A Model of the Scientific Communication Life Cycle Process

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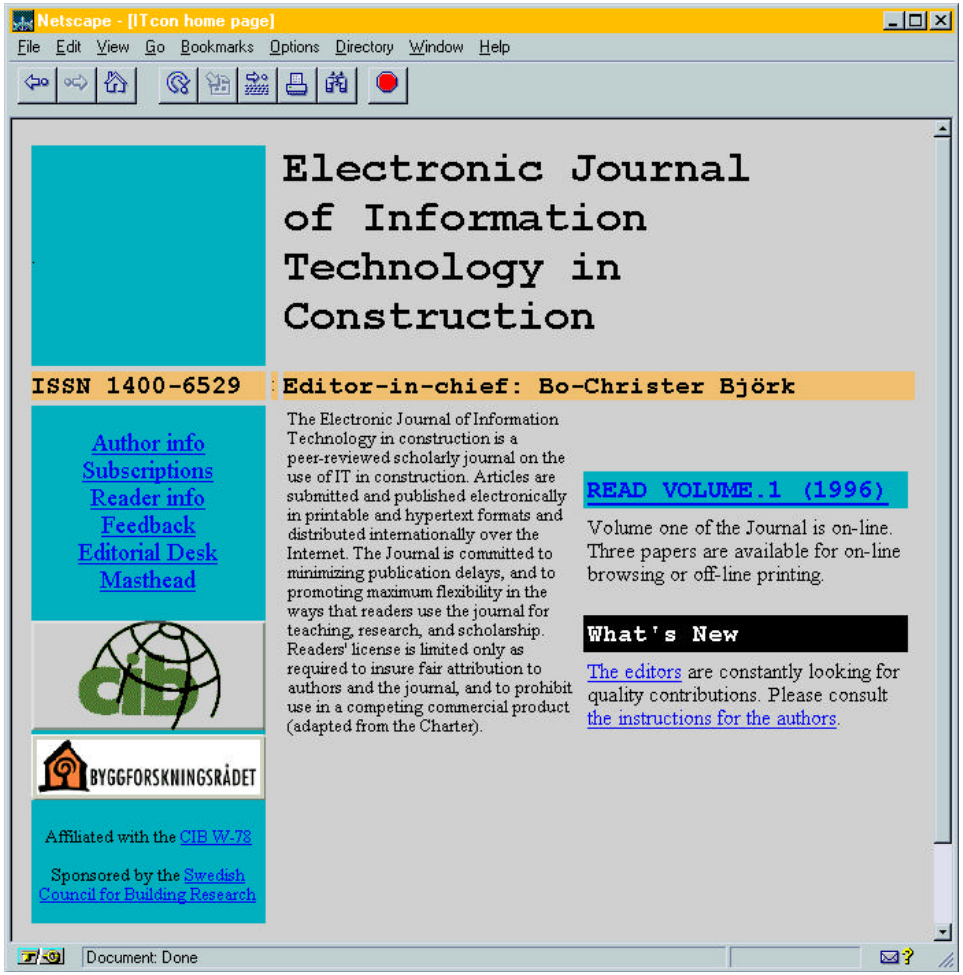
Helsinki, Finland

Presentation at the IATUL conference
Stockholm 11.6.2007

A good reason to return to KTH!

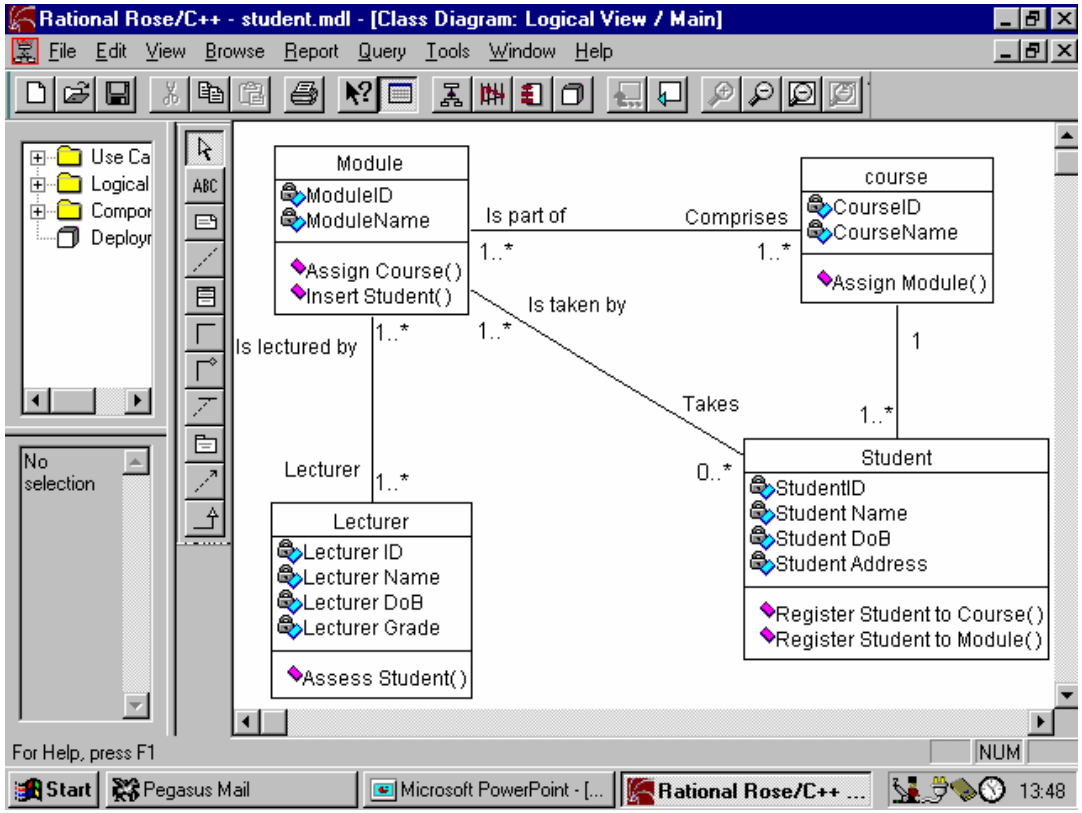


Two ways for complex information systems to develop

- Top down, planned
- Bottom up, independently

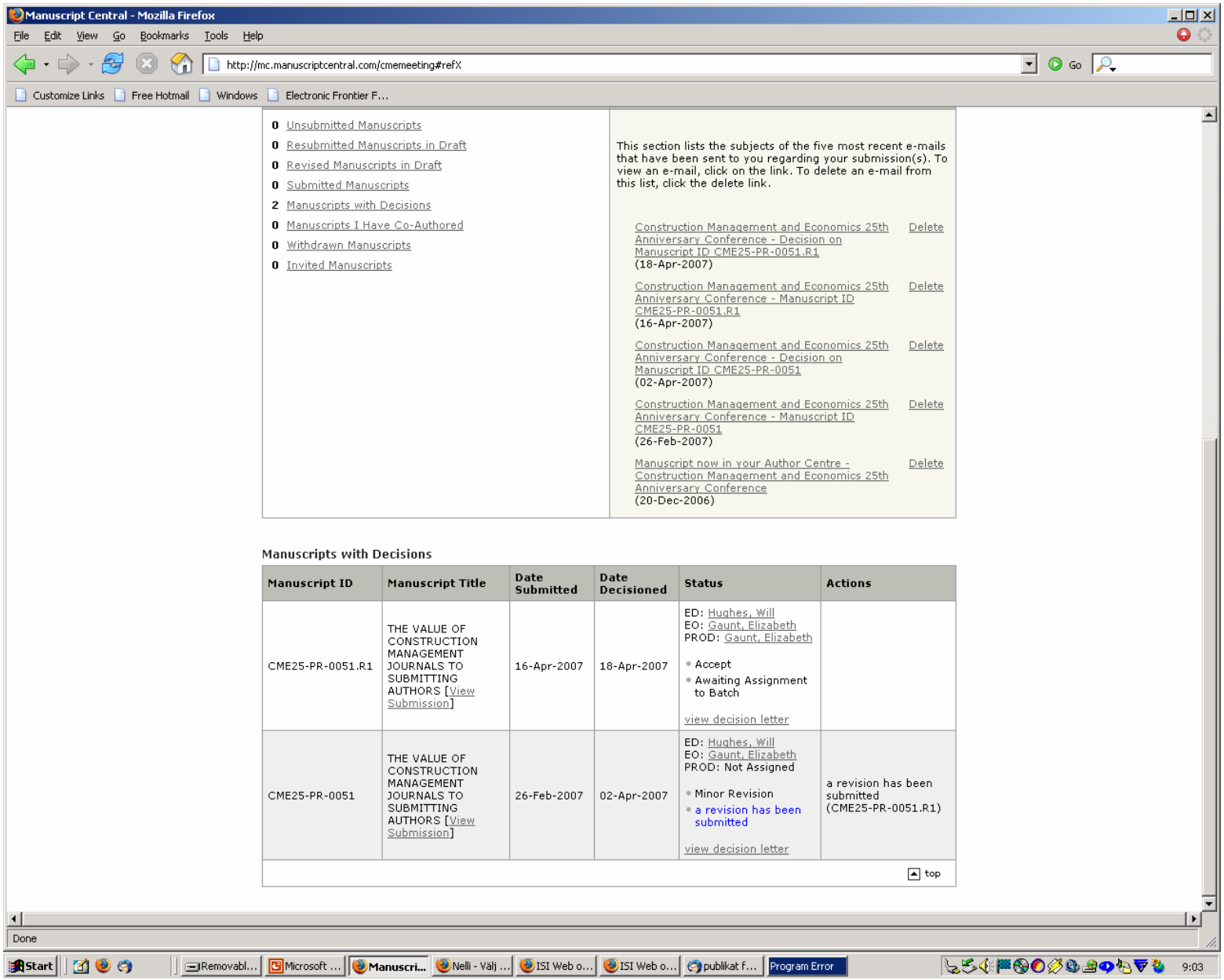
Top down

- Formalised methods can be used to plan Management Information Systems (MIS)
- For instance the ERP systems (Entreprise planning systems) used by many large companies, example SAP
- Prerequisite that one company or client organisation controls and can plan the whole system



