have a poor understanding and lack of respect for intellectual property,
- are format agnostic,
- may perceive virtual reality as real as the real experience,

However, it is interesting to see that studies show that not many of these assumptions are true (see for example De Vry and Watson, 2003, Benett, Maton and Kervin, 2008, Williams and Rowlands, 2007). These authors mainly follow the idea that, naturally, exposure to various forms of digital technology and also of information seems to have certain influence on digital literacy, but not necessarily on information literacy. Needless to say, recent studies have also discovered that 'digital natives' may be very confident, but not necessarily very competent using digital devices as well as information. However, as Williams and Rowlands (2007) conclude, these problems are not new, and many of them are not solely characteristic for youngsters.

Regardless of this, it is interesting to observe results of studies of scholarly information behaviour. They without a doubt show significant changes in the ways researchers look for information and how they deal with it, which, in turn, may have significat impact on their information tools. Rowlands and Fieldhouse (2007) have discovered some patterns in researchers' recent information behaviour:

- Skimming (1-2 pages at a time)
- Navigating (looking around the electronic sweet shop)
- Power browsing (reading abstracts and titles, even indexing terms, rather than full text)
- Squirrelling (downloading material to `read' later)
- Cross-checking (collecting information from different sites)

Until rather recently, as Xie (2002) points out, identification of information-seeking strategies was focused on approaches to query formulation and reformulation. Even though some research (see for example Xie, 2007) has shifted focus to investigating levels of user goals, levels and dimensions of tasks, personal information infrastructure, the social-organizational context, plans and their dimensions, situations and their dimensions, and information-seeking strategies consisting of interactive intentions and retrieval tactics, approaches to querying and working with search hits are still an important, in fact crucial, part of any information seeking

On the basis of these studies it seemed interesting to see whether our repondents expressed any of the traits of digital natives and new researchers. Of the above characteristics we were interested in preference for visual information over text, multitasking and task switching, impatience for delay, preference of quick information over lenghthy fulltexts, format agnosticism, navigating, power browsing and squirrelling. We also tried to see whether any of the traits found to be generally true for users of digital technology can also be identified in their work with information systems.

2.3 Our previous research

The decision for this study is partly due to results of ideas arising during our preceding research (Vilar and Zumer 2008 a and b) and partly due to the fact that we saw unused potential in the material gathered for this previous study. For this reason and before we present the methodology of our current study, we will briefly present our previous study, since it is intrinsically connected with the current one in terms of material used.

The study (reported in Vilar and Zumer 2008 a and b) was focused on user perceptions of user interface friendliness. In the study three e-journal databases (Science Direct, Proquest Direct and Ebsco Host) were used as examples of large interdisciplinary databases. The study included 61 researchers, who were purposely selected from the postgraduate students of University of Ljubljana, thus representing the ratios between different disciplines. They used two randomly assigned systems to look for information for their own real research needs. Their sessions were digitally recorded and afterwards analysed by the research team; and after each session a comprehensive questionnaire was filled in by each participant. The two sources of data allowed a comparison of participants' subjective perceptions of system's user friendliness, satisfaction with the system or with search outcome, and of objectively analysed actions and perceptions. Such analysis allowed a more detailed and objective picture.

The findings of our previous research indicated that some users might express preferences and behaviour close to that which, according to some studies, is associated with the digital natives. For example, users from certain academic areas (especially humanities and social sciences) were found to prefer search facilities resembling internet search engines, were bothered with large amount of information on the screen, and, on the whole, liked if search facilities were as simple as possible. For us this was an indication that more research would be needed to investigate more deeply into these preferences which are otherwise unusual for scientists. We decided to have another look at the recordings, this time analyzing them from a different angle. Our focus was therefore on the behaviour of the users, with the emphasis on their approaches to searching and working with results of their searching. We present more details about the methodology in the corresponding section.

3 RESEARCH

3.1 Participants and IR systems

As explained before, in the initial study (Vilar and Zumer, 2008 a and b) we included three interdisciplinary e-journal IR systems (Science Direct, Proquest Direct and Ebsco Host) and 61 participants. Of these every individual used two different and randomly assigned IR systems. The final result was therefore 122 recordings.

It must be noted that analyzing the recordings proved to be more difficult than initially expected, due to the circumstances of the first study. Namely, the original experimental situation was such that participants were asked to perform their own search, but to pay attention to various user friendliness features of the interface. As a consequence, in the course

of their searching they did not act as if they normally would in a real searching situation. Instead they were much more aware of the system features to which users normally do not pay attention (i.e. user friendliness features). Circumstances under which the recordings were created were therefore not ideal for studying user search behaviour. Some recordings were for this reason unusable for our current study focus. For this study we decided to use only the recordings where participants conducted a search process which was as realistic as possible. This means that we looked at the ways they worked with the system. Participants, who only followed instructions which were given to them for the purpose of the first study, usually did a single query, had a quick look at list of hits, maybe opened one or two full hits, and ended their work with the system rather quickly. But, we noticed that some participants followed a thread in their search process; in most cases this meant developing their searching on a single topic through a number of queries and longer working with search results (saving them, sending them via email, etc). We regarded this as expressing actual information seeking behaviour or at least the behaviour which was as close to realistic as possible. For the purpose of this study we were therefore interested in the second group.

We did not analyze participants for any of their individual characteristics, therefore we decided to analyze recordings as if stemming from different users. With this we disregarded the fact that every user in fact worked on two systems but at the same time gained the possibility of less complex analysis focusing on information behaviour which was also helpful due to the fact that we did not have a big number of instances to work with. In the end this meant that we worked with 21 recordings (8 for Science Direct, 6 for Proquest Direct and 7 for Ebsco Host).

3.2 Methodology

The recordings stemming from our previous study were analyzed once more to examine user search behaviour. Based on review of literature and on our previous study we composed a list of searching behaviour features to investigate for our respondents. In this preliminary report we included the following:

- *Initial approach*: Here we looked at what the user chose as his/her initial search approach: was he/she satisfied with what the system offered or did he/she do anything other than what was offered on the first screen.
- *Happy with the first set of hits*: We estimated the user's satisfaction with the hits which were a consequence of the first query. Our decision was: the user was satisfied with hits, if he/she did more with them than simply review the list of hits and return to query formulation.
- *Nature of dissatisfaction*: If the user was dissatisfied with initial hits, what was the nature of his/her dissatisfaction: wrong hits, too many hits, too few hits
- *Action after viewing first set of hits*: What was the user's action after having a look at the first list of hits.
- *If back to QF, what was approach*: If the user returned to query formulation, what approach did he/she take: narrowing or broadening of query, browsing indexes or thesauri, query reformulation using keywords from the hits, or using his/her own terms
- *Action in case of 0 hits*: What did the user do in case his/her query resulted in no hits: quit, return to query formulation to form a new query, broaden or narrow an existing query
- *Actions in case of hits*: What did the user do with hits once he/she was satisfied with them: inspect only the list of hits, inspect the list of hits and then work with full hits, inspection of hits and return to query formulation

- *Attention of pictures in hits*: Was it important to the user that the full hits contained pictorial material?
- *Multitasking*: Did the user express multitasking?
- *Type of error (in QF resulting in 0 hits)*: What type of error resulted in no hits? Was it a typographic error, wrong content, too narrow query.
- *Satisfaction with results (hits)*: How satisfied was the user with hits as a result of his queries?
- *Satisfaction with system*: How satisfied was the user with system and its features, including user interface?
- *Prevalent search strategy / behaviour*: On the basis of everything above, what was the prevailing searching behaviour of the user: standard searching and working with hits, mainly browsing, berrypicking, task switching, multitasking, giving up if not happy

We combined these with some data on use of auxiliary functions, full-text formats, and perceptions of user friendliness from our initial study.

4 RESULTS

Due to a small number of recordings in this preliminary analysis we did not perform detailed statistical analysis, instead we paid more attention to potentially interesting patterns, emerging in crosstabulations of variables, which we intend to investigate in our subsequent study (in preparation). Duration of recordings varied from 3 to 47 minutes, in most cases it was somewhere between 20 and 30 minutes.

To most users these systems were unknown, as can be seen from Table 1. This in turn explains some of their actions and decisions further on. We must also note that there seems to be no difference between users or their search approaches and the order of systems used or their previous knowledge of the system (results are very similar regardless whether they used the first or second system and also regardless whether the system was known to them or not). As can be seen from Tables 2 and 3, all users were satisfied with system-offered searching or browsing facilities, and no user was satisfied with the first set of hits. In this phase they expressed behaviour close to so called power-browsing (Rowlands and Fieldhouse, 2007), reviewing hits by reading short formats only. Table 4 presents the nature of their dissatisfaction revealing that in most cases it was a consequence of too many hits, with the exception of third system (Ebsco Host) where most users were bothered with too few hits.

Table 1: Acquaintance with systems

		Known / Unknown		
		Known	Unknown	Total
System	Science Direct	4	4	8
	ProQuest Direct	1	5	6
	Ebsco Host	1	6	7
Total		6	15	21

Table 2: Satisfaction with system-offered search facilities

| | | Initial Approach | | |
		System offered - Standard form search	System offered - Browsing indexes	Total
System	Science Direct	7	1	8
	ProQuest Direct	5	1	6
	Ebsco Host	4	3	7
Total		16	5	21

Table 3: Satisfaction with the first set of hits

| | | Happy With First Hits | |
		No	Total
System	Science Direct	8	8
	ProQuest Direct	6	6
	Ebsco Host	7	7
Total		21	21

Table 4: Nature of dissatisfaction with the first set of hits

| | | Nature of dissatisfaction | | | |
		Content - wrong hits	Too many hits	Too few hits	Total
System	Science Direct	2	4	2	8
	ProQuest Direct	1	3	2	6
	Ebsco Host	1	2	4	7
Total		4	9	8	21

It was therefore not surprising that all users after viewing initial set of hits either returned to query formulation or opened online help (see Table 5). As Table 6 shows, those who returned to query formulation mostly reformulated their initial query using their own terms, not terms from hits which they initially viewed, or made a completely new query.

Table 5: User action after viewing the first set of hits

| | | Action after viewing first hits | | | |
		Back to QF	Online Help	Other	Total
System	Science Direct	8	0	0	8
	ProQuest Direct	4	2	0	6
	Ebsco Host	4	2	1	7
Total		16	4	1	21

Table 6: Approach to query formulation

		If back to QF, what approach			
		Narrowing	Broadening	QRef with own terms, synonims	QRef with KWs from hits
System	Science Direct	1	1	3	1
	ProQuest Direct	2	0	2	0
	Ebsco Host	1	2	3	0
Total		4	3	8	1

Similarly, Table 7 reveals that, in case their query resulted in no hits, users in most cases returned to query formulation and either reformulated their query, broadened it, formulated a new one or opened online help. The most common type of error resulting in no hits was too narrow query, as is shown in Table 8. From Table 9 we see that, even though it was an artificial situation, most users worked with hits once they were satisfied with what they found, as is, naturally, the purpose of any information system. Quite a number of users remarked that they normally download hits to read later, which can be interpreted as a form of so called squirreling behaviour (Rowlands and Fieldhouse, 2007).

Table 7: User action in case of no hits

		Action in case of no hits					
		Q Reformulation	Q Broadening	Online Help	New query	Other	Total
System	Science Direct	5	1	0	2	0	8
	ProQuest Direct	1	2	2	1	0	6
	Ebsco Host	0	2	3	1	1	7
Total		6	5	5	4	1	21

Table 8: The most common types of errors in queries resulting in no hits

		Type of error				
		Wrong content	Too narrow Q	Too broad Q	Other	Total
System	Science Direct	1	6	1	0	8
	ProQuest Direct	0	6	0	0	6
	Ebsco Host	0	5	1	1	7
Total		1	17	2	1	21

Table 9: Action with hits

		Action with hits				
		Inspection of SF	Inspection of SF and work with full hits	Inspection of SF and return to QF	None	Total
System	Science Direct	1	6	1	0	8
	ProQuest Direct	0	6	0	0	6
	Ebsco Host	0	6	0	1	7
Total		1	18	1	1	21

No user expressed any form of multitasking, however, Table 10 shows that quite a large portion of users considered important that search results contained pictures or graphics.

Table 10: Attention to pictures in hits

		Attention to pictures		
		Yes	No	Total
System	Science Direct	3	5	8
	ProQuest Direct	1	5	6
	Ebsco Host	2	5	7
Total		6	15	21

We also analyzed user satisfaction with two aspects, search results and system on the whole. This is shown in Table 11. Users who were unsatisfied with search results were in every case also unsatisfied with the system. On the other hand, users who were unsatisfied with the system were in minority of cases satisfied with search results which indicates that some users are willing to sacrifice user friendliness for content.

Table 11: User satisfaction with system on the whole and with search results

		Satisfaction with system		
		Dissfatisfaction	Satisfaction	Total
Satisfaction with results	Dissfatisfaction	13	0	13
	Satisfaction	5	3	8
Total		18	3	21

Data from previous research (Vilar and Zumer 2008a) show that most users did not use auxiliary functions such as indexes or search history, but they did show a considerable interest in using online help. Those users, who did use auxiliary functions, mostly felt that they were relatively easy to use

In our previous study we also found that most respondents felt it was very important, if not essential, to have various formats of full text available. Among formats they strongly preferred format pdf, however, admitted that on the one hand use more than one format fvor various purposes and on the other that in order to get desired content they use whichever format is available.

In regard to perception of user friendliness, our previous research shows that most users liked the systems and found them relatively easy to use. In this study we were unable to identify connections between these perceptions and their information behaviour.

5 DISCUSSION

We can say with quite firm certainty that our respondents do not express many of the features associated with digital natives. Everybody simply used what system offered on an initial screen (searching/browsing). Most peple used search forms in a very "disciplined" way (as they were taught or as they taught themselves) and also most simply moved between searching and examining hits In regard to information behaviour we found that they do not multitask, do not switch between tasks or berrypick, but also do not show great dependence of user friendliness of the system – they do not give up easily even though they are not happy with the system or with results. We could argue that on the whole they express characteristics of rather average users of information systems. They judged hits from their current research perspective and were in many cases surprised to find relevant ones in databases, which were unknown to them, but nobody found interesting hits on a new topic

We did confirm some features: Users seem to be quite attentive to pictorial material. However, we would need more insight into the nature of their information needs to be convinced whether this is connected to their research work or a consequence of their preference of visual information over text. Unfortunately we were not able to extract this information from out research data due to the fact it was collected for a different purpose. The users also seem to be format agnostic, as stated by Williams and Rowlands (2007), namely, they do not show preference for the format of text they are using; instead the content is more important to them.

In regard to behaviour which seems to be characteristic for today's researchers, we found evidence of power browsing and squirrelling (Rowlands and Fieldhouse, 2007). In order to quickly evaluate worthiness of hits most users reviewed short format of hits ("list of hits") thus looking at titles, keywords, abstracts, and similar items. Some users also admitted that they do squirreling, i.e. they download interesting results for later detailed reading.

Also, quite close connection was found between their satisfaction with search results and overall satisfaction with the systems they were using. All users who were unhappy with the system which they were using were also unhappy with the results of their searching. On the other hand, some users expressed greater patience by being satisfied with search results inspite of not being satisfied with the system. However, dependence on the satisfaction with search tools is, as we have seen from previous studies, not characteristic only for the net generation, but for majority of users of digital technology.

If we speculate about possible reasons for no multitasking, berrypicking or task switching, we can say the following. These are researchers with already formed search focus and are not that easily distracted from their line of thought. Although volunteers, they were in an experimental situation, were given a very detailed delegated task and were therefore performing not free, self motivated search. They would perhaps express different behaviour, if observed in their everyday work environment. It must again be noted that circumstances were not ideal for studying information behaviour. Our respondents from whom the recordings originate were included in an experiment of a different nature – namely, it looked at user friendliness features of the systems. The respondents were therefore asked to use the system with attention to user friendliness features, likeability of the interface, ease of its use, etc. These are features to which users normally do not pay attention, and for this reason other

elements of the search process were neglected. The users did not search the way they normally would thus making the study of their behaviour more difficult.

6 CONCLUSION

This preliminary study of the material gathered in another study proved to be very valuable for our further work. Firstly, it informed us of the fact that our respondents can not be counted as typical members of the net generation. Rather, they seem express some of the characteristics, and on the whole, behave like ordinary users of digital technology. We did find some evidence of behaviour which seems to be typical for younger researchers.

But the study also resulted on the one hand in a reconsideration of the circumstances under which we recorded our respondents and on the other in a change of our approach to the raw material. We discovered that our approach in searching for characteristics of digital natives needed more natural situations to be observed and different aspects of behaviour analysis. These findings will be very helpful in our planning of future work.

REFERENCES

Bennett, S., Maton, K. & Kervin L. (2008). The 'digital natives' debate: A critical review of the evidence. British Journal of Educational Technology, 39(5), 775–786.
De Vry, J.R. & Watson, G. (2003). University of Delaware's Faculty-IT Partnership: Educational Transformation through Teamwork. The Technology Source Archives at the University of North Carolina, May/June 2003. [Available at http://technologysource.org/article/university_of_delawares_facultyit_partnership] (Accessed 02.02.10)
Guenther, J. (2007). Digital natives & digital immigrants. Innsbruck, etc., Studien Verlag.
Information behaviour of the researcher of the future - Executive summary (2008). [Available at http://www.jisc.ac.uk/media/documents/programmes/reppres/gg_final_keynote_11012008.pdf] (Accessed 02.02.10)
Prensky, M. (2001a). Digital natives, digital immigrants. On the Horizon 9(5): 1-6. [Available at http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf] (Accessed 28.01.10).
Prensky, M. (2001b). Digital natives, digital immigrants, part 2: Do they really think differently? On the Horizon, 9(6): 1-6. [Available at http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part2.pdf] (Accessed 28.01.10)
Prensky, M. 2009. H. sapiens digital: From digital immigrants and digital natives to digital wisdom. Innovate 5 (3). [Available at http://www.innovateonline.info/index.php?view=article&id=705] (Accessed 04.02.10)
Rowlands, I. & Fieldhouse, M. (2007) Information behaviour of the researcher of the future. Work Package I: Trends in Scholarly Information Behaviour. [Available at http://www.jisc.ac.uk/media/documents/programmes/reppres/ggworkpackagei.pdf] (Accessed 02.02.10)
Synovate (2007) Leisure time: clean living youth shun new technology. [Available at: http://www.synovate.com/current/news/article/2007/02/leisure-time-clean-living-youth-shun-newtechnology.html] (Accessed 19.01.10)

Vilar, P. & Žumer, M. (2008a) Perceptions and importance of user friendliness of IR systems according to users' individual characteristics and users' academic discipline. *Journal of the American Society for Information Science and Technology*, 59(12), 1999-2007.

Vilar, P. & Žumer, M. (2008b) Comparison and evaluation of the user interfaces of e-journals II: perceptions of the users. *Journal of Documentation*, 64 (3), 816-841.

Williams, P. & Rowlands, I. (2007). Information behaviour of the researcher of the future. Work Package II: The Literature on Young People and their Information Behaviour. [Available at http://www.jisc.ac.uk/media/documents/programmes/reppres/ggworkpackageii.pdf] (Accessed 02.02.10)

Xie, H. (2007). Shifts in information-seeking strategies in information retrieval in the digital age: Planned-situational model. *Information Research*, 12(4) paper colis22. [Available at http://InformationR.net/ir/12-4/colis/colis22.html]

Xie, H.I. (2002) Patterns between interactive intentions and information seeking strategies. *Information processing and management*, 38, 55-77.

Evaluation Insights to Key Processes of Digital Repositories

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ABSTRACT

Digital repositories are considered essential information tools for scholarly communication. Their acceptability and extensive use by communities and institutions, as well as the users' commitment in self-archiving, highlight the need for developing alternative channels of communication to expose the scholar productivity. Furthermore, the digital repositories community is interested into transforming them into viable, reliable and useful systems. This interest is primarily expressed by intense research activity, including - among the others - the evaluation and the usability of the technological solutions that support these services. On an institutional level, digital repositories are systems supported by physical organizations, such as libraries, which undertake many tasks in order to enable a variety of processes associated with these systems, such as submission, editing and access.

In this paper, a multifaceted evaluation initiative that aimed at the redesign of University of Patras' institutional repository, namely 'Nemertes', is presented. 'Nemertes' is operating on a DSpace installation and the 'Theses and Dissertations' collection was placed at the center of evaluation as the most important collection accommodated in the service. Emphasis was given to key processes held inside the repository by conducting surveys and interviews with typical classes of users. In order to collect data from these sources three different studies were held. First the quality of Submission process inside the physical and the digital space was evaluated through a questionnaire survey, which was addressed to people who had earlier submitted in the 'Theses and Dissertation' collection. Secondly, the information retrieval processes and the interface were evaluated by Human-Computer Interaction savvy students using the usability heuristics principles. Finally, the Editing processes and the quality of the delivery of services were assessed through interviews with the librarians that support the service.

The findings of these studies point to areas that the system can be improved and help to eliminate the barriers that prohibit the service to be upgraded and host new collections. The areas identified concern both the way of delivering the service and the operation of the system. While the contextual parameters make the generalization of the findings about the service more ambiguous, the findings concerning the system performance and the interface intuitiveness validate the results of previous studies, such as the case of terminology, affordances and effectiveness of search interfaces. It is anticipated that the findings of the study can be further exploited by organizations with similar repository services and technological infrastructures.

Evaluation Insights to Key Processes of Digital Repositories

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Abstract: Digital repositories are considered essential information tools for scholarly communication. Their acceptability and extensive use by communities and institutions, as well as the users' commitment in self-archiving, highlight the need for developing alternative channels of communication to expose scholarly productivity. Furthermore, the digital repositories community is interested into transforming them into viable, reliable and useful systems. This interest is primarily expressed by intense research activity, including - among the others - the evaluation and the usability of the technological solutions that support these services. On an institutional level, digital repositories are systems supported by physical organizations, such as libraries, which undertake many tasks in order to enable a variety of processes associated with these systems, such as submission, editing and access.

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1. Introduction

Digital repositories have undertaken the heavy task for the advancement of scholarly communication through the invention of new channels. For the successful provision of their services, several repositories, mostly institutional, rely on physical agents, such as libraries and IT centers. These repositories are dedicated to the collection, curation and preservation of institutional publications and research outcomes, such as theses and dissertations, learning objects, scholarly publications, technical reports and so on. They host a significant amount of the scholar productivity and they provide alternative means for communicating science and research, often complementary to subject defined repositories. Despite their wide adoption by institutions in a global level, digital

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repositories are not well understood, due to contextual variations and different political frameworks. Moreover, the work on the technical level, such as the systems available for realising such activities, is more solid; yet there remain open research issues on the enhancement of user interaction.

To the end of understanding some critical factors that affect IR operation, we conducted a multifaceted evaluation activity. In this paper, following the example of previous studies [Ebenezer, 2003; Marchionini, 2000], we present the results of an evaluation initiative, assessing the operation 'Nemertes', the IR of University of Patras, Greece. 'Nemertes' is a digital repository, supported by the University's library, that collects, organizes, disposes and preserves digital assets of the institutional productivity, such as electronic theses and dissertations and full-text pre/post prints. The present evaluation took place after the completion of the first two years of IR operation on the DSpace platform and was based on the emergence of new needs, such as creating other collections. The evaluation focused on several aspects of the processes held inside digital repositories, such as submission, retrieval and editing.

The following section briefly presents the previous work, while Section 3 outlines the research setting and the methodology. Section 4 gives a presentation of the results and the following section, Section 5, holds a discussion on the main findings.

2. Background

IRs are undergoing various evaluations and assessments, with the evaluators trying to identify the best possible practices. This search seems to be infertile due to contextual conditions and uniqueness of each application. However many threads of evaluation can be traced, like the managerial challenges, the stuff awareness, the introduction of new metrics in the assessment of scholarly progress, the reasons that propel participation in IRs and self-archiving, institutional policies towards encouragement or mandating etc. These threads signify the dependence of IRs to geographically defined constrains, the amalgamation of these systems and the increased difficulty to evaluate them in whole.

One important area is the evaluation of software solutions and the technical aspects of the implementation of these systems. Up to now there are many solutions proposed with three open source options, namely DSpace, Fedora and EPrints, dominating the scenery. In particular DSpace is a widespread platform, as recorded in studies from both sides of the Atlantic. The 2008 Survey of the EU-funded project DRIVER II [Van Der Graaf, 2008] showed that DSpace holds almost one third of the applications that took part (increased by 10.1 percent since 2006), while a survey of the MIRACLE project [Markey et al., 2007] listed that 46.4 percent of the CNI, CARL and ARL members are using DSpace. Several studies have tried to conduct comparisons between these systems. Kim [2005] has evaluated the efficiency of users as they had to search for information in two established repository systems, EPrints and DSpace. He found that the DSpace interface required a refinement in several areas, such as the support during searching, the help in the results pages review and the terms used. However, DSpace has been evaluated individually with the results of the University of Calgary [Atkinson, 2006] expressing a criticism on the search and browsing functionalities, and the findings of the short study in Oregon State University [Boock, 2005] suggesting a strengthening of the instruction pages. A recent study by Caccialupi et al. [2009] highlighted problems in the terminology and the provision of navigational aids in the interface. Caccialupi et al. evaluated a recent version of DSpace (v. 1.5), and included both retrieval and submission interfaces.

3. Setting and Research Questions

3.1. 'Nemertes': The Institutional Repository of University of Patras

'Nemertes' is the IR of University of Patras, Greece. 'Nemertes' is provided by the Library and Information Center (LIC) of the University and it was first developed on an in-house application. For over two years, 2004-2006, 'Nemertes' run on this application, before moving to the widely known repository platform DSpace. This was decided due to the need to rely on a reliable open source platform. While 'Nemertes' started by developing only the 'Theses and Dissertations' collection, recently new collections, such as the 'Technical Reports' and the 'Journals/Proceedings Publications of the LIC personnel' collections, were inaugurated. Both are very limited collections, but they highlight the will of LIC to host diverse collections and to support in multiple ways the concept of self-archiving. The most ambitious and challenging collection is the one of 'Faculty Members Publications', which aims to host pre/post-prints of the faculty members of the University.

3.2. Research Questions

Usage and submission are the two main activities in an IR regarding end user tasks. Other activities, such as editing, moderating and administrating, refer to librarians or technical personnel. All of these activities were agreed to be evaluated by different methodologies. Therefore, the following research questions were set to drive this study:

(1) What is the opinion of users for the submission process in the physical and digital space?
(2) What is the opinion of end users regarding interface and retrieval features?
(3) What is the opinion of the librarians regarding their interaction with the users and the level of service delivery?

4. Methodology

The evaluation was held in different stages within the last year and included many agents in order to acquire a representative view of the IR operation. Figure 1 summarizes the research procedure, by showing the research foci and the evaluation methods used. In more detail they are outlined below:

Questionnaires: In order to address the first research question, an online questionnaire survey was conducted, with only registered users taking part. These users had at least one deposit, most probably their own thesis/dissertation. They were invited by a mail call, which included information about the process, the consent policy and a link to the questionnaire that remained online for over a month. From the 1410 registered users in the system at that time 126 participated, resulting to a 10.57 percent response rate. The questionnaire was comprised by 25 questions and the measurement scale ranged from 1 to 5, with 1 reflecting negative opinions and 5 reflecting positive. The questionnaire was addressing issues of service delivery and system usability, with only the former being discussed in this paper.

HCI user study: To answer the second research question we conducted a user study. Participants in this study were 24 graduate students from the Department of Electrical Engineering that had a Human-Computer Interaction background. They were instructed to walk through the repository and to evaluate the retrieval

interfaces, i.e. searching and browsing, against the ten usability heuristic metrics, proposed by Nielsen [2005]. The participants had to write a report of their findings, naming the problems they discovered and assigning a severity rate, namely minor, medium, serious and catastrophic. This approach varies from the usual one of the method, which requires the implication of expert evaluators. Though fully qualified experts were available, it was decided to follow this approach in order (a) to exploit the comprehensiveness of the heuristic metrics, as indicated by previous studies [Peng, Ramaiah, & Foo, 2004] and (b) to simulate the state of occasional users.

Librarians: The third research question was addressed by interviewing the five librarians that support the IR and interact with the system at the back end. The interviews had an average duration of 19.32 minutes and they were held in a semi-structured way. The discussions were audio-recorded, coded and analyzed.
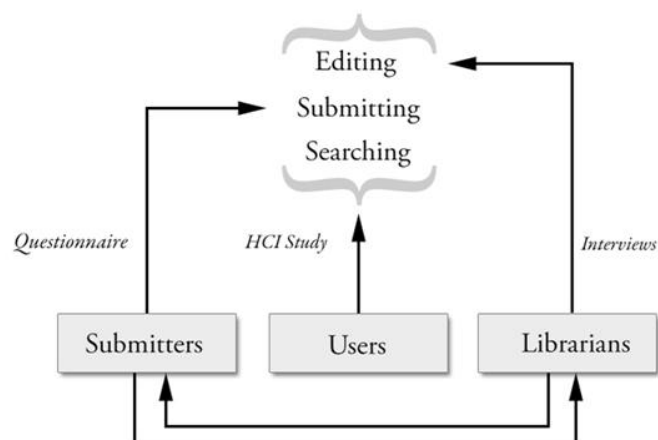
Figure 1: Evaluation foci, classes of users and methodologies.

5. Results

5.1. Insight one: Submission

The submission process was investigated through a questionnaire survey. Users, who had prior deposited their documents in 'Nemertes', expressed their satisfaction regarding service delivery in the physical and digital space.

Concerning delivery service users evaluated the registration into the system, the help provided, the metadata entry, as well as 'Nemertes' bilingual character. The participants were satisfied with the registration options that 'Nemertes' offer, namely personal or institutional, giving an average rate of 4.21 out of 5.

Help facilities during submission are mainly expressed by the submission wizard, while in the physical space assistance is provided by the librarians. According to the users, the help and the wizard of 'Nemertes' is quite efficient, as the average rate (3.98) reflects a slightly positive opinion. They assessed also the effect of librarians' support on their own performance, stating their general appreciation towards their contribution. In particular, they believe that the guidance of librarians assisted them to deposit their work successfully and quickly to an extend of 51.6 and 43.4 percent respectively (Table 1).

In this self-archiving repository users have to enter their own descriptions of the submitted documents and almost half of the sample (46.8 percent) reacted in a positive manner. In particular, an average rate of 4.29 highlighted the overall satisfaction with the process of entering their own metadata. They stated also that they are satisfied by the

ability to deposit their documents in two languages, Greek and English. 'Nemertes' bilingual character absolutely satisfies the participants in our study as 49.2 percent of the sample rated it extremely positive with an average of 4.31.

Table 1: Descriptive statistics regarding the effect of personnel's assistance

	1	2	3	4	5	DK/DA	Mean
Effective	6 (4.8)	11(8.7)	17 (13.5)	22 (17.5)	65 (51.6)	5 (4)	4.14
Efficient	8 (6.3)	11 (8.7)	15 (11.9)	34 (27)	55 (43.7)	3 (2.4)	4

n (%), 1: disagree – 5: agree

In terms of copyright policy, LIC provides users with an agreement paper, a 'contract' between the library and them, while also offers them the opportunity of choosing a supplementary Creative Commons license. Users evaluated this highly with an average of 4.3, although there is an important share of 15.1 percent that answered 'Don't Know/ Don't Answer', making us conclude that copyright issues, despite their importance, are not well established among the users. Submitters may choose three options of exclusion period (three, six and twelve months) and after that period their theses are published. The participants were very satisfied with these options with an average rate of 4.37. When asked for alternatives, most of them (29.4 percent) preferred a maximum period of two years, while a small percentage (4.8) requested a five year period.

'Nemertes' is freely accessible, without any constrains, allowing everyone to search and download documents. This policy gathered the slight acceptance of the participants scoring an average rate of 4.06. Once again when the participants were asked for alternative suggestions, 36.5 percent asked for controlled access to everyone, while only 2.4 percent asked for a closed to everyone policy. Moreover, the survey respondents are slightly positive towards the creation of new collections in 'Nemertes', rating this prospect with 3.97 out of 5. Generally, 54 percent of the sample was satisfied with 'Nemertes' rating it with a mean of 3.98, indicating thus that 'Nemertes' is covering most submitters' needs. Table 2 summarizes the scores in each construct.

Table 2: Descriptive statistics on satisfaction

	1	2	3	4	5	DK/DA	Mean
Registration	2 (1.6)	5 (4.0)	15 (11.9)	52 (41.3)	46 (36.5)	6 (4.8)	4.21
Help/Wizard	4 (3.2)	10 (7.9)	20 (15.9)	46 (36.5)	43 (34.1)	3 (2.4)	3.98
Metadata entry	3 (2.4)	2 (1.6)	17 (13.5)	41 (32.5)	59 (46.8)	4 (3.2)	4.29
Bilingualism	3 (2.4)	6 (4.8)	16 (12.7)	32 (25.4)	62 (49.2)	7 (5.6)	4.31
Copyright	4 (3.2)	6 (4.8)	18 (14.3)	37 (29.4)	42 (33.3)	19 (15.1)	4.3
Exclusion period	3 (2.4)	6 (4.8)	18 (14.3)	31 (24.6)	51 (40.5)	17 (13.5)	4.37
Access policy	6 (4.8)	6 (4.8)	24 (19)	38 (30.2)	43 (34.1)	9 (7.1)	4.06
Future prospects	5 (4)	10 (7.9)	30 (23.8)	33 (26.2)	35 (27.8)	13 (10.3)	3.97
Overall satisfaction	2 (1.6)	6 (4.8)	18 (14.3)	68 (54)	31 (24.6)	1 (0.8)	3.98

n (%), 1: disagree – 5: agree

5.2. Insight two: Retrieval and interfaces

The 24 participants reported they found 303 usability problems. All these reports were coded, grouped in one principle, if reported on two different heuristic principles, and cleared from purely subjective judgments (e.g. like/dislike of aesthetic items) or problems attributed to temporary technical instabilities. This coding resulted to 84 unique

problems, which are presented in Table 3, together with the number of reports per severity rate. Table 3 highlights the absence of catastrophic problems with the important ones resulting to almost 65 percent of the overall reports. This means that the reported problems were not reflecting system deficiencies that could injure severely users' performance. The larger part of the reports were found to refer to the aesthetic appearance of the interface, the comprehension and clarity of labels, terms and graphics, and the levels of consistent design. Table 3 shows also that two principles, 'Aesthetic and minimalist design' and 'Match between system and the real world', accounted for almost 50 percent of all unique problems. The principle with the least unique problems was the 'Recognition rather than recall', which meant that the system supported satisfactory the cognitive processes of users' tasks. Due to limited space, a selection of indicative problems per principle is presented in Table 4.

