evaluation of digital libraries: an overview

Tefko Saracevic, Ph.D.

School of Communication, Information and Library Studies

Rutgers University

http://www.scils.rutgers.edu/~tefko

"Evaluating digital libraries is a bit like judging how successful is a marriage"

(Marchionini, 2000)

digital libraries

- since emergence in early/mid 1990's
  - many institutions & fields got involved
  - great many practical developments
  - many research efforts & programs globally
  - large expenditures in research & practice
  - applications & use growing exponentially
- everything about digital libraries is explosive
- except evaluation
  - relatively small, even neglected area

literature reports on DL evaluation

- two distinct types:
  - meta or “about” literature
    - suggest approaches, models, concepts
    - discussed evaluation
  - object or “on” literature
    - actual evaluations, contains data
      - data could be hard or soft
- meta literature much larger
  - parallel with IR evaluation literature in 1960’s & early 70’s

objective & corpus

- to synthesize object literature only
- selection criteria:
  1. directly address a DL entity or a DL process
  2. contain data in whatever form
- some 80 reports selected
- estimate: no more than 100 or so evaluation reports exist totally

boundaries

- difficult to establish, apply
  - particularly as to process – e.g.
    - crossing into IR: where does IR evaluation stop & DL evaluation start?
    - or any technology evaluation?
    - or evaluation of web resources and portals?
- brings up the perennial issues:
  - what is a digital library? what are all the processes that fall under DL umbrella?

approach

- **construct** for evaluation.
  - *what was evaluated? What elements (components, parts, processes...) were involved in evaluation?*
- **context** of evaluation - selection of a goal, framework, viewpoint or level(s) of evaluation.
  - *what was the basic approach or perspective?*
- **criteria** reflecting performance as related to selected objectives.
  - *what parameters of performance were concentrated on?*
- **methodology** for doing evaluation.
  - *what measures and measuring instruments were used?*
- **findings**, except one, were not generalized

constructs: entities

- constructed as DL in R&D projects:
  - Perseus – classics; evaluated most
  - ADEPT – geo resources for undergrad
  - DeLIVER – sci-tech journals
  - Envision – comp. sc. literature
  - Water in the Earth System – high school
  - National Gallery of the Spoken Word - archive
  - Making of America prototype - 19th cent. journals
  - Moving Images Collection – catalog
- some are full DL, some components

constructs: entities (cont.)

- some aspect of operational DL:
  - New Zealand DL – comp. sc. tech. reports
  - ARTEMIS – science materials for school 6 to 12
  - Internet Public library – digital reference
  - UK Nat Electronic Library for Health – in a large hospital
  - Mann Library Gateway, Cornell – access interface

constructs: entities (cont.)

- multiple DL:
  - Project SOUP, Cornell – 6 digital collections in libraries & museums
  - Middlesex U – 6 general DL accesing journals & articles

constructs: entities missing

- missing evaluation of operational DLs
  - in academic, public, national libraries, museums, ...
- lot of statistics collected, but as yet not subject of evaluation
- institutional DLs are a terra incognita as to evaluation
- commercial DL products also missing from formal evaluation

constructs: processes

- variety of processes evaluated without reference to a DL:
  - various representations e.g.
    - noun-phrasing, context-based, key-phrasing
  - various tools
    - video searching, link generation, interfaces, load balancing on servers, image retrieval

constructs: processes (cont.)

- user behavior
  - usage patterns in service logs
  - perception of quality
  - work patterns of experts
  - user preferences
  - information seeking in hypermedia DL

users: issue, borders

- when or to what extend are
  - user (who, why)
  - use (how), usage (what)
  - or usability studies
  - in DL also evaluations of DL?
- some are clearly e.g. when examining barriers or difficulties, others are not
- is every usability study also evaluation?
- DL evaluation & studies of human information behavior are mixed together

context of studies

- widely diverse approaches were used:
  - **Systems-centered approach:**
    - most prevalent
    - study of performance assessing effectiveness and/or efficiency
    - results may inform specific choices in design or operations
  - **Human-centered approach:**
    - also widely applied
    - study of behavior such as information seeking, browsing, searching or performance in completion of given tasks
    - implications for design, but indirectly rather than directly
  - **Usability-centered approach:**
    - assessment of different features e.g. of portals, by users.
    - a bridge between systems- and human-centered approaches.
    - mixed, or self-evident results

context of studies (cont.)