Bottom up

- Several independent organisations have developed their own information systems (manual or electronic)
- There is no master plan, the different systems start to integrate in an ad hoc manner
- Scientific communication is a good example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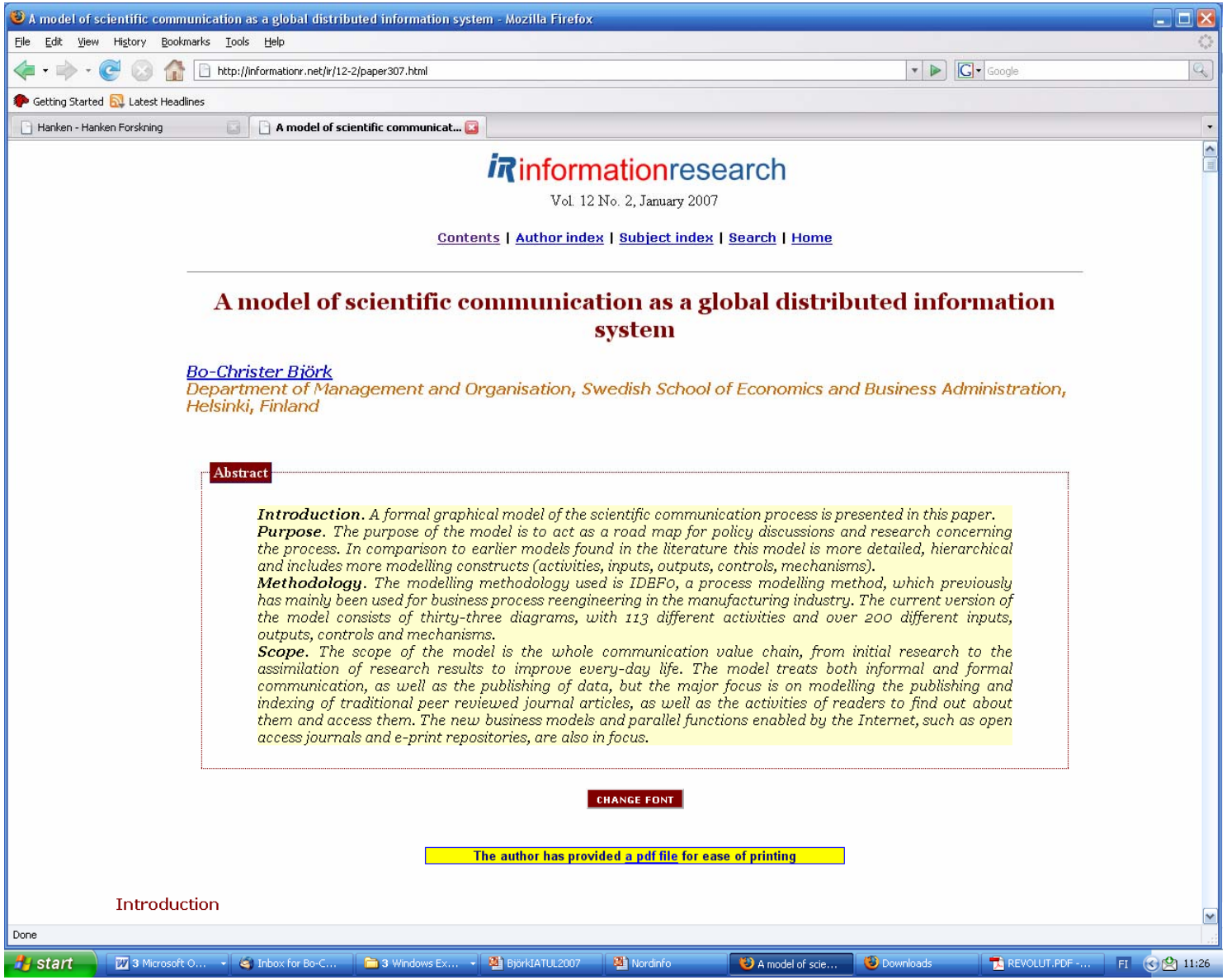
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A model of scientific communication as a global distributed information system
Bo-Christer Björk
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Abstract
Introduction. A formal graphical model of the scientific communication process is presented in this paper.
Purpose. The purpose of the model is to act as a road map for policy discussions and research concerning the process. In comparison to earlier models found in the literature this model is more detailed, hierarchical and includes more modelling constructs (activities, inputs, outputs, controls, mechanisms).
Methodology. The modelling methodology used is IDEF0, a process modelling method, which previously has mainly been used for business process reengineering in the manufacturing industry. The current version of the model consists of thirty-three diagrams, with 113 different activities and over 200 different inputs, outputs, controls and mechanisms.
Scope. The scope of the model is the whole communication value chain, from initial research to the assimilation of research results to improve every-day life. The model treats both informal and formal communication, as well as the