Table 3: Number of reported usability problems per severity rate

Principle	Unique problems	Severity		
		Minor	Important	Serious
Visibility of system status	4	2	4	3
Match between system and the real world	17	10	29	20
User control and freedom	6	3	9	3
Consistency and standards	12	5	24	8
Error prevention	4	1	14	2
Recognition rather than recall	3	1	11	4
Flexibility and efficiency of use	9	9	13	5
Aesthetic and minimalist design	20	0	74	18
Help users recognize, diagnose, and recover from errors	4	0	11	7
Help and documentation	5	5	6	2
TOTAL		36 (11.88%)	195 (64.36%)	72 (23.76)

Other significant findings regarded imperfections in interface design and texts, such as variant labeling, font coloring and sizing, inconsistent appearance of menus, etc. Though not requested in their task, a few participants attempted to deposit an item. During their attempts they reported several problems, with one particular raising important design questions about users' control of the submission process. It concerned the use of the 'Cancel/Save' button, which is available in the depositing forms, with one participant characterizing it as "frustrating".

While the majority of problems seemed to affect interface and texts, a significant amount of problems revolved around retrieval. Two were identified as the most crucial problems. The first is that the list of retrieved results does not support relevance sorting, but instead it presents a page with the most relevant items appearing in a list of terms or names. The second one is regarding the terms' indices, where mistyped terms, mainly due to malpractice in keyboard language selection, e.g. an English descriptor starting with the equivalent Greek letter, prohibit the users to find the desired items. One participant identified the inability of the search engine to retrieve documents on words' stems and therefore decreasing the precision and recall ranges of the results.

Table 4: A Selection of unique usability problems

Aesthetic and minimalist design
1. Redundant use of search text boxes in the main page
2. Wrong and pale colors in various pages (e.g. subscriptions, links)
3. Empty collections, while named
Match between the system and the real world
1. Dewey numbers in subjects (affecting also the 'Recognition' principle).
2. Abbreviations that are not easily comprehended (affecting also the 'Recognition' principle).
3. Unclear terminology, such as 'communities', 'collections', 'identifiers' etc.
Visibility of system status
1. Better use of breadcrumbs as navigational aids.
2. No knowledge which fields are mandatory before entering information.
3. Unclear icons on the right side of the page.
Recognition rather than recall
1. Abbreviations that are not easily comprehended.
2. Dewey numbers in subjects.
Consistency and standards
1. Inconsistent labeling, such as 'Work' and 'Item'.
2. Inconsistent date writing, e.g. full or only the year.
3. Index of 'Title' letters in English language.
Flexibility and efficiency of use
1. Appearance of pop-up information while requesting to deposit a document.
2. Lack of a/Non operating communication form.
3. Small icons at the right menu.
User Control and Freedom
1. More ranking/sorting options - More results per page.
2. Repetition of the last item of the previous page as first of the next page.
3. Log out period quite short. No such order on behalf of the users.
Help users recognize, diagnose, and recover from error
1. No error prompts while entering wrong login information.
2. No error prompts while entering wrong information in numerical data fields.
3. Control buttons in the pop-up information, such as 'Save', 'Cancel', 'Help'.
Help and documentation
1. Better structuring of help files. Integration of 'Instruction' file parts in the 'Help' file.
2. Absence of index in help
3. Better grouping of the links 'Submission issues' and 'Contact'
Error prevention
1. Losing of information typed in fields when using browser navigational aids (e.g. 'Back' button)
2. Return of results without indicating the most relevant.
3. Self entry of date/No selection from controlled lists

5.3. Insight three: Editing and service delivery

The third insight was supplied by the librarians that participate in the service delivery team, being responsible for works of reference, support and cataloguing.

The librarians stated their satisfaction about the procedure of editing in general. They commented that, although the three steps that they follow to edit documents are minimizing the possibility of errors, they are time-consuming, doubting about the necessity of only the first step. Currently, the procedure of editing and uploading a thesis consists of three stages. At the first stage the librarians accept or decline the submitted document, while at the following two they correct the metadata and check quality aspects of the full-text file, such as file accessibility, conformance to common formats, etc. Trying to mine options on alternatives for the acceleration of the process, one librarian suggested that the editing should be fragmented, with different groups of librarians undertaking

different tasks. Retrospective editing of metadata and corrections to damaged files is considered fatal by the personnel concerning their productivity. They demanded more managerial rights, such as the ability of making corrections after the document's upload, without the assistance of the database technician.

According to LIC personnel, the metadata schema is quite satisfactory, describing completely a thesis and providing all means to retrieve a record. Regarding retrieval, the majority of the librarians stated that the keywords submitted by the authors are usually precise; acknowledging thus that their expertise enhances retrieval due to natural language. Users' keywords are also guiding them in their own subject indexing tasks, but they also identified problems with consistent and correct keyword entry. As a resolution, they proposed adding keywords from auto-suggestion fields, supported by thesaurus or subject headings occasionally. Librarians stated the most usual problems in self-archiving is the absence of abstracts and keywords, especially of those in English, the errors in bibliographic descriptions, like capitals or mixed keyboard languages, and the uploading of damaged or non compliant files.

Furthermore commenting on the submission policy of LIC, the personnel agreed with the mandatory character. According to two of them the mandatory submission in the IR is safeguarding the research process. They also agreed on the decision of mandatory entry of key metadata in English. They believe that the mandatory entry of English keywords, title and abstract is enhancing document exposure and retrieval, because in several scientific fields English terms are dominant in describing documents.

The library's personnel believe that the academic community should be familiarized with 'Nemertes', adding that the Faculties and the Departments should assist the library in promoting the significance of the IR in research and education. Many of the problems are also found in the way users orientate in the physical space to accomplish a submission. In the current practice, submitters are visiting two different areas in the library building, one to deposit their printed thesis and another to submit their electronic version. According to the librarians, the users encounter problems signing up to 'Nemertes' via their personal mail, while they stated that the users are unsatisfied with the way the system supplies the copyright license. Thus, they suggested that a useful addition to the system should be the automatic completion of the license. They concluded their suggestions with the proposal of extending the service working hours and centralizing the procedure in only one department of the library.

While orientation in the physical space is awkward, they believe that the navigation in the system is satisfactory. Yet, their opinions regarding document sorting options in the pool differ, as half of them does not face any problem, while the other half is unsatisfied asking for sorting filters. As far as searching for documents in 'Nemertes' is concerned, the library's personnel are totally satisfied, while they added that the users have never referred to any search problems. Finally they think that the terminology used by 'Nemertes' is easily comprehended by both them and the users.

6. Discussion

The present study revealed a significant number of problems in the operation of 'Nemertes' and collected a few suggestions to refine the service. It was found that the users who had submitted earlier in the system had a general good opinion about the system, as nearly all constructs of the questionnaire scored above 4 out of 5. On the other hand, the participants in the HCI study and the librarians were more critical towards the system and

submitted in the system also regarded that the helping functionalities in the system had some improvement margins. While the mean score touches 4 out of 5, it is one of the lowest in the questionnaire survey. All these coincide with the librarians' demand to shorten the procedures of submitting and editing. The librarians would like to formulate a practice that is quick, accurate and effective, keeping the bibliographic paradigm safe. By including the users and self-archiving however this becomes very challenging and unarguably a puzzling task.

7. Conclusions

The present study synopsized the results of heterogeneous evaluation study that aimed towards gaining an insight to the operation of 'Nemertes'. It was a multifaceted evaluation study with diverge methodologies and several classes of users participating, in an attempt to cover the many facets of the IR. The problems found were assessed to be addressable and therefore the administration team of 'Nemertes' has already started redesigning some aspects of the system and the service. Problems that will remain are presumed to be lessened with the proper instruction and further dissemination of the idea of self-archiving. Despite all deficiencies found, the users who had submitted in the system recognized 'Nemertes' as a valuable service, while the librarians supporting it consent on its usefulness for academics and scholars.

8. Acknowledgements

9. References

Atkinson, L. (2006). The rejection of D-Space: Selecting theses database software at the University of Calgary Archive. In *9th International Symposium on Electronic Theses and Dissertations, Quebec City, Canada*. Available from *https://dspace.ucalgary.ca/handle/1880/43513*, retrieved 04.01.10.

ARL (2006). *Institutional Repositories*. Washington, D.C.: ARL.

Boock, M. (2005). Improving DSpace@OSU with a usability study of the ET/D submission process. Ariadne, (45). Available from http://www.ariadne.ac.uk/issue45/boock/, retrieved 05.01.10.

Caccialupi, R., Calvi, L., Cassella, M., & Conte, G. (2009) Usability evaluation of a multimedia archive: B@bele. In *Proceedings of the 13th European Conference on Digital Libraries, LNCS 5714*, (370-376). Berlin; Heidelberg: Springer-Verlag.

Davis, P.M. & Connolly, M.J.L. (2007). Institutional repositories: evaluating the reasons for non-use of Cornell University's installation of DSpace. *D-Lib Magazine 13*(3/4). Available from *http://www.dlib.org/dlib/march07/davis/03davis.html*, retrieved 07.12.09.

Ebenezer, C. (2003). Usability evaluation of an NHS library website. *Health Information & Libraries Journal, 20*(3), 134-142.

Kim, J. (2005). Finding documents in a digital institutional repository: DSpace and Eprints. *Proceedings of the American Society for Information Science and Technology, 42* (1). Available at http://dx.doi.org/10.1002/meet.1450420173, retrieved 24.11.09.

Markey, K., Rieh, S.Y., St. Jean, B., Kim, J., & Yakel, E. (2007). *Census of Institutional Repositories in the United States: MIRACLE project research findings.* Washington, D.C.: CLIR.

Marchionini, G. (2000). Evaluating digital libraries: A longitudinal and multifaceted view. *Library Trends, 49*(2), 4-33.

Nielsen, J. (2005). *Ten usability heuristics.* Available from *http://www.useit.com/papers/ heuristic/heuristic_list.html*, retrieved 05.01.10.

Peng, L.K., Ramaiah, C.K., & Foo, S. (2004). Heuristic-based user interface evaluation at Nanyang Technological University in Singapore. *Program, 38*(1), 42-59.

Van Der Graaf, M. (2008). *The European Repository landscape 2008: Inventory of digital repositories for research output in the EU.* Amsterdam. Available from *http://dare.uva.nl/ document/150724*, retrieved 11.01.10.

Digital libraries and the challenge of a "digital dark ages"

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This paper deals with the duration and reliability of information hold inside digital libraries. These two aspects are crucial for support of digital scholarship through digital libraries and they emphasize the problems of preservation of cultural heritage in digital form and obstacles which information managers must face with in the process of successful conservation and preservation of electronic information. Several research questions will be addressed for identification of viable and reliable solutions for digital preservation and management of digital libraries in the future.

A "Digital Dark Ages" term was used by Terry Kuny in 1997[1] to describe the loss of "enormous amounts of digital information", because digital information wasn't archived or managed properly or it resides on obsolete media and in obsolete formats, among other factors. Digital Cultural Heritage proved to be very pressing for the cultural institutions when decision about collecting, selecting and preserving digital text, database, audio, film or image have to be made. The complexity of the problem arose when rapid change in technology is taken into account.[2] Digitized or digital born cultural heritage (texts, books, images, art, multimedia, audio and video documents, Web content) undoubtedly represents national and global cultural value and must be treated as every other artifact by cultural institutions, in their effort to preserve it for the future generations. But the instability of digital formats and ephemeral character of the Internet (on one side), with uncertain development of technologies used to create, disseminate, store, describe, retrieve, read and present (on the other) put stress on the management of digital information and thorough re-investigation of the preservation methods and practices used in the last two decades.

The main question or problem this paper treats could be described in one sentence: what strategies memory institutions should apply to overcome the state of "Digital Dark Ages" or "Digital Libraries' time bomb"? Digital Scholarship relies on the access to digital information, but that information must be accurate, reliable and unchanged during the time. One pilot-project conducted recently[3] proved that electronic or digital documents used in research papers, as references or electronic resources are not there to stay for long. That particular stands for the online (Web) resources, with so many restraints in an effort of creating reliable and lasting system of incorporating online sources in the academic practice. The same principle should be adopted for the digital objects inside digital libraries, because digital scholarship will need both digital literature and digitized objects which represent the objective of research. For instance, when scholar use digital repository looking for relevant literature about some old manuscript, it is natural that he or she will also use digital image of that manuscript for the research, supposing that original is preserved in some library or archive far away. That put stress on the quality of digital copy, but more on its credibility and

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[1] Kuny, Terry (1997). "A Digital Dark Ages? Challenges in the Preservation of Electronic Information". *63rd International Federation of Library Associations and Institutions) Council and General Conference*.
<http://archive.ifla.org/IV/ifla63/63kuny1.pdf>
[2] "Guidelines for the preservation of Digital Heritage". *UNESCO*, 2003.
<http://unesdoc.unesco.org/images/0013/001300/130071e.pdf>
[3] The title of the project was "Using online sources for academic research: framing reliable referencing system". It showed that in the course of six years (from 2003) 40% of the cited online sources or the Internet addresses in one research paper, published in respectable historical journal, aren't correct any more – 33 of 84 URL addresses do not point to the cited papers or authors mentioned in the text.

reliability to adequately represent original in digital form for the long time. The question how researchers should use digitized and online documents exceeds adoption of some citation style or rule. The real question should be where that source will be in five or fifty years or will it exist at all. Practice has also shown that information loss is greater when the gap between research and preservation process is getting wider.[4] Therefore, framing theoretical and practical issues of preserving and sharing electronic resources must include the question of building and maintaining trusted digital libraries, but on some other premises than established.

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[4] Russell, Edmund and Kane, Jennifer (2008). "The Missing Link: Accessing the Reliability of Internet Citations in History Journals". *Technology and Culture*, April 2008, Vol. 49 Number 2, 420-424; Canós, J.H., Llavador, M., Mena, E., and Borges, M. (2008). "A Service-Oriented Infrastructure for Early Citation Management". *Proceedings of the 12th European Conference on Research and Advanced Technology for Digital Libraries (ECDL 2008)*. LNCS 5173, Springer, 2008.

User Interface of the National Repository of Grey Literature

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Increasing importance of grey literature[1] leads to building coordinated digital collections of this kind of literature in science, research and education areas. The National Technical Library aims to create digital collection of grey literature on national level to complement the role of the National Library of the Czech Republic, whose main task is to collect and preserve white literature. The implementation of this initiative began in the year 2008 with the support of the Ministry of Culture of the Czech Republic in the framework of research and development projects. The target of this project is to create the National Repository of Grey Literature.

We are building a partner network to support collection of the grey literature documents. Main sources are from the field of science and research, here are key partners the Academy of Sciences of the Czech Republic and Grant Agencies. The Czech universities are the key partners in education area and the area of government is represented by institutions of state administration. To support partner network we created methodology, rules, web pages (http://nrgl.techlib.cz) and we organize trainings and seminars.

The software solution is composed of an open source software system CDS Invenio used as a digital repository and ESP FAST system used for user interface. Demonstration is focused on presentation of the user interface of the National Repository of Grey Literature. The major idea is to gain quick, intuitive and free access to primary documents of grey literature. We try to make the user interface as much intuitive as possible to support these goals. We use for that purpose intuitive navigations like texts filters and visualized data (for example timeline), which help users to refine their searches.

User interface of the National Repository of Grey Literature is accessible on-line at http://www.nusl.cz. English version will be in operation in March 2010.

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[1] Grey Literature "Information produced and distributed on all levels of government, academics, business and industry in electronic and print formats not controlled by commercial publishing i.e. where publishing is not the primary activity of the producing body." *(Luxembourg, 1997 and Expanded in New York, 2004)*

PART II: DIGITAL NATIVES: CHALLENGES & INNOVATIONS IN REACHING OUT TO DIGITAL BORN GENERATIONS

The Effects of Digital Environments on Adolescent Engagement with Information and Reading

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This proposal for presentation of a paper addresses the second theme of the conference, "Digital Natives: Challenges and Innovation in Reaching Out to Digital Born Generations." The paper includes research methodology, findings, and implications from studies of a digital environment created to engage adolescents in independent reading. The paper reports the research conducted in Massachusetts, USA that resulted in the publication of three peer-reviewed articles, and subsequent research that is ongoing in the state of Delaware. The research focus is on the reading dispositions and interests of adolescents, particularly those who are at academic risk.

The paper will discuss digital natives, including research findings on the unique characteristics of this user-group in terms of their information and reading interests. Digital natives have accumulated many labels: Millennial Generation; Next Gen; Net Generation; Generation Y; Nexters; Nintendo Generation; Digital Generation; Echo Boomers. The collective image that emerges depicts them as digitally competent communicators and content creators. Until recently, there has been little research on how digital environments affect the information and reading behaviors of adolescents born into the Digital Age. This is a particularly urgent question for adolescents who are alliterate, or do not read, and those who do not read with adequate comprehension. A recent study indicates that digital natives are using libraries less and spending little time on e-book and e-journal sites. They engage in horizontal information seeking and skimming a small number of pages, then bounce out of the website never to return (Rowlands & Nicholas, 2008). These findings raise questions about the future of information processing and use and the future of reading. Will sustained discourse and scholarly communication disappear from digital environments? Will traditional print resources, with regard to content and format, disappear from a reading culture that sustains deep and continuous thought? How will a shift in information and reading interactions affect digital natives as learners?

The paper will describe my studies of adolescents' reading dispositions and interests that are situated in web-based "summer reading" programs. In the U.S. students are expected to read at least three books during summer break. Traditional summer reading programs consist of graded reading lists containing a limited number of mostly fiction book titles chosen by educators. School and public libraries are expected to provide supporting services and materials. The Massachusetts study, conducted in 2006-2007, examined the effects of a web-based summer reading program that included ungraded, annotated, and digitally enhanced reading lists accompanied by access points for books and reading response activities (*http://www.barnstable.k12.ma.us/bhs/Library/SummerReadingProgram.htm*) was the context for pre- and post-surveys on reading dispositions and interests of 2,000 students. Focus groups of low-achievers also provided data. Findings, which showed positive effects for most students and no effect on low-achieving students, inform Phase 1 of the research conducted in the state of Delaware at two technical high schools. Students created their own summer reading website (desurfsup.com), including social networking tools. The proposed paper will report the methodology and findings of this Phase 1 study, which include gender differences in reading dispositions and interests, a profile of three types of readers, and how adolescents used social networking as part of their reading experiences. The paper will also describe Phase 2 of the project, which expands the study to six middle/high schools in

Delaware. This study, which takes place from January-December 2010, explores the effects of including alternative materials (i.e., non-book), the effects of the program on reading scores, and the effects of social networking tools on reading dispositions and interests.

The proposed paper analyzes the implications for future research directions that explore the shaping digital library resources and services that support the information use, reading, and learning of digital natives. This discussion will include how the future of school and public libraries is associated with how successfully they meet the information, reading, and learning needs and demands of digital users.

School Students, Information Retrieval and the Transfer of Skills

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EXTENDED ABSTRACT

PURPOSE

This paper seeks to examine the views of students, teachers and teacher librarians on students' attitudes to, use of and reflections on, information retrieval, when completing a curricular assignment. The paper also seeks to examine the issue of transfer in relation to information literacy skills and in particular, to information retrieval.

BACKGROUND

The context of this paper is a wider study by the author of the use of information literacy skills by year 7 (1st year high/secondary school) students in 3 rural Australian schools. The paper will also draw on previous research conducted by the author of year 7 and 8 students' use of information retrieval in UK secondary schools. While the wider study examined students' views on and use of a range of information literacy skills (e.g. students' definition of purpose, question formulation and concept mapping), this paper focuses on students' approaches to information retrieval, particularly from the web.

Information literacy has been one of the most widely discussed topics in the literature of teacher librarianship. While much of this literature is related to practice, there is a growing body of research related to information literacy with key authors including Kuhlthau (2004), Todd (2007), Farmer (2005), Barranoik (2004), Herring (2006), Wolf (2007) and Woolls and Loertscher (2002). Loertscher (2008) notes that despite the wide range of research and publications, a number of issues relating to information literacy remain unresolved. An examination of student views on information retrieval was part of research by Herring, Tarter and Naylor (2002), Herring (2006), Herring and Hurst (2006) and Herring and Tarter (2007). Kuhlthau (2004), Bilal, Sarangthem and Bachir (2008), Chung and Neuman (2007), Myers, Nathan and Saxton (2006), Chelton and Cool (2004) and Gross (2004) reported on a range of studies into information retrieval. While there has been much research on information seeking and retrieval in schools, these studies have not focused on information retrieval in relation to transfer in any depth. While there is much *implied* attention given to the concept of transfer in relation to information literacy, there is little coverage of this issue in the literature. Detterman (1993), Haskell (2001), Royer et al (2005) and Hakel and Halpern (2005) discuss definitions, theories and types of transfer in educational settings.

METHODOLOGY

A constructivist grounded theory approach was taken to the study. Grounded theory has progressed from the early work of Glaser and Strauss (1967) to Strauss and Corbin (1998) and constructivist grounded theory has been most influenced by Charmaz (2006). The key elements of constructivist grounded theory are that the researcher is viewed as an interpreter of the observed world and that data, such as student interviews, is viewed as construction of reality by participants in the study. The researcher examines what emerges from the data and does not approach the study with a preconceived hypothesis. Grounded theorists seek to explain studied phenomena but do not seek to generalise from their findings.

FINDINGS

The findings of the study present a complex picture of students', teachers' and teacher librarians' views on the value of information retrieval, the use of information retrieval skills and the extent to which students might be likely to transfer the use of information retrieval skills across time and curricular subjects. The data showed that almost all students valued the use of information retrieval skills. While some students could see extensive value in information retrieval, other students saw more limited value A minority of students saw little value as they lacked understanding of the value of information retrieval. Students used information retrieval skills when encouraged to do so by teachers and teacher librarians, who both saw extensive value in effective information retrieval. The issue of transfer is a complex one in the context of this study. There was some clear evidence of transfer, in that some students applied what they had learned about information retrieval in a previous term to a new subject assignment. On the other hand, many other students did not transfer what they had learned. It was clear from the study that there was no *culture* of transfer in these schools and that this made it unlikely that students, apart from a well motivated minority, would transfer skills.

REFERENCES

Barranoik, L., (2004). Students and their research: architects of meaning. *SCAN*, Vol.23, No. 2, 33-37.

Bilal, D, Sarangthem, S and Bachir, I 2008, 'Toward a model of children's information seeking behavior in using digital libraries' in *Proceedings of the second international symposium on Information interaction in context* London, United Kingdom, pp. 145-151. ACM, New York.

Charmaz, K. (2006). *Constructing grounded theory: a practical guide through qualitative analysis*. London: Sage.

Chelton, M. and Cool, C. (2004). *Youth information seeking behavior: Theories, models, and Issues*. Lanham, MD: Rowan and Littlefield.

Chung, J. and Neuman, D. (2007) High school students' information seeking and use for class projects. *Journal of the American Society for Information Science and Technology*. Vol. 58, No. 10, 1503-1517.

Detterman, D., (1993). The case for the prosecution: transfer as an epiphenomenon In Detterman, D and Sternberg, R 1993, '*Transfer on trial: intelligence, cognition and instruction*'. Ablex Publishing, Norwood, NJ.

Farmer, L., (2005). Social-emotional behavior and information literacy In S. Lee, P. Warning, D. Singh, E. Howe, L. Farmer and S. Hughes (Eds.) *IASL Reports 2005: Information leadership in a culture of change.* International Association of School Librarianship, Erie, PA.

Glaser, B. and Strauss, A. (1967). *The discovery of grounded theory: strategies for qualitative research*. Chicago: Aldine.

Gross, M. (2004) Children's Information Seeking at School: Findings from a qualitative Study. In M. Chelton and C. Cool *Youth Information-seeking behaviour: theories, models and issues*. , Lanham, MD: Scarecrow Press.

Hakel, M. and Halpern, D., (2005). How far can transfer go? In Mestre, J ed. 2005, *Transfer of learning from a modern multidisciplinary perspective*. Information Age Publishing, Greenwich, CT,

Haskell, R., (2001). *Transfer of learning: cognition, instruction and reasoning*. Academic Press, San Diego.

Herring, J., (2006). A critical investigation of students' and teachers' views of the use of information literacy skills in school assignments. *School Library Media Research*, vol. 9. Viewed22 January 2009, <http://www.ala.org/ala/aasl/aaslpubsandjournals/slmrb/slmrcontents/volume9/informatio nliteracy.cfm>

Herring, J. and Hurst, J., (2006). An investigation into the extent to which Year 6 students transfer information literacy across subjects In McGregor, J and Hay, L eds. *Research in Teacher Librarianship: Proceedings of the Centre for Studies in Teacher Librarianship Research Conference, Australian National University, Canberra, 9-10 April 2005.* Viewed 22 January 2009 <http://www.csu.edu.au/faculty/educat/sis/CIS/epubs/CSTLpapers.htm>

Herring, J. and Tarter, A-M., (2007). Progress in developing information literacy in a secondary school using the PLUS model. *School Libraries in View*, Vol. 23, 3-7.

Herring, J., Tarter, A-M. and Naylor, S., (2002) An evaluation of the PLUS model to develop pupils' information skills in a secondary school. *School Libraries Worldwide* Vol.8, No.1, 1-24.

Kuhlthau, C., (2004). *Seeking meaning: a process approach to library and information services.* 2nd ed., Libraries Unlimited, Westport CT.

Loertscher, D., (2008) Information literacy: 20 years later. *Teacher Librarian*, Vol. 35 Issue 5, 42-43.

Myers, E, Nathan, L and Saxton, M (2007) Barriers to information seeking in school libraries: conflicts in perceptions and practice. *Information Research* Vol. 11, No. 2. Viewed 14 January 2010 <http://informationr.net/ir/12-2/paper295.html>

Royer, J. Mestre, J. and Dufresne, R., (2005). Introduction: framing the transfer problem In Mestre, J ed. 2005, *Transfer of learning from a modern multidisciplinary perspective*. Information Age Publishing, Greenwich, CT.

Strauss, A. and Corbin, J. (1998). *Basics of qualitative research* (2nd ed.). London: Sage.

Todd, R., (2007). Guided inquiry supporting information literacy', *Scan*, vol. 26, no.2, 28-29.

Wolf, S., (2007) Information literacy and self-regulation: A convergence of disciplines. *School Library Media Research*, vol. 10, viewed 22 January 2009,
<http://www.ala.org/ala/aasl/aaslpubsandjournals/slmrb/slmrcontents/volume10/wolf_inform ationliteracy.cfm>

Woolls, B. & Loertscher, D., (2002). *Information literacy: A review of the research: A guide for practitioners and researchers*. 2nd ed. Hi Willow Research and Publishing, San José, CA.

The New Digital Library Symbiosis: the Digital Library and Its Digital Native Patrons

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BACKGROUND

Digital natives are much more accepting of the active role that users of information can play. This will accelerate the transition from the authoritative posture of "Old Librarianship" towards the more collaborative relationship that exists between librarians and their patrons, in the New Digital World. Libraries must, however, choose carefully among the strategies that are available for such collaboration. While the convenience of "tweets" would be excellent, if we can harness them, the noise level associated with some types of social media would lead to negative feedback amongst the library and its patrons, with a corresponding loss of the opportunity to exploit the insights and knowledge of the patrons. We discuss two aspects of this problem: (a) an abstract model of the feedback relationship itself, which considers not only the interaction between the library and its patrons, but also the patron-patron interaction (many-to- many) to explore how the overall growth of the library and its impact on the patrons is crucially dependent on the patron-patron interaction; and (b) the concrete issue of which among the many modalities that have been developed for collaborative filtering have the potential to be most effective in developing the new symbiosis between the library and its continually growing population of Digital Native patrons.

REVIEW OF RELATED LITERATURE

(to be provided in the paper itself)

OVERVIEW OF THE FEEDBACK MODEL

Feedback is described by mathematical structures called difference equations, which express the increase or decrease in some quantity of interest, as a function of the present and past values of the several variables describing a system. We will present a simple four variable system of difference equations whose variables represent: the degree to which the library can provide information that is useful for a person with a particular information need (I); the number of persons who are willing to provide information of that type (W); and the total number of users of the system (N). At a very abstract level:

$$\Delta W = f(I, P(W))N$$
$$\Delta I = f(\{I\}, \{W\})$$
$$P(W) = g(N, user\_type)$$

where $\{X\}$ means: the cumulated amount of X (which may represent any of the several variables) that has already occurred. Here the specific functions f and g must be determined, but it is assumed that they are monotonically increasing in their arguments. The *user_type* is a categorical value which takes values such as "traditional user", "digital native", and perhaps some transitional values.

Most important is the hidden variable, $P(W)$ which is the *perception* on the part of library patrons, of the prevalence of willingness. We note that for the older level of patrons, this is virtually non-existent, while for the Digital Natives this may well be initially perceived as

$P(W) = N$ [that is, an expectation that **all** users are willing to share]. Detailed simulations will be presented, including some speculative equations for the determination of *P(W)*..

OVERVIEW OF THE COLLABORATIVE MODALITIES

Collaborative Modalities are discussed in great detail in the forthcoming Handbook of Recommender Systems (Ricci, Rokach, Shapira and Kantor, Editors; Springer 2010). Broadly they may be classified as 'passive' and 'active'. The earliest passive recommender system for libraries was the ANLI (Rutgers; Zhou and Kantor) which was a research system, assessing whether 'co-checkout' provided a complementary approach to the organization of library materials. A corresponding approach has become the basis for Amazon book recommender systems, Netflix, etc. With 'active' systems, some degree of information is requested from the user, and must be provided actively. Examples of such information that might be available to the library are: the year, and major, of a college student; the age of a public library patron, etc.

The pervasive commitment of librarians to the protection of their patrons reading privacy has prohibited exploitation of these types of information. However, as Varian has pointed out (and has exploited, as Chief Economist at Google) consumers are willing to make an economic decision to share information, in order to gain the benefits of somewhat improved service. Thus, within the self-imposed constraints of the library profession, there is a need to explore the degree to which patrons might voluntarily (essentially via a kind of Informed Consent, rather than the 'Opt-out' alternative favored by many commercial enterprises) choose to share a certain amount of information about themselves, in order to improve the library services that they receive.

Alternative to the provision of 'personal' information, the user of a library might choose to provide information not about herself as a person, but about the particular purpose for which given information materials have (or have not) proven helpful. This would support, in principle, a kind of recommendation which is based not (solely) on information about the user, but also on information about her present quest. These ideas have been explored in the AntWorld concept (Rutgers; Boros, Melamed & Kantor; Shapira and Kantor) but have not ever been implemented in the library setting.

THE CHANGING SOCIO-CULTURAL ENVIRONMENT

In earlier work it was found that social-cultural barriers were the key obstacle to development of a quest-based model, which relies on network externalities to grow to critical mass. We propose now that while the older layer of patrons were naturally resistant to its adoption, the Digital Native will be far more willing to explore it, and may, indeed, be disappointed in a library that does not offer opportunities for the kind of feedback that are increasingly associated with digital media of all kinds, and with electronic commerce.

DISCUSSION

We stand at an historical moment in which the world-wide change in acceptance of digital media may finally eventuate in a kind of sharing and increase in the power of a library to serve its users that was anticipated by the proposal of the HyperCat (Hjerppe) and the Scholar's Cross Reference (Kantor) in the 1980s. We may restate Victor Hugo's axiom to suggest that the problem was not that the ideas were too weak to overcome armies, but simply that their time had not yet come.

CONCLUSION

This may be a moment in which wise and knowing acceptance of some aspects of the new digital media, ranging from blogs to virtual worlds may enable digital libraries to achieve a quantum leap in the effectiveness of their services to their patrons. To do this, the libraries must develop and master means of making their patrons into partners, in a guided, yet self-motivated, manner.

ACKNOWLEDGMENTS.

REFERENCES AND LITERATURE CITED

[to be provided in full detail]

Hjerppe, R. (1989). "HYPERCAT at LIBLAB in Sweden: A Progress Report." In Ch. R. Hildreth (Ed.), The Online Catalogue: Development and Directions (pp. 177-209). London: The Library Association.

Hjerppe, R. " HYPERCATalog and Three Meta-Schemata for Database Views: Knowledge Organizing, Collection Derived, and User Established Structures." Linköping University, Department of Computer and Information Science, Linköping, Sweden, Report LiU-LIBLAB-R-1986:2; 1986. Paper presented at Online Public Access to Library Files, 2nd National Conference, Bath, U.K., April 5-7, 1986.

Kantor, P.B. (1993). The adaptive network library interface: A historical overview and interim Report. *Library Hi-Tech, 11* (3), 81-92.

Kantor, P.B., Boros, E., Melamed, B., Menkov, V., Shapira, B., & Neu, D.J. (2000). Enabling technologies: capturing human intelligence in the Net. *Communications of the ACM*, *43* (8), 112-115.

Kantor, PB. (2008) A historical Note on the AntWorld and its Origins. At:http://www.scils.rutgers.edu/~kantor/AntWorld/OCLC_ANTWORLD_Historical Note.doc

Shapira, B., Kantor, P.B., & Melamed, B. (2001). The Effect of Extrinsic Motivation on User Behavior a Collaborative Information Finding System. *Journal of the American Society for Information Science and Technology (JASIST), 52,* 879-887.

Zhou, S.Y., & Kantor, P.B. (1993). Development of an adaptive network library interface: Progress report and system design issues. In Bonzi & Katzer (Eds.). *Proceedings 56th Annual American Society for Information Science Meeting,* 211-216.

Slovenian School Libraries: Ready for new Services?

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ABSTRACT

While the mission of a modern school library covers much more than just the traditional tasks of collecting, cataloguing and organising books, the library catalogue remains the cornerstone of a modern library. New, innovative library automation software should support the role of the library as a learning centre.

In order to encourage the use of catalogues (and libraries) by the new generations of "digital natives", libraries need to create new tools and be innovative, by building on the solid foundation of good catalogue.