- **Ethnographic approach:** comprehensive observation of
  - life-ways, culture and customs in a digital library environment
  - impact of a digital library on a given community
  - applied successfully in a few studies, with illuminating results, particularly as to impact.
- **Anthropological approach:** comprehensive observation of
  - different stakeholders or communities and their cultures in relation to a given digital library
  - applied in one study with interesting results illuminating barriers between stakeholder communities.

context of studies (cont.)

- **Sociological approach:** assessment of
  - situated action or user communities in social setting of a DL
  - applied in one study with disappointing results
- **Economic approach:** study of
  - costs, cost benefits, economic values and impacts.
  - strangely, it was applied at the outset of digital library history (e.g. project PEAK) but now the approach is not really present at all

context of studies (cont.)

- levels of evaluation vary from
  - micro level – e.g. fast forward for video surrogates
  - macro level – e.g. impact of Perseus on the field and education in classics
- temporal aspects
  - some obsolete fast e.g. on technology
  - other longitudinal

criteria

- chosen standard(s) to judge thing by
  - there is no evaluation without criteria
- in IR: relevance is basic criterion
- in libraries: fairly standardized
- in DL: no basic or standardized criteria, no agreement
  - DL metrics efforts not yet fruitful
  - thus, every evaluator choose own criteria
    - as to DL evaluation criteria

      there is a jungle out there

usability criteria

- “extent to which a user can achieve goals with effectiveness, efficiency & satisfaction in context of use” (ISO)
- widely used, but no uniform definition for DL
- general, meta criterion, covers a lot of ground
- umbrella for many specific criteria used in DL evaluations

usability criteria (cont.)

Content (of a portal or site)

- accessibly, availability
- clarity (as presented)
- complexity (organization, structure)
- informativeness
- transparency
- understanding, effort to understand
- adequacy
- coverage, overlap,
- quality, accuracy
- validity, reliability
- authority

Process (carrying out tasks as search, browse, navigate, find, evaluate or obtain a resource)

- learnability to carry out
- effort/time to carry out
- convenience, ease of use
- lostness (confusion)
- support for carrying out
- completion (achievement of task)
- interpretation difficulty
- sureness in results
- error rate

usability criteria (cont.)

Format

- attractiveness
- sustaining efforts
- consistency
- representation of labels (how well are concepts represented?)
- communicativeness of messages

Overall assessment

- satisfaction
- success
- relevance, usefulness of results
- impact, value
- quality of experience
- barriers, irritability
- preferences
- learning

systems criteria

- as DL are systems, many traditional systems criteria used
- pertain to performance of given processes/algorithms, technology, or system overall

systems criteria (cont.)

- **Process / algorithm performance**
  - relevance (of obtained results)
  - clustering
  - similarity
  - functionality
  - flexibility
  - comparison with human performance
  - error rate
  - optimization
  - logical decisions
  - path length
  - clickthroughs
  - retrieval time

Technology performance

- response time
- processing time, speed
- capacity, load

Overall system

- maintainability
- scalability
- interoperability
- sharability
- costs

other criteria

use, usage

- usage patterns
- use of materials
- usage statistics
- who uses what, when
- for what reasons/decisions

ethnographic...

in different groups:

- conceptions, misconceptions
- practices
- language, frame of reference
- communication
- learning
- priorities
- impact

methodologies

- DL are complex entities
  - many methods appropriate
  - each has strengths, weaknesses
- range of methods used is wide
  - there is no “best” method
  - but, no agreement or standardization on any methods
- makes generalizations difficult, even impossible

methodologies (cont.)