publishing of data, but the major focus is on modelling the publishing and indexing of traditional peer reviewed journal articles, as well as the activities of readers to find out about them and access them. The new business models and parallel functions enabled by the Internet, such as open access journals and e-print repositories, are also in focus.
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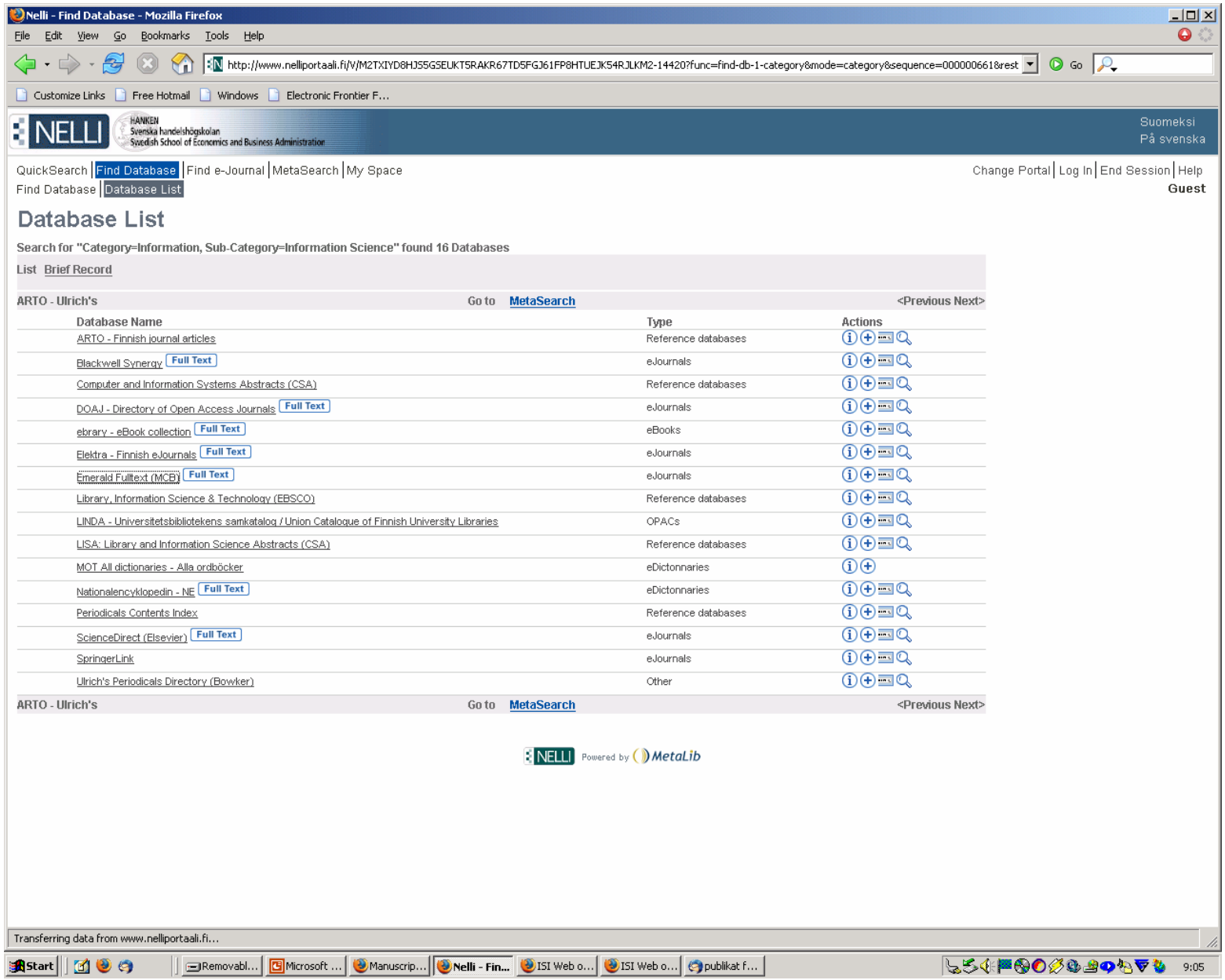
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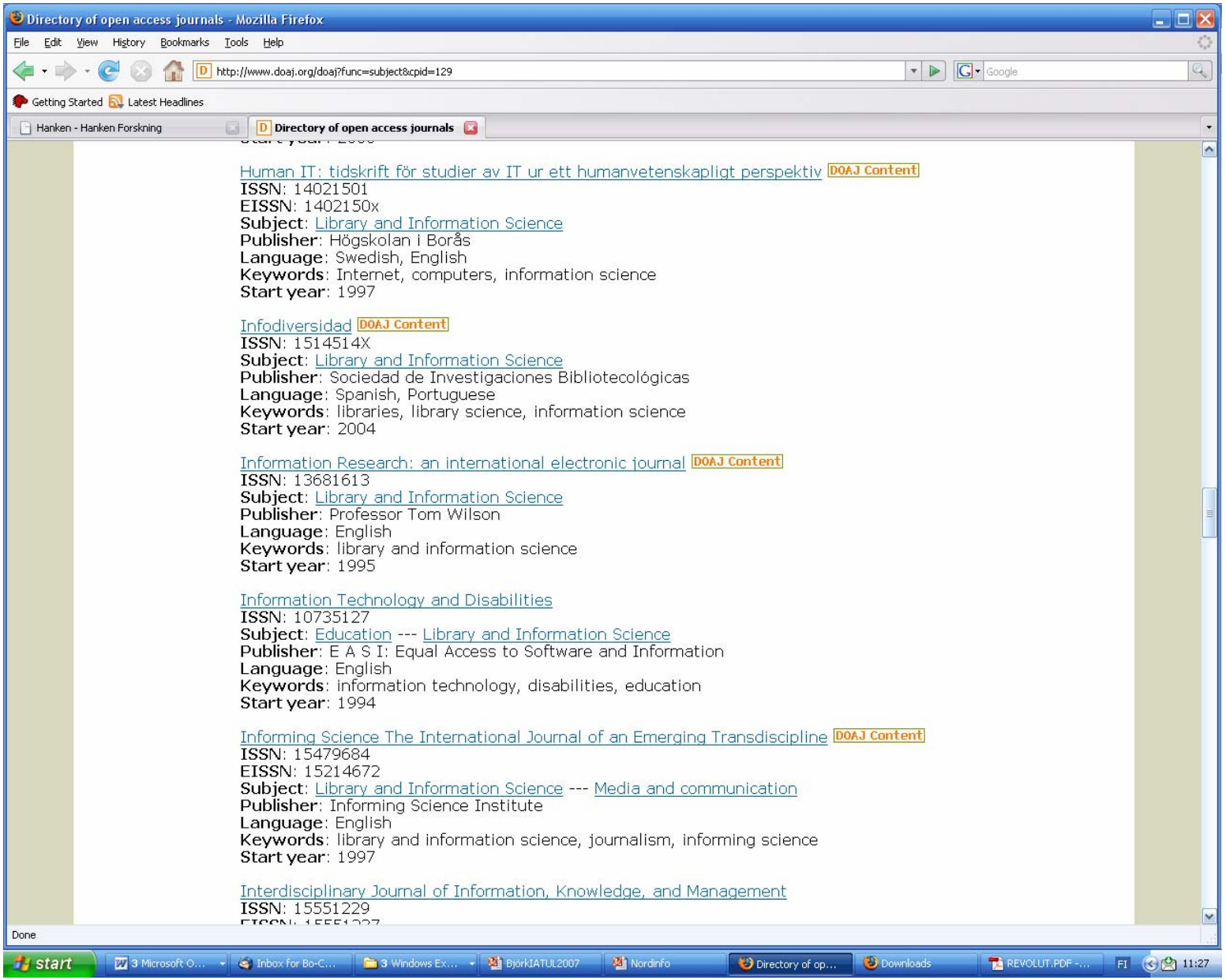
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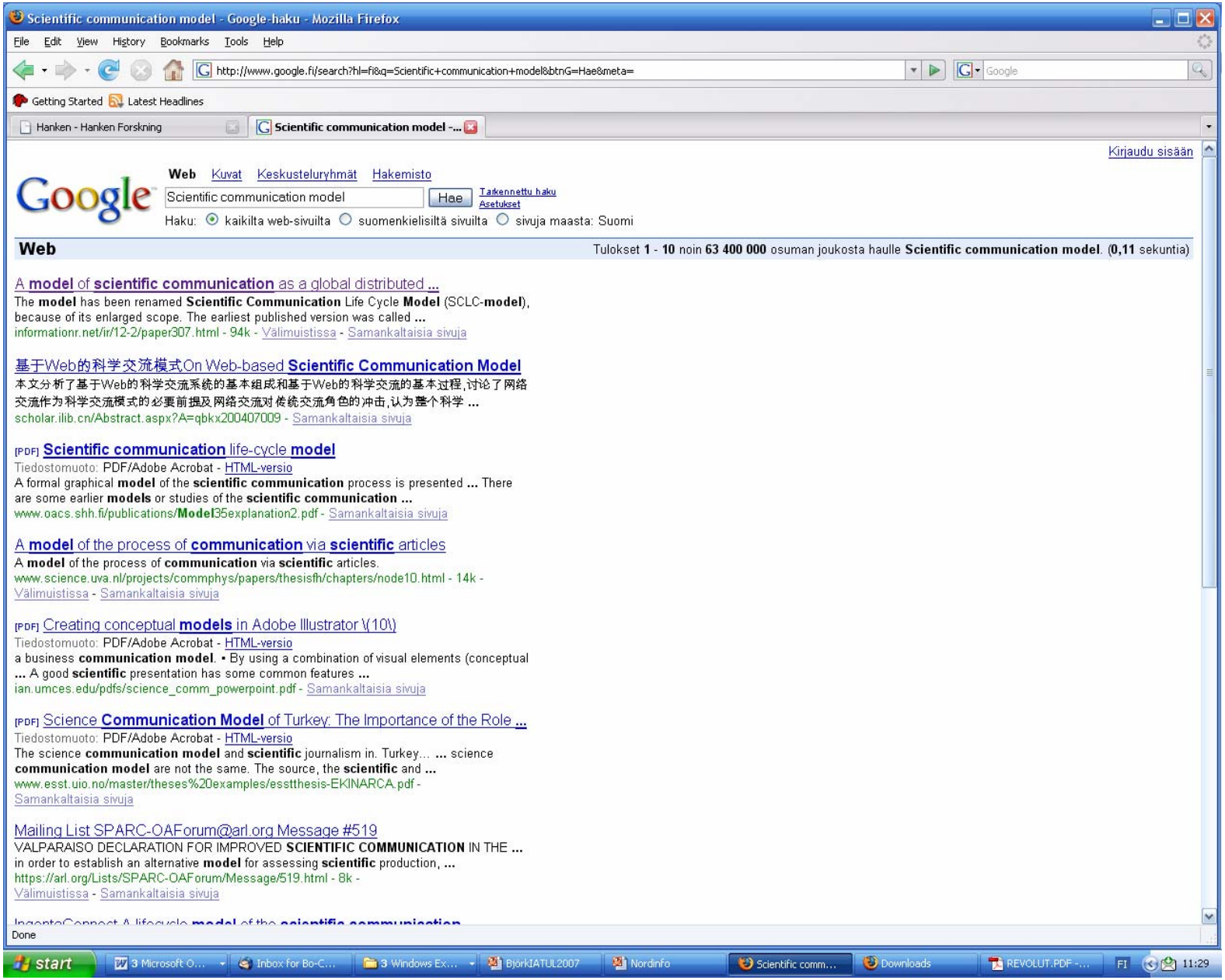
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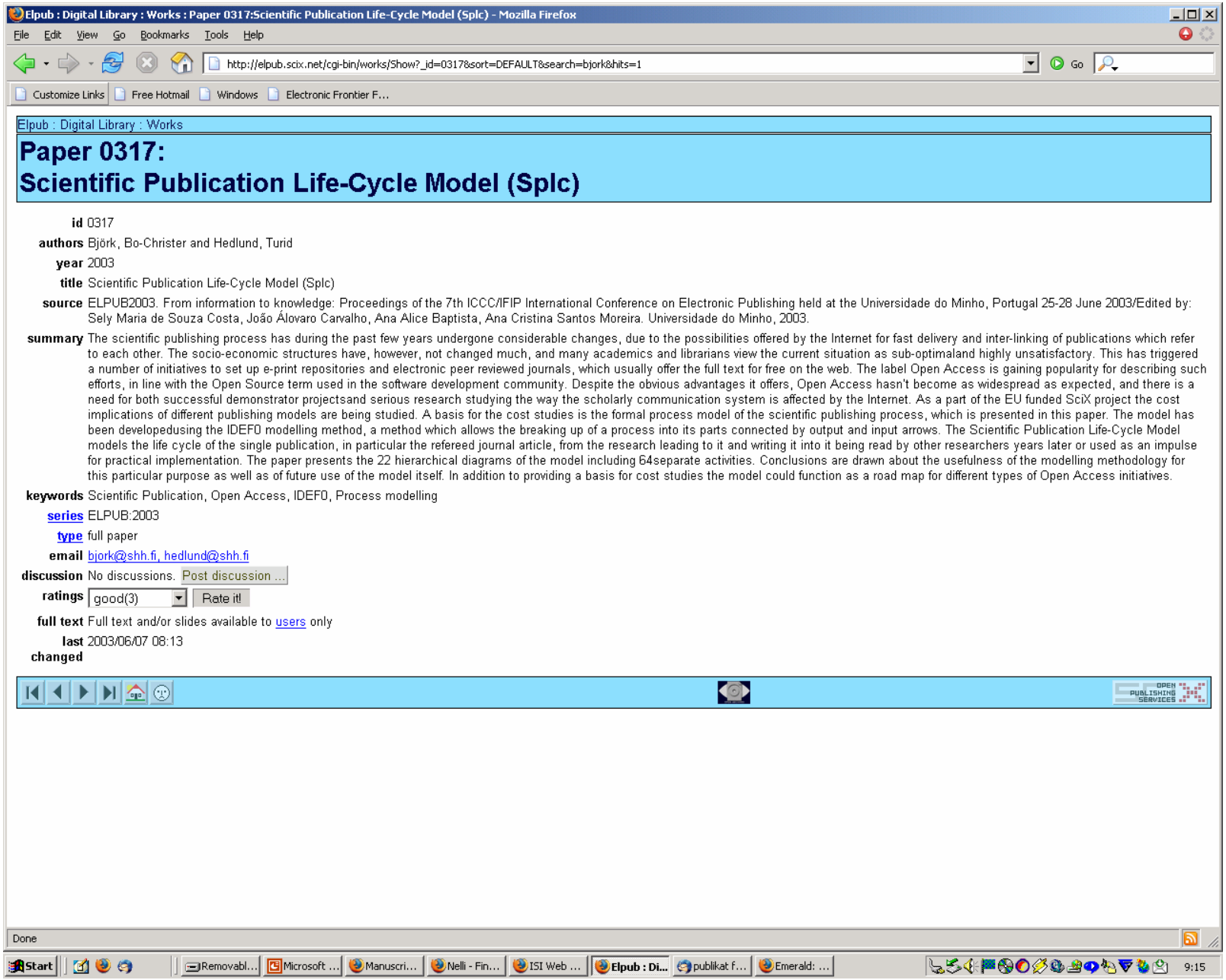
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summary The scientific publishing process has during the past few years undergone considerable changes, due to the possibilities offered by the Internet for fast delivery and inter-linking of publications which refer to each other. The socio-economic structures have, however, not changed much, and many academics and librarians view the current situation as sub-optimaland highly unsatisfactory. This has triggered a number of initiatives to set up e-print repositories and electronic peer reviewed journals, which usually offer the full text for free on the web. The label Open Access is gaining popularity for describing such efforts, in line with the Open Source term used in the software development community. Despite the obvious advantages it offers, Open Access hasn't