The paper presents the results of a study conducted among librarians in Slovenian primary schools. The purpose of the study was to provide general overview of library automation systems in school libraries, librarian's attitude towards their system and to discuss the awarness of the importance and functionality of the catalogue.

In Slovenia, school libraries are the only type of publicly funded libraries in position to choose their library automation system, as opposed to all others, for which COBISS is mandatory. We wanted to look into the use of the three systems available (COBISS, Šolska knjižnica and WinKnj) and to establish the reasons for choosing them.

In addition, we analyse the satisfaction of librarians with their catalogues as well as the awareness of (and attitude towards) the possible advanced functionality of the catalogue such as improved displays, relevance ranking, support for browsing and exploration.

1. INTRODUCTION

Some experts argue that the decline of the role of libraries began to come about in the previous century. The 2009 Online Computer Library Center (OCLC) research revealed most notably the trend of information seekers searching for information with a search engine (84 %) rather than on a library web site (1 %). In addition, our own research has shown that 31 % of libraries do not offer their catalogue on the web, and that pupils cannot search for information by themselves – librarians do it for them (for different reasons). They should offer pupils the possibility of independent searching, browsing, gathering and checking of information contained in different databases, catalogues and web sites, given the fact that "pupils have spent their entire lives surrounded by and using computers, videogames, digital music players, cell phones and all the other toys and tools of the digital age" (Prensky 2001).

Librarians have kept abreast of the latest advances in technology, striving to develop understanding and support of young people growing up in the digital age. The goals of the school library, as proposed in the IFLA/UNESCO School Library Manifesto, are clear and obtainable, provided that every library can ensure the necessary technology and access to information. We found that librarians are not prepared for the new services that would suit the new, evidently different generation. New technologies, services, systems for learning, etc. cannot be planned and developed if there are no basic tools (like OPAC) and computers with database access.

The school library offers learning services, books and resources that enable all members of the school community to develop critical thinking and effectively user information in all formats and media (IFLA/UNESCO 2000).

In Slovenia, there are 449 primary schools. School libraries are the only type of publicly funded libraries allowed to choose their library automation system. Their choice however is limited to three different library automation systems: Šolska knjižnica, supported by the

Ministry of Education and Sport until 2000, the improved version of Šolska knjižnica called WinKnj, and COBISS (Co-operative Online Bibliographic System and Services).

2. SITUATION IN SLOVENIAN PRIMARY SCHOOL LIBRARIES

2.1 ŠOLSKA KNJIŽNICA

In 1990, a working group started to develop an automation system that would consider the specific needs of school libraries. This system is DOS-based and was last officially updated in 2000 to version 4.15.W, funded by the Ministry of Education and Sport (Kovačič, Miklič, Kuštrin Tušek 2007).

There were no subsequent upgrades and there is no support. The reasons for the continuous use of Šolska knjižnica are diverse; one of them undoubtedly related to the fact that the software is free, meaning that schools, especially smaller ones, can save a considerable amount of money.

2.2 WINKNJ

In 2006, growing dissatisfaction with Šolska knjižnica led to the opening of dialogue between practicing librarians and computer programmers of the company MordiCom and the development of the Windows version of the programme started. The conversion of bibliographic records, user and loan records was made possible in 2007, and the new programme effectively came into use. The cost of one-year maintenance contract is 390 EUR. The system is used by 318 primary school libraries, with 17 of them offering the use of OPAC (Online Public Access Catalogue) on the web. As shown in Figure 1, the majority of school libraries use WinKnj system.

2.3 COBISS

IZUM (Institute of Information Science) assumed the leading role in developing the shared cataloguing system software in 1987, when it was chosen as the host of the then Yugoslav union catalogue. In 1991 COBISS was established as Slovenian union catalogue and its use is mandatory in academic, public and publicly funded special libraries. Some primary school libraries joined in 2000, with 59 libraries currently participating in the system (Figure 1). The cost of one-year membership is 684 EUR.

COBISS is most widely used by school libraries in the Eastern part of Slovenia. Possible reasons may include the fact that IZUM is based in the town of Maribor, and the positive experience of local libraries with the system.
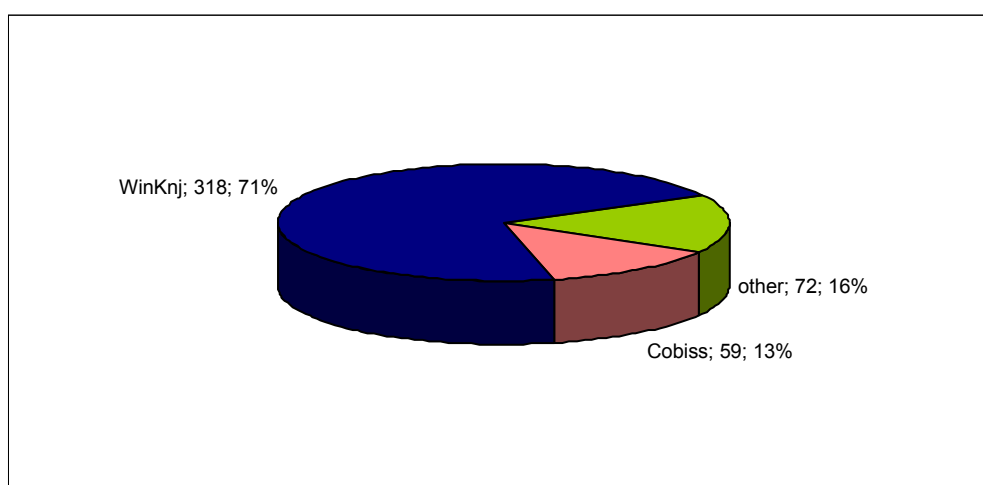
Figure 1: Automation systems in school libraries

3. RESEARCH

Invitations for an online survey were sent to the mailing list of primary school librarians.

We were interested in:

- general information regarding the librarian: age, years of service in (the current) library, education;
- information about automation system: which system they use, change of the system if any and why, influence on decision, functions of the system, satisfaction with the system in use, price of the system;
- functions which should be offered in catalogues;
- other information: number of computers for pupils and their independent use of catalogue.

4. PARTICIPANTS

We sent invitation to 449 participants and received 131 responses. The survey was conducted between January 20th and February 15th, 2010. Participants' characteristics differed in many aspects, most notably in the size of schools where they work, their age and years of service.

Most participants (40 %) were 40–49 years old, with the average of 13 years of service in the current library and with 15 years of overall working experience. This confirms the assumption that primary school librarians are usually very experienced at their work.

Another large group (30 %) of participants was 30–39 years old. On average, the librarians from this group have 12 years of service in the current library and 14 years of overall working experience in libraries.

67 % of librarians (88 out of 131) have been employed by the same library from the beginning of their career. 48 % of respondents have a degree in library science, 48 % received some other education, and 4 % provided no answer.

5. FINDINGS
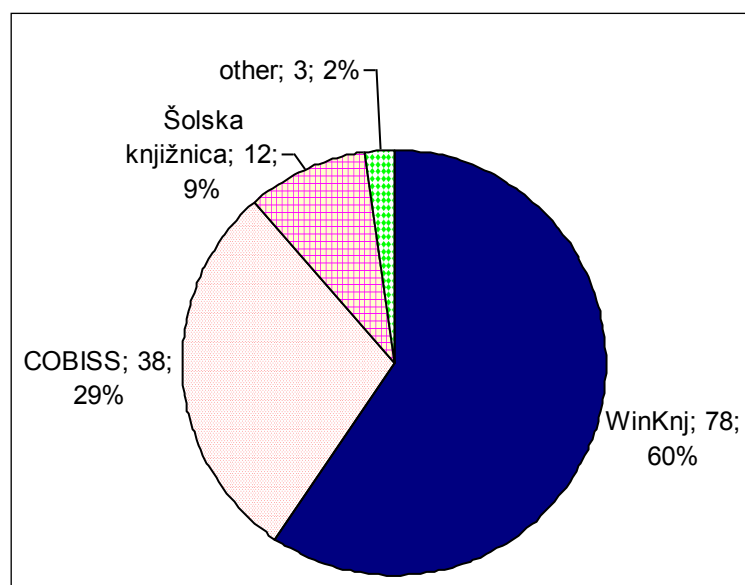
Figure 2: Automation system in primary school libraries

The main reason for changing from one automation system to another was the fact that Šolska knjižnica had become obsolete. The change of the system for the most part occurred in 2007. Due to discontinued technical support and updating of Šolska knjižnica, librarians opted for a new system, with 25 choosing COBISS and 139 choosing WinKnj.

As shown in Figure 2, 78 (60%) use WinKnj and 29 % of respondents use COBISS. Only 9 % of school librarians in our survey still use Šolska knjižnica.

Librarians usually become acquainted with the new automation system when talking informally to their colleagues at meetings of school librarians, organised by Ministry of Education.

The study revealed that 53 % of participants made the decision themselves. This suggests a high level of autonomy for the majority of librarians.

	WinKnj	COBISS
STRENGTHS	- Simplicity, - transparency, - automatic system upgrades, - Windows environment, - fast processing, - easy switching between windows, - high level of support and assistance.	- Simplicity, - transparency, - system updates, - OPAC, access to OPAC from home, - quick access to information, - reliability, - assistance and service, - accuracy, - size of the bibliographic database, - membership in COBISS.
WEAKNESSES	- No weaknesses, - complexity of statistics, - poor visibility (small letters), - no connection with COBISS or other school libraries, - user instructions difficult to understand.	- No weaknesses, - difficult to use, - too extensive for the needs of school libraries, - server errors, - slow development of applications, - expensive membership fees, - not adapted to the needs of school libraries.

Table 1: Satisfaction with automation system

As shown in Table 1, the majority of librarians are very satisfied with their automation system. According to some, the new system does not even have any weaknesses. Librarians had no critical remarks about the catalogue, its functions or features, especially those that the catalogue does not offer, even though it should. We expected the participants to be more critical of the catalogue's lack of adaptivity to the needs of users – the pupils. On the other hand, it is somewhat surprising that the respondents consider important the very functions not provided by current catalogues.

Those automation systems are very traditional and they do not have new functions. Librarians expressed that new possibilities in catalogue are very important. On the other hand it seems that they do not miss new functions in the current catalogues as they do not demand them from their software.
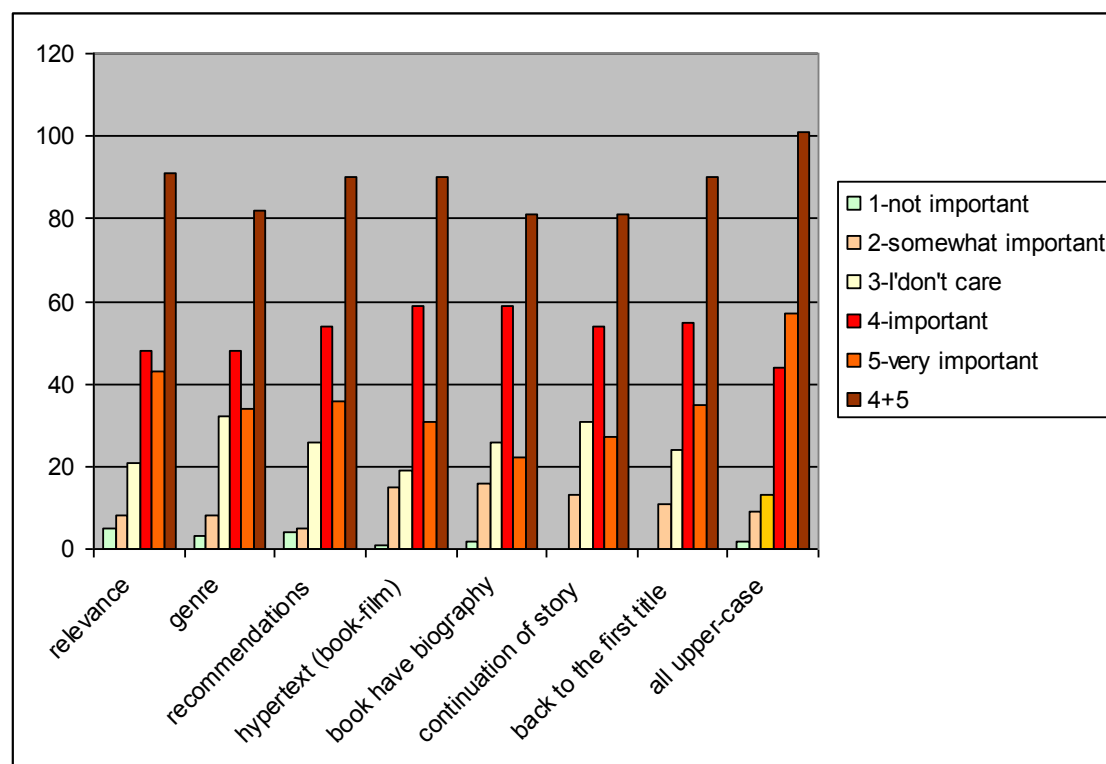
Figure 3: In your opinion, how important it is for the catalogue to provide the following functions/features?

We asked librarians about the importance of some new functions that can be included in library catalogues (Figure 3):

- relevance- ranking of results,
- searching by genre,
- borrowing suggestions ("User who borrowed this also borrowed) or recommendation system,
- hypertext links between related works (book –film),
- content of catalogue can be enriched by information that e.g. a biography is included in the book,
- link to the next part of the work (continuation to the second title of story),
- link back to the first part of the work (book, film, music),
- an indication that the book is in upper-case (for young children).

Of all the functions, searching for all upper-case books was most often identified as an important feature. As children begin to learn to read and write, the library assumes a central role in encouraging pupils as well as offering support to parents and teachers. Therefore hits sorted by relevance, links between different types of the same content, and list of recommendations were also often rated as important.

The catalogue featuring these functions should not simply be a copy of a card catalogue. Such a catalogue already exists as a concept in the form of the FRBR model (Functional Requirements for Bibliographic Records), implementations however remain limited, as the model is considered (seemingly) demanding and complex.
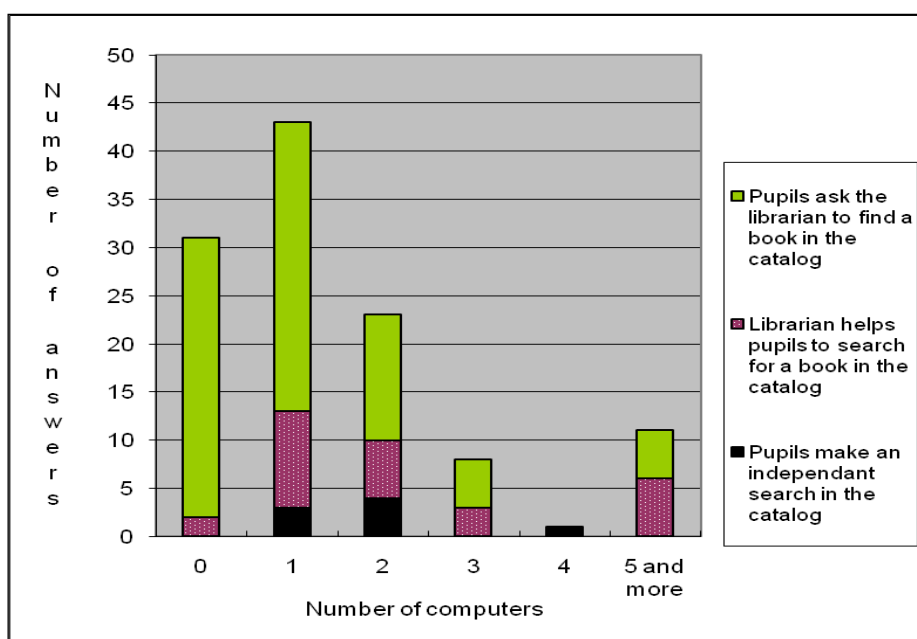
Figure 4: Number of computers and pupils' use of the catalogue.

Based on the findings of our survey, 31 % of primary school libraries have no computers available to pupils (Figure 4). Consequently, pupils have to ask the librarian to find the material, since they do not have the option to search for literature independently.

36 % of libraries offer only one computer with a library catalogue for the entire school population. Only schools with more than 300 pupils offer a higher number of computers.

We cannot however confirm any correlation between the number of pupils and their autonomy when performing a library database search. The majority of schools offering no computers in the library are not the smallest in terms of school population, as they have 400–499 pupils. The most independent, when performing a catalogue search are pupils from schools with the population of 200–299. These pupils are also more likely to ask librarians for help. Furthermore, the same librarians are more likely to devote their attention to helping pupils, as their school is not so big.

6. CONCLUSION

School librarians confirmed the importance of new possibilities in catalogues and automation systems, but it seems that they do not miss them in their own catalogues as they do not demand them from their software vendors.

The second problem is quality of the catalogue. Usually librarians do not think about the quality of catalogue and about the possibilities to improve it.

Libraries do not have facilities to allow their pupils to search and browse in local catalogue by themselves. The main reason is in the absence of the computers partly due to lack of space. As long as all school libraries do not have at least one computer for the users for independent searching, users cannot learn how to use the catalogue. This means that the users are dependent of librarian's help and they cannot identify by themselves the relevant materials.

We cannot include new services and tools in the catalogue if we do not have basics on which we can build these new services.

We found that the choice of software is not related to education of librarians, and that the cost of membership does not have such a strong effect on the choice of software as we assumed.

Librarians obtain the first and most important information regarding the automation system from their colleagues and on other meetings. (This is also reflected in the map showing the spatial distribution of automation system software in Slovenia.) Moreover, our survey reveals that primary school librarians are satisfied with the software they use (some even see the system as flawless). However, when asked how important it is to them that the catalogue provides functions such as sorting hits by relevance, searching for books which are in upper-case, providing links between different types of the same content, etc. (especially in view of the fact that current catalogues provide no such options), answers mostly fall into the category of (very) important. It is necessary to note that library catalogues are not adapted to the needs of pupils, who are consequently forced to deal with irrelevant or unclear data, terminology and procedures. Librarians commend some of the aspects such as upgrading, but do not present any requests or proposals, functioning merely as passive users of automation systems. It is therefore too optimistic to expect librarians to take the initiative in pursuing the necessary changes in libraries. Without conforming to the needs of "digital natives", libraries will remain limited to storage and simple circulation.

It is also very important to be familiar with the users' wishes and needs. Librarians too often believe that they know users well, which is hardly the case. As a consequence, some services that they provide (which are usually time-, energy- and money-consuming) prove to be ineffective after only a short time (Ismail, 2009). Therefore, librarians ought to participate in the development of the already existing and basic services before trying to introduce new ones, especially since software development is too much in the purview of computer programmers. Librarians should realise that the current status of school libraries is only partly satisfactory, so they should combine their efforts and direct them towards an active role in equipping their libraries with proper hardware and developing proper software, one that would fit the needs of the school library. Only then will they be able to offer services one expects from modern school libraries well familiarised with new technologies and their users.

However, several questions still remain: Will pupils use libraries to satisfy their information needs or will they go somewhere else? Do librarians devote enough attention to users, and do they provide a suitable environment that will enable pupils to develop the searching skills and critical evaluation of data retrieved? Where will users search for information and in what way? The problem of information literacy transcends the boundaries of primary school, so librarians need to formulate an effective development strategy. Pupils may or may not be users of secondary school, university or public libraries at some time in their future. Their informational behaviour will depend on the knowledge and experience acquired in the primary school.

In short, school libraries should remain the central hub of primary schools, offering the entire set of current services as well as new ones, which will answer the pupils' needs, and will keep up with the progress of modern, education- and schooling-oriented technologies.

First of all librarians have to improve their catalogues and educate their users. Only after that Web 2.0 and Library 2.0 can became a reality.

REFERENCES
COBISS (2009). http://cobiss.izum.si/.
IFLA/UNESCO School Library Manifesto: The School Library in Teaching and Learning for All (http://archive.ifla.org/VII/s11/pubs/manifest.htm)
IFLA/UNESCO-ve smernice za šolske knjižnice. (2003). Šolska knjižnica, 13 (3), 115–124.
Ismail, L. (2009). What net generation students really want? Reference Services Review, 38 (1), 10-27.

Kovačič, A., Miklič, M., Kuštrin Tušek, N. (2007). Programski paket Šolska knjižnica v Windows okolju : sanje ali resničnost?. *Šolska knjižnica*, 17 (3/4), 151–154.

MordiCom. (2010). http://www.WinKnj.si/slo.php?page=prva.

Number of pupils in Slovenia at school year 2008/09 in 2009/2010. Ministry of Education and Sport.

OCLC, (2009). *Online catalogs : what users and librarians want : an OCLC report*.

Petejan, M. (2009). Correspondence. (2009, December).

Prensky, M. (2001). Digital Natives, Digital Immigrants. *On the Horizon*, 9 (5). http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Šobot, P. (2010). Correspondence. (12. 1. 2010).

Supporting Undergraduate Students in using Digital Biomedical Information

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ABSTRACT

Digital libraries of biomedical/genetic information, linked and supported by powerful cross-referencing tools have become critical resources for researchers and students in the life sciences. These user-friendly tools enable users to quickly process vast amounts of freely available genetics data in order to study genes and proteins that have applications for diseases and drug treatments, biotechnology and clinical diagnostics. Despite the perceived complexity of the content of these libraries of genetic information, the links between databases and the common search interface allow new users to quickly develop a familiarity with the suite of resources, and to extract relevant data relatively easily. Today's researchers have the human genome at their fingertips, connected gene by gene, protein by protein, to databanks of information on genetic diseases and disorders, and a growing set of animal and plant genomes. For students to become fluent in the discipline, they too must become familiar with a rich information environment.

This paper will describe an information literacy workshop developed in collaboration with a biology instructor that encourages undergraduate students to explore the synergies between these data repositories, traditional sources of scientific information and patents. In the context of this work, the author will also provide an overview of OMIM (Online Mendelian Inheritance in Man), a gateway to genetic disease data, and some of the key related data sets accessible through this portal. Integrating data librarianship into our services has had rich rewards for the librarian, the instructor and, most importantly, the students. Students engage with the same tools used by researchers, to work with the cutting edge of information where knowledge is created. The assignments students complete provide a vital link between the textbook and lecture information of an introductory genetics class and the real life tools used by researchers and practitioners; students not only learn more about genetics, they acquire the ways of learning and knowing relevant to the discipline. Ongoing assessment indicates that students use what they learn in this workshop throughout their academic careers. The instructor has benefited through developing a greater understanding of the structure of these data sets and how they function, integrated with other databases like PubMed and patents; collaborating with a librarian experienced in teaching database searching has resulted in a better lab exercise and assignment. As a librarian, I've benefited in several ways. In addition to enhancing my skill set I have become a more effective campus partner by facilitating access to these diverse data sets for students, faculty and librarians, increasing campus awareness of these resources.

INTRODUCTION

There has been an explosion in the range and depth of bioinformatics data available to researchers in the biomedical sciences, and the growth shows no signs of stopping. Daily discoveries at the edges of science expand our understanding of genes, proteins and the mechanisms for inheritance and disease on a daily basis. The free availability of this abundance of data, coupled with increasingly user-friendly interfaces and sophisticated search capabilities put it within the reach of undergraduate students around the world. Librarians in the sciences must understand the advantage these tools offer in order to provide the services our users need, and to increase our value as partners in education and research. Collaborating with research faculty is one way to develop the required expertise and share it with students. This paper describes a workshop designed to introduce second and third year undergraduate genetics students to some of these data sets. The workshop's success is measured in the gains in competencies and understanding made by the students. The success is due to a strong, open collaboration between a librarian and the instructor, a well-structured lab assignment, paired with a larger poster presentation, supported by excellent learning

materials, and careful attention to pedagogy, including scaffolding, review, active learning, focused time-on-task, and accommodation of different learning styles through multiple modes of instruction.

LITERATURE REVIEW

Since the completion of the Human Genome Project in 2003 there has been a proliferation of gene and protein data that has revolutionized the nature of biomedical research. Its importance to librarians has been highlighted by entire issues of key journals that have been devoted to bioinformatics such as the March 2005 *Journal of the American Society for Information Science & Technology* and the July 2006 *Journal of the Medical Library Association*.

Since then, there have been a number of excellent introductory articles on specific bioinformatics tools (McKusick 2007; Amberger, Bocchini, Scott, & Homosh, 2009; O'Grady 2008; Rapp & Wheeler 2005). Tennant and Lyon (2007) provided an extensive overview of NCBI's "Entrez Gene" database, explaining why it is the primary data source for bioinformatics specialists as it provides comprehensive access to thousands of data and organism specific gene and protein databases.

Wth the expansion of the availability of this data, librarians have to develop fluencies beyond traditional bibliographic resources if they are to remain relevant and credible partners in teaching and research. Herron has highlighted the "need for medical librarians to engage in the plethora of molecular and genetic resources within the Entrez information retrieval system" (2008). Garritano and Carlson, note that adapting library science skills and subject expertise will provide a foundation for librarians to communicate effectively with researchers and fellow information professionals to address digital data needs (2009). If librarians do not take up the challenge, others may perform this role inadequately and librarians may lose their connection to scientists (Osswald 2008).

Librarians in academic settings must go beyond understanding the use of bioinformatics data to consider how it may be incorporated in information literacy instruction so that students learn how to use this data and to solve genetics problems like geneticists (Adams, 2009, Dinkleman 2007, Pham 2008). In fact the American Society for Biochemistry and Molecular Biology (ASBMB) has recommended that undergraduate curriculums in microbiology and biochemistry include skills in the use of computational biology databases and data repositories such as bioinformatics as a core competency or skill that students should have upon graduation (Boyle 2003, Voet et al 2003). More recently, Dymond suggests that areas such as bioinformatics and synthetic biology provide an excellent framework for students to participate in "cutting-edge interdisciplinary" research and should be included in undergraduate biology curriculums (2009). The case study reported here, outlining the workshop and the tools it introduces to students is an example of how this may be achieved.

SETTING

The University of Calgary is a research intensive institution with a student population of 29,000 students enrolled in undergraduate, graduate and professional degree programs. Faculty members in the Biological Sciences and Faculty of Medicine are actively involved in genetics research. The librarian has been working with discipline instructors since 2003, and has built a sequenced program of information literacy instruction with introductory assignments in first-year biology labs, and more specialized, advanced workshops for senior students. In 2007, the opportunity arose to add an intermediate lab for second or third year

students in a genetics course. This collaboration included a review of bibliographic databases searching, and to stretch student skills into new domains, namely patents and the expanding suite of bioinformatics or biomedical data resources available through the United States National Institute of Health (NIH) and elsewhere. A productive collaboration between the librarian and the instructor, Dr. Isabelle Barrette-Ng resulted in a 90-minute lab that takes students step by step into a series of interconnected resources on genetics.

The course, Biology 311, is an introduction to genetics, meant primarily for biology majors many of whom are anticipating careers in medicine or related fields. In a typical semester, 550 students register in this course. The library session occurs during a scheduled three-hour lab, two-thirds of the way through the semester when the students have developed sufficient familiarity with the vocabulary and concepts of genetics to understand the data they retrieve. The students complete an assignment in the lab, and then also use the information in a poster presentation which is held two weeks later. The lab assignment starts by having the students choose a genetically-inherited human disease or disorder with a strong genetic link to research. Linking the assignment to medical conditions increases student engagement, as connections to 'real life' are obvious, and students often choose topics based on family medical history. The laboratory assignment is very structured, asking students to locate, interpret, and in some cases perform calculations with specific pieces of data they retrieve. The sequence of the assignment, described in detail below, leads students from simple, textual information obtained through a user-friendly, clear interface, to a review of article searching in PubMed, and thence into the realms of numeric and diagrammatic information in the genetics databases. The follow-up assignment which allows for greater exploration of the information resources and promotes consolidation and retention of the searching skills results in a poster shared with the rest of the class that details the medical condition, its genetic links, and current therapies and research.

The instructor's learning objectives for the assignment, aside from developing students' research skills included increasing students' awareness of the depth of genetics resources available, encouraging students to see links between the microbiological aspects and the more visible implications of genetic disorders, in fact, between genetics in the lab and real advances in medical diagnosis and treatment, and finally to better understand gene structure, including the relationship of proteins and genes through the data provided which links loci, forms, processes and errors.

The librarian's objectives were to provide students with clear pathways to the data they required, with sufficient practice in using the tools to become familiar with how they worked and the information provided by each one. There is often a divergence of opinion in developing information literacy sessions like this, where the librarian would like to spend more time on the tools, and the discipline instructor would prefer students to concentrate on the content. It is important to develop assignments that accommodate both aims, but focus on what students need to know, and apportion time-on-task appropriately. This collaboration began with a very clear mutual understanding of what students needed to know, and the workshop and assignments were written to provide students with the most efficient path possible to their information, so they could spend more time exploring and interacting with the data they found. The lab manual for the assignment contains specific directions to and information about each source. It also provides explanations of why each resource is important both to the students' learning and to researchers in the field.

RESOURCES

The resources used in the workshop are predominantly those that are freely available from the National Center for Biotechnology Information (NCBI) database which is a division of the National Library of Medicine in the United States. Founded in 1988 the National Center for Biotechnology Information enables users to simultaneously search over 30 discrete databases such as PubMed, as well as gene and protein sequence databases using its Entrez federated search tool. Entrez provides a common search interface between all of NCBI's databases and the ability to easily extract information from one database and use it to search another. It should be noted that there are more databases available in NCBI Entrez-Gene than are required by this assignment, and librarians are encouraged to explore the wealth of data they contain. Over the three years the course has been offered, there have been significant developments in the range of tools available and the workshop has evolved to include these where they are appropriate, sometimes because of their content, sometimes because they provide simpler access to the required data. The resources used in the current version of the assignment are described below, in the order that students encounter them, with notes on how the students use each one in both the lab and the final poster assignment.

Genes and Disease

http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=gnd&part=gnd_book_info

This is an online encyclopedia comprised of approximately 80 human genetic disorders, with each entry providing brief descriptions of the disorder, including the implicated genes, and links to other materials. The students use this resource to select a disorder to use as their topic, and obtain basic information, as well as keywords they can use searching other resources. This is a good place for students to begin their research as it serves as an introduction to more complex portions of the assignment.

PubMed
http://www.ncbi.nlm.nih.gov/pubmed/

This resource likely needs no introduction. Students revisit searching techniques from their first-year information literacy sessions and use the database to locate one recent review articles on their topic. These are intended to provide background material for the poster, and incidentally the opportunity for students to demonstrate their ability to cite articles in proper Harvard format. PubMed is likely the students' first exposure/introduction to NCBI's Entrez search and retrieval interface and serves as a jumping of point for other NCBI gene and protein databases that will be used later in the assignment.

Patents
http://www.google.com/patents

Patent searching is an increasingly valuable skill for science students and researchers, as it is estimated that over two thirds of issued patents are not published elsewhere (WIPO n.d.). This is particularly true in the fields of biomedical sciences and biotechnology where much of the research may have financial or commercial implications and therefore higher corresponding patent activity. Through researching patents related to their chosen disease, students discover that genes and processes involving them can be patented, that many medical interventions, both pharmaceutical and technical are also the subjects of patents, and indeed often appear in patents before they are published in peer-reviewed journals. One of the most relevant examples of this is the development of DNA fingerprinting, by Alec Jeffreys, as he described in a recent interview (Corbyn 2009). As this is an introductory session, Google Patents is used rather than the United States Patent and Trademark Office's (USPTO)

database because it provides an easy, familiar way to search complex content. There is a lag of approximately twelve months between the latest results retrieved in Google Patents compared to the USPTO but Google Patents does provide convenient links for users to view patents in the USPTO and to conduct classification or controlled vocabulary searches to ensure comprehensive and current results if desired. Students are introduced to patents as key sources of information, and briefly instructed on the anatomy and linguistic peculiarities of patents. They must extract specific pieces of information from a patent related to the inherited genetic disorder they are studying for the lab exercise, and include this information in their poster. By searching PubMed and Patents in a short period of time students are able to recognize the different types of information that are available from each source and the differences between publishing academic and commercial research results. In the time between the lab and the poster session, students often return to the patent databases to refine their searches and find patents more relevant to the focus of the poster.

OMIM (Online Mendelian Inheritance in Man)
http://www.ncbi.nlm.nih.gov/sites/entrez?db=omim

OMIM, created and maintained by researchers at Johns Hopkins University, provides access to information on Mendelian disorders and related genes. As of April 2010, there were approximately 20,000 entries which consist of published biomedical articles that are updated daily and extensively referenced and cross-referenced, providing invaluable collections of information for genetic research. Entries on disorders include information about the genetic aspects of the condition – loci, and inheritance patterns as well as clinical features, and epidemiological factors. OMIM references link to scholarly journal articles in PubMed and to information on specific genes found in other NCBI databases such as Entrez-Gene. The entries on specific genes provide information on associated conditions and link to further information, including a Map Viewer view showing where on the chromosome the gene is located. The database is searchable by keyword, chromosome number or gene sequence.

Researchers use OMIM to quickly access known information on disorders and their associated genes, mechanisms and mutations. The database allows for data to be viewed in relation to a disorder or to a specific gene, making it relatively easy to determine common genetic factors between disorders, or isolate particular genes or sequences for further exploration.

The students in Biology 311 use OMIM to first extract salient pieces of information about the disease, genes and associated proteins. The OMIM interface they use is textual and shares the Entrez interface used earlier in PubMed which makes it easy for users to begin their research on their genetic disorder topic. The fact that the references lead back to PubMed underlines the link between bibliographic and non-bibliographic resources. Once they have explored the textual entry on their disease, students then venture through links to Entrez-Gene, and into less familiar-looking data-based material. The material they find here includes minimal textual information, supplemented by diagrams, codes, reference numbers and other data. Students must navigate this complex material and follow links specified in the lab manual to determine key factors about the gene. The path they take to obtain the answers allows students to find required information efficiently, while also providing a tour of different parts of the OMIM site and illustrating the links between resources. Students will see the same codes used throughout various parts of the Entrez-Gene database, and other related resources, and can develop some idea of the system that allows all of these tools to work together, and indeed allows scientists working on similar projects to exchange data.

From the OMIM site students will also find links to Entrez-Protein where they are required to answer two questions about the size of the protein encoded by the gene the had selected

earlier. Students were then required to copy and paste the protein sequence located on the bottom of the Entrez-Protein page which would be used to answer questions in the two remaining resources- ExPASy ProtParam (Protein Parameter) and BLAST (Basic Local Alignment Search Tool).