- surveys
- interviews
- observations
- think aloud
- focus groups
- task performance

- log analysis
- usage analysis
- record analysis
- experiments
- economic analysis
- case study
- ethnographic analysis

results

- not synthesized here
- hard to synthesize anyhow
- generalizations are hard to come by
- except one!

users and digital libraries

- a number of studies reported various versions of the same result:

users have many difficulties with DLs

- usually do not fully understand them
- they hold different conception of a DL from operators or designers
- they lack familiarity with the range of capabilities, content and interactions
- they often engage in blind alley interactions

analogy

- perceptions of users and perceptions of designers and operators of a DL are generally not very close
- users are from Venus and DLs are from Mars
- leads to the versus hypothesis

is it:

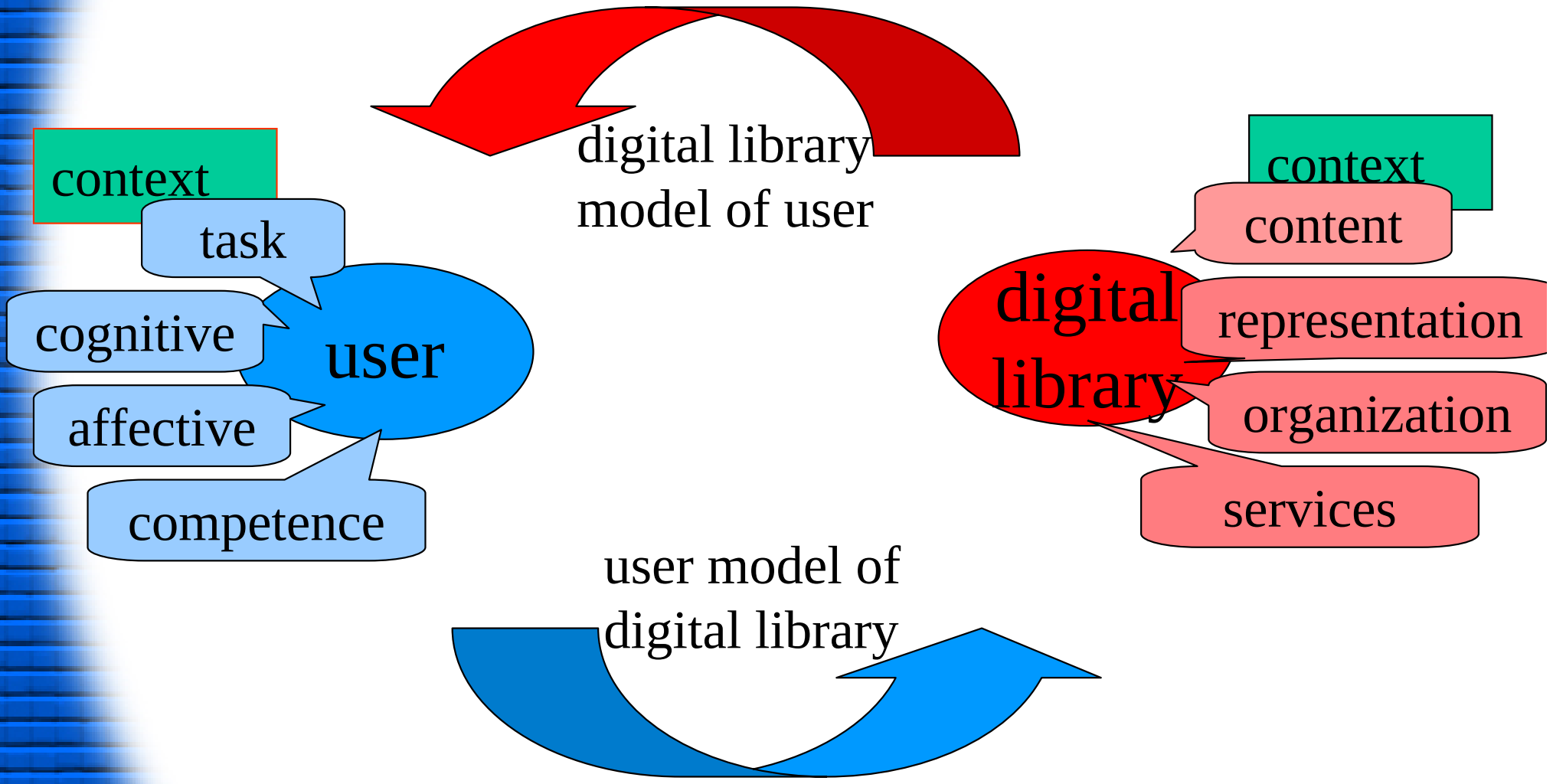
user AND digital library

or

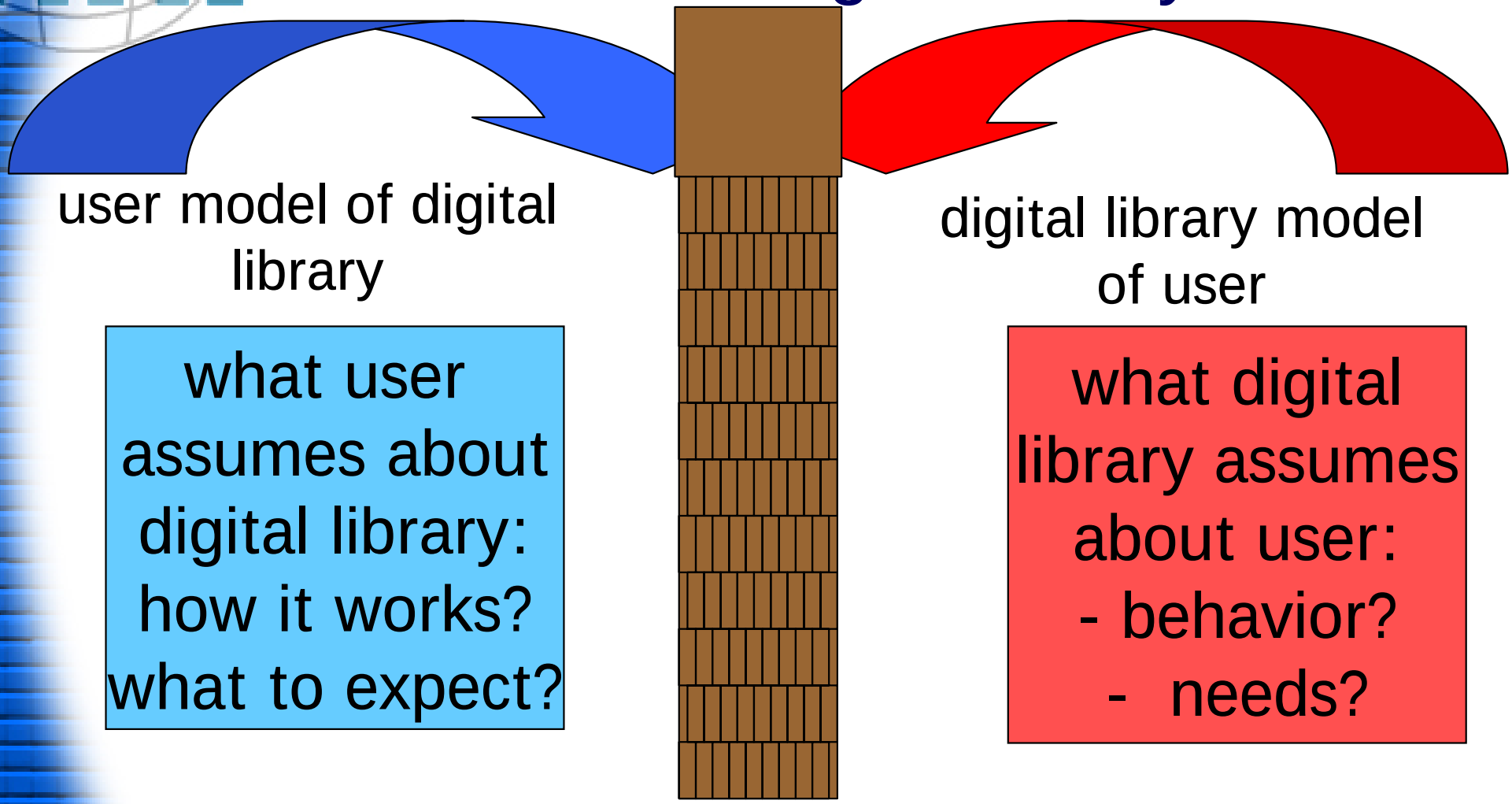
user VERSUS digital library

- why VERSUS?
  - users and digital libraries see each other differently

user AND digital library model



how close are they?
user VERSUS digital library model



user model of digital library

what user assumes about digital library: how it works? what to expect?