become as widespread as expected, and there is a need for both successful demonstrator projectsand serious research studying the way the scholarly communication system is affected by the Internet. As a part of the EU funded SciX project the cost implications of different publishing models are being studied. A basis for the cost studies is the formal process model of the scientific publishing process, which is presented in this paper. The model has been developedusing the IDEF0 modelling method, a method which allows the breaking up of a process into its parts connected by output and input arrows. The Scientific Publication Life-Cycle Model models the life cycle of the single publication, in particular the refereed journal article, from the research leading to it and writing it into it being read by other researchers years later or used as an impulse for practical implementation. The paper presents the 22 hierarchical diagrams of the model including 64separate activities. Conclusions are drawn about the usefulness of the modelling methodology for this particular purpose as well as of future use of the model itself. In addition to providing a basis for cost studies the model could function as a road map for different types of Open Access initiatives.
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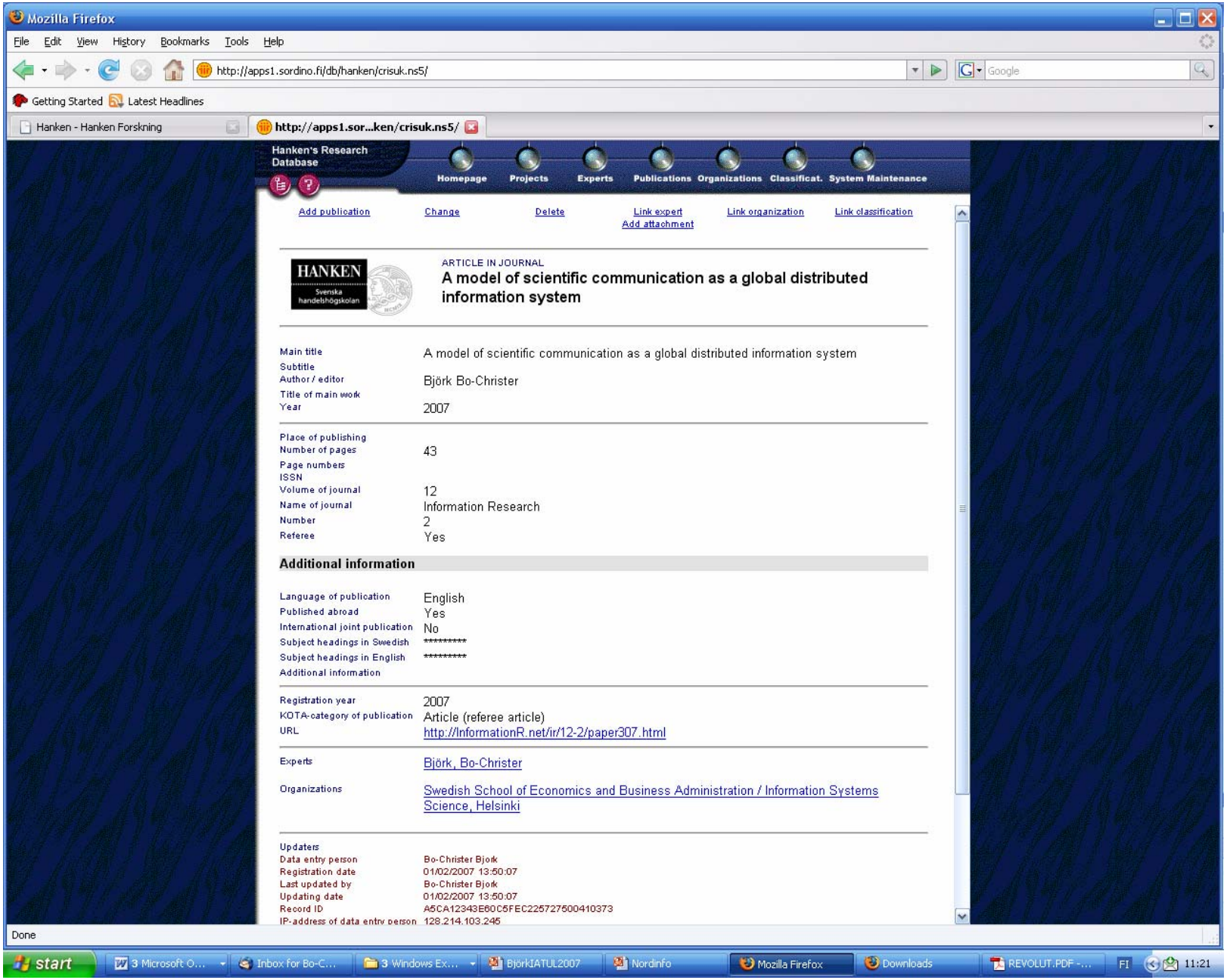
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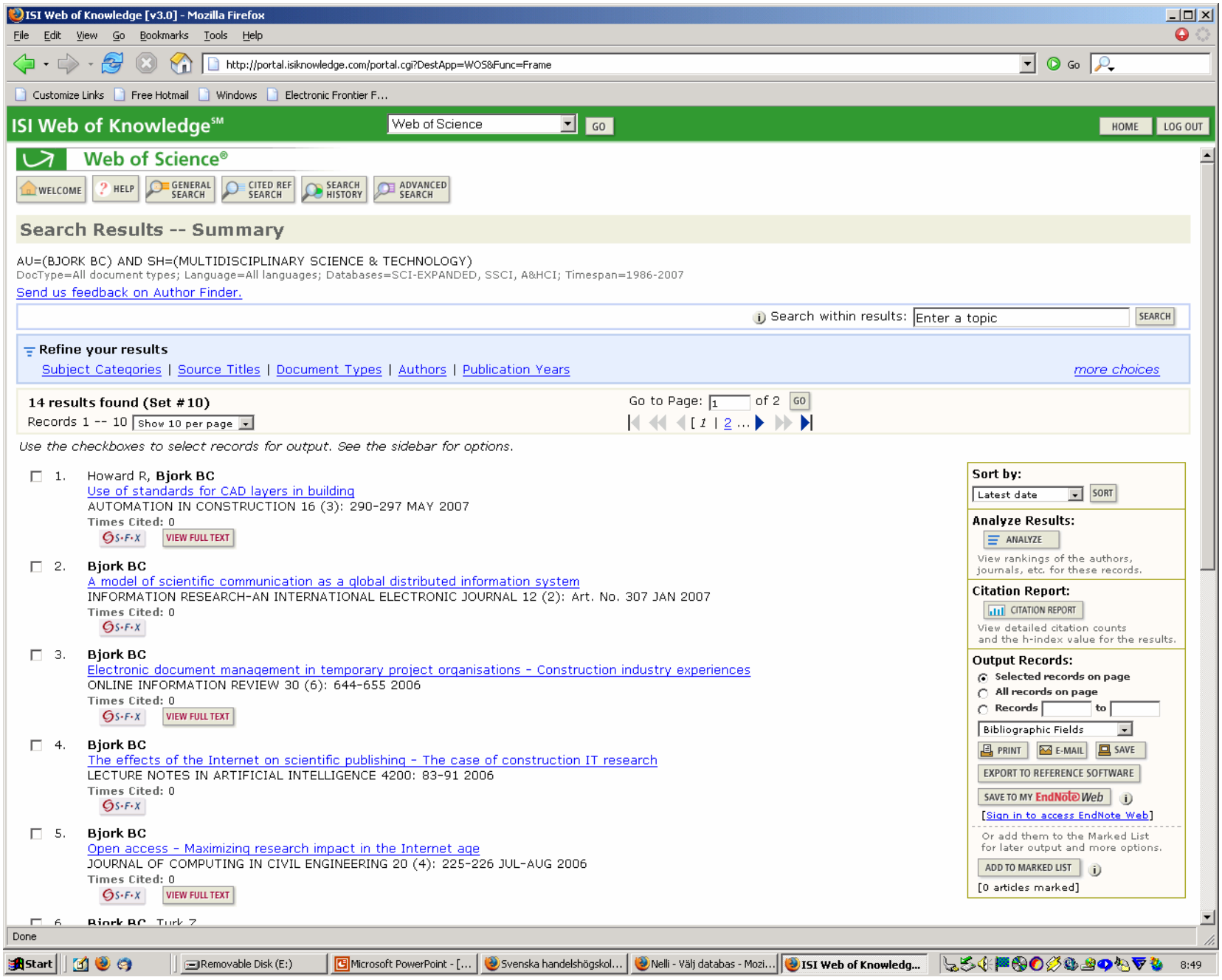
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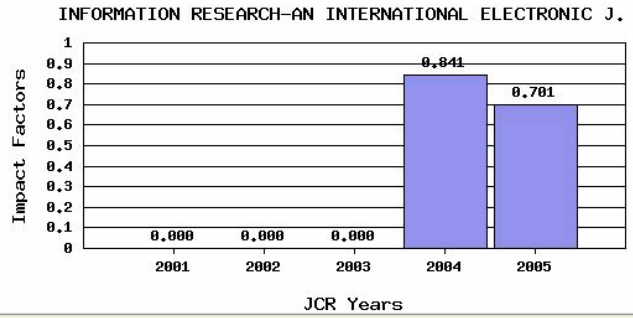