ExPASy ProtParam (Protein Parameter)

http://www.expasy.ch/tools/protparam.html

The common 'language' used in Bioinformatics is what makes it possible to easily use codes retrieved from NCBI databases such as Entrez-Protein in ExPASy ProtParam, a resource maintained by the Swiss Institute for Bioinformatics. This resource provides information on the structure of proteins, critical to understanding the function of proteins encoded by genes. Researchers use it to obtain information on the physical and chemical properties of proteins; the assignment asks students to obtain information on amino acids found in the protein behind the disorder they are studying, and on the predicted molecular weight. This section of the assignment reinforces that data in a recognizable format (FASTA sequence) from one database can be easily used in another bioinformatics database even if that database is not hosted by the National Center for Biotechnology Information (NCBI).

BLAST (Basic Local Alignment Search Tool)
 http://www.ncbi.nlm.nih.gov/blast/Blast.cgi .

This resource, another NCBI database, allows users to conduct similarity searches between protein sequences. It searches non-human sequence information as well as human data, allowing researchers to locate similar protein sequences across genomes to better understand their functions, and suggest paths of enquiry. Students search BLAST with the exact protein sequence copied from their protein exercise, to determine first the 'conserved domains' – regions of the proteins that have known functions in other proteins, and second the entry BLAST finds that is closest to their sequence.

RESULTS AND DISCUSSION

In reading through the material these students must negotiate to successfully complete their lab and poster assignments, it may seem like an impossible task to shepherd second and third-year students through these resources. However, the assignment and workshop are well designed to provide student clear paths to the data they need to use, and clear uses for the data they find. As with the genes and proteins themselves, students see that the structure and the function of the information resources are deeply linked, and that similar sequences of actions, codes, and search statements operate in similar ways even in databases maintained by quite separate entities. The lab assignment leads students from familiar, text-based information through progressively more unfamiliar resources to graphic and numeric data, all the while illustrating the links between sources. A library page set up for the course provides links and instructions that complement the lab manual. Students learn by exploring these sources how each can help them understand aspects of genetics, and translate what they have been learning in class to the groundbreaking research being done in the field. The poster assignment consolidates the learning done in the lab, as students must revisit the resources to refine and compile the information they present, and gives them practice in reassembling information from disparate sources to provide a clear picture of a very focused topic.

The success of the collaboration between the librarian and the instructor is evident in short and long-term assessments. Students receive immediate feedback in the lab session as the librarian, teaching assistant and often the instructor circulate and provide assistance as needed. This feedback and checking ensures that most students who are present for the lab

complete the assignment successfully. In conducting the lab over three years, the librarian has been able to make adjustments and provide more instruction where students seem to have problems, and less where they grasp the concepts quickly.

Students are further assessed on their ability to locate, interpret and integrate the information they find in the poster presentations. Here too, students are generally successful in incorporating material from the genetics resources.

In the longer term, another research project by the librarian has provided unexpected insights into the impact of the workshop. Senior biology students are surveyed on their use of various information sources. Assessment data from 2006, before the inception of the Biology 311 class and from 2008, after it had run, and most students in the survey had taken it, show some interesting differences. Specifically, more students showed appreciation for patent literature, and familiarity with advanced searching techniques in PubMed (the study is ongoing, initial results were reported in (MacMillan, 2007), intermediate results are available from the author on request). Unfortunately, to this point the senior students have not been asked about their subsequent use of the bioinformatics resources, but that will be added to the survey this year.

As noted above, the course has evolved over time in response to student difficulties, and the arrival of new tools. Changes include the inclusion of the ExPASy-ProtParam database in 2008 which provides current and comprehensive access to information about the physical characteristics and size of proteins such as the number of amino acids and calculated molecular weight. Another change was made in 2009 that had students select one consolidated RefSeq Protein Product which eliminated a lot of the guesswork students used to encounter when selecting the correct protein encoded for their specific gene. These changes have resulted in a considerable reduction in the number of questions this librarian has had to answer in the past several years.

The students are not the only ones to benefit from this collaboration. Both the instructor and the librarian have developed deeper knowledge of the other's expertise. The librarian has an increased understanding of the resources and the science they support, which has in turn made him a more useful campus partner for other faculty, and an advocate at the University for the use of these resources, by other librarians and other faculty in the biological and medical sciences.

CONCLUSION

Bioinformatics sources have become as necessary to the genetics researcher as an electron microscope. They are used across the biological and medical sciences to determine everything from taxonomy to therapies. The data they contain is now as readily available to students as bibliographic records and full-text articles, and arguably more critical to the students' success as scientists. For the coming generations of scientists to use the resources effectively, the resources must be integrated deeply and well into the curriculum, beginning in undergraduate education.

The workshop described in this article is evidence that students can successfully use the information as early as second year, if their introduction to the material is designed to provide graduated exposure to the concepts and systems they need to understand to make use of it. The workshop and assignment lead students from the simple to the complex, from the familiar to the unfamiliar in a series of defined steps, providing a map to the information so students can develop some familiarity with the data and retrace their steps later as needed. The pieces of information student extract from these resources alert them to the highlights and particular strengths and uses of each source. The lab assignment and poster provide

students with ample opportunity to practice using the resources. As a whole, the assignments and instruction introduce students to a world of data that helps them connect their textbook learning to cutting-edge research.

The resources are available, the students are capable; it is now up to librarians to take up the challenge of stretching their skills into new domains, and expanding information literacy to include data sets such as the resources noted here.

REFERENCES

Adams, D. J. (2009). Current trends in laboratory class teaching in university bioscience programmes. *Bioscience Education, 13*, 13-3.

Amberger, J., Bocchini, C.A., Scott, A. F., & Homosh, A. (2009). McKusick's Online Mendelian Inheritance in Man (OMIM). *Nucleic Acids Research, 37* (Database Issue), D793-D796.

Boyle, J. A**.** (2004). Bioinformatics in undergraduate education: Practical examples. *Biochemistry and Molecular Biology Education, 32*, 236-238.

Corbyn, Z. (2009, September 3). The small scientist. *Times Higher Education*. Retrieved, April 2, 2010, from http://www.timeshighereducation.co.uk/story.asp?storycode=407947

Dinkelman, A.L. (2007). "See a need, fill a need" – reaching out to the bioinformatics research community at Iowa State University, *Issues in Science and Technology Librarianship, 52,* Retrieved April 2, 2010, from http://www.istl.org/07-fall/refereed1.html

Dymond, J.S., Scheifele, L.Z., Richardson, S., Lee, P., Chandrasegaran, S., Bader, J.S. & Boeke, J.D. (2009). Teaching synthetic biology, bioinformatics and engineering to undergraduates: the Interdisciplinary build-a-genome course *Genetics, 81*, 13-21.

Garritano, J.R. & Carlson, J.R. (2009). A subject librarian's guide to collaborating on e-science projects. *Issues in Science & Technology Libraries, 57*. Retrieved April 5, 2010, from http://www.istl.org/09-spring/refereed2.html

Herron, D. (2008, June). *Entrez – bridging the gap between PubMed and institutional bioinformatics course- a case study*. Paper presented at the European Conference of Medical and Health Libraries, Helsinki, Finland.

MacMillan, D. (2007). Ask an interesting question: insights from a reflective survey of senior biology students. In B.Seitz (Ed.), *Uncharted Waters: Tapping the Depths of Our Community to Enhance Learning: Proceedings of the 35th National LOEX Library Instruction Conference* (pp. 149-153). San Diego, CA.: LOEX Press.

MacMullen, J. W. & Denn, S. O. (2005). Information problems in molecular biology and bioinformatics. *Journal of the American Society for Information Science and Technology, 56,* 447-456.

McKusick, V.A. 2007. Mendelian inheritance in Man and its Online version, OMIM. *The American Journal of Human Genetics, 80*, 588-604.

O'Grady, T. 2008. Internet resources: Bioinformatics, a brief overview of resources on the web. *College & Research Library News, 69*, 404-407.

Osswald, A. 2008. E-science and information services: A missing link in the context of digital libraries. *Online Information Review*, *32*, 516-523.

Pham, D.Q.D., Higgs, D.C., Statham, A. & Schleiter, M.K**.** 2008. Implementation and assessment of a molecular biology and bioinformatics undergraduate degree program. *Biochemistry and Molecular Biology Education, 36*, 106:115.

Rapp, B. A. & Wheeler, D. L. 2005. Bioinformatics resources from the National Center for Biotechnology Information: An integrated foundation for discovery. *Journal of the American Society for Information Science and Technology, 56*, 538-550.

Tennant, M. R. & Lyon, J.A. 2007. Entrez Gene: A gene-centered "information hub". *Journal of Electronic Resources in Medical Libraries, 4(3),* 53-78.

Voet, J. G., Bell, E., Boyer, R., Boyle, J., O'Leary, M., & Zimmerman, J. K. 2003. Mini-Series: The ASBMB recommended biochemistry and molecular biology undergraduate curriculum and its implementation: recommended curriculum for a program in biochemistry and molecular biology. *Biochemistry and Molecular Biology Education, 31*, 161-16.

World Intellectual Property Organization. (n.d.). *Using patent information for the benefit of your SME.* Retrieved April 2, 2010, from http://www.wipo.int/sme/en/ip_business/patents/patent_information.htm

Digital Pioneers

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In this study, I examined how the teacher-librarians of one Canadian school district that has set as its goal to incorporate digital literacy practices within the curriculum, used the Internet in democratic, participatory, distributive, collaborative, and multimodal ways to encourage learning in different disciplinary areas and to investigate what tensions arose as a result of its imposition on the traditional structures of schooling.

Though these teacher-librarians would be considered digital immigrants according to Mark Prensky, I would argue that instead they are digital pioneers leading their students and their colleagues into unchartered territories. I prefer using the term digital pioneers over digital immigrants as it is mainly those born before 1984 who are the ones building the digital applications and the ones perceiving novel ways for them to be used. It is these digital pioneers who are paving new frontier of possibilities.

Furthermore, the notion of a generation gap between teacher librarians and their adolescent students is more of a perception than a reality as many new educators are quite close in age to their students and are part of the same generation and have many of the same cultural interest. The generation gap develops rather as a result of the identities that each party ends up forming because of the place they have taken in society (Lewis & Finders 2002).

The librarians in this study perceived themselves as leaders within their schools and community and as a result were keen to learn new technologies and implement them within their practices. Though they were two to three decades older than their students, they were significantly more knowledgeable and skilled on the internet. Consequently, they were capable of assisting their students in using the internet in democratic, participatory, distributive, collaborative, and multimodal ways.

Some example activities that the teacher-librarians set up included creating classroom wikis and blogs, filming movies and uploading them to YouTube for entry into contests, and creating information podcasts. They also started a district wide online book club for youth, set up pen pal programs, and taught information and critical literacy skills.

In reading much of the literature on the engagement of adolescents with new digital literacies, I imagined a picture of active, excited youngsters who could do anything they want as long as they were allowed access to a computer and were let free to explore. This, however, is not the image of many of the youth participants in my study. Some youth still feared new technologies and were not drawn to spending their time engaged in this manner. This lack of interest, disinclination, or fear would potentially widen the digital divide if the teacher-librarians had not played an integral role in introducing students to the many digital tools and teaching them critical literacy skills surrounding those tools.

REFERENCES

Lewis, C, and Finders, M. (2002) Implied adolescents and implied teachers: A generation gap for new times. In D.E. Alverman (ed.) Adolescents and literacies in a digital world. New York: Peter Lang, 101-113.

Visualizing for Exploration and Discovery

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ABSTRACT

In the last few years, libraries have been faced with a harsh reality in which they have been losing their users and their position as a primary information source. In the attempt to improve their services, we have witnessed a growing number of modernized library information systems, tools, and features and while libraries (or at least some of them) have made a significant step forward in this area, there is still a need for improved exploratory and discovery tools. The paper first looks into the concepts of discovery, serendipity, and exploration and how they are supported in the new generation library systems. In the second part, possible role and application of visualization for exploration is discussed and examples given from a number of existing online visual tools and services. The last part then reflects on potential uses of visualization in library information systems and gives some guidelines on designing visualization for discovery. The authors conclude with the thought that libraries should couple visualization with textual data and implement simple and small-scale visualization that would give users some more insight into the library data and at the same time invite them to explore the collections.

Keywords: exploration, discovery, library information systems, information visualization

1   INTRODUCTION

Today, users have high expectations from all services provided to them and therefore have no problem turning elsewhere when a service does not meet their strict requirements. This behaviour is not typical only of the young, but rather of all population that uses the web on daily basis. Faced with this new reality, where users have chosen the rich online environment over traditional library services and systems, libraries have been forced to reflect on their current services. With the demanding and unforgiving google generation users and the rapidly developing technology, libraries have realized they needed to improve their online presence and services and make better use of their data. Libraries do hold and produce a vast number of valuable data that could be better exploited and used to libraries' advantage over other information providers. We know that going beyond simple known-item search systems is a must and developing more effective and innovative tools for exploration is one of the areas where libraries could put their specific knowledge and data into good use. Faceted navigation, suggested titles, and tag clouds have proven to be one possible way to enhance users' navigation and exploration, but with the growing numbers of library materials and users, who demand easy access and high performance systems, there is still a need for further development. We believe that with the people's growing preferences for visual information and the potentials of information visualization for exploration, libraries should look into ways to visualize at least some of the data in their information systems.

2 BEYOND KNOWN-ITEM SEARCH: THE NEED FOR EXPLORATION AND DISCOVERY

In current library information systems, users do not get full benefit from library data. The reason for that is twofold: while there is no doubt that more could be done to improve the quality of the data, our current systems in many cases do not really use the full potential of the data that we do have. In order to improve the systems' ability to support exploration and discovery, changes need to be made on both levels. This paper, however, will mainly deal with the latter, focusing on how presentation of results in user interface design could enhance exploration and discovery.

2.1 DISCOVERY & SERENDIPITY

Exploratory information seeking not only supports users' vague information needs, but can also lead to unexpected, accidental discovery of something valuable or what is often called serendipity or serendipitous discovery. Although research on serendipity in the information seeking process has been rare and serendipity has not been given a visible place in the information seeking models, it has been recognized to bear important potential in the exploratory information seeking process (Foster & Ford, 2003). The definitions of serendipity show that people often encounter it when seeking for something completely different, thus finding unexpected, needed, or just interesting information that can result in an unexpected change in the direction of their search (McBirnie, 2009).

André et al. (2009) define serendipity as:

1) the finding of unexpected information (relevant to the goal or not) while engaged in any information activity
2) the making of an intellectual leap of understanding with that information to arrive at an insight.

In their paper André et al. (2009) argue that while the second half of definition depends largely on an individual's previous knowledge and ability to use information and make the connection, we should design our systems to aid the first part of the serendipity process: the discovery of new pieces of information that would most likely encourage the creation of unexpected connections.

2.2 EXPLORATORY INFORMATION SEEKING

Exploratory information seeking can be defined as a class of search activities that move beyond fact or known-item retrieval towards fostering learning and investigation, generally using a combination of querying and browsing strategies (White et al. 2006a; 2007). Also Wilson et al. (2007) mark investigation and learning as the two most important actions in exploratory information seeking, both requiring large user involvement and a range of activities such as comparison, aggregation, and evaluation.

Designing exploratory search systems, we therefore need to think about ways to support this interactive and dynamic process between the user, the system, and the information sources. As Schraefel (2009) well puts it, our tools must go even further than "people who read a also read b" and tell searchers what they do not know but should.

Considering the question of how user interfaces should support exploratory information seeking, Marchionini (2006) suggests tools for:

a) query development and improvement,
b) navigation,

c) organization,

d) and visualization.

There are also others that suggest some or all of these features. Authors such as Kules (2006) and White et al. (2007) promote organization and navigation as two of the basic elements for exploratory information seeking. As they explain it, meaningful groups or categories have a good potential for supporting user exploration, understanding, reflection, and discovery by providing a semantic roadmap to knowledge creation and improved learning (Kules 2006; Kwasnik, 1999; Kules & Shneiderman, 2008; Koshman et al., 2006). White et al. (2006b; 2007) further argue that navigation is a crucial part in supporting exploratory search as users benefit from interfaces that offer browsing, dynamic queries, guided navigation, hypertext, and visual representation of the space. Also Shneiderman (2008), Kules (2006), and Schraefel (2009) see potential in integrating interactive information visualization to support insight, facilitate rapid refinements of queries and allow users to research questions that are not very easily expressed in keyword search.

Anick (2008) and Schraefel (2009) add to the basic list some additional supporting tools such as: longer snippets (for supporting the learning phase in exploratory search), recommendations, tools for marking and remembering useful documents, and tools for collaborative knowledge building, all of which are not really exploratory tools in themselves, but can support the investigating and learning process in exploration.

3   SUPPORTING EXPLORATION IN NEW GEN LIBRARY SYSTEMS

In new generation library systems we have witnessed some interesting features that have the ability to support exploration and discovery. Unfortunately their creation cannot really be contributed to libraries themselves as most of the tools first appeared on the web and have only later been recognized and adopted by libraries.

One of the most noted exploratory tools in the last few years has been the faceted search (e.g. Wilson & Schraefel, 2008; Kules, 2006), which has, according to Lemieux (2009) and Medynskiy (2009), become a de facto standard and so ubiquitous that users are coming to expect it. Ben-Yitzhak et al. (2008) describe it as an interaction paradigm for discovery and mining, where the user is able to start search, refine a search query, or navigate through multiple independent categories that describe the data by drill-down (refinement) or roll-up (generalization) operations. But while faceted navigation has most often been noted as a technique that supports exploratory information, Zhuge & He (2009) argue that it is poor in schema flexibility and lacks rich semantics needed to fulfil the exploration task, such as advanced operations for exposing relations among resource sets. We believe that information visualization could fill this void.

Besides faceted navigation, there are also other features we can describe as exploratory, such as recommendations and featured items lists, query suggestions, and social navigation. University of Huddersfield library catalogue has even developed a visual shelf that enables users the kind of browsing they would experience in a physical library.

3.1   EXPLORATION AND DISCOVERY USING VISUALIZATION?

As we have reported in previous chapters, visualization is believed to be a promising tool for exploring data in order to gain understanding of the data and the phenomena behind them (Purchase et al., 2008; André et al., 2009; Beale, 2006). The argument for the use of visualization is therefore that it presents an interactive mechanism for browsing, exploring,

and analysing which increases people's ability to perform these activities, thus helping them overcome large information spaces, build new knowledge, as well as discover and understand relationships and the information space.

The idea of information visualization has been around for more than two decades, but even though visual presentations are supposed to enable people to process the data quicker and better by diminishing the cognitive load, studies so far have not been able to really prove its superiority over linear information presentation. What is also concerning is that already established information visualization systems such as Grokker and Kartoo closed down in the last couple of years.

Admitting that visualization attempts in library systems and elsewhere have not yet proven very successful, one could conclude that visualization may not be the solution we are looking for. However, the discouraging results may not necessarily lie in the visualization concept itself, but in the way visualization was designed and implemented. As Kules (2006) wrote, designers have too often experimented with all the possibilities of what could be done instead of creating what should actually be done. While it is difficult to make such claims without a proper in-depth study of existing experiments, we must realize that poor design and usability have very likely attributed to the current status of visualization.

4   EXAMPLES OF CURRENT VISUALIZATIONS ON THE WEB

To get a better understanding of the current use of information visualization in search systems, we will look at some examples currently available on the web (figures can be found in Appendix).

EYEPLORER

Eyeplorer (Figure 1) searches Wikipedia and MEDLINE/PubMed database, processes the retrieved sites, pulls out the main concepts and organises them in categories. Holding a mouse over a node displays an explanation on how the concept relates to our query and clicking on a term shows relations with other concepts. These relations are not only indicated with lines as it often happens in visualizations, but can also give a textual explanation as clicking on a link brings forward a description of the connection. The system is quite novel and managed solely by computers, so the results and descriptions vary in their quality and accuracy. Nevertheless, we can say that Eyeplorer presents a good idea of what information visualization system should offer: it gives clear overviews of the most important topics, shows and even explains relations and enables users to interact with the visualization.

LIVEPLASMA & TUNEGLUE

Both, Liveplasma and Tuneglue show clusters of related entities. Similar to Eyeplorer, which advertises its services with a slogan "Explore relationships", the two tools also describe themselves as exploratory in nature: Tuneglue as "relationship explorer" and Liveplasma as "discovery engine". Tuneglue (Figure 2) focuses only on musical artists and displays entities that are related to the chosen artist/band. It does not, however, offer the user much interactivity with the results, take advantage of visual properties (such as colour, size, proximity) or give information on the nature of relations between entities. We might assume that if we liked one artist, we would also like related artists, but beyond that relationships are not made clear to the user. Whether they were made on the basis of music genre, popularity, time period, or some other attribute therefore remains unanswered.

Liveplasma on the other hand, offers music as well as movie exploration. In displays for music (Figure 3), users are presented with the artist/band nods of different sizes according to the popularity of the artist but again no explanation is given on the nature of relationships or the meaning of node's colour. For movie search (Figure 4), the situation is somewhat better as the legend explains which colour belongs to which movie genre and how the line colour is used to differentiate between the person's roles in a movie: violet line for movie director and yellow line for actors. When searching for movies, the retrieved visual display shows related movies and movie directors, and when searching for a director/actor it presents the person's opus. Both Liveplasma and Tuneglue enable interaction with the visualization, Tuneglue only to the extent that the user can expand a chosen entitiy while Lieplasma enables expansion as well as formulation of a new query by clicking on the chosen entity.

MUSICOVERY

Another tool for music discovery is Musicovery (Figure 5). The most interesting feature it offers is certainly the visual browsing bar where it is possible to define either the mood or dance tempo within a kind of coordinate system. Depending on the chosen value, the system then displays results, colouring them according to the music genre. The visual display of results itself is not a visualization that would produce any additional information, interaction options for the user, meaningful relations, or use other visualization parameters to communicate information, so the value of the system really lies in its ability to browse using the visual mood/tempo feature.

TOUCHGRAPH

Visualizations for books are few and hard to find on the web. Touchgraph is a visualization tool that provides online visualizations for movies, music, and books based on Amazon data. Figure 6 presents an example of results display that has been expanded to more similar items by clicking on some of the nodes. The size of the cover reflects the sales rank and colour is used to show clusters where an item is a recommended purchase for another item. Using the visualization itself, users can only expand the search results, while they need to use bars on the left in order to refine the search. On the left there is also a detailed description of the chosen result, but as with other visualizations, it is still difficult to guess for a user how some item relate to each other or what exactly are the differences between items with the same title based solely on the visualization.

The presented tools deal with data similar to our library information systems. While their final aim is, as they all claim, exploration and discovery, there are some differences in their approaches. Some systems are quite simple and limited in the amount of presented data (for example Tuneglue only shows the names of related artists) while others provide somewhat more information either on the chosen nods or the relationships between them. Beside the content level they also differ in their execution. In opposite to all others who visualized result lists, Musicovery for example decided on using information visualization as a dynamic query option. Further looking at the options for interaction and modification, Touchgraph and Eyeplorer used the most options that enable users to not only refine the contents, but also to control the display itself. In Touchgraph users have the possibility to determine the size and colour of clusters and spacing between the nods and in Eyeplorer they can drag and drop interesting explanation from the visualization into their notebook, drag a node into a query field and thus form a new refined search, they can also choose the number of concepts they wish shown or just the cluster that they want to take a closer look at (for example only Science or People cluster). In all systems except Eyeplorer we have missed some sort of

explanations on both the content and the way visualization was constructed as the lack of that information gave us the feeling that we cannot really take the full advantage of the system.

While some visualizations were better planned and executed than others, they all showed us several problems we can encounter in design of visualizations. One is the lack of information that would enable users to understand the visualization (such as explanations of relations, used colours…) and the other is the lack of textual data that would give more information about the domain and thus bring users new knowledge and support the exploratory process. Many of the presented examples exploited only a fraction of visualization possibilities, which goes against Tufte's (1990) fundamental rules for visual displays, which says that every pixel on the screen should be information bearing. The presented visualizations also offered little interaction and customization options, thus limiting the amount of information that visualization could communicate to the user.

A quick look into a few visualizations found on the web showed that making visualizations work is a difficult task that requires a well-planned information architecture and interaction design as well as appropriate visual presentation. We must also consider the quality of our underlying data (which we know is likely to be a problem in many library databases) as, similarly to other groupings and automated procedures, small mistakes or even inconsistencies are quickly revealed in visualized displays and may misguide users or take away some of the usefulness of visualization.

5 POSSIBLE APPLICATIONS OF VISUALIZATION FOR EXPLORATION IN LIBRARY SYSTEMS

When thinking about visualization in library systems, we should consider two aspects:

 a) what functions/features could benefit from visualization and
 b) how should visualization be designed in order to be enable easy and intuitive use.

5.1 FUNCTIONS THAT COULD BE VISUALIZED

Looking at library catalogues, we have seen that visual information is gaining importance with simple visualizations such as tag clouds, time sliders for refining search, featured cover displays of new acquisitions, recently borrowed items, book shelf display etc., and even a sort of vocabularies ("word cloud" in Aquabrowser). Considering other visualization possibilities, there are various options as to how visualisations could assist and encourage user's exploration and discovery in library information systems. The key with visualizations is that we use already existing relationships or relationships that can be derived from our data to improve methods for displaying, organising, and browsing information (Kipp, 2008). So far we have not really put the mass of data already available in our databases to a good use, which is why visualization seems a good way to make our data work harder (if we borrow Lorcan Dempsy's phrase). That is why we are currently researching the possible use of visualization for the display of frbrized records (see Merčun & Žumer, 2009) that could present a network of relations connected to the chosen entity (for example expressions and manifestations of a work, works deriving from or preceding a work, related authors and topics etc.).

There are also other possibilities that, to some extent, depend on the type of system, the content it holds and users it serves. The needs of an academic or governmental library system are, in many cases, completely different from systems such as public library catalogues or digital libraries. Academic and research information systems could, for example, benefit from bibliometric visualizations that have already been quite extensively tested in various

prototypes. On a more general note, we could visualize data such as circulation, personalized suggestions based on user's search history and borrowed items, or thesaurus display and subject categories. In 2.0 participatory systems, visualizations could also be applied to social features such as user-created lists and user profiles, making a network that would help people find other potentially interesting books or users. In case we had full text, visualization of content would be useful; it would also be really exciting to implement something similar to Musicovery's mood/tempo navigation with different values according to media and type (for fiction works maybe attributes such as sad-happy ending, easy-difficult read), but that would probably require some additional metadata descriptions and manual positioning. Similarly to the examples we presented in the previous chapter, library systems could also enable users to explore similar artists, writers or movies via a visualized presentation. We could even introduce geovisualization to our systems and allow users to explore literature or music via maps.

Generally looking at the features and functions, visualization can aid the exploratory process in various levels of information seeking. By its function, we could say that visualization can take up different roles. It can be the central point of the system, presenting overviews of the collection and search results, allowing us to browse and explore records by interacting with the visualization or it can have an assistive or auxiliary function that visualizes other potentially interesting data or helps with queries or browsing.

5.2 HOW TO DESIGN VISUALIZATION?

Once we have decided on what functions or features could be visualized, we need to think about how to plan the system to reach its full potential. Designing a useful visualized display, we must consider three perspectives:

- textual data,
- visual appearance, and
- interactivity of the interface.

While the central point of visualization is the graphical presentation of data, planning the role of **textual data** is just as important. Kules (2006) even argues that it is the general lack of textual data in visualizations that has contributed to the disappointing results of information visualization. There are several questions to contemplate, such as: how to integrate textual data into what is essentially a graphical presentation of a large amount of data, what labels to use, and how much and what textual data is needed to support visualization. Only with some textual explanations will users gain more understanding of the visualization and knowledge of the explored topic. This may not be as necessary in visualization systems for experts on very specialized areas (where information visualization has really been most used so far), but when we are moving into more general environment such as libraries, we believe a combination of text and visual presentation is required.

For the **visual appearance** we choose the visualization technique, the size and granularity of visualization, and decide on parameters such as colours, node size, link strength and elasticity. The nature of underlying data (hierarchical, network, linear …) and the purpose of our visualization (do we want to expose links or do we want to emphasize the main trends etc.) help us determine which technique would best present the values of the dataset. The size and granularity of visualization are also important as displays can soon become illegible with all the visual clutter and make it difficult for users to perceive and comprehend all the elements on screen. Whether we display a general overview or only a smaller fraction of data, there should be only the amount of information that still stimulate human cognitive abilities.

As for the colours, sizes, and proximity, they are the elements that can be used to communicate some of the information that should otherwise be explained textually.

Some implementations stop at the graphic presentation of data, a picture giving the user a general overview but missing, in our opinion, the crucial element that gives information visualization such potential: the **interactivity** - the ability for the user to interact with the display and learn through it. Also Ahlberg and Schneiderman (1994) write that the key principle of visual information seeking applications is to support browsing which enables rapid filtering to reduce result sets, progressive refinement of search parameters, continuous reformulation of goals, and visual scanning to identify results. The real power of visualization is therefore not in the passive displays, but in dynamic and flexible interfaces that enable users to indicate what is interesting and what is not and provide users with data that are needed for identification and explanations of the data that are understandable. Planning the visualization, we should therefore map and predict how the session can evolve with the human interaction and what customization options should be available to the user.

6   CONCLUSION

Visualizing information could be the next step in mining the data library holds either on the collection itself or the use of that collection. The biggest mistake with information visualization in the past has probably been the fact that visualizations have been too complicated to intuitively understand and very often too extensive to enable effective manipulation and exploration. What we would suggest at this point is that libraries try with small scale visualizations coupled with textual data and use them as supporting tools that invite users to further explore the collection and at the same time give them a better insight into library data. Much of the success lies in the hands of designers and librarians that need to make sure visualizations are well planned, attractive, useful, and usable. People are becoming increasingly visual beings that have come to expect interactive and discovery tools. If libraries want to keep up with other information sources on the web and offer their users the best possible service, they need to explore new possibilities and design services that will lead their user interfaces onto the next level.

BIBLIOGRAPHY

Ahlberg, C. & Schneiderman, B. (1994). Visual information seeking: tight coupling of dynamic query filters with Starfield displays. In *Human Factors in Computing Systems CHI '94 Conference Proceedings*, (pp. 313-317).

André, P., Schraefel, M.C., Teevan, J. & Dumais, S.T. (2009). Discovery is never by chance : designing for (un)serendipity. In *C&C '09: Proceedings of the Seventh ACM Conference on Creativity and Cognition* (pp. 305-314).

Anick, P. (2008). From web search to exploratory search: can we get there from here? *Information Seeking Support Systems Workshop: an international workshop sponsored by the National Science Fundation*. Retrieved from http://ils.unc.edu/ISSS/papers/

Beale, R. (2007). Supporting serendipity: using ambient intelligence to augment user exploration for data mining and web browsing. *Int. J. Human-Computer Studies* 65, 421-433.

Ben-Yitzhak, O., Golbandi, N., Har'El, N., Lempel, R., Neumann, A., Ofek-Koifman, S., Sheinwald, D., Shekita, E., Sznajder, B., & Yogev, S. (2008). Beyond basic faceted search. In *Proceedings of the international conference on Web search and web data mining* (pp. 33-44). ACM.

Foster, A. & Ford, N. (2003). Serendipity and information seeking: an empirical study. *Journal of Documentation*, *59*(3), 321-340.

Kipp, M. (2008). LIS 512: Introduction to Knowledge Organization. Retrieved from: http://wotan.liu.edu/home/meik/512/512fall2008.html

Koshman, S., Spink, A. & Jansen, B.J. (2006). Web searching on the Vivisimo search engine. Journal of the American Society for Information Science and Technology, *57*(14), 1875-1897.

Kules, B. & Shneiderman, B. (2008). Users can change their web search tactics: design guidelines for categorized overviews. *Information Processing and Management*, 44, 463-484.

Kules, W.B. (2006). *Supporting exploratory web search with meaningful and stable categories overviews.* Dissertation. College Park: University of Maryland.

Kwasnik, B.H. (1999). The role of classification in knowledge representation and discovery. *Library Trends*, *48*(1), 22-47.

Lemieux, S. (2009, March 1). Designing for faceted search. *KMWorld*, 18(3). Retrieved from http://www.kmworld.com/Articles/Editorial/Feature/Designing-for-faceted-search-52781.aspx

Marchionini, G. (2006). Exploratory search: from finding to understanding. *Communications of the ACM*, 49(4), 41-46.

McBirnie, A. (2009). Seeking serendipity: the paradox of control. *Aslib Proceedings: New Information Perspectives*, *60*(6), 600-618.

Medynskiy, Y., Dontcheva, M. & Drucker, S.M. (2009). Exploring websites through contextual facets. In *Proceeding of CHI: ACM Conference on Human Factors in Computing Systems* (pp. 2013-2022).

Merčun, T. & Žumer, M. (2009). Visualizing FRBR. In *Libraries in the Digital Age, LIDA 2009, May 25-30 2009, Dubrovnik and Zadar Croatia* (pp. 209-215).

Purchase, H.C., Andrienko, N., Jankun-Kelly, T.J. & Ward. M. (1998). Theoretical Foundations of Information Visualization. In Information *Visualization: Human-Centered Issues and Perspectives*, Lecture Notes In Computer Science, vol. 4950 (pp. 46-64). Berlin, Heidelberg : Springer-Verlag.

Schraefel, M.C. (2009). Building knowledge: what's beyond keyword search? Computer, *42*(3), 52-59.

Shneiderman, B. (2008). Research agenda: visual overviews for exploratory search. *Information Seeking Support Systems Workshop: an international workshop sponsored by the National Science Fundation*. Retrieved from http://ils.unc.edu/ISSS/papers/

Tufte, E. (1990). *Envisioning information*. Cheshire : Graphics Press.

White, R.W., Hearst, M., Drucker, S.M., Schraefel, M.C. & Marchionini, G. (2007). Exploratory search and HCI: designing and evaluating interfaces to support exploratory search interaction. *Conference on Human Factors in Computing Systems, CHI '07 extended abstracts on Human factors in computing systems*. ACM.

White, R.W., Kules, B., Drucker, S.M. & Schraefel, M.C. (2006a). Supporting exploratory search. *Communications of the ACM*, *49*(4), 37-39.