digital library model of user

what digital library assumes about user:
- behavior?
- needs?

the versus hypothesis

in use, more often than not, digital library users and digital libraries are in an adversarial position

- hypothesis does not apportion blame
  - does not say that DL are poorly designed
  - or that users are poorly prepared
- adversarial relation may be a natural order of things

evaluation of digital libraries

- impossible? not really
- hard? very
- could not generalize yet
- no theories
- no general models embraced yet, although quite a few proposed
- in comparison to total works on DL, only a fraction devoted to evaluation

why? – some speculations

- **Complexity:** DLs are highly complex
  - more than technological systems alone
  - evaluation of complex systems is very hard
  - just learning how to do this job
  - experimenting with doing it in many different ways
- **Premature:** it may be too early in the evolution of DL for evaluation on a more organized scale

why? (cont.)

- **Interest:** There is no interest in evaluation
  - R&D interested in doing, building, implementing, breaking new paths, operating ...
  - evaluation of little or no interest, plus there is no time to do it, no payoff
- **Funding:** inadequate or no funds for evaluation
  - evaluation time consuming, expensive requires commitment
  - grants have minimal or no funds for evaluation
  - granting agencies not allocating programs for evaluation
  - no funds = no evaluation.

why? (cont.)

- **Culture:** evaluation not a part of research and operations of DL
  - below the cultural radar; a stepchild
  - communities with very different cultures involved
    - language, frames of reference, priorities, understandings differ
    - communication is hard, at times impossible
  - evaluation means very different things to different constituencies

why – the end

- **Cynical:** who wants to know or demonstrate actual performance?
  - emperor clothes around?
  - evaluation may be subconsciously or consciously suppressed
  - dangerous?