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NOTE: Title changes and coverage changes may result in no impact factor for one or more years in the above graph.

2005 Impact Factor

Cites in 2005 to articles published in:	2004 = 21	Number of articles published in:	2004 = 46
	2003 = 26		2003 = 21
	Sum: 47		Sum: 67

Calculation: Cites to recent articles 47 / Number of recent articles 67 = **0.701**

2004 Impact Factor

Cites in 2004 to articles published in:	2003 = 23	Number of articles published in:	2003 = 21
	2002 = 14		2002 = 23
	Sum: 37		Sum: 44

Calculation: Cites to recent articles 37 / Number of recent articles 44 = **0.841**

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The ”glue” that integrates the information systems

- **MIS systems**

- The business transaction (order, sale)
- Customer id’s, product ideas
- prices

- **Scientific communication**

- The individual publication
- Publication metadata
- The citation

Two main uses of the information

- **MIS systems**

- Support of sales and logistics
- Bookkeeping
- Management decision support (Quarterly reports)

- **Scientific communication**

- Communicating research results
- Supporting funders and university administrations in deciding about grants and appointments

Background of the SCLC-model

- Model has been developed since 2000
- SciX project (EC)
- OACS-project (Academy of Finland)

Purpose of the model

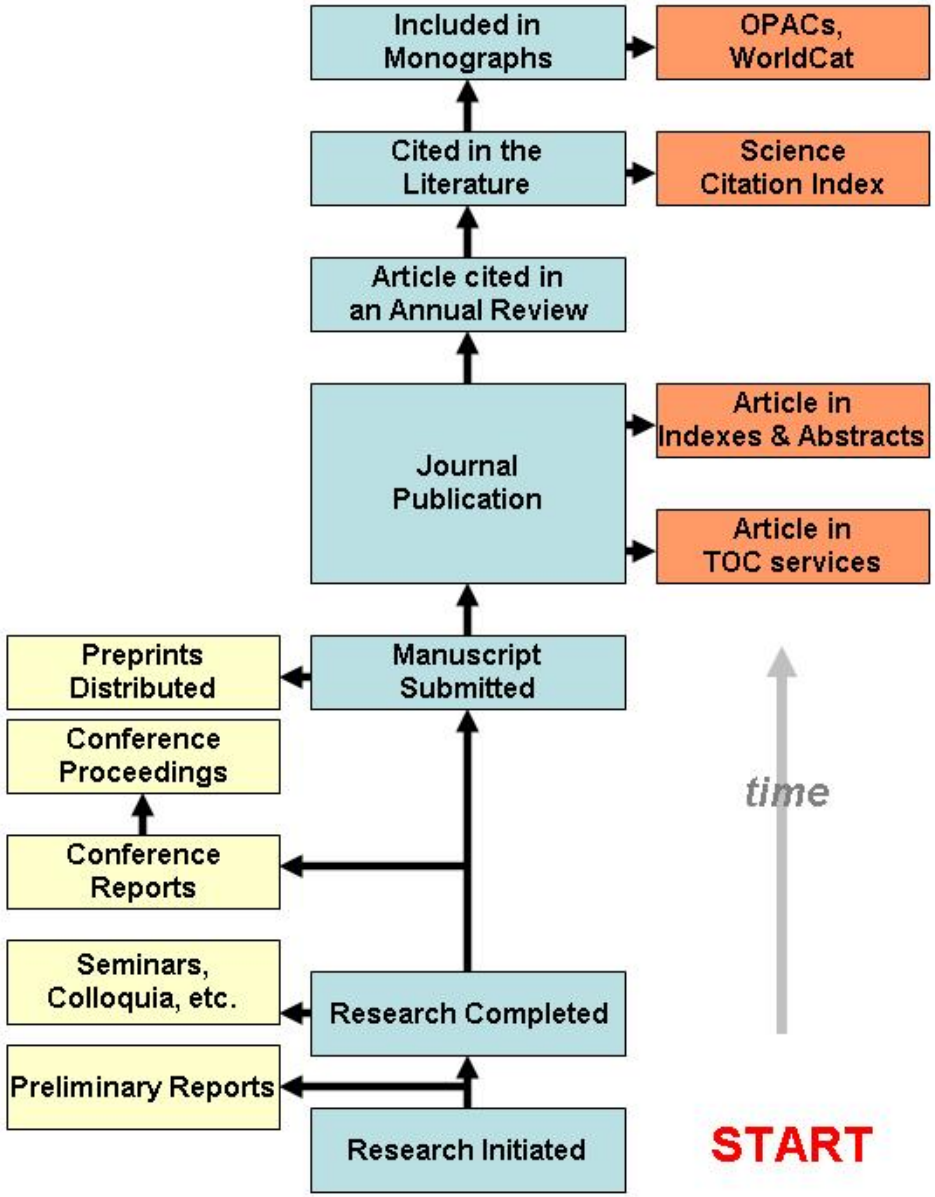
- The purpose of the model is to act as a roadmap for policy discussions and research concerning the process. In comparison to earlier models found in the literature this model is more detailed, hierarchical and includes more modelling constructs (activities, inputs,outputs, controls, mechanisms).

Scope of the model

- The whole scientific communication value chain
- From initial research improvements in every-day life.
- Major focus is on modelling the publishing, indexing and retrieval and reading of traditional peer reviewed journal articles
- The new business models and parallel functions enabled by the Internet, such as open access journals and e-print repositories, are also included.