White, R.W., Muresan, G. & Marchionini, G. (2006b). Evaluating exploratory search systems. In *Proceedings of the ACM SIGIR 2006 Workshop on "Evaluating Exploratory Search Systems"* (pp. 1-2). Retrieved from http://research.microsoft.com/~ryenw/eess/

Wilson, M.L. & Schraefel, M.C. (2008). A longitudinal study of exploratory and keyword search. In *Proceedings of the 8th ACM/IEEE-CS joint conference on Digital libraries* (pp. 52-55). ACM.

Zhuge, H. & He, C. (2009). *Faceted exploration of emerging resource spaces*. Retrieved from: http://arxiv.org/ftp/arxiv/papers/0903/0903.1680.pdf
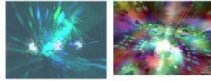
APPENDIX

Figure 4: Visualized display of results in Eyeplorer groups results, indicates the node's importance with size and provides also explanations of relationships.
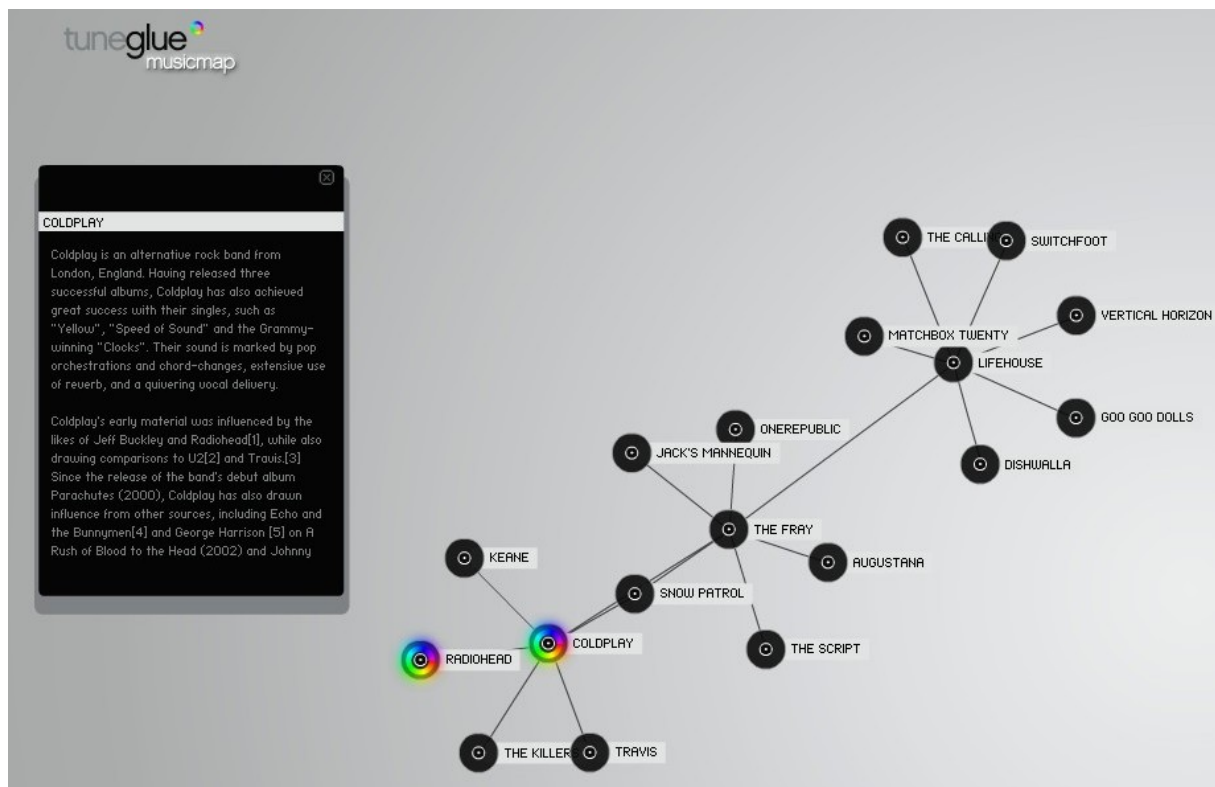
Figure 5: Tuneglue display of related artists does not use the full potential of visualization options.
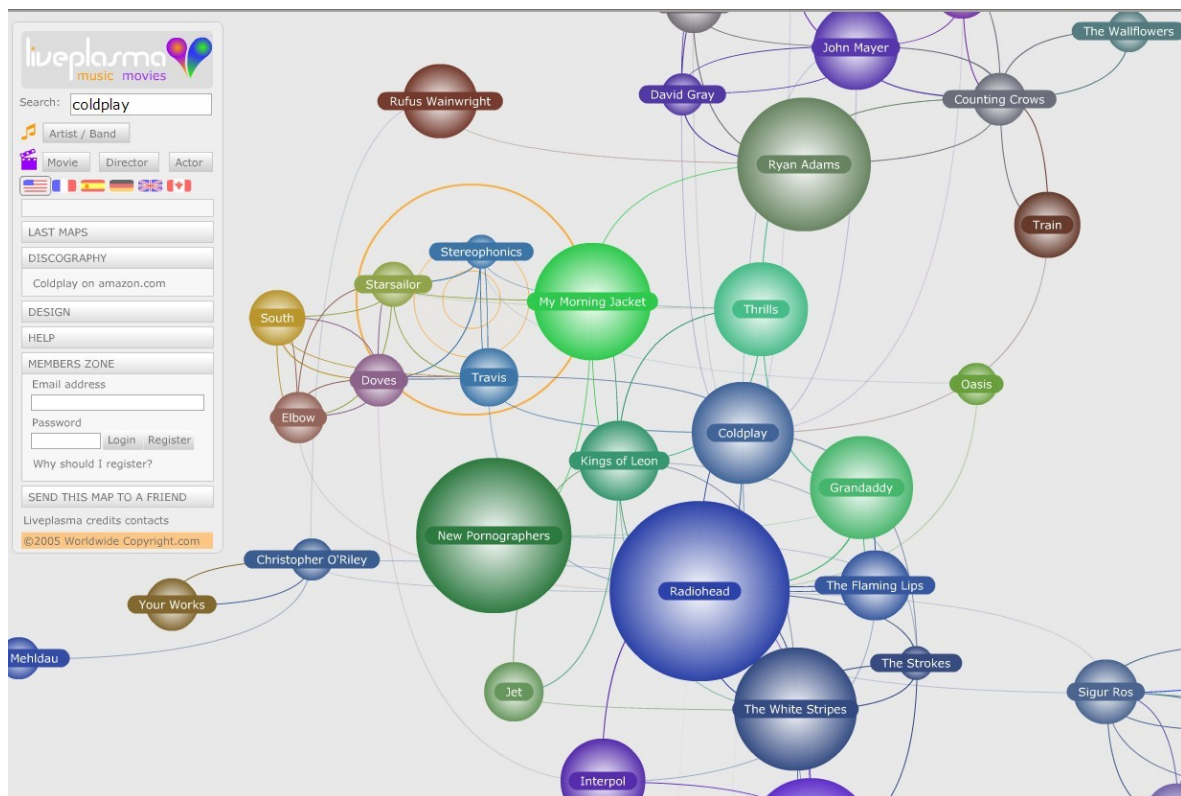
Figure 6: Liveplasma network display for related bands/artists uses proximity and node size parameters.
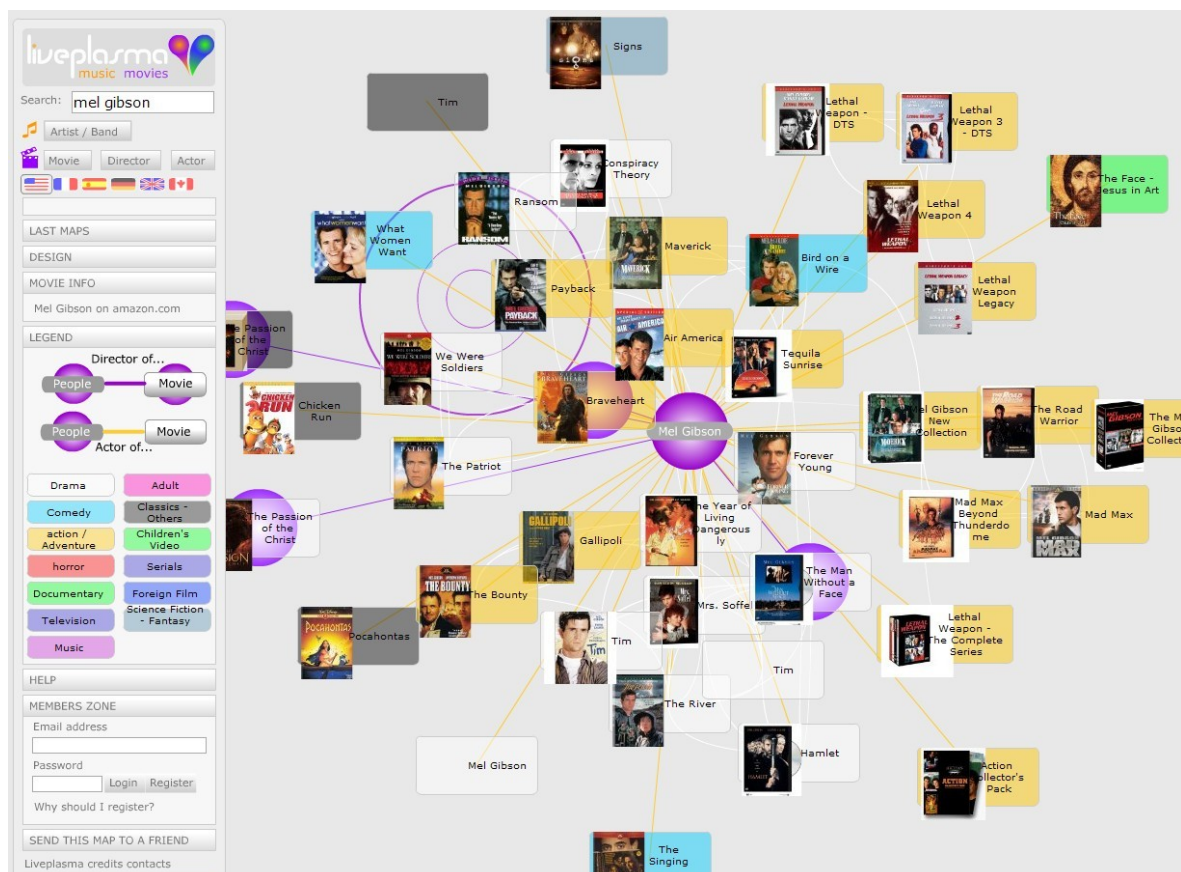
Figure 7: Liveplasma display for movie search uses colour to differentiate between relationships (director vs actor) and movie genres.
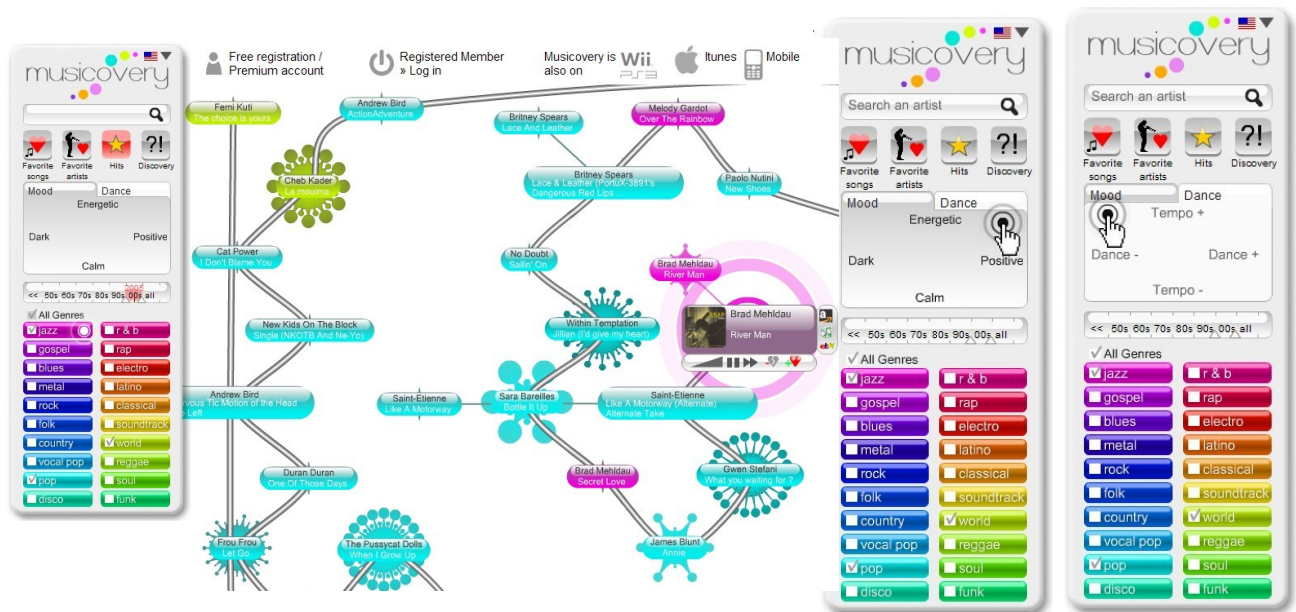
Figure 8: The value of Musicovery lies in the visual touchpad for defining the desired mood or dance tempo, while the display of results serves a more aesthetic than informative purpose visualization should provide.
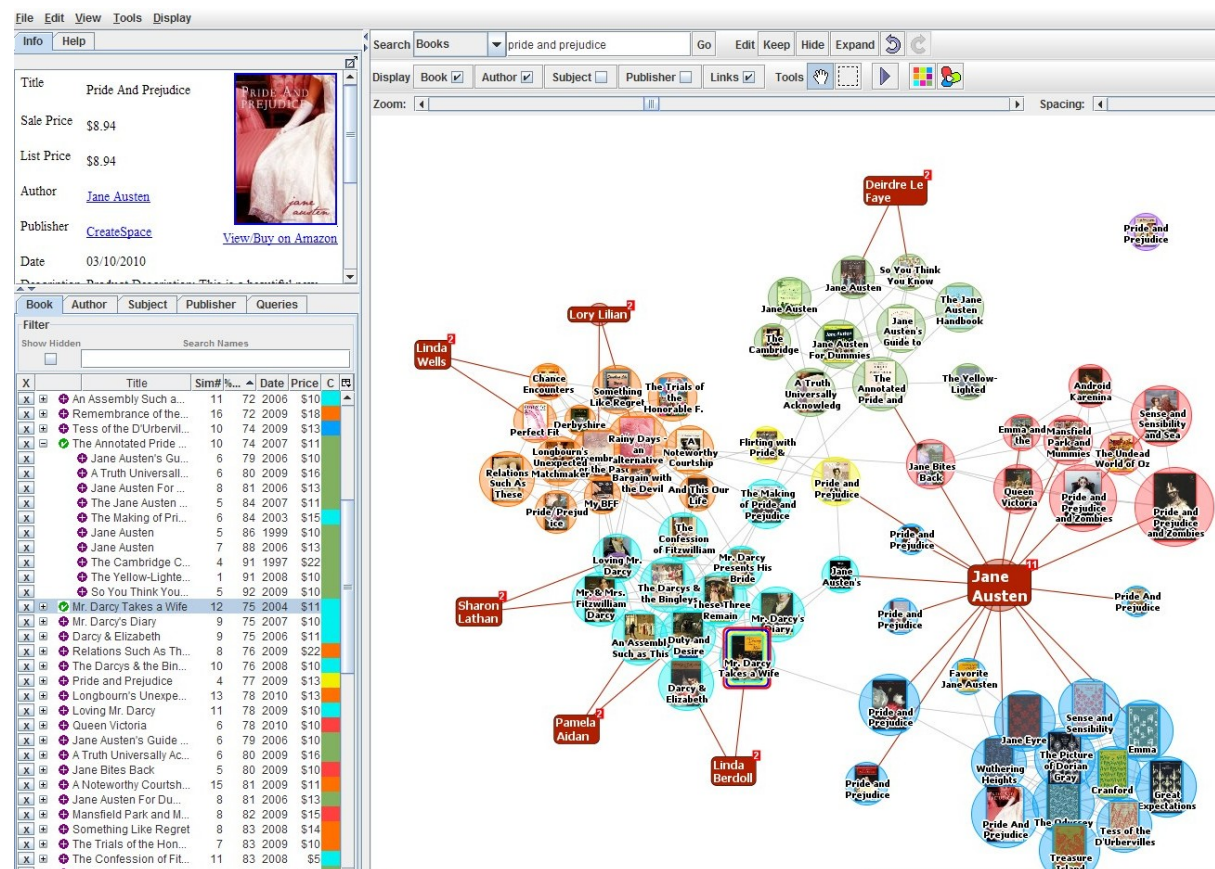
Figure 9: Touchgraph presents grouped networks of related books which the user can expand on or refine. Additional data on the chosen node are presented on the left handsite, but the user may miss explanations of the established relations.

Could Social Tags Enrich the Library Subject Index?

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ABSTRACT

Social tagging aims to generate folksonomies through the users' collaboration and activation. This paper is motivated by the trend of several libraries to adopt social tagging functionalities and presents a tag analysis study aiming to exploit a social tag collection for the benefit of the subject description of an academic library material. In this context, cataloguers are interviewed to assess the semantic value of the concepts expressed by the set of social tags and discuss the possibility of their incorporation in the well-formed and structured library authority file.

1. INTRODUCTION

Web 2.0 enables users to index resources and organize information according to their own background and needs. While up to now information resources were described, organized and classified, either by experts, or by their creators, nowadays users produce new sets of metadata by adding to the resources uncontrolled keywords, which are referred as "tags". The association of tags to resources is named social tagging and generates folksonomies. A folksonomy is a flat classification system using as descriptors the tags created by the users collaboratively.

The phenomenon of social tagging appeared in blogs and social bookmarking sites, but nowadays has been expanded to information organizations such as libraries, museums and archives, which use tags along with their knowledge organization systems (KOS). This trend affects the scholar communication and information seeking behavior and this is evident by the increasing number of social bookmarking sites for scientific material as well as the number of academic libraries that use such technologies. Recently many pioneer libraries are inspired by the Web 2.0 technologies and their catalogues (OPAC) provide a set of key features, promoting digital scholarship and encouraging their user communities to collaborate. Given that an increasing number of libraries develop social tagging systems (Penn Tags, SOPAC, MTagger, etc.) in parallel to their traditional services, a key issue concerns the impact of social tags to the subject indexing process of an information organization.

This paper introduces OPACIAL (http://library.panteion.gr/opacial/), an OPAC system enhanced by Web 2.0 features, developed by the Panteion University Library, Athens, Greece and aims to investigate (a) whether the social tags correct, enhance or refine the subject description of an academic library collection and (b) how the social tags could improve the library's local authority file. For this purpose it presents the results of a study, which analyzes

the tags associated with a representative sample of 30 bibliographic records. The tags belong to OPACIAL and LibraryThing (http://www.librarything.com/), a social cataloguing web-based service that supports the tagging of bibliographic records. In the study the library's subject cataloguers were interviewed to (a) assess the semantic value of the tags with respect to the corresponding subject headings that describe thematically the selected bibliographic records, and (b) suggest alternatives to exploit the tags for the benefit of subject indexing. The next section presents the research that focus on the correlation of folksonomies and subject indexing, while section 3 describes OPACIAL. In section 4 the experimental setting of this study is presented and its findings are described in section 5. The conclusions derived by this experiment are presented in section 6.

2. RELATED WORK

Many scientists foresee possibilities and dynamics in tagging (Quintarelli, 2005; Mathes, 2004; McCulloch & Macgregor, 2006) but at the same time they recognize significant limitations. The current state of the art on the semantic correlation between folksonomies and knowledge organization systems (KOS) centers upon the analysis and integration of user, creator, expert and machine generated vocabularies.

Kipp (2006) compared the vocabularies of users, authors and cataloguers analyzing tags on CiteULike, a social bookmarking site specialized on academic articles. She correlated the tags associated to specific articles with author keywords and thesaurus descriptors and she showed that user tags are related to the author keywords and cataloguers subjects, and the majority of tags were broader or new terms. Lin, Beaudoin, Bui, and Desai (2006) compared social tags with controlled vocabularies and title-based automatic indexing in three empirical studies. They observed overlaps among the three approaches and investigated how tags could be categorized to improve the searching and browsing effectiveness. Moreover the study of Al-Khalifa and Davis (2007) showed that the folksonomy tags overlap significantly with the human generated keywords in contrast to the automatically generated.

Heckner, Mühlbacher and Wolff (2008) created a document classifier for a collection of articles from Connotea, based on the linguistic and functional aspects of tag usage, as well as on the relationship between the tags and document's full text. The classifier was applied to approximately 500 randomly selected tagged articles from the information and computer technology domain and the findings demonstrated a great overlap between the tags and text. Voss (2006) explored the similarities and differences between Wikipedia, folksonomies and traditional hierarchical classification systems (e.g. Dewey Decimal Classification) and he concluded that Wikipedia's category system constitutes a thesaurus based on a special combination of social tagging and hierarchical subject indexing.

Yi and Chan (2009) investigated the relation of the LCSH and social tags selected from Delicious. The study of the tags distribution over LCSH concluded that LCSH "may greatly enhance the collaborative tagging systems information control process" and "it is possible to connect collaborative tagging systems with OPACs or digital libraries". Thomas, Caudle and Schmitz (2009) performed also a comparison of social tags with LCSH. They report an effort of the librarians of the Cataloging Department, Auburn that compares the social tags and LCSH assigned to a sample of ten books in problematic subject areas across a sample of libraries. The analysis followed a combination of tag classification criteria mentioned by Golder and Huberman (2006) and Kipp (2006).

LibraryThing (http://www.librarything.com/) is a social cataloguing web application permitting the tagging of the bibliographic records. The inserted tags are used for organizing personal book collections, recommending related books, linking editions and translations of a

work, etc. According to (Mendes, Quinonez-Skinner & Skaggs, 2008) the usage of LibraryThing tags might transform an OPAC from static to an open, interactive and usable site. LibraryThing content has been used by several tag analysis experiments and innovative systems. For instance EnLibS system, which expands users' queries with tags from LibraryThing in order to reduce the high percentage of the failed queries (Pera, Lund, & Ng, 2009). Smith (2007) explored the relationship between folksonomy and subject analysis in a study of LibraryThing tags and Library of Congress Subject Headings (LCSH) associated with the same documents. Her results showed that the tags identified latent subjects. Finally Lawson (2009) compared the 31 top-level subject divisions and the tags from Amazon.com and LibraryThing associated with a sample of 155 books and she claimed that social tagging enables librarians to partner with users to enhance subject access.

3. THE OPACIAL SYSTEM

The presented experimental study is based upon the tags inserted to OPACIAL, an OPAC system enhanced with Web 2.0 features, developed by the Panteion University Library, Athens, Greece. The added-value features of OPACIAL include tagging functionalities, folksonomy-based navigation to the library material, as well as tag searching (Figure 1 shows a small part of the tag cloud of OPACIAL). Successive tag selections operate as faceted information retrieval and narrow down the retrieved records. Furthermore OPACIAL provides user annotations, ranking functionalities and use of reference tools. The users are able to annotate and rank each resource (on a 1 to 5 scale) and to export a record to external social networking sites by using a social networking site aggregator, like Socializer.

A significant feature of OPACIAL is the integration of OPAC records with the ones of the University's digital repository, named Pandemos and also deployed by the Library. Thus, for each OPAC record the user is capable to retrieve similar digital objects.

Figure 1: *Part of OPACIAL's tag cloud*

OPACIAL has been evaluated by an technology acceptance experiment (Gavrilis, Kakali & Papatheodorou, 2008), in which twenty users (post graduate students and faculty members) used all its functionalities for a week, inserted more than 500 tags and finally were interviewed to assess the system usability and usefulness. The results of this experiment were encouraging since the users declared that they are satisfied by the offered service and consider useful and reliable the information searching using tags. Moreover they prefer to use both the tags and library subject index in information seeking. Given these findings the tags

inserted by these users were analyzed in order to explore and categorize their tagging behavior. The results emerged that users insert tags to either correct, or complement weak subject descriptions.

These promising results triggered the design of the presented experiment, which aims to survey the subject cataloguers' opinion concerning the impact of the user community vocabularies to the local authority file evolution and the definition of a policy to converge the user-based and the expert-based subject indexing approaches.

4. EXPERIMENTAL SETUP

The Panteion University library's authority file consists of up to 100,000 entries – most of them translated in Greek language from LCSH – and the majority is interlinked by references of broader, narrower and non-preferred terms. The authority entries correspond to a collection of 80,000 titles of books, serials, video, and grey literature specialized on social and human sciences. For the investigation of the mentioned issues a representative random sample of 30 socially tagged bibliographic records was selected, which carried 72 subject headings, 66 being unique. The 18 records correspond to books written in English, 1 in French and 11 in Greek language.

Totally 540 tags were gathered, 120 being from OPACIAL and 420 from LibraryThing. The distribution of the tags over the bibliographic records is as follows: 12 records has been annotated exclusively by the OPACIAL tags, 8 records has been annotated only by LibraryThing tags and the rest 10 carry tags from both folksonomies.

The bibliographic records along with the corresponding subject headings and the associated tags were presented in a tabular form (Table 1 presents a part of the data) and given to the 9 subject cataloguers of the Panteion University Library. Regarding their profile, they all hold a BSc on librarianship, 1 holds a second BSc on History and 4 of them hold a MSc on Information Science. All of them are women and 3 of them have more than 15 years professional experience, 2 have an experience between 6-10 years and 3 are junior cataloguers. Most of them acquainted with social tagging due to OPACIAL, while 4 of them are familiar with social networking applications.

The cataloguers had to study the thematic description and the tags associated with each record in a period of a week; then each cataloguer was interviewed. The interview was structured in three axes:

(A1): Comparison of the expressiveness and usefulness of the OPACIAL and LibraryThing tags.

(A2): Assessment of the semantic value of both the OPACIAL and LibraryThing tags, with respect to the corresponding subject headings of the selected records. The focus of the discussion was on whether the tags (a) are identical to a part of the subject description of the selected documents, (b) are identical to some subject descriptors of the authority file but disjoint to the description of the selected documents (c) correct the subject description of the selected documents, (d) enhance the subject description of the selected documents. The enhancement of the subject description by a tag is defined as either

(i) the tag introduces a new descriptor; it might be synonym, broader or narrower to the terms of the subject description, or

(ii) the tag is identical to existing descriptors and disjoint to the terms of the subject description; it might to be correlated to the terms of the subject description with equivalence, hierarchical or association relations.

(A3): Exploitation of the social tagging in subject indexing and the development of a social tagging policy by the library. Indicative questions of this axis are:

(i) does social tagging upgrade the library information access services,

(ii) whether the library should encourage its users to insert social tags and why,

(iii) how a library could incorporate social tags in its authorities; by creating new subject headings; by correlating existing subject headings; by correcting/modifying the translation of the subject headings to the local language according to the user communities vocabulary evolution.

The first two were closed questions aiming to disambiguate the participants' opinion about the usefulness of social tagging. These attitudes were recorded using 7-point Likert scale, with 1 being in the negative side and 7 being the positive. Finally each interview had an average duration 30 – 40 minutes.

5. RESULTS

Concerning the first axis (A1) the interviews proved that OPACIAL has more representative and accurate tags than LibraryThing. The librarians found a number of pointless expressions and misunderstood some of the tags of the LibraryThing's clouds. In particular they "vote" for the 60% of OPACIAL tags are useful and more precise and 40% for LibraryThing. However the OPACIAL percentage increased after the exhaustive enumeration and examination of the tags.

This finding is explained by the fact that OPACIAL hosts material focusing on social sciences and serves a scholar community that uses a specialized vocabulary. On the other hand LibraryThing is a general-purpose collaborative cataloguing service, thus carries several tags that do not add value to the subject description. For instance 20 (out of the 420) LibraryThing tags represent the taggers instead of the subject of the documents (e.g. Norton, wanted), or are too general terms (e.g. book). Furthermore some tags are identical to the last names of authors, editors, or personal names as subject. Finally a couple of them are annotations instead of tags since they are phrases, comments or definitions.

Regarding axis (A2), all librarians confirmed that in general the tags enrich the subject description of the documents. The tags supplement the thematic description of most documents, while a librarian said, "they complement the information" of the books. However they hardly discerned a trend of the users' tags to correct the subject description of some documents but they admitted that they have already corrected some bibliographic records due the appearance of more accurate tags. Most of them they found a significant number of tags that are identical to authority records, and certainly enrich the subjects of the bibliographic records. This opinion is confirmed by the fact that only 21 tags are the same with the subject description of the selected documents, while the majority of the tags, 355 out of 540, are identical to the subject descriptors of the library authorities.

Indicative examples of this analysis are given in Table 1. In the record of the first row the 2 subject headings are included in the tag cloud. The tag cloud consists of 34 tags and 28 of them belong to the local authority. The evaluation of the tag cloud revealed that 11 of the tags could be used in the subject description of the record, while 2 of them are new terms. In the second row there are 3 subject headings and 2 tags are part of them. Totally 21 tags are associated with this record, while 12 of them are terms in the authority file. The evaluation emerged that 5 tags enhance the subject description of the record, while just the tag "digital humanities" is a new term.

Moreover librarians opined that the majority of OPACIAL tags are narrower terms as compared with the subjects of the documents and sometimes too specific. Contrary LibraryThing tags are diverse; some of them are broader terms (e.g. Philosophy, Sociology, Economics, Culture) and do not add value to information retrieval.

Finally the librarians found that several tags constitute either new concepts or neologisms, or alternative translations of terms to the Greek language. However most of them hesitate to create new authority records but are eager to consider the tags non-preferred terms and add relations to them.

Table 1. *A sample of tagged records*

Bibliographic Record	Subject Headings	Tags
Author: Weber, Max (1864-1920), Roth, Guenther (Editor), Wittich, Claus (Editor). **Title**: Economy and society : an outline of interpretive sociology / Max Weber; edited by Guenther Roth and Claus Wittich **Publication**: Berkeley, Calif. : University of California Press, c1978	Sociology Economics	19th century 20th century Europe Germany Verstehen Weber bureaucracy class structure economic sociology economics economy german history interpretation knowledge philosophy political economy political science political theory politics religion social theory society sociological theory sociology state the state theory world history Αξιολογική Ελευθερία Γερμανοί Φιλόσοφοι Κατανόηση Κοινωνιολογία
Author : Janes, Joseph (1962-) **Title**: Introduction to reference work in the digital age / Joseph Janes **Publication**: New York: Neal-Schuman Publishers, c2003	Reference services (Libraries) Internet in library reference services Electronic reference services (Libraries)	Digital Reference LIS Professional Books Reference/Business best practices biblioteques computers digital humanities guidelines info science information management information science internet librarians librarianship library library science reference reference service textbook

Summarizing the third axis (A3) of the interview, the cataloguers are positive towards the adoption of social tagging by the Panteion University Library and they find it useful. Some of them argued, "we have the chance to discover our weakness in subject indexing, especially the non-subject librarians". In addition they agreed that social tagging could help them to approach the user's way of thinking and help them more effectively as well as to observe the communities terminology evolution. As cataloguers, they believe that tags provide new terms for the benefit of subject indexing – even the subject description precedes the insertion of tags. It is worthy to mention that metadata cataloguers proposed the implementation of tagging system in the digital library of the University (Pandemos, http://library.panteion.gr/pandemos), which hosts specialized material such as theses and digitized scientific journals.

An issue revealed by the interviews is the quality assurance of the tagging process. The cataloguers expressed their reservation about the tags being inserted by under-graduate students and external users, while some of them stated, "we must encourage faculty and post-graduate students to tag". Nevertheless an open question is to "buy" LibraryThing's tags or to encourage the users to enrich the local folksonomy.

A relevant issue concerns the process of the social tags exploitation. The discussion among the others concerned the frequency and the criteria of the tag assessment process. Some

librarians suggested the refinement of the inserted tags by searching, in pre-defined time periods, the LCSH to identify overlapping terms and keep in the folksonomy only the non-overlapping tags, while the overlapping to be inserted in the local authority file. However this proposal characterized as a "luxury" for an academic library with a limited number of personnel that serves almost 3,000 users per day and inserts more than 4,000 records in the catalog.

Two librarians proposed the creation of a wiki to enhance the collaboration of subject cataloguers and the faculty members for the disambiguation of the inserted tags, the apodosis of subject descriptors in the Greek language and in general the improvement of the library authorities. Moreover two other cataloguers suggested the creation of new authority records "out of the LCSH frontiers", especially in cases the tags are identical to Wikipedia entries.

Concerning the closed questions, the librarians believe that OPACIAL upgrade the library services giving an average grade 5.66 in the 7-point Likert scale. Regarding the reasons for which a library must encourage its users to tag records, the results are as follows: (i) to activate the user participation gained an average grade 6.22, (ii) to develop an user – friendly alternative for information retrieval, gained an average 6.44, (iii) to receive feedback for the users needs, gained an average 6.44, and finally (iv) to develop a direct way for subject indexing according the users' vocabulary, gained an average 5.66. These results confirm the hypothesis that the cataloguers consider useful the OPACIAL tagging functionality and thus the cooperation between the local index and folksonomy.

6. CONCLUSION

This study signified the opening of an in depth discussion between the library staff about the power of Web 2.0 opportunities. The library cataloguers recognized the role of "long tail" and the importance of the development of social networks through the activation of their users to create metadata.

The findings of this study provide the opportunity to the library staff to evaluate the library subject index, and to renew its content by new terms or relations. In particular the study addresses that the tags express directly the evolution of a scientific domain and the library should (a) create new subject descriptors, (b) substitute the current subject headings with more appropriate ones and (c) create references between the subject descriptors of the local authority file.

Essentially, the development of a policy for the exploitation of social tagging is equivalent to the establishment of a Library 2.0 environment in an information organization grounded on the concept of user collaboration and the design of collective information services.

REFERENCES

Al-Khalifa, H.S., & Davis, H.C. (2007). Exploring the value of folksonomies for creating semantic metadata. *International Journal on Semantic Web and Information Systems (IJSWIS)*, *3* (1), 13-39.