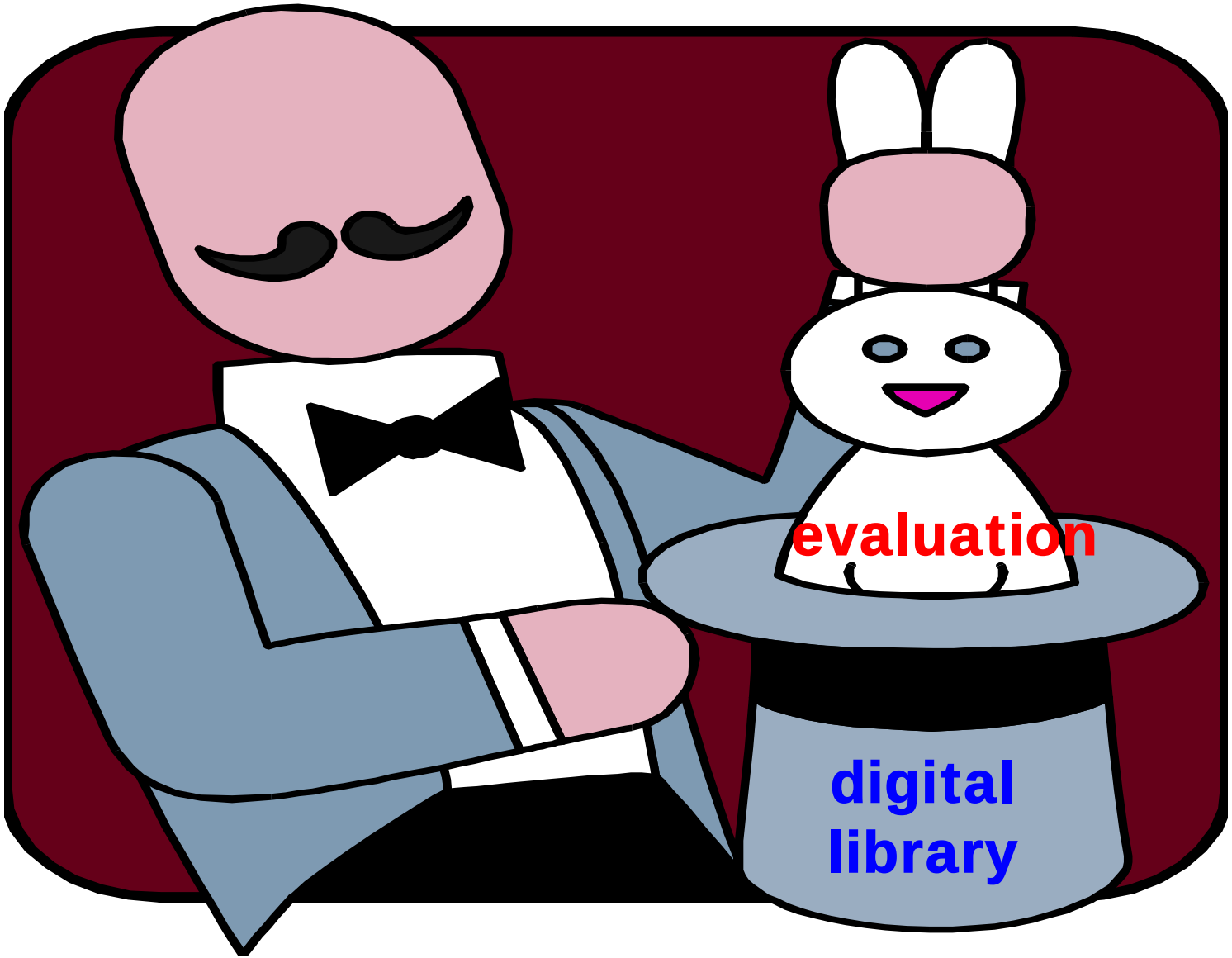
ultimate evaluation

- The ultimate evaluation of digital libraries:
  - assessing transformation in their context, environment
  - determining possible enhancing changes in institutions, learning, scholarly publishing, disciplines, small worlds ...
  - and ultimately in society due to digital libraries.

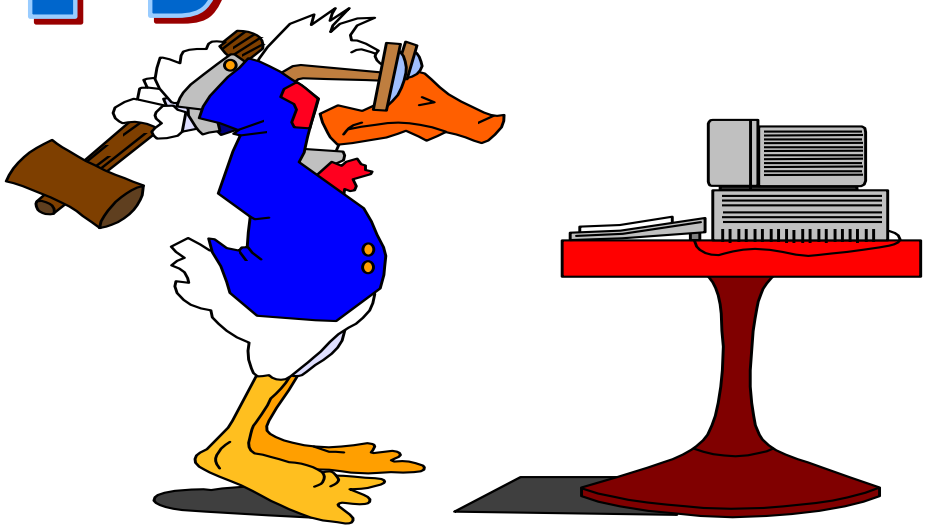
conclusions

- evaluation of digital libraries still in formative years
- not funded much, if at all
- but necessary for understanding how to
  - build better digital libraries & services &
  - enhance their role

How to do it?



Happy evaluation!



hvala

grazie

thank you

ευχαριστίες

danke

köszönöm

tak

takk

tack

sources

- the paper and PowerPoint presentation at:

http://www.scils.rutgers.edu/~tefko/articles

- annotated bibliography at:

http://www.scils.rutgers.edu/~miceval