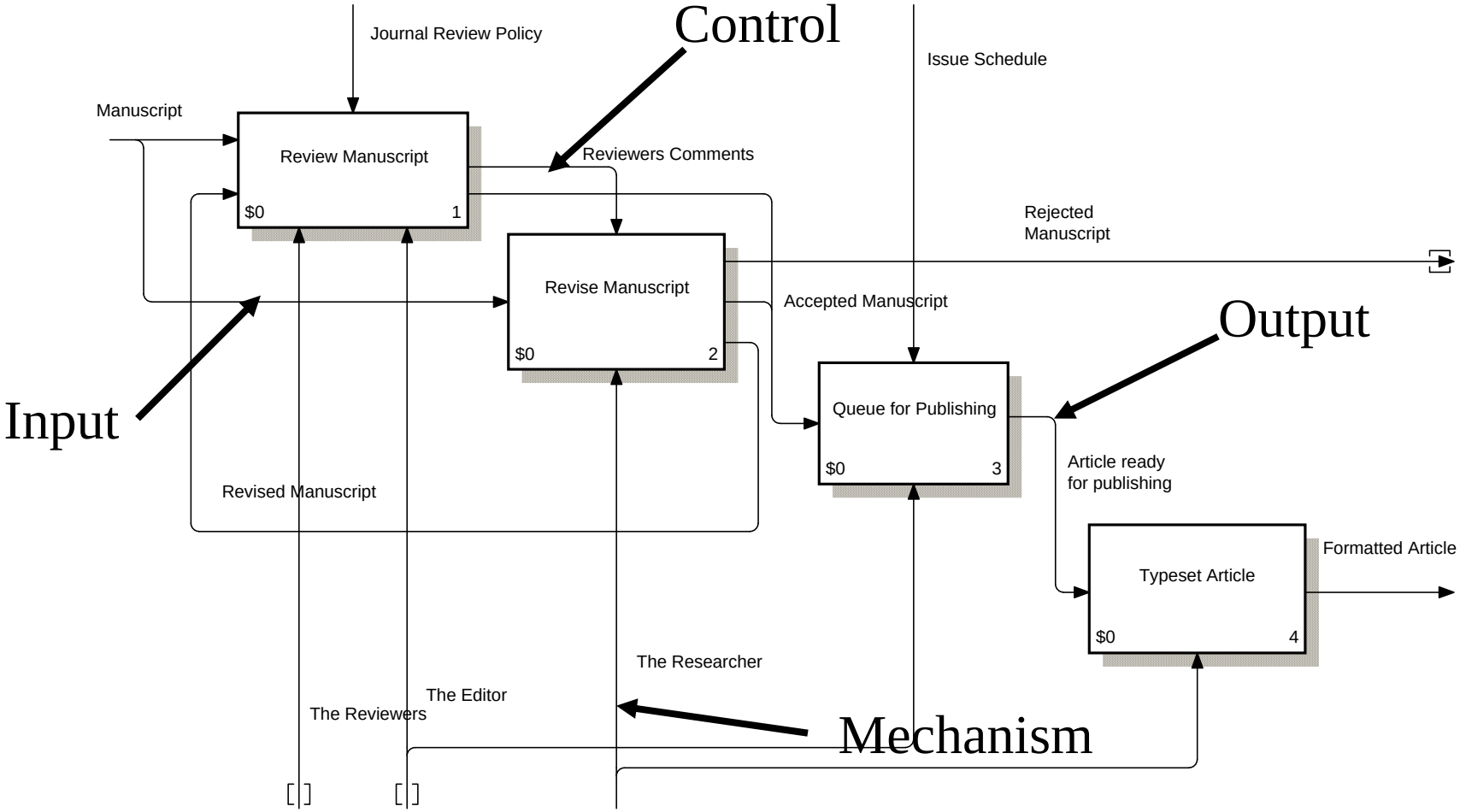
Earlier research

- Garvey&Griffith
- Hurd
- Tenopir&King



Modelling methodology

- The modelling methodology used is IDEF0, a process modelling method, which previously has mainly been used for business process reengineering in the manufacturing industries.



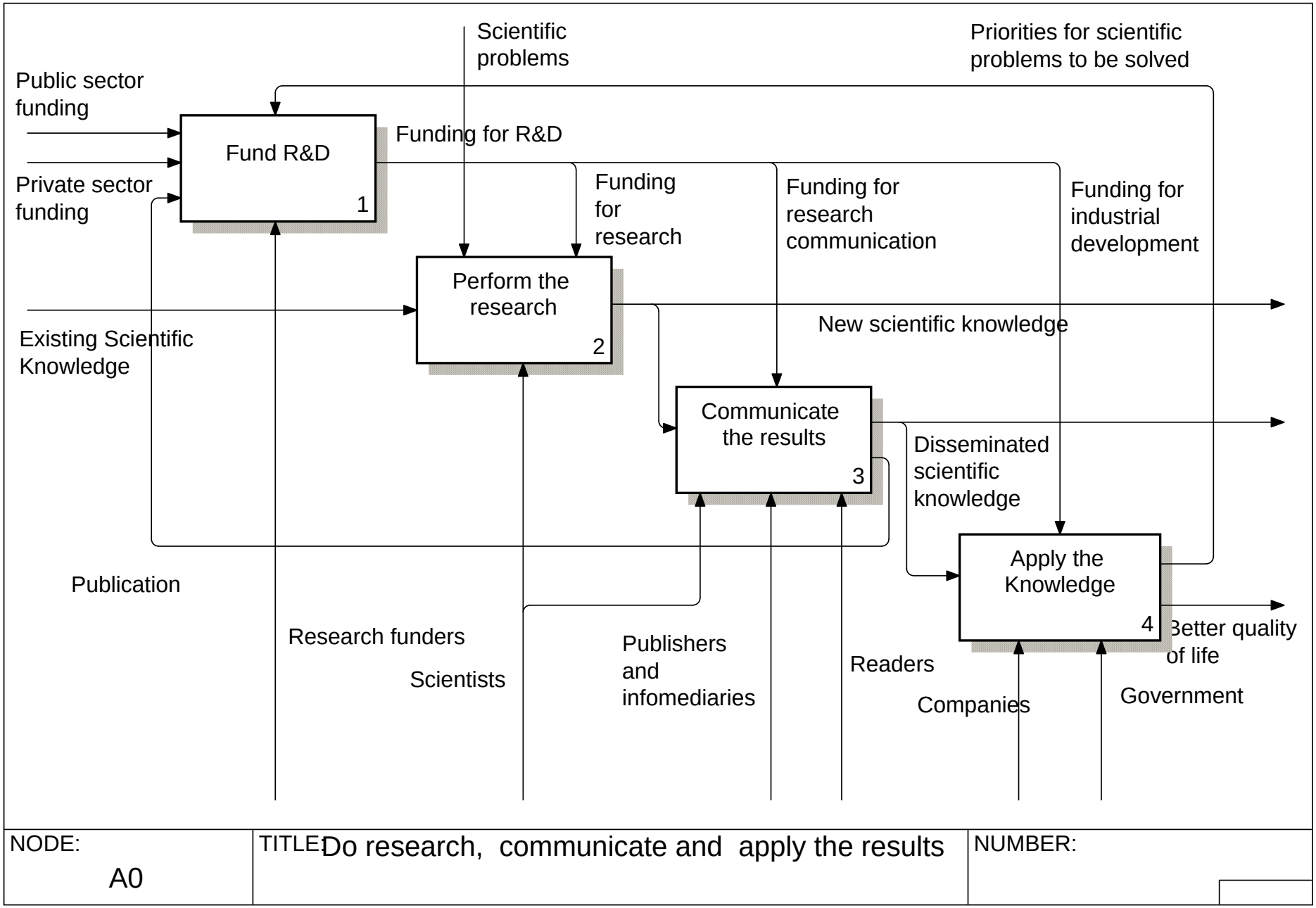
Model diagrams

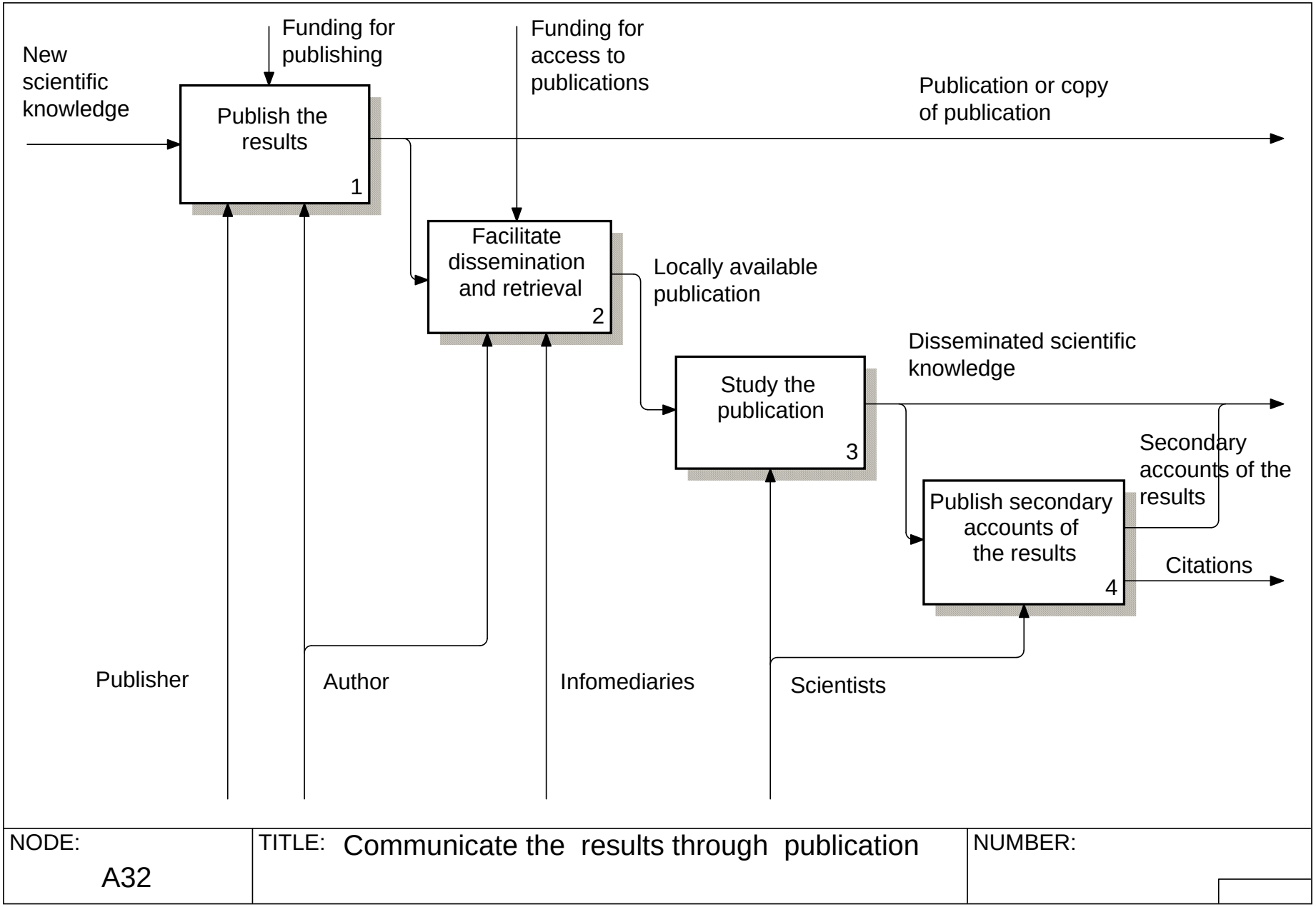
- The current version of the model consists of 33 diagrams, with 113 different activities and over 200 different inputs, outputs, controls and mechanisms.
- They are here presented in hierachical order. The number indicates the place in the hierarchy (i.e. Diagram A11 is a breakdown of one of the activities in diagram A1)