Gavrilis, D., Kakali, C., & Papatheodorou, C. (2008). Enhancing library services with Web 2.0 functionalities. In *Proceedings of the 12th European Conference on Research and Advanced Technology for Digital Libraries (Aarhus, Denmark, September 14 - 19, 2008).* / B. Christensen-Dalsgaard, D. Castelli, B. Ammitzbøll Jurik, and J. Lippincott, Eds. Lecture Notes In Computer Science, vol. 5173. Springer-Verlag, Berlin, Heidelberg, 148-159. Doi: 10.1007/978-3-540-87599-4_16

Golder, S., & Huberman, B. (2006). Usage patterns of collaborative tagging systems. *Journal of Information Science, 32*(2), 198-208.

Heckner, M., Mühlbacher, S. & Wolff, C. (2008). Tagging tagging: Analysing user keywords in scientific bibliography management systems'. *Journal of Digital Information,* 9(27).

Kipp, M.E.I. (2006). Complementary or discrete contexts in online indexing: a comparison of user, creator, and intermediary keywords. *Canadian Journal of Information and Library Science 30(3).* Retrieved October 26th, 2009 from http://dlist.sir.arizona.edu/1533/01/mkipp-caispaper.pdf

Lawson, K. (2009). Mining social tagging data for enhanced subject access for readers and researchers. The Journal of Academic Librarianship 35(6), 574-82.

Lin, X., Beaudoin, J. E., Bui, Y., & Desai, K. (2006). Exploring characteristics of social classification. In *Proceedings of the 17th ASIS&T Classification Research Workshop*, Austin, Texas, USA. J. Furner & J. T. Tennis (Eds.). Retrieved November 20th, 2009 from http://dlist.sir.arizona.edu/1790/01/lin.pdf.

Mathes, A. (2004). Folksonomies - cooperative classification and communication through shared metadata. *Report, Graduate School of Library and Information Science, Illinois Urbana-Champaign*. Retrieved November 20th, 2009 from http://www.adammathes.com/academic/computer-mediated-communication/folksonomies.html

McCulloch, E. & MacGregor, G. (2006). Collaborative tagging as a knowledge organisation and resource discovery tool. *Library Review 55*(5), 291-300.

Mendes, L.H. Quinonez-Skinner J., & Skaggs D. (2008). Subjecting the catalog to tagging. Library Hi Tech 27(1), 30-41.

Pera, M.S., Lund, W., & Ng, Y-K., (2009). A sophisticated library search strategy using folksonomies and similarity matching. *Journal of the American Society for Information Science and Technology*, *60* (7), 1392-1406.

Quintarelli, E. (2005) Folksonomies: power to the people. In *ISKO Italy-UniMIB meeting. Milan, Italy.* Retrieved December 20th, 2009 from
http://www.iskoi.org/doc/folksonomies.htm

Smith, T. (2007). Cataloguing and you: Measuring the efficacy of a folksonomy for subject analysis. In 18th Workshop of the American Society for Information Science and Technology Special Interest Group in Classification Research, Milwaukee, Wisconsin, USA. J. Lussky (Ed.), Retrieved July 18th, 2009, from http://dlist.sir.arizona.edu/2061/01/Smith%5FUpdated.doc.

Thomas, M., Caudle D. & Schmitz C. (2009). To tag or not to tag? Library Hi Tech 27(3), 411-334.

Voss, J. (2006). Collaborative thesaurus tagging the wikipedia way. Retrieved July 18th, 2009 from http://arxiv.org/abs/cs.IR/0604036.

Yi, K. & Chan, L. M. (2009). Linking folksonomy to Library of Congress subject headings: an exploratory study. *Journal of Documentation 65*(6), 872-900.

Museums on the Move

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INTRODUCTION

This paper describes iMuseum, an iPhone application has been developed to allow distribution of historical information about any location through the concept of a virtual museum that is accessed through the screen of a smartphone. Viewing the world through the phone's camera reveals icons that are associated with objects in the real world; these icons can be selected to reveal information about the physical artifact. This paper will briefly review the concepts that inspired this work before describing how the combination of these techniques allowed the creation of the application. The paper will continue with a description of the application and the supporting infrastructure required to publish a virtual museum. It will conclude with a brief discussion of why this technology is beneficial from both an economic point of view and from the perspective of users of the application.

BACKGROUND

The mobile communications revolution has continued apace. The high end phones - so-called SmartPhones - provide a range of capabilities beyond the making and taking of a phone call. The addition of high-resolution cameras, a range of communications media, audio and rich graphical displays – in addition to fast processors, significant amounts of memory and publicly available programming tools – has led to a profusion of third party applications that leverage these capabilities. The development of these phones has coincided with the advent of fast cellular data networks and broadband that allows transmission of large volumes of data. While these devices are expensive today, they will, like previous mobile phone evolutions, become cheaper as new capabilities emerge; the features available on these phones will be standard in under five years time.

One commonly used feature of smartphones relates to the capability of browsing and searching content on the web and/or intranets. We would contend that, beyond simple search, smartphone devices are capable of providing a mass of contextual information that both allow augmentation of queries on the users' behalf and provide a set of filters to improve the efficiency of search algorithms. A current research topic, Augmented Reality (AR) allows decoration of views of the real world with contextual information about the objects in the view. A simple example occurs everyday on television news broadcasts: often news reports are augmented with maps and rolling summary points about the incident. When this concept is ported to a device that allows for interaction by the user, then the concept becomes a powerful means of querying the immediate environment of the user. For instance, a modern smartphone, e.g. the Apple iPhone, can provide information about location, direction and orientation as well as being aware of its visual and audio environment through its built in camera and microphone. Multimedia retrieval techniques can then be used to take these inputs so as to produce appropriate AR views.

The confluence of these technologies provides a great opportunity to provide contextual mobile information-seeking tools. These applications will not be constrained by complex query syntax; rather, they will form queries using the seeker's environment. This paper will now describe an application that allows a user to point the camera on their smartphone at a historical artifact and use that input, combined with their orientation and position, as a query to look up information about the object.

THE IMUSEUM APPLICATION

The iMuseum iPhone application works as follows: aware of the user's position - this is provided by the device's Global Positioning System (GPS) - the application would know that the user had approached a location that is documented. The user would be alerted accordingly. The user could then use the device as a portal into the environment, taking input from the environment through the device's built-in camera. The feed from the camera would be examined in real-time for significant objects stored in the location's artifact database. While this would be computationally expensive, the number of items that would need to be matched would be quite small, as a combination of location, direction and orientation are used to filter the number of candidate objects that could be matched against the real-time video input. On locating a suitable artifact, the user sees the item highlighted on the device's screen and would have the choice of viewing information about the artifact presented in a Wikipedia style information base.

The smartphone application is just one part of the application's framework. The application also provides a web-based interface that allows indexing and uploading of information about these artifacts. This service automatically creates an information bundle which is downloaded by visitors to a site. This bundle allows the phone's application to provide the functionality described previously.

BENEFITS OF IMUSEUM

This type of technology has several benefits. From an economic viewpoint, the application allows dissemination of information about minor historical sites, without the cost and overhead of providing information at the site's location. Using iMuseum, once information about a site and its artifacts is bundled, then the only overhead involves providing this information to interested users; these could include downloading the information in-situ if a suitable broadband connection is available. If a connection isn't available, then the download facility might be provided locally, a-priori (before the user visits the site) or at a hotel or some other juncture of their visit.

The technology also has the benefit of engaging *digital-natives,* those that have grown up with these technologies and who feel empowered when these tools are made available to them. These users might not normally be interested in visiting a site of historical significance. However the novelty of a technological aid, and its ability to display information in several media including interactive animation, might make the story interesting and accessible.

Five Years of the Croatian National Librarie's Web Archive : state-of-the-art and perspectives

Tanja Buzina

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ABSTRACT

Web resources are an important part of the contemporary cultural heritage. Since 1997 web resources are subject to legal deposit in Croatia.

In order to collect and preserve this part of the Croatian national heritage the National and University Library (NUL) in cooperation with the University Computing Center (SRCE) has created the Croatian Web Archive.

The online resources archived in the Croatian Web Archive are an integral part of the National and University Library collection and can be searched through NUL's WebPAC and directly at http://haw.nsk.hr.

The NUL decided to archive web resources selectively according to criteria which pertain to content, issuing body/author, web site structure, domain and uniqueness. The frequency of archiving is determined by the Library.

Statistic data and new user interface will be presented.

Ludiformation: A Database Search Game for Teaching Online Searching

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As part of your conference on Digital Natives, we would like to propose a demonstration of a web-based game, called "Ludiformation" aimed at teaching undergraduate students how to create an online searching concept plan.

In this demonstration, we will review the challenges that we have encountered during the creation of the game and we will summarize the results of a pre-test involving fifteen students who were asked to give critical comments after trying the game of Ludiformation.

This game, originally created in French, consists of fifteen questions that enable the player to gradually develop a concept plan. A storyline provides a framework that takes the player step-by-step through all the basic stages of an online search. The search begins with the identification of a single concept and slowly integrates different techniques such as truncation and Boolean operators. The player must also learn to use synonyms and find an array of term for each concept of a concept plan in order to answer the questions adequately.

Prior to developing the game we have reviewed the literature from three main areas: information seeking and retrieval, educational game design and gaming use in libraries. These domains have provided the key concepts required to create our educational game. We have also used storytelling techniques to develop strong narrative elements in order to immerse the player in the game.

From a technical point of view, the game is rendered dynamically and each answer from the player returns two variables, recall and precision, on which success is determined. The game is generated around a database that evaluates the meaning behind each term and calculates the number of document that can be found in a virtual document database. This database is at the center of the game and its creation is based on terms representativeness, simulated extraction from Google and mathematical formulas.

This project was created as part of an independent studies course fallowed during the Fall-2009 semester at EBSI. The game, still under development, is entering Phase II and the new interface will be released in the middle of February 2010. For the moment, we present you with a glimpse of our initial project (only five of the fifteen questions have been translated in English so far) with the hope that it will enable you to understand the basic premises of the game.

For the English version (partial), please use this URL:

http://www.gin-ebsi.umontreal.ca/p0684031/ludiformationeng.

For the French version (full), please visit this URL:

http://www.gin-ebsi.umontreal.ca/p0684031/ludiformation.

insideadog.com.au: Australia's Teen Literature Website

Paula Kelly
Reader Development Manager, State Library of Victoria, Australia
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"Outside of a dog, a book is a man's best friend. Inside of a dog, it's too dark to read.'

Groucho Marx

PROJECT DESCRIPTION

insideadog.com.au is the State Library of Victoria's website for teenagers about books and reading. Launched in 2006, the website has enjoyed continued success, achieving over a million visits and attracting young people from all over the world.

Insideadog.com.au engages young readers through reviews, competitions, news, booklists, sample chapters, podcasts and a monthly online writer in residence. It also hosts the Inky Awards, Australia's only teenage-choice book award. As well as voting for their favourite book, teenagers can also enter the Inkys Creative Reading Prize by responding creatively to a book they love, in any format they choose, be it fiction, poetry, illustration, music, crochet or cupcakes.

insideadog has received support from the Copyright Agency Limited, the Australia Council, Australian publishers, booksellers, writers and schools.

By providing access to authors, discussions and information on Young Adult literature, insideadog makes it possible for young people all over Australia – in regional and remote areas as well as cities – to participate creatively in a dynamic literary community.

insideadog's continued success has put strain on the structure and functionality of the site – however it is in a phase of rebuilding to include Web 2.0 functionality which has emerged since the launch of the site in 2006.

Keeping young Australians reading is vital. Reading for pleasure has significant positive outcomes for the individual and society as a whole, and it is good for the economy. Today's young people are tomorrow's legislators, educators, politicians, writers, tax-payers and voters. By encouraging and inspiring young people to read for pleasure, we are helping to produce better educated citizens, with improved employment prospects, likely to make a greater contribution to the nation's wellbeing and economic prosperity.

Young Adult literature is thriving, despite global economic uncertainty. On the back of international success stories like *Harry Potter* and *Twilight*, young people are reading more, and more voraciously, than ever before.

THE CENTRE FOR YOUTH LITERATURE

The Centre for Youth Literature is recognised as the nation's leading organisation in its field. It was founded in 1991 by Agnes Nieuwenhuizen. It moved to the State Library of Victoria in 1999, where it now sits within the Reader Development unit under Paula Kelly's Management, and is part of the Library's Learning Services Division. The Centre's work is carried out almost exclusively within the State of Victoria, but the knowledge, expertise and resources it has developed are available to libraries and other institutions via the internet. In this way, and by providing advice direct to interested parties, the Centre for Youth Literature

supports the development of nascent youth literature bodies in other parts of Australia. Its influence spreads not only across other states and territories, but indeed to an international audience.

The Centre for Youth Literature's goal is to keep young Australians reading for pleasure, and in order to do so, it presents professionals with information and insight; provides authors and publishers with a platform; speaks directly with young Victorians, and supports the development of dedicated youth literature bodies in other states and territories.

The Centre for Youth Literature programs and events include:

- ❖ Reading Matters, a sell-out conference, with a national impact; held every other year in Melbourne, it brings professionals and young people together to hear from Australian and international authors
- ❖ Insideadog.com, a website where young readers can find out about their favourite books, read the latest writer-in-residence blog and post their own reviews
- ❖ Read Alert, the latest news about youth literature online
- ❖ Booktalkers, sessions for authors and readers, and authors and professionals. The youth components provide a unique blend of talks, panel sessions and performance.
- ❖ Bookgig on the Road, in partnership with arts2go, taking writers and actors to visit schools in regional Victoria
- ❖ The Inky Awards, Australia's only literary awards voted for by young people
- ❖ Boys, Books, Blokes and Bytes, a highly successful program developed to encourage boys to read
- ❖ Workshops for writers, teachers and teacher-librarians

The Centre's Latest report Keeping Young Australian's Reading can be downloaded here. http://www.slv.vic.gov.au/pdfs/aboutus/publications/KeepingYoungAustraliansReading2009.pdf

The Centre for Youth Literature works in partnership with colleagues at the State Library and with many other organisations, including the Australia Council, Copyright Agency Limited, Regional Arts Victoria, The Age, the Children's Book Council of Australia and charitable foundations.

ABOUT THE STATE LIBRARY OF VICTORIA

Located in the heart of Melbourne's Central Business District, the State Library of Victoria is Australia's oldest cultural institution and an iconic landmark of architectural and historic significance.

Founded over 150 years ago, the Library houses a vast collection of more than 2 million books and serials, one of Australia's largest newspaper archives and many hundred thousand historical artefacts, including maps, manuscripts and other one-of-a-kind materials and memorabilia.

The Library serves as a leading repository for worldwide information resources offered free-of-charge. Since it's founding the Library continues to be a place of cultural, educational, social and economic enrichment. With over 1.5 million unique visitors each year, this historic institution plays a vital role in the Victorian and broader Australian and international communities.

As a world-leader in the archival and display of rare art and materials, the State Library of Victoria hosts a changing roster of free exhibitions throughout the year in its spacious and state-of-the art Keith Murdoch Gallery. Its exhibitions have earned critical acclaim for their

quality and scholarship, while free entry continues to ensure the highest level of community access and attract a large and diverse audience.

In 2008 the Library's spectacularly successful *Medieval Imagination* exhibition attracted over 100,000 visitors – as did the popular 2003 exhibition *Kelly Culture – Reconstructing Ned Kelly.*

Developing E-library and Interractive On-line Learning at Technical University of Ukraine

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ABSTRACT

In this paper some peculiarities of creating and developing e-library are presented. We pursue both recording, documenting, preserving, and safeguarding the documentary heritage and on-line interactive learning at Technical University. To support new experiences for the target audience we expose users to digital virtual resources of scientific heritage. The concept of interoperability and multi-channel Web applications is introduced. Web design perspectives are dwelled upon. We provide a comprehensive web solutions package for optimizing the process of studying. Our work presupposes installing and testing different sites for multi-browser compatibility and troubleshoots bugs. In the paper we discuss the number of design issues arisen in the process of transferring an existing Web site for cultural-scientific heritage to mobile devices. In the work the problems of phishing (anti-phishing) and countermeasures are considered realizing the issue of identity theft problem. This paper attempts to establish the documented content, form and attributes of records; assesses the digitization requirements. Developing engaging and effective on-line interactive learning requires understanding of many things. Subject knowledge and technical expertise are often emphasized, but just as critical are understanding the target audience and theories of learning as applied to the Web. In this paper, we will see ways to define target audience(s) and apply several learning theories to educational Web development. All the data were analyzed and presented according to the main objectives and themes of the study.

KEYWORDS: recording, documenting, preserving, safeguarding, scientific heritage, indigenous knowledge , metadata, standards, multimedia

1. A FRAMEWORK FOR DIGITIZATION AT UKRAINIAN STATE TECHNICAL UNIVERSITY

1.1 Introduction

At Ukrainian technical university it is being held the work on creating e-library of scientific heritage and indigenous knowledge, the group of specialists work on developing effective on-line learning perspectives for university library users. Chasing this aim some security problems are being solved.

1.2 Strategies

UNESCO (1995) provides guidelines for safeguarding documentary heritage: its aim is to safeguard the world's documentary heritage, democratize access to it, and raise awareness about its significance and the need to preserve it. In Ukraine there is hardly any system of recording, documenting and preserving indigenous information, let alone a mechanism for capturing it to cope with dynamic world needs. Digitisation is ideal for sharing, exchanging, educating, and preserving indigenous knowledge, cultures (IK) and scientific heritage (SH). This requires a clear design for metadata and standards procedures, multimedia technologies, and appropriate structures for access and use. Our aim is also to develop e-library at

Ukrainian technical university in cooperation with some other establishments digitizing not only scientific heritage but also indigenous knowledge. Our partners in Ukraine are Kyiv university of culture, Ukrainian historical museum in Dnipropetrovs'k, governmental establishments, and others.

2. THE METADATA AND STANDARDS

2.1 Standard systems

We try to use existnig systems, ranging from the traditional cataloguing approaches of Machine Readable Cataloguing (MARC), Anglo American Cataloguing Rules, 2nd (AACR2), and WorldCat (Online Computer Library Centre (OCLC on-line Union catalogue). The other approaches include the United States MARC (USMARC), Online Public Access Catalogues (OPACs), Web OPAC, Matchbox, and Dublin Core that facilitate network resource information retrieval (Weibel, 1997:6). Recently, a team of metadata researchers visiting Quinkan rock art in Cape York, Australia, proposed a collaboration with Quinkan Culture elders (Nevile, 2003:1). The team developed a cataloguing system, using Dublin Core (DC) Metadata – to describe, collect, and represent Quinkan culture. The description produced can be represented completely in Hypertext Markup Language (HTML), written in plain text with tags; and the content, in the Resource Description Framework (RDF) (Nevile, 2003:6). Weibel (1997:9) defines the Dublin Core elements as title, creator, subject, description, publisher, contributor, date, type (category), format, identifier, source, language, relationship to other resources, coverage, and rights. Hunter classifies metadata requirements for multimedia as bibliographic metadata and formatting metadata that include structural, content, events and rights (Hunter, 2002:6). At the National Library of Education in the USA, Sutton and Oh (1997:21) identified the variables of a gateway to educational materials to include systematic metadata profile, syntax and well-specified practices (standards), prototype interfaces, harvesting tools for retrieving (multimedia), and organisational structure and use. On the Web, recording the Unique Resource Identifier (URI), Universal Resource Locator (URL), Universal Resource Names, (URN), and Universal Resource Characteristics (URC) is a fundamental requirement for the bibliographic description of networked resources (Schwartz, 1997:12). The URI, for instance, is the primary work of the Dublin Core Metadata Element Set (DCMES). Domain-specific ontologies have been developed by two different International Organisations for Standards (ISO) working groups to standardise the semantics associated with the description of museum objects and multi-media content (Hunter, 2002:1). However, no single ontology or metadata model exists for describing indigenious knowledge and scientific heritage multimedia content.

3. MULTIMEDIA TECHNOLOGIES

3.1 Multimedia Techniques

Hunter (2003:3) has observed that technologies in a digitisation environment are multimedia in nature. These technologies include images, audio, video, and multimedia. Images technologies consist of photographs, prints, manuscripts, documents, drawings, paintings, movie stills, and posters. Audio technologies include songs, music, plays, interviews, oral histories, radio programs, speeches, lectures, performances, language recordings. Video/film technologies include full features, documentaries, news clips, anthropological/expedition footage, home movies, animation; whereas multimedia include presentations and slide shows (Hunter, 2002:3).

The Digitisation Centre of USCTU has developed a set of inexpensive, simple, and robust software tools designed to enable description, annotation and rights management of

collections of mixed media digital and physical objects in various categories (Hunter, Koopman & Sledge, 2002:2). This institution has also developed a search, retrieval, and presentation interface which retrieves different result sets, and aggregates the results automatically into coherent multimedia Synchronised Multimedia Integration Language (SMIL) (synchronised) presentations. The developers recommend that design requirements for software include a security mechanism, a simple user interface, robustness, low cost, interoperability, portability, flexibility, and scalability (ibid:6). According to them, software tools should be built on international standards such as Dublin Core, in order to ensure maximum interoperability between disparate databases. They also recommend an additional security mechanism such as XML Encryption, XML Digital Signatures (XML Digital), Security Assertion Mark-up Language (SAML), Secure Sockets Layer (SSL), and watermarking techniques (Hunter, Koopman & Sledge, 2002: 18).

3.2 Structures for Access and Use

One way of ensuring IK developments in Ukraine is to establish documentation units and networks where recorded information is stored and made available for use by all those who wish to access proper data. For example, in Australia, various networks, including the Australian Cultural Network (CAN), Government Information Locator Services (GILS), Environmental Resources Information Network (ERIN), The Education Network of Australia (EdNA), Australian and New Zealand Land Information Council (AZLIC), and the Australian Geological Survey Organisation (AGSO), have attempted digitisation of community IK (Maguire, 1997:18). Similarly, the Land Data Bank System in Sweden and the New York Computerised Criminal History System in the USA facilitate the sharing of information among various systems (Gavrel, 1990:23). That is why it is important to define distributed digital access strategy, search/discovery services, interfaces, and user and information systems or gateways (e.g. African Digital Library) to create the environment in which the user is in control of the use of information (Maguire, 1997:18). In fact we suggest a system to register, index, search, and make reports. Although technology has made more information more available to more people, at the same time it has made access to it more difficult (Feather, 1994:35). The major concern is how to adapt these technologies to meet the needs of the developing world (Magara, 2002b:146). We believe that proper marketing of IK systems, products and services will promote the accessibility and usage of IK information in developing countries. This paper provides the guidelines for sustainable digitisation of IK and SH information in Ukraine.

4. METHODOLOGY

A qualitative research design was adopted, and the SH institutions and IK organisations from which to collect data were purposely selected. Interviews, observations and document analysis were the main data collection methods. The respondents of the study were IK information managers, skilled personnel, government officials, and community and institutional leaders, among others. Interviews were conducted with the Heads of programmes on culture, library and archives. Physical visits were made to observe how information is documented in EU countries, in particular, National Library of CZ, historical and traditional sites were visited. Analysis of documents of the institutions' brochures, strategic plans, finding aids, Web sites, and company files was done. Data was analyzed and presented according to the main theme of the study, including the institutions that keep IK information, the content of IK, the records kept about IK, and the digitization requirements for IK.

5. FINDINGS

The study identified places that manage IK information, that information's content, the records kept about it, and requirements for digitising it.

Educational institutions in Ukraine are attempting to transfer indigenous knowledge to the students in a number of fields. At Ukrainan State Technological University and also at Ukrainian State University of Culture and Arts the Departments of History, Music, Dance and Drama are involved. For example, the Department of Music, Dance and Drama trains specialist teachers to be performers, composers, choreographers, and playwrights using traditional dances. On its part, Information Science has introduced palaeography, oral history and tradition, museum, preservation and conservation, and archives management to its curriculum.

The Ukrainian National strategy is to promote the use of community Tele-centres in Ukraine to enable communities in remote places to access information on the global network. IT is also currently promoting the adoption of the System to involve the people in health care delivery and the fight against HIV/Aids. Emphasis is in areas of traditional medicines, pure herbalists, herbalists/spiritualists, divines and magicians, mixed activity practitioners, bone settlers, and traditional midwives.

However, although initiatives are focused on the preservation of culture heritage, there are difficulties in collecting, storing, preserving, co-ordinating and enabling access to IK information in Ukraine.

6. OBSERVATIONS

6.1.1 The Need for Digitisation

The digitisation of community IK in developing countries is a vital strategy in preserving culture identities, bridging the past and the present, and transferring information required by various users within and between community networks. This requires a strategy to address community values, principles and norms.

There is no institution responsible for co-ordinating the collection, management, use and proper utilisation of IK, but there is an unco-ordinated mechanism available among the IK institutions to share community IK. The semblance of partnership available lacks guidelines/policy for the proper utilisation and preservation of IK. The Ministry of Gender, Labour and Social Development has attempted setting standards and making guidelines for the preservation of IK. A number of policies to guide IK in Ukraine , a number of proposals have been made; although the government has proposed legislation on Freedom of Access to Information and a National Information and Communication Policy, none of these guidelines provides a strategy for digitisation of IK in Ukraine.

There is a lack of institutional registers in most institutions and communities. Such registers are necessary to record such information as Ukrainian traditions, customs and cultures, legal documents governing cultures, institutions, indigenous technology and medicine. No standard scheme is available to define the content, format and attributes of records about IK. In addition, there is a need for a national register of all information concerning various cultures; this is a perquisite to any machinery/policy to monitor its implementation.

6.1.2 Format of Records

The majority of the institutions keep information in the form of a catalogue or use other finding aids manually. For example, the majority of Libraries record their holdings in the form of Card catalogues, book catalogues, Accession lists, and bibliographies. In the National Archives, there are a number of finding aids, including catalogues, index cards, accession registers, repository lists, storage lists. Although the majority of institutions had access to on-line services and the Internet, there was little information on IK kept there. University Library had access to CD-ROMs, OPAC and the Internet for keeping information about Ukrainian culture and scientific knowledge of most of the educational esteblishments. Tapes, compact cassettes, digital audio-tapes are used to record information on IK. In the country people who orally store and disseminate information.

The majority of respondents agreed with a proposition for digitisation although most of them had not computerised their own records and IKs. In libraries, digitisation was envisaged to facilitate retrieval, indexing, and cataloguing of information materials. Digitisation of information helps locate information since it is kept in files. Some of the institutions have Web sites. For example, the Internet can be used when accessing University database with current faculty affairs. Digitisation would help to access and co-ordinate information to ease locating and retrieving information. We want to have a networked database of all libraries (audio-Visual or book materials) that keep IK, SH information. The organisations would build a library management system to facilitate easy access to information on IK. Digitisation would facilitate research, and information would be centred in one place.

6.1.3 Co-ordination

According to the study, there is a need for a central co-ordinating body – having one central place where people can look for IK. There was a demonstrable need to co-ordinate IK, SH in record centres, archives and libraries, museum, art galleries, traditional institutions. In fact, University Library recommended the establishment of a consortium of IK institutions to enable the sharing of textbooks, journals and theses on information about IK.

6.1.4 Facilities and Resources

It was observed that a strategy to obtain funds from government and non-governmental organisations should be devised. Government should be urged to increase its funding commitment to the development and management of cultural and IK information. It was felt crucial that institutions and organisations establish registries and Archival centres with proper access and finding aids. Establishing IK resource centres at different communities with modern information and communication services would facilitate the digitisation of IK.

6.1.5 Preservation of IK

There was an expressed need for promotion and preservation of Ukrainian culture. The need for promoting cultural heritage, encouraging living cultures and creativity, and ensuring standards to monitor and to safeguard the documentary heritage was expressed. Kyiv University of Art and Culture pledged to establish ethnic galleries at district levels. The materials collected would include photographs and videotape. The legal and ethical, intellectual property rights, and cultural restrictions would be invested in a government policy-making body.

6.2 Institutions that Keep IK Information

A number of efforts have been made in the promotion of community IK in Ukraine with varying degrees of success. The institutions that have made efforts include the Museum of Ukrainian history, National Committee of Science and Technology, Kyiv University of Arts,

National Archives, various cultural centres, the Thechnical university library. The Technical Library of Dnepropetrovsk State University of Chemical Engineering (DSUCE) participates in the promoting of a reading culture. It acts as a depository of national and foreign documents (not only technical ones), and compiles and publishes a national bibliography. This role was a responsibility of University Library from the time Ukraine having got independency. Currently, Kyiv University of Arts Library keeps general literature on Ukrainian culture: books, papers, letters, notices, reports, diaries of events, church memoranda, registers, and manuscripts that are important to Ukraine's heritage. Its materials date back to the late nineteenth Century. The National Archives offers research service and enriches the cultural heritage of the country. It preserves and disposes of records and archives, and makes records available for consultation.

The Department of Antiquities and Museums is responsible for historical, archaeological, and palaenotological sites within Ukraine. These include traditional sites, buildings, signposts, and tombs. It is concerned with conservation, research and preservation of sites. The over-all aim of this department is to develop such sites into educational purposes for the people of Ukraine as well as for interested foreign visitors. The specific objectives include preserving, conserving, promoting, and presenting the national cultural heritage.

Educational institutions in Ukraine are attempting to transfer indigenous knowledge to the students in a number of fields. At DSCE University, Kyiv University of Arts , the Departments of History, and Music, Dance and Drama are involved. The Ukraine National Commity of Science and Technology with the assistance of some private funds is promoting the use of community Tele-centres to enable communities in remote places to access information on the global network. USUCE is also currently promoting the work on creating effective on-line learning techniques. Some work has been done in the fields of selected disciplines for students of distant learning department.

7. CONCLUSION

This eases reference to the location of and the time trends of the required information. It helps in finding trends in various IK and investigating social, economic, political and cultural relationships as well as relationships between IK record attributes. The digitisation of community IK may be linked to driving a vehicle that requires an engine and wheels (ICTs), the body (Community), passengers (Content), the driver (information Professionals, experts, IK Managers, etc), and driving and traffic policies (standards, ICT policies). Digitisation requires the metadata showing locations for content (e.g. communities, sites, traditions, medicines, and subjects). A policy guideline for the digitisation of IK and SH is a priority. A requirement analysis needs to be done for the overall feasibility of the project in Ukraine.

8. STRATEGIES FOR THE DIGITISATION OF COMMUNITY IK

8.1. A secretariat for IK should be established for the administration of IK management and preservation in Ukraine. This will be responsible for setting standards, registration of IK, acquisition of funds for projects in IK, and provision of reports on IK on behalf of the Government.

8.2 National and Community or Institutional committees responsible for capturing IK in Ukraine should be established to bring together the stakeholders in a particular IK. A national register of all IK should be compiled by the secretariat. This will require a nomination form of what should be included in the Register.

8.3 Preservation should be given a priority in IK management. Policy guidelines on the preservation and conservation of IK in Ukraine should be drafted and presented by the

responsible ministry. . Institutions need to be aware of preservation techniques and approaches. Preventive measure, reformatting or reproduction techniques including photocopying, microfilming, recording, and digitising have to be enhanced

8.4 A bibliographic control that requires all partners to participate needs to be maintained by the National committee. This will require a database of both national, and community or institutional registers that have controlled access to users. Conservators and archivists should come out and join hands with Ukraine Library Association to produce a code of ethics which should establish limits on cost of access, form of access and relationship between owners and custodians of the IK. Policies on copyrights, cultural restrictions, and public investment in private IK management need to be clearly stated. Forms of distribution and product identification and control need to be observed in the policy. When digitising, there is a need to put in place technical and usage standards for various functions like scanning or data compressions/reduction.

8.5 The digitisation of community IK needs a marketing and awareness strategy as a priority approach. Promoting the programme to target groups, raising funds, making copies of IK in various formats: micro images, audio tapes, films, videos and digital representations in various languages; is important. Promotional materials need to be developed. Exhibitors and displays of IK, articles in news papers, and the formation of strategic alliances with other partners, including museums, galleries, park sectors, tourism, etc., need to be encouraged. Promotion and publicity for stakeholders, together with education and training for staff and implementers, are prerequisites to the success of the project.

8.6 There is a need for curriculum review and development at all levels of the educational system in Ukraine. Schools should introduce simple preservation techniques of IK at various levels. Training institutions in the areas of library and information science should introduce IK curriculum and short courses to cover IK management systems, digitisation of IK, and preservation and conservation of IK. The institutions that keep and store IK should organise sensitisation seminars and workshops to promote

9. RECOMMENDATIONS

9.1 Digitisation of IK suggests not only that the technology is available, but also that it is appropriate for the promotion of IK in Ukraine at the moment. There is a need for first developing the culture of preserving IK, together with a thorough awareness campaign and sensitisation programmes for the appropriate adoption and utilisation of IK.

9.2 Information requirement analysis is necessary for the creation and integration of new technologies in the management and preservation of IK. A cost benefit analysis for application of digitisation is a priority. Financial models and methodologies need to be developed to specify the baseline conditions and requirements, strategic implementation plan, benefits determination, security and risk analysis.

9.3 At the Organisational level, database management systems technologies are essential before the adoption of digitisation; developmental support must be offered by various organisations.

9.4 The Traditional Knowledge and ecological functions must be emphasised to create a functional digital IK in the country.

10. RESULTS AND PERSPECTIVES

In the process of recording, documenting, preserving, safeguarding the documentary heritage we have already got some results – the working group has digitized the most valuable sources and now it is in open access for professors and students of the University. Some work

concerning on-line interactive learning at Technical University is still held. To support new experiences for the target audience we expose users to digital virtual resources of scientific heritage. The concept of interoperability and multi-channel Web applications is attempted to be introduced. Some problems arise with web design. We provide a comprehensive web solutions package for optimizing the process of studying. Our work presupposes installing and testing different sites for multi-browser compatibility and troubleshoots bugs. All the work is in the process and much is still to be done. We would like to discuss design issues arisen in the process of transferring an existing Web site for cultural-scientific heritage to mobile devices.

We give an overview of both the potential and the limits of mobile technology, and note the implications for application design.

In the work the problems of phishing (anti-phishing) and countermeasures are considered realizing the issue of identity theft problem.

Our security groupe technology is part of a complete package. It includes a sophisticated risk/threat engine as part of their adoptive authentication product. Just like the credit card companies use data mining to pick out fraudulent transactions based on signals and fuzzy data, it also gives the ability to assign a good/bad score to an IP address, and the risk that it may be an attacker and not the real customer.

If a naive attacker did deploy a phishing site similar to the one we have demonstrated in this page, it is quite likely that RSA would very quickly suspect that something bad was happening - simply due to the fact that hundreds of different users' SiteKeys would all be requested from the same IP address.

We made attempts to establish the documented content, form and attributes of records; assesses the digitization requirements. Developing engaging and effective on-line interactive learning requires understanding of many things. Subject knowledge and technical expertise are often emphasized, but just as critical are understanding the target audience and theories of learning as applied to the Web. In this paper, we will see ways to define target audience(s) and apply several learning theories to educational Web development.

REFERENCES

Bakardieva, Maria and Andrew Feenberg (2002). *Community Technology*, 18, 181-192.
Carroll, John M and Beth Rosson (2003). A Trajectory of Community Networks, *Information Society*, 19, 381-390.
Ezera 5:17-6:15). *The Bible, Revised Standard Version: The Bible Containing the Old and News Testament,* with Illustrations by Horace Knowles, Swindon: The British and Foreign Bible Society, 1967:377-386
Feather, John. (1994). *The Information Society: A Study of Continuity and Change.* London: Library Association Publishing LTD
Gavrel, Katharine. (1990). *Conceptual Problems Posed by Electronic Records: A Ramp Study*, Paris: UNESCO, GIP and UNISIST.
Harley, Ester S. and John Hampden (1964). *Books: From Papyrus to Paper Back.* London: Methuens.
Haywood, Trevor. (1995). *Info-Rich Info- Poor: Access and Exchange in the Global Information Society*. Bowker, London, p. 126.
Holsapple, C.W. and K.D. Joshi (2002). Knowledge Management: A Threefold Framework, Information Society. 18:47-64.

http://www.inasp.org.uk/ajol/journals/indilinga/about.html (accessed 15th December 2004).

Hunter, Jane. (2002). Combining the CIDOC CRM and MPEG-7 to Describe Multimedia in Museums. *Museums and the Web 2002: Proceedings.* D. Bearman and J. Trant (eds.) Pittsburgh: Archives & Museum Informatics. http://www.archimuse.com/mw2002/papers/hunter/hunter.html(Accessed 8th January, 2005).

Hunter, Jane, Bevan Koopman, and Jane Sledge (2002). Software Tools for Indigenous management. *Museums and the Web: Proceedings 2002*. D. Bearman and J. Trant. (eds.) . Pittsburgh: Archives & Museum Informatics. http://www.archimuse.com/mw2003/papers/hunter/hunter.html (Accessed 8th January, 2005).

Jul, Erik. (1997). Cataloguing Internet Resources: Survey and Prospectus, *Bulletin of American Society of Information Science*, 24(1): 6-8.

Nevile, Liddy and Sophie Lissonnet (2003). Dublin Core: The Basic for an Indigenous Culture Environment? In D. Bearman and J. Trant (eds.)*, Museum and the Web 2003: Proceedings*, D. Bearman and J. Trant (eds.) Toronto: Archives & Museum Informatics, http://www.archimuse.com/mw2003/nevile/nevile.html (Accessed 8th January, 2005).

Nevile, Liddy. (2002). The Virtual Ramp to the Equivalent Experience in the Virtual Museum: Accessibility to Museums on the Web, *Museum and the Web 2002: Proceedings , D. Bearman and J. Trant (eds.).* Pittsburgh: Archives & Museum Informatics, http://www.archimuse.com/mw2002/papers/nevile/nevile.html (Accessed 8th January, 2005).

Schwartz, Ray. (1997). Universal Resource Identifiers and the Effort to Bring "Bibliographic Control" to the Web: An Overview of Current progress, *Bulletin of American society of Information Science*, 24(1), 12-13.

Soergeil, Dogobert. (1985). *Organising Information: Principles of Database and Retrieval System*. San Diego: Academic Press.

Sutton, Stuart A & Sam G. Oh (1997). GEM: Using Metadata to Enhance Internet Retrieval by K-12 Teachers, *Bulletin of American society of Information Science*, 24(1), 21-24

UNESCO. (1995). *Memory of the World: General Guidelines to Safeguard Documentary Heritage*. C11-95/CW-11, National Library of Australia.

PHD FORUM

Children and information sources: boundaries and barriers to high quality information retrieval

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DESCRIPTION OF PROPOSED RESEARCH, INCLUDING MAIN RESEARCH QUESTIONS

Ala public library is situated in a town (Ala) of almost 9.000 inhabitants in the province of Trento, Italy. The library offers many activities and programmes for every age group, and particularly towards school and pre-school children (0-3, 3-5, 6-11, 12-14 year-olds). The library aims to develop a digital collection with internal and external resources in local history, that can be used both by the classes and by the general public interested in the history of the community where they live. In the next two years, the library will be involved in a programme devised and coordinated by experts and researchers (University of Padova, Italy and IPRASE, Trento, Italy), conducted in various schools in the Trentino province. Three classes of our community of pupils are involved in the programme called "Didaduezero" (something like "Edu2.0"), which aims to develop active skills in Web 2.0 environments, first at school, then in other settings.

During the first year of the project, the pupils have learned how to use a blog to present to their peers abstracts about their curricular readings. From the second year (school year 2009-2010) they have been asked to interact with each other and other pupils from other classes in a wider context such as web communities and social networks (e.g. Anobii), with the help of the teachers and the local library. One of the specific aims of the programme is to let them create materials by children for children. The programme includes various skills to be acquired by the pupils involved. The pupils will have the opportunity to share their acquired competencies and skills with members outside their programme, from computers located either at school, the library or their homes. Starting from a controlled information environment, they will be moving in a more complex information environment, still moderated by tutors, but including members they do not know, and such simulating the real information environment they could encounter during independent navigation on the Web.

- All these programme features provide a good starting point for many questions to be answered. Which will be the information behaviour of children in a different information environment?
- How will their interaction with the primary / secondary / tertiary sources be?
- How will it develop in the process of transforming information from the primary sources provided by the library or by other institutions / third parties on the Web to other sources?
- Which will the role of the library be in this process?

Probably, in the process of transferring information, the awareness about the reliability and credibility of sources is the most important feature both for children and adults. This feature may be considered a step beyond, or above, every other issue raised above.

The study might be carried out both in the library and in the classes. The population to be studied should be the children involved in the programme, and the teachers, the library staff, administrators and parents as key informants about the population.

The study could last at least three years, not only until the programme comes to an end (school year 2010-2011), but also later on for another year to assess the independence gained by the pupils in using the tools of Web 2.0 – and beyond.

As stated by Kuhlthau (1994, 2007) collaboration in the research project between school and public library is auspicable, for two main reasons. One is that collaboration allows the researcher to collect data from different contexts on the same (or on similar) projects, and after the research, gain more visibility and have more impact on the local communities and on the various stakeholders involved. In this way, the results of small-scale studies can be tested in other settings and their transferability checked. Kuhlthau, thank to the CISSL group and their collaboration, has been able to verify the credibility and validity of her studies in various settings. In my case, the local elementary school is already working on a Web 2.0 project conducted by the University of Padua, under the supervision of the researcher Marina De Rossi. This researcher is conducting a study about the benefit of an active approach to Web 2.0 and social networks in schools on a provincial basis, since this study is financed by the Province of Trento, Italy, through the Institute for Education (IPRASE) based in that city (Trento). A participation in the project could be a great opportunity to evaluate which impact has the development of such educational practices onto general library services. Another reason for starting a collaborative research project is that of being aware of potential fields from which our disciplines can learn and to which our disciplines can contribute effectively. Since I mentioned before cognitive science and information science, I only refer to another possibility of collaboration with the nearby University of Bozen, running a course in Information Technology; Fondazione Bruno Kessler with its research labs in cognitive science and IT, and Trento University, with its Faculty of Cognitive Science.

The results of a research could be used to improve existing library services and information systems, or to implement new ones, depending on the outcomes of the study undertaken. Kuhlthau's model has had an important follow-up in the development of the Guided Inquiry "framework"; in my case the results could be significant to revise free time literacy programs (e.g. non-curricular interventions offered in the library) and to revamp existing services.

Undertaking a research project is a task that has a definite beginning, but often comes out in a continuous reflection about the outcomes, so that it is not possible to say when it comes to an end, if that is ever the case. Looking to the future is an attitude of the researcher (and the reflective practitioner, as Donald Schon would put it), asking himself/herself about what it has been done, if it is enough, what is missing, what unnecessary, what profitable. After a study, some tracks will be maybe abandoned, others will invite the researcher to explore in more depth and expand his/her knowledge on the topic. This is in line with the current viewpoints on researching as an activity based on curiosity that reaches tentatively approximate answers to questions.

MOTIVATION FOR PROPOSED RESEARCH

The aims and objectives of the study could be:

- to provide a method to assess current and future literacy programmes led by education experts and teachers at school;
- to provide a method to assess current and future literacy programmes led by the public library active in the community where the pupils participating in the programme live;
- to provide data to managers, administrators and experts in order to understand the significance of a literacy programme for children;

- to stress the importance of being aware about the quality and reliability of information since an early age.

The last objective stated above can be considered a good reason to conduct this study, since children are asked more and more frequently to do their homework including web resources which they shall often evaluate by themselves or among their peers. Trying to refine the general knowledge about the information searching behaviour of young internet users by studying a specific population could reinforce previous studies in the same field and come to new conclusions, recommendations and suggestions for further research.

BACKGROUND AND RELATED WORK

Every research should be based on previous knowlegde on the topic. The application of a framework already adopted in the LIS sector is preferrable, both to gain a more wider perspective on the everyday work, and to successfully disseminate research results among colleagues. In the case of the ISP study, Kuhlthau, who was working in a school library, adopted and adapted frameworks from psychology, philosophy and the cognitive sciences, and this was an advantage for the implementation of her research results, because stakeholders were acquainted with the preliminary considerations of her work. In my case, in order to have an impact either on the provision of public library services, information literacy or simply library instruction, this would mean to relate the research to more practical fields that colleagues are acquainted with: for instance, library services and organisation, knowledge organisation, and introduce them to main concepts in cognitive sciences, information science, psychology and other disciplines that, in the course of the research, might be relevant to discuss the findings.

RESEARCH METHODOLOGY

Depending on the collaboration and co-operation of the various stakeholders involved, the research might be carried out as a case study or an action research, following a grounded theory method. It might be interesting to compare and analyse on one hand the abilities of the children involved in this study, before they experience a wider information environment, and on the other their presumed abilities stated by the experts who devised the programme and the teachers who freely decided to be involved in it.

The techniques to be used should be varied and include as many as possible of the following, to provide the best chances for triangulation of data: questionnaires, in-depth interviews, focus groups, observation at different stages during the programme to tackle specific aspects of the main problem.

REFERENCE AND BIBLIOGRAPHY TO START WITH

Fraenkel, J. R., Wallen, N. E. (2003) *How to Design and Evaluate Research in Education,* 5th ed., Boston, MA, McGraw-Hill.

Kuhlthau, C. C. (2009) *Information Search Process.* [Available at: <http://www.scils.rutgers.edu/ ~kuhlthau/>].

Kuhlthau, C. C. (2007) *Inside the Information Search Process: Reflections on the user's perspective of information seeking.* Lazerow Lecture at the University of Kentucky. [Available at: <http://www.scils.rutgers.edu/~kuhlthau/>].

Kuhlthau, C. C., Maniotes, L. K., and Caspari, A. K. (2007) *Guided Inquiry: Learning in the 21st Century.* Westport, CT; London, Libraries Unlimited.

Kuhlthau, C. C. (1994) *Seeking Meaning: A Process Approach to Library and Information Services*. 2nd printing. Norwood, NJ, Ablex.

Kuhlthau, C. C. (2004) *Student Learning in the Library: What Library Power Librarians Say.* In: Chelton, M.K., Cool, C. (eds.), *Youth Information-Seeking Behaviour: Theories, Models, and Issues,* Lanham, MD; Toronto; Oxford, Scarecrow, p. 37-63.

Kuhlthau, C. C. (2005) "Towards collaboration between information seeking and information retrieval" *Information Research*, 10 (2), paper 225 [Available at: <http://InformationR.net/ir/10-2/paper225.html>].

Kuhlthau, C. C., Heinström, J., Todd, R. (2008) "The 'information search process' revisited: is the model still useful?" *Information Research*, 13 (4), paper 355. [Available at <http://InformationR.net/ir/13-4/paper355.html>].

Patton, M. Q. (2002) *Qualitative Research & Evaluation Methods,* 3rd ed., Thousand Oaks; London; New Delhi, Sage.

SHORT BIOGRAPHY

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Time-Driven Activity-Based Costing (TDABC) in Assessing the Effectiveness of University Library: in the Case of the Tallinn University of Technology Library

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THEORETICAL BACKROUND OF THE DOCTORAL PROJECT

It is believed that public sector organizations have less incentive to be efficient and this is related to the principle of budgetary. Indeed, the budget does not depend on the efficiency of the public organization. Because of the lack of control the public sector organizations are not too often interested in its budget funds to save. If an organization or its department strives to be financially effective and save money, it may result in a lower budget for the next year.

In the current socio-economic situation, efficiency has become very important. It is challenging to cope with the same or reduced resources in managing the same processes and activities, so that the quality of the result would not be affected. University libraries are faced with the challenge of retaining and effective staff who have skills necessary to respond to new and changing circumstances and increased user demands.

In ensuring the work efficiency of public organizations, the role of the employee has been underestimated and there is lack of respective academic research. Public sector organizations are generally considered old organizations. Throughout centuries, public organizations have retained a relatively unchanged hierarchy, structure and strict rules of procedure and their long-term status is characterized by a certain inertness which makes it difficult to carry out rapid changes in public organizations and their structural units. The university and academic libraries also can be considered as old organizations.

In library and information science cost accounting research, it is however quite common to measure the time spent by employees on various activities. Efficiency equals results divided by costs, in other words, the efficiency of employees means how much good quality work is being done in as short time as possible.

In the library as a service enterprise, efficiency depends mainly on the employees, thus, if the organization begins to pay more attention to efficiency and the optimization of costs, the work of all employees is considerably affected.

The implementation of new costing methods in libraries is treated as a technical innovation and not as organizational or management innovation. Technical design issues focus on areas that ensure that appropriate cost information is provided to support decisions and actions.

For example the literature on Activity Based Costing (ABC) and Time-driven Activity based Costing (TDABC) provides detailed and technical instructions on the design of ABC and TDABC, but little indication of how to deal with organizational and behavioural issues. The management perspective focuses on how organizational and behavioural variables can affect the process of implementations, which follows a logical sequence of defining needs, specifying the characteristics of the organization, top management support, designing, testing, training and so on (Agbejule, 2000).

Following from the classic organizational theory, the choice of staff plays a significant, if not the most important role, in the success of the organization, as many organizations understand that it is important to recruit good employees first and then to keep on to them and motivate them (Brooks, 2006).

The school of the scientific management of the organization followed from placing an emphasis on rationality in the organization and disregarding the feelings of the employees. Scientific management school stems from the classical organizational theory which deals mainly with the organization and its structure, while the former is focusing on the working procedures. The representatives of the school of scientific management claim that scientific principles should be used in managing work, in order to determine the best way to complete each task. As a result, work should become more efficient, and productivity and effectiveness should increase, which in turn would increase the profitability/performance of the enterprise/organization, however, the working environment would become less human-centered (Brooks, 2006).

According to the most prominent representative of the school of scientific management, Frederick Taylor, scientific management of work tasks increases discipline in the organization. In his work *The Principles of Scientific Management* (1911), the following principles of work organization are presented:

- work should be scientifically analyzed in order to find the best method to complete a task;
- a scientific process of selection should be applied in order to find the best employee to complete the task;
- work must be standardized and simplified (Brooks, 2006).

Taylor divided work in units and single operations and recommended to standardize work. He was the first to apply the method of timekeeping (timing), which is based on analyzing the repeating elements of a work operation and measuring how much is spent on work with a watch, camera or other technical devices.

It should be note that the first library institution, which was used in the measuring cataloging in terms of time spent was The Grand Rapids Public Library (USA) in 1914 (Rider, 1936; Harris, 1989).

Systematic measurements have began to be made of the quality of work of employees which has brought about controversial reactions among employees in the initial stages. For example in the staff allocations project study, held between 2003 and 2004 in Notre Dame and Vanderbilt University libraries by Dilys E. Morris, Joanne M. Bessler et al. argued, that though a number of staff understood the potential benefits and usefulness of the information gathered, the time and cost study was an unpopular activity (Morris, Bessler et al, 2006). However, most employees realize that the indicators enable them to develop themselves better professionally and to gain more recognition. Many organizations have admitted, though, that not all employees are comfortable with these changes in the working culture and therefore leave the organization sooner or later.

The prerequisites for increasing the efficiency of the staff are the following:

- right choice of employees, that is, the right person is doing the right work (the employee has relevant education, preparation and skills);
- initiative from the management and the skill to conduct work efficiency studies, and to relocate employees if necessary;
- compatibility of employees, or a team who is sharing the same values;
- the understanding that the employee matters;

- good working equipment;
- conducting only a minimal number of unnecessary tasks.

These perspectives will be used to develop a theoretical framework for the research – a framework for TDABC implementation in Tallinn University of Technology Library.

TIME-DRIVEN ACTIVITY-BASED COSTING (TDABC) MODEL

The Activity-Based Costing (ABC) method, the forerunner of the TDABC was designed in the United-States during the 80's (Cooper and Kaplan, 1988). It is a refined cost system which enables classifying more costs as direct, to expend the number of indirect-cost pools and to identify cost drivers. ABC favours better cost allocation using smaller cost pools called activities. Using cost drivers, the costs of these activities are the basis for assigning costs to other cost objects such as products or services. Activity-based costing philosophy is simple and logical - costs and expenses are not arised automatically, charges and expenses incurred as a result of management activities. There is no holding cost inside the organization, there is only activities carried out for customer service which in turn lead to charges.

But – ABC appeared to cause two significant problems. First – setting up and ABC system can be very costly, especially if the current accounting system does not support the collection of ABC information. Second, the system needs to be regularly updated, which further increases its costs. Kaplan and Anderson (2004) note that the high time and cost to estimate an ABC model and to maintain it – through re-interviews and re-surveys – has been a major barrier to widespread ABC adoption. In a similar vein, Everaert et al. (2008) claim that many managers who have tried to implement ABC in their organizations, have abandoned the attempt in the face of rising costs and employee irritation. These limitations motivated Kaplan and Anderson to develop time-driven activity-based costing (TDABC), a revised version of ABC, solving these problems, without losing the benefits (Kaplan, Anderson, 2004). The Time-driven Activity-based costing is also referred to as "new ABC".

It is an equivalence approach which consists in using equivalent-time cost drivers. The principle of the Time-driven ABC (now TDABC) is to translate the costs drivers in time-equivalents (standards of working hours). The standards can be revised when the production conditions change. The TDABC is a way to re-introduce the standard costing approach into the ABC methodology. With the TDABC, we can highlight sub-activity costs.

The testing and implementation of the ABC-method is already very common in university libraries around the world (Goddard, Ooi, 1998; Ceynova, 2000; Poll, 2001; Ellis-Newman, 2003; Heaney, 2004; Ching, Leung, 2008). Many library managers are decided that activity based costing method is the best of existing cost analysis method adapted for evaluating library products. But the fact is that this method can only be implemented in collaboration with the accounting department of university if the library itself does not have one.

The TDABC method in the context of the university library has been tested only in Belgium, at the Arenberg library of the Catholic University of Leuven was carried out the study with using TDABC model. But this study was only concentrated on the inter–library loan (ILL). The researchers had set up a time-driven activity-based costing system for the ILL service. The authors of this study concludes that TDABC can contribute to the provision of better library services at lower costs. Moreover, according to the authors, it looks very promising to apply the TDABC approach to other library services, like to the analysis on the activity "acquisition", which has similar characteristics with ILL (complex, time consuming and lots of variation) (Pernot, Roodhooft et al, 2007).

TDABC-method otherwise can be tested and implemented by the departmental managers even for each library department separately. But the involvement of experts in costing and economy has recommended.

The actuality of the current research can be characterised by following:

- if the efficiency in the good times is not a major problem, then under the economic downturn conditions, it becomes suddenly important.
The need for more effective management of library activities was mentioned already in the *Development project of the Estonian Academic Libraries 2001-2005 in Annex 2*, in which were outlined a cost-saving opportunities and the needs of libraries;
- the lack of theoretical and practical implementation of new cost accounting methods in university libraries in Estonia, so we do not have the opportunity to compare themselves in this regard with academic libraries elsewhere in the world;
- various cost-saving opportunities and the lack of efficacy studies in university libraries in Estonia, which would help to shape the sustainable organizations with the optimal structure and rational organization of work;
- although a number of new cost accounting techniques have been developed in recent years, studies of the implementation in libraries have focused on technical aspects, with inadequate attention being given to the behavioural and organisational factors;
- the development vision of the Tallinn University of Technology Library is to develop a sustainable organization with an optimal structure and rational organization of work, which for, inter alia, is necessary:

  1. to examine the effectiveness of library and information services (information needs and information behavior, service quality and user satisfaction, cost efficiency etc.);

  2. optimize the structure and the composition of the library's staff;

  3. develop performance evaluation criteria and procedures;

  4. implement performance management principles.

The hyphothesis of the doctoral project: University libraries as the organizations with a optimal structure and the completion of a rational organization of work can not exist without a cost-saving opprtunities to identify and better operational control.

The aim of the research is to study the TDABC method in organizational effectiveness and human resource management perspective, how these perspectives affects to the process of implementation.

The research questions are formulated as follows:

1. what were the historical developments and factors that created the need for cost accounting in library sector;

2. what are the modern theoretical considerations and treatments relating to the cost accounting and costing of academic libraries;

3. what are the national information policy principles, the dynamics of income and expenditure as well as the most relevant performance indicators related to staff of the members of the *IATUL (International Association of Scientific and Technological University Libraries)* - Tallinn University of Technology Library, Helsinki University of Technology Library, Swedish Royal University of Technology Library and Scientific Library of Riga Technical University - during the last 5 years;

4. what would be an appropriate model of the time-driven activity-based costing (TDABC) according to the needs of the Tallinn University of Technology Library;

5. what would be the impact of the use of the TDABC method as the tool for measuring the effectiveness of their work to the library staff and to the organizational culture in general.

METHODOLOGY AND DATA COLLECTION

1. The theoretical part of the study, based on the analysis and processing of the thematic professional literature, gives an overview about the main organizational effectiveness as well as the human resource management theories related to the staff efficiency and productivity, and historic path and contemporary trends in cost accounting/costing which is implemented in the academic libraries all-over the world.

2. The empirical work consists of three phases:

I phase: a pilot study in acquisitions department, using in-depth interviews with staff, to identify their attitudes and extending the methodology and to explain the rationale and purpose and to discuss the specifics of the tasks and how to record time.

II phase: precise identification of the duties of all employees of the departments, participating in the study, according to their job descriptions with heads of departments and services; interviews and a questionnaire form for library staff; elaborating of the accounting and statistical data.

III phase: on the basis of the data collected on first phase will take place the verifying of capacity cost rate, of time driver or in other words a time required to perform on each activity, and, ultimately each activity with mathematical methods.

Thus, the case study research with combination of qualitative and quantitative methods will be used.

REFERENCES

Agbejule, A. (2000). An Administrative and Institutional Perspective of Activity-Based Costing Implementation. University of Vaasa, Vaasa.

Brooks, I. (2006). Organisational behaviour: Individuals, Groups and organisation. Pearson Education Limited, London.

Ceynowa, K. (2000). Activity-based cost management in academic libraries - a project of the German Research Association. *Performance Measurement and Metrics*. Vol. 1(2), pp. 99-114.

Ching, S., Leung, M. (2008). Allocating costs in the business operation of library consortium: The case study of Super e-Book Consortium. *Library Collections, Acquisitions and technical Services.* (June), Vol. 32(2), pp. 97-103.

Cooper, R., Kaplan, R.S. (1988). Measure costs right: Make the right decisions. *Harvard Business Review*, September-October, pp.96-103.

Ellis-Newman, J. (2003). Activity-based costing in user services of an academic library, *Library Trends* 51(3), pp. 333–348.

Everaert P., BruggemanW, Sarens G, Anderson S, Levant Y. (2008). Cost modeling in logistics using time-driven ABC. Experiences from a wholesaler. *International Journal of Physical Distribution & Logistics Management*. Vol 38(3), pp. 172–91.

Goddard, A., Ooi, K. (1998). Activity-based costing and central overhead cost allocation in university, *Public Money and Management.* Vol**.** 18(3), pp. 31–38.

Harris, G. (1989). Historic cataloging costs, issues and trends. The Library Quarterly. Vol. 59, No.1. (Jan), pp. 1-21

Heaney, M. (2004). Easy as ABC?, *Activity-based Costing in Oxford University Library Services The Bottom Line.* Vol. 17(3), pp. 93–97.

Kaplan R., Anderson S. (2007). The innovation of time-driven activity-based costing. *Journal of Cost Management.* Vol. 21(2), pp. 5–15.

Kaplan, R., Anderson, S. (2004). Time-Driven Activity-Based Costing. *Harvard Business Review,* no. 82 (November), pp. 131-138.

Morris, D.E., Bessler, J.M. (2006). Where Does the Time Go? Staff Allocations Project. *Library Administration & Management.* Vol. 20 Issue 4, pp. 177-191.

Pernot, E., Roodhooft, F. (2007). Time-Driven Activity-Based Costing for Inter-Library Services: A Case Study in a University. *The Journal of Academic Librarianship.* Vol. 33, No 5, pp. 551-560.

Poll, R. (2001). Analysing costs in libraries. *The Bottom Line: Managing Library Finances.* Vol. 14(3).

Rider, F. (1936). Library cost accounting. *The Library Quarterly*, Vol. VI, Oct., No. 4, pp. 331-381.

Organization and Appropriation of Text in Manuscripts and Early Printed Books: Research on Selected Croatian Glagolitic Manuscript and Early Printed Breviaries from the period from 1460 to 1561

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BACKGROUND AND RELATED WORK

Croatian Glagolitic manuscripts, incunabulas and cinquecentinas have been the subject of many studies in the fields of Croatian philology (Anica Nazor, Marija Agnezija Pantelić, Josip Tandarić, Stjepan Damjanović, Milan Mihaljević, Marica Čuničić, Vesna Badurina Stipčević, Mateo Žagar), cultural history (Marija Agnezija Pantelić, Josip Bratulić, Stjepan Damjanović) and typography (Frane Paro, Ivan Bakmaz, Marica Čunčić). The studies resulted in setting the place and the date of printing of books without colophons, as well as in the publication of reprints and facsimiles of manuscripts and early prints that are important sources for the Croatian history. But the change in the appropriation of those texts and the impact that the appropriation had on the organization of the text and the usage of graphetic elements was only occasionally a subject of a research. This research will follow the model of research of graphetic elements and the organization of the page in the Croatian medieval texts settled in the work of Mateo Žagar.

This research is also based on the studies on the organization and presentation of the texts brought by Paul Saenger, on the concepts of communication circles brought by Roger Chartier and Robert Darnton, and the modes of appropriation elaborated by Michael de Certeau. The special attention will be given to the studies on the reading habits in Middle Ages conducted by Antony Grafton.

MOTIVATION FOR THE PROPOSED RESEARCH

It is often repeated that the first printed books were not very different in appearance from traditional manuscripts. Nevertheless, the invention of printing press brought many revolutional changes, one of which is the spread of the written word among much heterogeneous reading public. The book had to adjust to the wide spectrum of readers and due to the appropriation, its appearance has been changing. That change has been researched by many scholars and many studies have been conducted in the field of the history of the book, history of printing, communication history, transmission of the text, etc. Consequently, we know a lot about the history of the book and about the appropriation, but in the world of Latin texts.

The main characteristic of medieval Croatian literature is threefoldness: there are texts written on Glagolitic alphabet, the Cyrillic texts and the Latin ones. Although it was also used in other countries, owing to its unique angular form used only in Croatia, the Glagolitic alphabet is in Croatia called „angular". The first European non-Latin printed book was printed on Glagolitic script in 1483, and soon other Glagolitic printed books showed up. Among them are those printed by Blaž Baromić, a priest from Senj. As the printing process was expensive and as those books were printed very soon after the invention of printing press, we can state that the Glagolitic priests were very soon aware of European inventions

and eager to follow those movements and spread the book on vernacular among the Croats. It is important to research the Glagolitic texts and compare it with Latin ones in order to enrich the research in cultural history of Croatian Glagolitic period.

By the organization of the text it is assumed the way that the text is settled on the page, the contrast between text and white spaces on the page, the elements that facilitate reading, like graphetic elements, and those that facilitate the reader to find his way through the text. The graphetic elements are those that are used in written texts, although they have no pronounced equivalent. They are used in order to facilitate the reading process and were changed throughout the history of the written page (ligatures, abbreviations, capital letters, punctuation). As one of the postulates of this research is that the change in the organization was dictated by the readers, the systematic research of those changes will make a contribution to the study of Croatian medieval readers, its habits and history.

DESCRIPTION OF PROPOSED RESEARCH, INCLUDING MAIN RESEARCH QUESTIONS

The sources of the research are four breviaries, two manuscripts, one incunabula and one cinquecentina: Breviary of priest Mavro written by Blaž Baromić in 1460, Breviary of Blaž Baromić printed in 1460 in Venice in the Toressani printing office and edited by Blaž Baromić, the second Novljan Breviary, manuscript breviary written in 1495 (it is assumed that it was copied from the Breviary of priest Mavro), and the Breviary of Brozić from 1561 which is considered in the literature as the second edition of the Breviary of Blaž Baromić. There are apparent connections between those breviaries and Blaž Baromić, who was a scribe, a printer and a priest, a man who wrote one breviary, went to Venice to learn how to print one and use that knowledge in order to print in Glagolitic alphabet. Baromić made a considerable impact on the other scribes, but also initiated the establishment of the printing office in Senj and made an impact on further Croatian printers. As all those breviaries are from the period of around 100 years, so the change in the organization of the text and in the usage of the graphetic elements is expected to show the trends in that change, the impact that manuscripts had on the printed books and vice versa, as well as the change caused by the appropriation issues seen by scribes and printers in that period.

The main goal of the proposed research is to describe the modes of the organization of the text and the usage of graphetic elements in Glagolitic liturgical manuscripts and in the first printed Glagolitic liturgical books. A comparison between manuscripts and the first printed book of the same genre and purpose is expected to show an influence that manuscripts made on the first printed books in the field of the organization of the text and the usage of graphetic elements, as well as the potential vice versa process. At the same time, a comparison between breviaries from different period is expected to show a standardization and/or development of the organization of the text and of the usage of graphetic elements throughout time.

One of the goals of the research is to study the change in the organization of the text and the usage of graphetic elements caused by the appropriation of the text, primarily by the change in the modes of reading (public/private reading). The appropriation will be examined by recording the interventions that scribes and printers made in the text in order to facilitate the process of reading and the to help the reader to finding the way through the pages of the codeces or of the books (the spaces between lines, words and letters that brake the principle of *scriptura continua*, the margines and other white spaces on the page, the proportion of the letters, the modes of abbreviation of the words and the usage of ligatures in order to facilitate and speed the reading process, the ways of preparing the book for the reader like marking the

paragraphs, punctuation, interpunction, the change in the typography, the decorations on the pages, the ways of decorating the initials, etc.).

In order to examine the modes of adjusting the text to the reader relating to the modes of reading (public reading vs. silent reading), the organization of the text and graphetic elements will be separately examined in the parts of breviaries intended for public and those intended for private reading. The results of that examination is expected to enumerate the differences between the usage of different modes of presentation of the text and of different graphetic elements in the functionally different texts.

One of the postulates of this research is that the usage of graphetic elements, especially abbreviations and ligatures, not only facilitate the process of writing but also the process of reading owing to cognitive processes they invoke. At the same time, a language of a written text can facilitate the reading process, especially the reading of words with ligatures and abbreviations. As the language of Croatian medieval texts is mostly the mixture of Old Slavic and Old Croatian languages, this research will examine the usage of Croatian and Old Slavic features in researched texts intended for different modes of reading.

RESEARCH METHODOLOGY

In this research the quantitative analyze will be used. The elements of the organization of the text, as well as the graphetic elements, will be observed in each breviary. In order to narrow the researched corpus for this research, the sanctorals are chosen because they are present in all of the researched breviaries and have texts intended both for private and for public reading.

Texts of the sanctorals will be transliterated and the observed elements will be encoded using TEI standard. The observed elements are the space between columnes, lines, words (or between groups of words) and letters (only if the space between letters is visualy considerably different from the space between letters in the rest of the text), as well as the other white spaces on the page (margines, the space between paragraphs etc.). Further elements are the ligatures and abbreviated words. Every ligature, as well as the abbreviated word will be encoded with the additional information important for the understanding of the function of those elements in the process of reading.

The type and colour of the letters, the ways of marking the paragraphs and other different parts of text, the modes of pagination and punctuation and the manner of different scribe's and printer's interventions in the text (notes, marginal notes, corrections etc.) will be shown in tables and analyzed separately for each breviary and afterwards compared.

The results will show the number of researched elements in each breviary, as well as in the separate parts of the breviaries intended for different modes of reading. The comparative analyze will show the differences in the modes of the organization of the text and the usage of graphetic elements in glagolitic liturgical manuscripts and in the first printed glagolitic liturgical books, as well as the directions of the influence. It is expected that this research will show the main trends and the process of standardization of the organization of the Croatian glagolitic texts as well as the influence that appropriation had on the organization of the texts and on the usage of graphetic elements.

The comparison with the other glagolitic texts, as well as the texts written on other scripts and languages will be proposed. This research will also be a contribution to the composition of the glagolitic paleography.