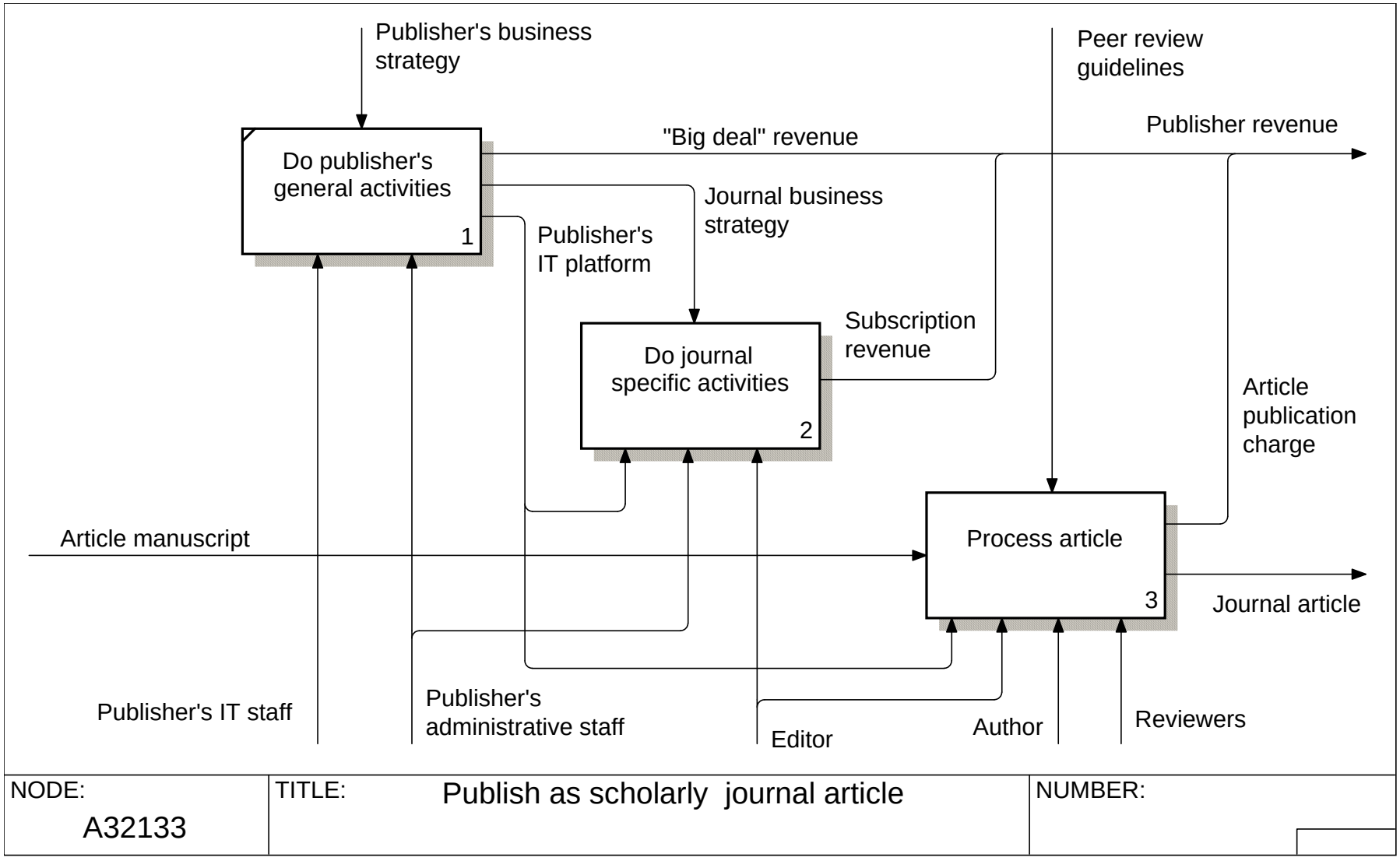
Model hierarcy (extract)

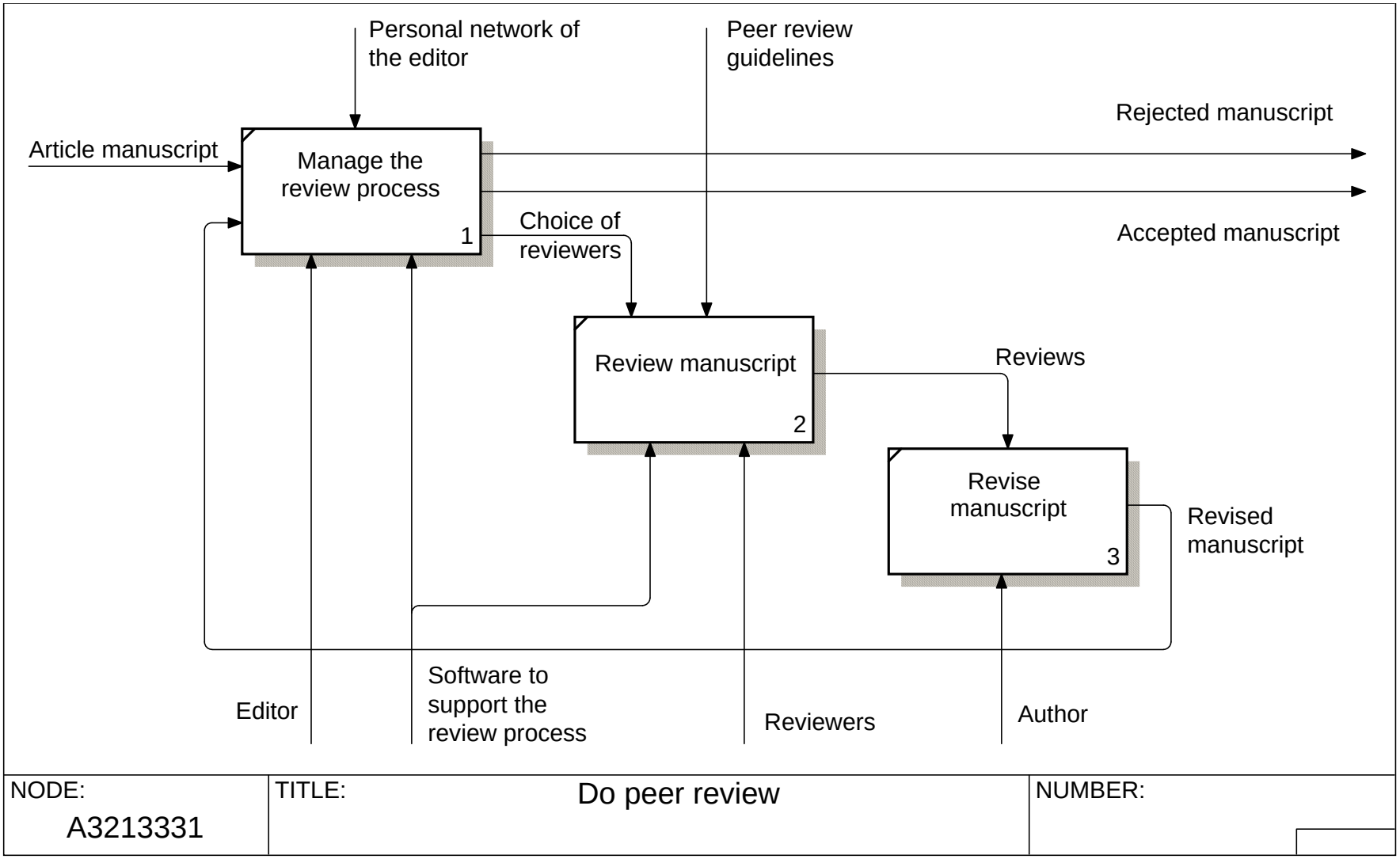
- 33 diagrams
- 113 activities
- 200+ arrows
- Diagram name indicates place in hierarchy
- A11, A12 are submodels of A1