POSTERS

Digital native's (in) formal learning environment

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ABSTRACT

Digital natives or so called millennial, net generation (net gen) or generation Y are some of the synonyms that refer to those born since 1982 (Ralph, Olsen, 2007.). The current literature accentuates that only approximately 1/6 of the world has access to digital technologies and the lack of digital literacy causes the digital divide so if we want to be precise we can not talk about digital natives as a generation but rather a population. (Palfrey, Gasser, 2009) However, digital natives form their own world-'cyberspace' and have their own culture and language. Some of the main characteristics of the digital natives are that they: possess sophisticated skills with ICT (information and communication technologies) and have particular learning preferences or styles; (Bennett, Maton, Kervin, 2008) develop their own social norms around digital culture and highly value creativity, innovation, and entrepreneurship; (Palfrey, Gasser, 2009) like to parallel process and multi-task, prefer random access (like hypertext), function best when networked, thrive on instant gratification and frequent rewards and prefer games to "serious" work; (Prensky, 2001) Regarding this last characteristics of digital natives it should be mentioned that gaming is recognized as a literacy activity. (Bolan, Canada, Cullin, 2007) Digital natives use social software tools frequently not just for entertainment but also in educational purpose and customize their (in) formal learning environment according to their above mentioned preferences. As the digital libraries play an important role in digital natives (in) formal learning environment and some studies (Secker, Price, 2007) conducted before have shown that social software tools can improve access to library resources, develop information literacy and collaboration among users or stuff it would be interesting to find out which of these tools are the most popular among digital natives at the moment and should be incorporated in digital libraries. That's why we surveyed the sample of N digital natives in Osjecko baranjska county about their use of social software tools. The results of the survey of digital natives and conclusions how these findings can help us to shape better digital libraries are presented.

REFERENCES

Bennett S., K. Maton and L. Kervin. The 'digital natives' debate: A critical review of the evidence. // British Journal of Educational Technology 39, 5 (2008), 775–786.
Bolan K., M. Canada and R. Cullin. Web, Library, and Teen Services 2.0. // Young Adult Library Services (2007), 40-43.
Darby A. and R. Gilmour. Adding Delicious Data to Your Library Website. // Information technology and libraries (2009), 100-103.
Hardacre M. Teens Talk Tech. // Young Adult Library Services (2010), 29-30.
Hastings R. Collaboration Tools, 2.0 Style. // Library Technology Reports (2009), 19-27.
Palfrey J. and U. Gasser. Born Digital: Understanding the First Generation of Digital Natives. // New York: World Future Review (2009), 109-110.

Peowski L. Where Are All the Teens? Engaging and Empowering Them Online.// Young Adult Library Services (2010), 26-28.

Prensky, M. Digital Natives, Digital Immigrants, Part I. // MCB University Press: On the Horizon 9, 5 (2001).

Prensky, M. Digital Natives, Digital Immigrants, Part II: Do They Really Think Differently?. // MCB University Press: On the Horizon 9, 6 (2001).

Prensky, M. Homo Sapiens Digital: From Digital Immigrants and Digital Natives to Digital Wisdom. URL: http://www.innovateonline.info/index.php?view=article&id=705 (revisited 2010-04-15)

Ralph J. and S. Olsen. Podcasting as an educational building block in academic libraries. // Australian Academic & Research Libraries 38, 4 (2007), 270-279.

Saxton B. Information Tools: Using Blogs, RSS, and Wikis As Professional Resources. // Young Adult Library Services (2008), 27-29.

Secker J. and G. Price. Libraries, social software and distance learners: blog it, tag it, share it! // New Review of Information Networking 13, 1 (2007), 39-52.

Spiteri L. R. The Structure and Form of Folksonomy Tags: The Road to the Public Library Catalog. // Information technology and libraries (2007), 13-25.

Summers L. L. The value of social software in school library: Instruction, communication and collaboration. // Knowledge Quest | Social Scholarship 37, 4 (2009), 49-50.

Should public libraries invest (more) in digital preservation? The public library in Čačak case study

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This demonstration aims to present how a relatively small public library in Serbia manages to keep running very successful digital preservation program from 2006 onwards. It will emphasize the main fields of digitization in the Public Library Čačak (digitization of paper materials from the Local History Collections, digitization of old audio and video materials, web archiving), our plans for the future (building strong cooperation among local memory institutions in collaborative effort of preserving the most of cultural heritage in digital form), but also some facts from the past, such as development of the program, funding, obstacles and results. For instance, our flag-ship project *Digital Library of Čačak* won prestigious award as "The best public library project 2006-2009" in Serbia, which for itself raise the importance of digitization activities among public libraries and other local cultural institutions. The Public Library in Čačak is the only public library in Serbia (for now) which built Digitization Center in January 2008, as organizational unit for digitization.

The demonstration will try to positively answer the above question in the title, pointing some key aspects of digital preservation of local heritage, it benefits for the institution and its services, and created quality for the society and culture. Presented projects and activities will show one example how that can be done, but could be also a inspiration for others thinking to challenge "digital divide" in their communities.

Library-user collaboration on bibliographical perspective

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SUMMARY

Modern library and information science is mostly focused on users, technology and information management. User perspective or cognitive approach has radically influenced organization of many library services. Digitally born users put new demands on library services, always being technologically one step forward the library. Facing new demands, libraries are rushing to respond, becoming "beta" libraries and offering services in constant flux.

Library catalogues and bibliographies remained for centuries immune on user perspective, especially regarding digitally-born user's demands. Bibliographical perspective is concentrate exclusively on documents. User and bibliographical perspectives were like two opposite sides on single library paradigm shift. Library services in digital age are fully embracing and integrating new digital technologies. Digital library services tent to become platforms where library and users could meet to collaborate. Library-user collaborative platform is endorsed by community-driven catalog systems, which support user's tagging, rating or reviewing of library holdings. Poster will analyze digital tools for opac 2.0 and bibliography 2.0 interfaces, outlining their benefits for users and as for library. Poster tents to show how digital technologies will bring user perspective and bibliographical perspective closer.

Keywords: Library services in digital age, bibliographical perspective, opac 2.0, bibliography 2.0

Google generation: myth or reality? Experiences with students of the Faculty of Philosophy in Osijek

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Information behavior has dramatically changed due the "information revolution" caused by the development of ICT, increase of the number of informations and experiencing information as important resource that runs the world economy in general. Researcher of the future, or we can say the present, presents informationally literate man, "born" with the technology, who has mastered the technique of information retrieval. Such a person tends to informal education, independent work and avoids the "traditional" sources of information, such as libraries and printed materials.

These researchers from the future are often called the Google generation. Google Generation is a term that represents a generation that is using Google search engine and, of course, the Internet as a primary source of information and knowledge source. This generation generally includes children and young people which have the inherent knowledge of computer skills and use of the Internet, or digital natives, but its volume is growing and even more includes other generations accustomed to the use of new technologies. However, tools used by the Google generation are no longer just a search engine. Google has recently released over thirty different services and tools for users, such as Gmail (Google e-mail), Google Scholar, Google Books, Google Docs, Google Maps, Google Earth, Google Wave, Google Reader, etc. and the latest Google Buzz. Listed tools and many others are covering different areas of search, organization, and exchanging of the information, and are mutually compatible and interactive. The crown of all is the development of a Web browser Google Chrome, Google Operating System and long expected Gphone.

The paper presents research of the effects of Google and its generation phenomenon on the students' example. Research method is a simple questionnaire which will include students from two departments of the Faculty. The assumption is that students also belong to the Google generation and are frequently using various Google tools, mostly search engine, for private and academic purposes. Moreover, it is assumed that the above phenomenon is also spreading between older generations.

The question is asked does the Google generation exist at all today, or whether have users gradually "outgrown" using Google tools because they have higher expectations on ICT, they stopped being passive consumers of informations and became experts of information retrieval. Research results should show the answer to the question on "micro example" of Faculty's students and it may be an initiative for further research of this problem.

Šibenik on old postcards (preposition for digitalisation)

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The Public Library Juraj Šižgorić's collection of postcards represents an unfailing resource for analyzing cultural heritage of the city. The postcards date from 1870, published in the cities of the Austro-Hungarian Empire, while those from 1899 were published in Šibenik. These postcards were first reproduced in lithographic technique, to be later replaced with more available, photographic one.

The most interesting part of the corpus is postcards from the beginning of the 20th century Most of them are black and white, while a smaller number of them is painted manually.

The earliest postcards preserve the image of Šibenik at the time, while those later ones show the city's harbour, restaurants, hotels, park ... all of them of interest to the emerging tourism, but also long lost attractions of the town.

Digital Scholarly Resources in Estonia – State Financing, Use and Expenditure of University Libraries

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Introduction

The use of online information resources is growing rapidly. The actual science information is electronic as a rule – practically all the journals of natural science and engineering have electronic versions and a certain number of them are available only electronically.

Scientific information is the basis for research and development, degree study and professional specialty, to a certain extent.

Universities and their libraries have experienced in recent years an enormous growth in documents in digital format. The number of publications, research data and results available via the Internet are growing continuously. In several important research fields, efficient research is no longer possible without network access and computers. This has intensified research and made global research networks a reality (Sinikara, 2007).

As a service providing institution, the planning of library work is based on service quality, the satisfaction of the information consumer and necessary resources to achieve the desired result. In the current economic situation, it is essential to be familiar with the statistical indicators related to the usage of the electronic environment. This enables the management of the library to assess whether all electronic databases, online journals and e-books, to which access has been bought during financially more secure times, are indeed indispensable to the users or need to be discontinued.

The purpose of the paper is to analyze the essential data, details of the use of e-resources and the cost of electronic scientific information as well as the cost of the most important performance indicators related to the increasing usage and acquisition of electronic scientific information of the three largest university libraries of Estonia – University of Tartu Library, Tallinn University of Technology Library and Tallinn University Academic Library – during the period 2004-2008. These three libraries were chosen because the critical mass for fulfilling the tasks of academic and university libraries has historically accumulated in these libraries. The choice of the period 2004-2008 is justified by the fact that during the period mentioned, the libraries were made a substantial increase in the e-services as well as in expenditures to the electronic scientific information.

METHODOLOGY

The data used in this short paper is based on the analysis and generalization of relevant literature. The details of the size, cost and usage of the collections of university libraries, based on the annual reports of these libraries, are analyzed.

FINDINGS

Funding allocation formula for university libraries is as follows: all the finances be divided in half between Tartu and Tallinn. Within Tallinn and Tartu, the finances allocated in accordance with the formula, where the largest component of the weight is the university's research capacity, then the university's own financial contribution to the purchase of the library materials, after which the number of students FTE, the number of collections and the number of readers is calculated. It is particularly important to note that only the collections on physical carriers (books and periodicals on paper, DVDs, CDs etc.) are calculated among the collections in this case. This is understandable because only the collections on physical carriers includes to the capital assets of the library/university by the accounting rules. Therefore, all electronic - purchased access to information, are not included in library collections.

The students constitute only one part of the readership, while a considerable part of the readership is formed by other target groups (lecturers, scientists, readers) in the three largest academic libraries in Estonia. Therefore, the role of university libraries in Estonia is much broader, offering services to different users.

The number of licensed databases as well as the number of e-journals and e-books in Estonian university libraries has grown rapidly. The development of electronic publishing has considerably increased the independence of scientists and enhanced research activities. Electronic publications are primarily acquired to be used through the entire university and are related to the IP addresses of the university.

All suppliers of databases and e-publications are currently still not able to offer standard usage statistics of electronic scientific information, which makes it difficult to receive comparable data. This constitutes as a problem to all academic and university libraries anywhere in the world.

The university library cannot exist without library materials costs, which belong to one of the biggest and main expenses (additionally to workforce expenses). The proportion of the expense of e-documents in the acquisition costs is considered an important performance indicator, which is included in official statistics since 2005, but has been recorded by libraries even earlier. The spending on electronic collections – purchased access to databases and acquired e-publications has increased in all three Estonian university libraries.

The two most interested stakeholder groups in the case of university libraries are the population the library is set up to serve and the institution to which it belongs. The institution, especially if it provides funding, will see university library quality on another scale i.e., the library is good if it helps to shorten studying time, produces graduates that quickly find a job, supports research in an effective way, helps to raise the image of the institution, and if it is cost-effective overall. The last issue will often be the most important when resources are scarce (Poll, 2001). To measure this, the performance indicator - acquisition costs per student – is used in the case of all three university libraries.

A number of cost indicators in library work (e.g. Cost per Loan and Cost per Contents Downloaded) are based on the relationship between a certain statistical indicator and the operating expenditures of the library (ISO 1162 : 2008).

CONCLUSIONS

Since Estonia joined the EU in May 1, 2004 – all foreign electronic publishers changed their pricing policy towards our countries. The Baltic region, including Estonia, is no longer a

region of transition and therefore many current benefits (for example discounts preferences for developing countries) have disappeared. The usage license fees for electronic resources and prices of printed books and journals continue to rise. However, expand the choice of electronic scientific information in the Baltic countries cannot be done without additional financing at the national level.

The analysis of the most important cost indicators shows that the main cost indicators of the electronic library - the cost of the downloaded e-content unit and acquisition costs for electronic materials per student have become cheaper than traditional loans and acquistion costs for printed materials. Thus, the contribution to the electronic library as a whole is more cost-effective for library and for parent university overall.

The most significant joint achievement of Estonian university libraries while acquiring scientific information has been a successful collective procurement of electronic licensed databases. Estonian university libraries are comparable in size to the libraries serving Northern European libraries, when taking into consideration the amount of electronic databases. However, space for development still exists.

REFERENCES

ISO 2789:2006 Information and documentation. International library statistics. International Organization for Standardization.

ISO 11620: 2008 *Information and documentation*. *Library performance indicators*. International Organization for Standardization.

Poll, R. (2001). Performance, Processes and Costs: Managing Service Quality with the Balanced Scorecard. *Library Trends*, Spring.

Sinikara, K. (2007). European University Libraries Support the Primary Functions of the Academic Community. In: *400th Anniversary of the National and University Library in Zagreb. Proceedings of the Scientific Conference, 9th – 11th May, pp. 133-145*.

ICT for managing digital content

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Work will be displayed in poster form by students Maja Janić and Tena Tormaš with mentor Tomislav Jakopec, research assistant. The objective of this poster is to introduce librarians with the basics of setting on information infrastructure for managing digital content.

The digital environment has changed and new ICT has shaken librarianship. Digital resources have become essential tools for scholars and accordingly librarians need to be educated and well informed about all aspects of technology in order to help their users to formulate their information request, perform complex search of relevant information objects, interpret the results and locate what is in the physical property of certain library. For managing digital content, setting on information infrastructure is essential. Librarians use ICT but in most cases they don't understand them. With the changing role of librarians in the new environment raises the question of whether knowledge of what is „behind the system" can contribute to improving the competence of the librarians in providing better services to its customers (for example in setting up quality modern education system). Perhaps learning about the „wheels that drive the system" is not necessary for librarians to provide quality service but is certainly represents a challenge which overcome would surely bring many advantages.

Poster will present free open source aplications like Wordpress, Drupal, Joomla, Moodle, Koha, Fedora (build on LAMP arhitecture) that can make use in digital scholary.

Poster aim is to help understanding modern library infrastructure platform requiered for digital content publising, useage, scholary, management and preservation. The modern library needs a modern librarian that understands rapidly changing technology and can take full adventage of them.

Mapping the Humanities: Illustrating the use of geographic information for the enhancement of Humanities research

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When geographic information systems (GIS) emerged into mainstream research arenas, social scientists were the first to use and espouse the use of this new mapping technology in their research. They immediately saw how the visualization of data could help identify patterns and better inform and test hypothesis in social research. However, due to technological and financial restraints the growth in the use of GIS more deeply in social science research and in other fields stagnated for the better part of the last twenty years. Pockets of innovation existed but in mainstream research the use of GIS and electronic mapping remained a mystery to most.

Computing developments of the past ten years have been revolutionary for moving GIS and electronic mapping into the mainstream. The leader in these developments has been Google with its Google Map and Google Earth applications. The ability for individual users to manipulate the maps for their own use has been mapping an almost ubiquitous function and has brought many users out of the fringes and into the forefront of map making. Google certainly opened the door for the development of other web mapping applications and many companies, universities and individuals have walked through, creating some dynamic, user-friendly applications highlighting a growing variety of uses for geographic information.

While use of GIS and maps to analyze space and spatial relationships in Humanities research has been slow to take hold, in recent years a number of digital projects have spawned increasing interest in the use of GIS and maps in Humanities research. Space and place are key components in humanist research and for a long time illustration of these components happened statically in a book or article. As technologies in geographic information science become ubiquitous, they provide the opportunity for researchers in the Humanities to bring their research to life through a variety of mapping and visualization resources. Along with integration of digital historical map collections researchers in the Humanities have a wealth of information available to produce more in-depth analysis and to weave increasingly rich stories into their research. Historic atlases, the exploration of space and time in ancient societies, analysis of the interaction of modern and ancient societies, and even geographical browsing of book collections are all excellent examples of how mapping can inform and enhance research in the humanities.

This poster/demonstration session will illustrate the variety of uses for geographic representations in Humanistic disciplines from ancient history to literature, religion and archaeology.

Comparing "British Printed Images to 1700" digital library with prints digital libraries in Croatia

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„Croatian cultural heritage"*(http://www.kultura.hr)* is a web site that contains catalogue and descriptions of digital collections made by materials digitized from physical collections held in libraries, museums and archives. These digital collections could be searched by different categories. One of these is „Graphics and drawings". There are 25 collections in this category and I will discuss two digital collections of printed images from this category: collection made by Museum of Modern and Contemporary Art of Rijeka and collection made by National and university library of Croatia. I have chosen these collections because of the importance of the institutions in which they have been made, because of possibilities of further development of these digital collections and because prints in these collections are presented, in opposite to many other collections in category "Prints and drawings", separated from other types of digitized content.

Digital prints collection of the Museum of Modern and Contemporary Art of Rijeka (MMSU) contains only 6 prints. Digital prints collection of the National and university library (NSK) has few hundred prints. Both institutions have in their physical collections much more prints then they have digitized up to now. But if they continue with their digitization efforts and enlarge their digital collections new ways of searching digitized prints and informing about them would be beneficial to their users.

On this poster I would also discuss digital prints collection "British printed images to 1700" (BPI) which holds few thousands prints originating from 16th to 18th century and also draw attention to some ways in which BPI enabled searching of prints and informing about them (*http://www.bpi1700.org.uk)*.

Goal of this poster would be to identify some beneficial methods of searching and informing about prints in BPI collection because these methods, if implemented in NSK and MMSU digital collections, could also advance their usefulness.

The Print-Internet Disconnect; Students are wary of the web but believe in print; Are we doing too good of a job?

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Digital natives are instructed to evaluate information that they find online and many can repeat by memory the criteria that they need to follow: students must know the purpose, authority, accuracy, currency and objectivity of each and every website one comes across. Furthermore, they must be especially wary of information found on Wikipedia. But are we, as educators, doing too good a job? Or are we forgetting to stress that all sources, including print and verbal, need to be evaluated?

In conversations with freshmen, as part of the first-year composition course, it was found that the students clearly understood that information found on the Web was not always correct or reliable, but surprisingly, and disconcertingly, they were certain that all information found in print resources such as books and newspapers was reliable and factual.

Is this an indication that we as information specialists are doing too good a job, and by focusing on evaluating Internet resources we are overlooking the point that **all** information needs to be evaluated? Or is it an indication of a lack of critical thinking skills in freshmen? Where we as educators want them to see gray they are only seeing black and white (or print resources are good and Internet resources may be unreliable). This poster presentation will highlight the responses from the discussions with freshmen and focus on possible solutions.

Emergence and Influence: Assessing Patterns of Organization in EPUB

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ABSTRACT

This research project attempts to understand the complex information interactions between electronic publishers (EPUB), database users, and authors. The goals of this project are (1) to contextualize electronic journal publishing within an emergence framework, (2) to explore the potential for electronic publishing to reduce tunnel vision within a discipline through emergence, and (3) to analyze the structural impact of electronic publishing on the printed journal.

1. INTRODUCTION & BACKGROUND

As a relatively new, dynamic, and shifting topic, the role of electronic publishing has been hotly debated. Noted benefits of EPUB include greater access to information, increased readership, and lower production costs, while the commonly mentioned drawbacks include the destabilization of content in the traditional print journal, lack of editorial control (Howard, 2009), and increases in piracy and plagiarism (Sota, 2004). In order to understand EPUB as an essential development in the digital age, it is useful to situate EPUB within the context of evolutionary emergence. Bates (2005) explains that the cognitive ability to "detect emergent ideas and objects" can be understood as useful biological developments to aid coding efficiency and as an "effective and powerful means of representation." Essentially, humans recognize information in patterns of organization in order to simplify and compartmentalize the glut of information.

In this project, EPUB will be viewed as a pattern of organization where journals operate not as whole issues but as a single input in an organized and searchable cloud of articles. The fragmentation of a carefully sequenced series of articles that comprise a complete issue of a journal has left editors and authors with a new set of challenges (Howard, 2009). Bates (2005) examines this point stating that "by thinking in terms of emergence, we can see that many actions and expressions can be efficiently stored and talked about in terms of their emergent meanings, while still using the key definitions for information, data and knowledge." The constant and rapid transformations in technology and ways to access information provide a momentous emergent landscape for users, editors, and authors. The ease of search and instant access to the most recent research are just two of the many benefits EPUB provides. The pattern of organization inherent in a database allows a coherence that can be just as essential and potentially more comprehensive as a complete issue.

As scholars search through online databases, they are confronted with articles that extend outside of their own libraries and known research interests. By fragmenting the disciplinary journal into articles spread across a database, scholars are more likely to stumble across potentially relevant articles from other disciplines. Radford (2003) addresses the importance of interdisciplinarity by using a bookshelf metaphor: "moving along the shelves, you see those books that tend to bleed over into other classifications and that straddle multiple discursive formations" (p. 5).

Because journal content has become destabilized, and searching has been simplified, scholars often look beyond their original, specific search interests. The push for accumulation of knowledge from other disciplines is, in large part, a result of emergent patterns of organization. G. P. Radford (2003) illustrates this by noting that his *Library Quarterly* article "is also the result of other books, other articles, other statements" (p. 12). The very title of the Wiegand (1999) article ("Tunnel Vision and Blind Spots: What the Past Tells Us about the Present: Reflections on the Twentieth Century of Librarianship") exemplifies this privileging of retrospection and epistemological accumulation. In G. P. Radford and M. L. Radford's (2005) view, information is inseparable from context, content, and all that came before it (p. 73). This stacking and layering of information, Wiegand (1999) seems to suggest, is essential to establish a body of knowledge; otherwise, as in the case of LIS, "this body of scholarship is too small, too light, too marginalized and easily ignored" (p. 3). Not only has EPUB helped expose scholars to outside disciplines, it also provides an audience that is often 20 times larger than that of publications in book form (Howard, 2009). It is clear that readers are finding their way to journals with digital availability. Now, understanding the information in the pattern of organization rests in the emergent ideas and concepts that allow for the efficient coding of the vast and complex system of EPUB articles.

2. RATIONALE

Within literature that attempts to take a user-oriented approach to human-information behavior and library studies, an approach relevant to this project is to emphasize the social concepts and the situational components at work in information seeking. Both have been developed within the scholarship on everyday life information seeking (ELIS) and will be applied to the information practices of electronic publishers, database users, and authors. Savolainen's (1995) influential paper rejects the categorization of information searchers based on socio-demographic variables, focusing instead on the spatial and temporal circumstances that inform an information-seeking session. These factors are fundamental to McKenzie's (2002) work on the information-seeking behavior of women pregnant with twins, which advances a model of information seeking that "reflect[s] the idiosyncrasies present in accounts of ELIS" and identifies four models of gaining information: active seeking, active scanning, non-directed monitoring, and by proxy. Where Savolainen (1995) sought to emphasize the context in which individuals acquire information, Chatman (1991) has used community as a lens through which to understand information-seeking behavior. By combining Bates (2005) concept of emergence with Radford's (2003) further articulation of discourse formation, I hope to further establish the basic similarity between information-seeking processes in EPUB and traditional print publications.

REFERENCES

Bates, M.J. (2005). Information and knowledge: an evolutionary framework for information science. *Information Research*, 10(4) (http://infromationr.net/ir/10 4/paper239.html)

Chatman, E. (1991). Life in a small world: Applicability of gratification theory to information-seeking behavior. *Journal of the American Society for Information Science and Technology,* 42(6), p. 438- 449.

Howard, J. (2009). Humanities Journals Confront Identity Crisis. *The Chronicle of Higher Education*, 55(29), A1.

McKenzie, P.J. (2002), Communication barriers and information-seeking counter strategies in accounts of practitioner-patient encounters. *Library & Information Science Research,* Vol. 24 No. 1, 31-47.

Radford, G. P. (2003). Trapped in our own discursive formations: Toward an archaeology of library and information science. *The Library Quarterly, 73*(1), 1–17.

Radford, G. P., & Radford, M. L. (2005). Structuralism, post-structuralism, and the library: de Saussure and Foucault. *Journal of Documentation 51*(1), 60–78.

Savolainen, R., (1995) Everyday life information seeking: Approaching information seeking in the context of way of life. *Library and Information Science Research* 17, pp. 259 294

Sota, T. (2004). Plagiarism in the age of electronic publishing. *Population Ecology*, 46(3), 219.

Wiegand, W.A. (1999). Tunnel Vision and Blind Spots: What the Past Tells Us About the Present: Reflections on the Twentieth Century of Librarianship. *The Library Quarterly*, 69(1).

How to bridge the gap between digital natives and digital immigrants: the experience of Fran Galović public library

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In the age of electronic media the fast-evolving societies need the libraries which will follow social, economic and technological trends, together with as active librarians, as reliable partners in finding, organizing and evaluating information, either from printed or electronic media.

Fran Galović Public Library is considering this point and working on implementing it, especially in bridging the gap between digital natives and digital immigrants. Fran Galoviž Library is aware that its future users will be digital natives but is also aiming at opening the door to the challenges of the digital era to its digital immigrants.

The aim of this presentation is to introduce two new Fran Galović Library projects – the "Personal Librarian" service and the "Become the Fran Galović Public Library friend on Facebook" service, as well as to present the results of the services usage evaluation. The goal of these services is developing digital competence of the library users, supporting the informational, informatics and librarian literacy, while simultaneously popularising the library's printed and electronic resources, using up-to-date technological tools.

THE PERSONAL LIBRARIAN SERVICE (CROATIAN: "OSOBNI KNJIŽNIČAR" – OK!)

In changing their approach and services librarians must not forget the specific position of the digital immigrants, who need to adapt to the new services. Approaching them in this way requires extra care because while some will react well to the new environment, others will not, preserving their old habits. Digital natives are used to fast access to information and prefer graphically processed data, while digital immigrants learn using classical methods, step-by-step and meticulously.

This is the why Fran Galović library has introduced the Personal Librarian service, wherein librarians act as instructors. This is individual training of users in independently finding quality information they need for a research, such as homework assignments, term papers, reports etc. The starting point of the training is the web page of Fran Galović Public Library www.knjiznica-koprivnica.hr. The training consists of a single workshop, lasting for an hour and a half. The workshop is run on one of the several appointed days within the librarians' working hours, based on the prior registration. It takes place in a separate room for the maximum of four learners at a time, which allows personal approach. Notebooks are used for the training, which enables the mobility of this service within the library building and outside it. The aim of the training is for the learners to acquire basic knowledge and skills in using the electronic library catalogue, online databases and other informational tools, in addition to determining the call number, scientific field for the required subject / topic, key words and finally, locating the work of a given author, title and topic on the library shelves. The acquired techniques and strategies should facilitate for the learners to use the library's services and collections, i.e. to achieve a greater level of librarian and informational literacy.

The librarians from Koprivnica have thought of two other variants of training, run in a methodologically similar way, based on individual approach. One is aimed at the users who

require the basic knowledge and skills in informatics literacy and using the Internet, while the other is a combination of informational and informatics training, aimed at children.

THE «BECOME FRAN GALOVIĆ LIBRARY'S FACEBOOK FRIEND » SERVICE – FB!

In addition to supporting the activities which will train the users in utilizing modern technology and direct them to finding accurate information and relevant information sources, especially on the Internet, which puts at users' disposal a huge quantity of information of variable quality and accuracy, librarians have another important role through which to satisfy users' demands. The librarians from Koprivnica are looking to approach digital natives via Fran Galović Library Facebook page, as a window on their world. They are doing this perfectly conscious of the fact that this world may today be entered through Facebook and tomorrow it through another door or application. Furthermore, in their everyday work, our librarians use web 2.0 tools, primarily to browse for information and in working with users.

Librarians have come to the turning point in converting their basic services into a new form. The user is still in the centre of our attention but we are approaching them in a new way. By doing this we remain focused on the user's needs, as libraries have always done.

Buzzwords! Which language do they speak?

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Do we always understand our users? Sometimes, we feel our users come from other planets! They live in some other space, virtual word with some transcendental language. Or maybe we do! Well, who are the digital natives?[1] For them, digital technology is like air, without Facebook, Youtube, Second life they feel like fish out of the water. Do we understand them? Do we speek same language like our digital native users? Why they can't borrow books from the shelves? They prefere digital book on the Kindl. The born-digital generation is distinguished by three characteristics[2]: The first is their relaxed attitude to information disclosure; the second, their aptitude at social networking; and the third, the very different way they process information, as compared with previous generations.

"Digital natives are generally more open about themselves and have fewer reservations about sharing their thoughts and opinions with the world.

"The fear is that this will lead them to share information about their jobs and the organisations they work for, without reflecting on how appropriate it might be to divulge information that might be considered confidential or commercially sensitive."

Digital natives generation use lot of words which are, for them, very common. Actually, those words have become a custom. But not for us! There are many sites that suggest different library buzzwords:

- Credaro, A.B. (2002). Library Buzzwords. Warrian Librarian Weekly [online] http://www.warriorlibrarian.com/ROFL/buzzword.html [Accessed: 02-05-2010]
- Lesley University Library http://www.lesley.edu/library/guides/research/glossary.html [Accessed: 02-05-2010]
- Mary Jo Venetis. Diversity: the latest buzzword in the library world [online] http://www.txla.org/pubs/tlj76_1/buzz.html [Accessed: 02-05-2010]

We belong to the generation of digital immigrants. We grew up in a none-digital world, were introduced for digital tools. We try to master them, but sometimes still feel like a foreign language to us. There are hundreds of examples of the digital immigrant accent. They include printing out your email (or having your secretary print it out for you – an even "thicker" accent); needing to print out a document written on the computer in order to edit it (rather than just editing on the screen); and bringing people physically into your office to see an interesting web site (rather than just sending them the URL). I'm sure you can think of one or two examples of your own without much effort. My own favorite example is the "Did you get

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[1] A digital native is a person for whom digital technologies already existed when they were born, and hence has grown up with digital technology such as computers, the Internet, mobile phones and MP3s. Source: wikipedia
[2] John Palfrey and Urs Gasser. Born Digital : Understanding the First Generation of Digital Natives. Basic Books, 2008, p. 375

my email?" phone call. Those of us who are Digital Immigrants can, and should, laugh at ourselves and our "accent."[3]

This presentation offers an overview of most common buzzwords which we very often hear, sometimes use, but certanly don't understand.

Buzzwords, such as: social softwares, second life, podcasting, blog, wiki, digital natives, digital immigrants, web 2.0, library 2.04, metadata, blogosphere, amazoned, open source networking, paradigm shift, database, ebook, openAPI, tag… and many more.

[3] Marc Prensky. Digital Natives, Digital Immigrants. *On the Horizon*. 9 (2001) 3.
http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf
[Accessed: 05-02-2010]
see also Part 2: Digital Natives, Digital Immigrants Part 2: The scientific evidence behind the Digital Native's thinking changes, and the evidence that Digital Native-style learning works! *On the Horizon*. 9 (2001) 3.
http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part2.pdf
[Accessed: 05-02-2010]
[4] The term "Library 2.0" was coined by Michael Casey on his blog LibraryCrunch as a direct spin-off of the terms Business 2.0 and Web 2.0. Casey suggested that libraries, especially public libraries, are at a crossroads where many of the elements of Web 2.0 have applicable value within the library community, both in technology-driven services and in non-technology based services. In particular, he described the need for libraries to adopt a strategy for constant change while promoting a participatory role for library users. Source: wikipedia.

"Light/Dark side" of technological modernization in the Bulgarian field of book (2000 – 2010

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The high technologies, especially personal computes and broadband Internet connection, rushed in irreversible in the Bulgarian society after the beginning of the new millennium. Since then in the field of book many changes appeared. Nevertheless, in Bulgaria no expert study has been conveyed on the influence of new technology in connection with book creation, publishing and reading. The practitioners implemented the new technologies in their business thus increasing the number of published titles, without asking themselves about the future of the book market. The theorists generally predicting the end of the Gutenberg Galaxy, often refer to the interesting but obsolete futuristic development[1]. The truth about the future of the book is somewhere in between but we still find it difficult to imagine the new information environment and means of communication, because our Digital native generation is too young.

This Poster will try to present the true influence of the new technologies in the field of book in Bulgaria for the last decade (2000-2010). The observations on the topic are supported with data published by National Library of the Republic of Bulgaria[2], National Statistical Institute of the Republic of Bulgaria[3] and The Organization of Book Publishers, Book Distributors and Book Agents in the Country – Bulgarian Book Association (BBA)[4]. The methodology of the poster is based on the Robert Darnton book system[5]. I will provide information about the good and bad sides of the technological modernization in relation with the participants involved: author, translator, publisher, editor, book seller, reader and librarian. The poster will try to present the political, economical and cultural background of the book environment.

Although systematic approach has disadvantages because of the dynamism of the units included in a System[6], such type of presentation can easily explain the situation which is very close to our literary reality and can provoke comparative reflection among other conference participants.

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[1] McLuhan, Marshall. The Gutenberg Galaxy. University of Toronto Press, 1962, pp. 293
[2] http://www.nationallibrary.bg/catalog_en.html
[3] http://www.nsi.bg/index_en.htm
[4] http://www.abk.bg/index.php?lang=en
[5] What is the History of Books? – In: The Kiss of Lamourette. Faber and Faber. London. Boston, 1990, 107-135
[6] Fromm, Erich. To Have or To Be. HarperCollinsPublisher, inc., 1976, 208

WORKSHOPS

WORKSHOP A

Early printed books in research process: meet the specific needs of researchers of Croatian glagolitic early printed books using the TEI (Text Encoding Initiative)

Boris Bosančić
University J.J. Strossmayer, Osijek, Croatia

Marijana Tomić
University of Zadar, Croatia

Workshop B

The use of ICT Tools for Knowledge organization in the Humanities

Robin Boast
Museum of Archaeology and Anthropology, U of Cambridge, UK

Workshop C

How to Design a Digital Library: What You Do Not Learn in Library and Information School!!!

Emil Levine

Workshop D

A Reference Model for Digital Libraries

Vittore Casarosa
ISTI – CNR, Pisa, Italy

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