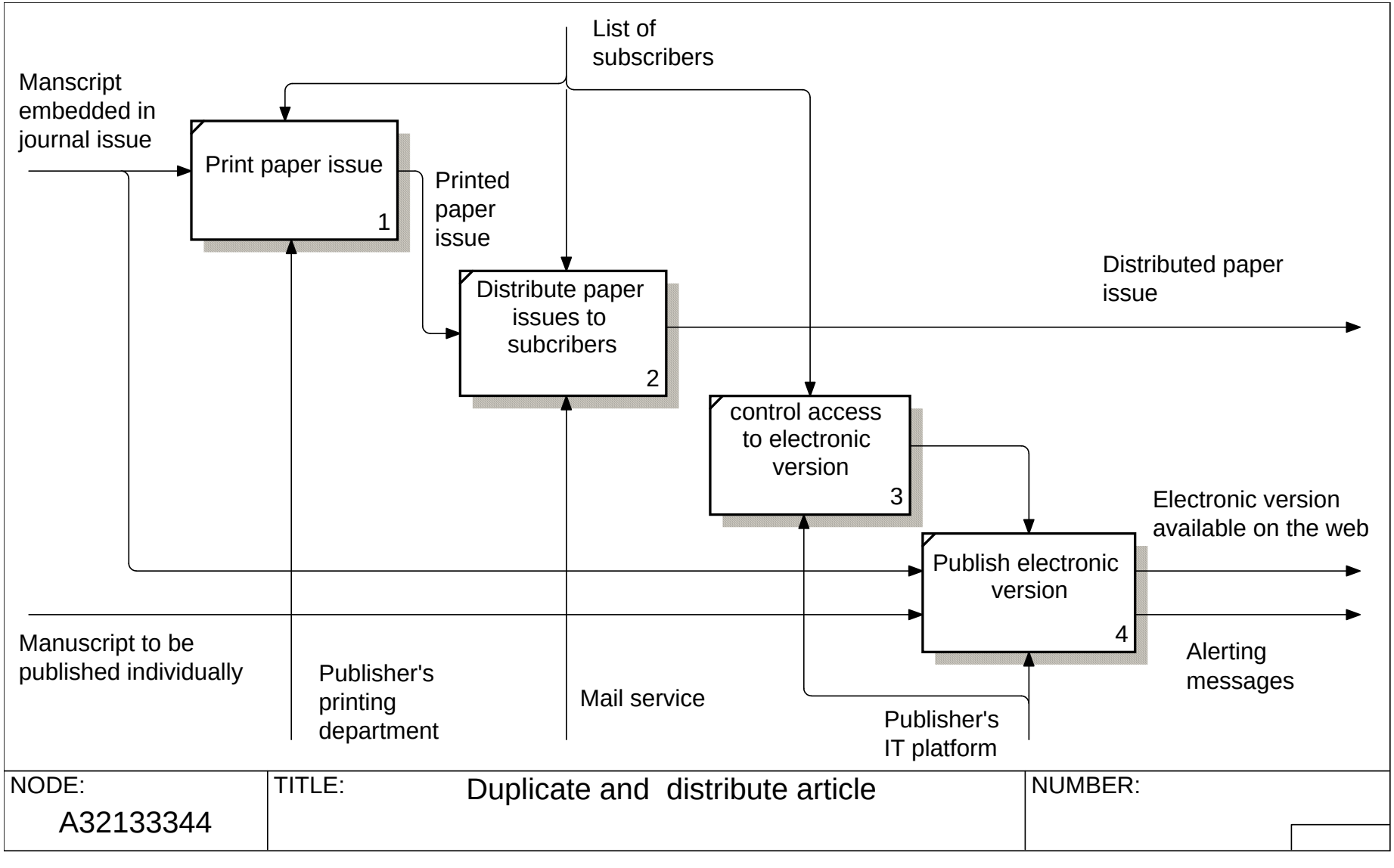
A-0 Context diagram
A0 Do research, communicate and apply the results
A1 Fund R&D
A11 Evaluate prior research of applicants
A12 Evaluate research proposals
A13 Make funding decisions
A2 Perform the research
A21 Study existing scientific knowledge
A22 Collect data from existing repositories
A23 Do experiments and make observations
A24 Analyse and draw conclusions
A3 Communicate the results
A31 Communicate the results informally
A32 Communicate the results through publications
A321 Publish the results
A3211 Write manuscript
A3212 Choose where to submit or negotiate publishing
A 3213 Produce publication
A32131 Publish as monograph
A32132 Publish as conference paper
A32133 Publish as scholarly journal article
A321331 Do publisher's general activities
A321332 Do journal specific activities
A321333 Process article
A3213331 Do peer review
A3213332 Negotiate copyright
A3213333 Pay article charges
A3213334 Do technical phases of publishing
A322 Facilitate dissemination and retrieval
A3221 Facilitate retrieval globally
A32211 Bundle publications from different sources into electronic services


Scientific problems
Priorities for scientific problems to be solved
Public sector funding
Private sector funding
Fund R&D
1
Funding for R&D
Funding for research
Funding for research communication
Funding for industrial development
Perform the research
2
Existing Scientific Knowledge
New scientific knowledge
Communicate the results
3
Disseminated scientific knowledge
Apply the Knowledge
4
Better quality of life
Publication
Research funders
Scientists
Publishers and infomediaries
Readers
Companies
Government
NODE:
A0
TITLE:
Do research, communicate and apply the results
NUMBER:


New scientific knowledge
Funding for publishing
Funding for access to publications
Publish the results
1
Publication or copy of publication
Facilitate dissemination and retrieval
2
Locally available publication
Study the publication
3
Disseminated scientific knowledge
Publish secondary accounts of the results
4
Secondary accounts of the results
Citations
Publisher
Author
Infomediaries
Scientists
NODE:
A32
TITLE: Communicate the results through publication
NUMBER:


Publisher's business strategy
Peer review guidelines
Publisher revenue
"Big deal" revenue
Do publisher's general activities
1
Journal business strategy
Publisher's IT platform
Subscription revenue
Do journal specific activities
2
Article publication charge
Article manuscript
Process article
3
Journal article
Publisher's IT staff
Publisher's administrative staff
Editor
Author
Reviewers
NODE:
A32133
TITLE:
Publish as scholarly journal article
NUMBER:


Personal network of the editor
Peer review guidelines
Rejected manuscript
Article manuscript
Manage the review process
1
Choice of reviewers
Accepted manuscript
Review manuscript
2
Reviews
Revise manuscript
3
Revised manuscript
Editor
Software to support the review process
Reviewers
Author
NODE:
A3213331
TITLE:
Do peer review
NUMBER:



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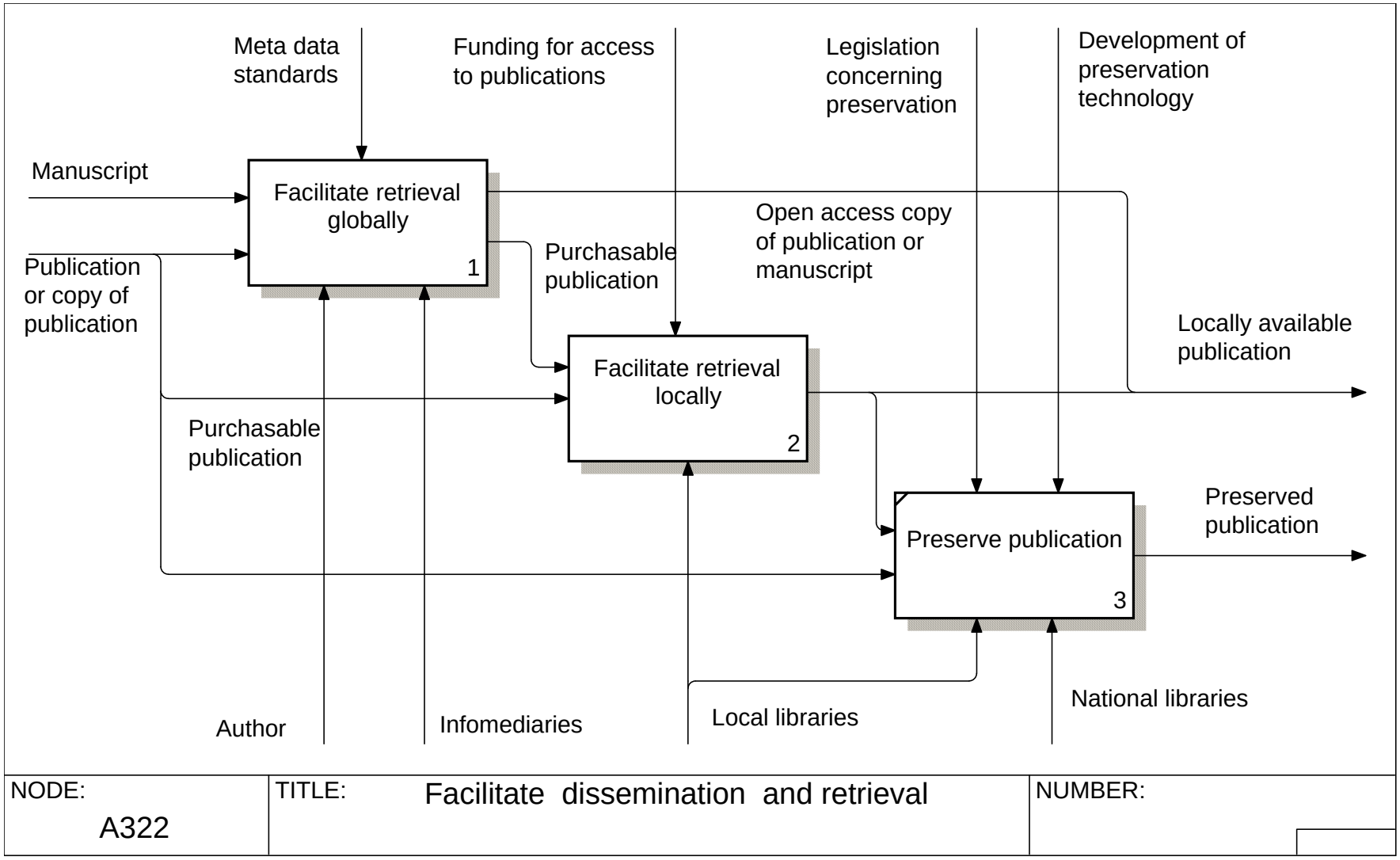
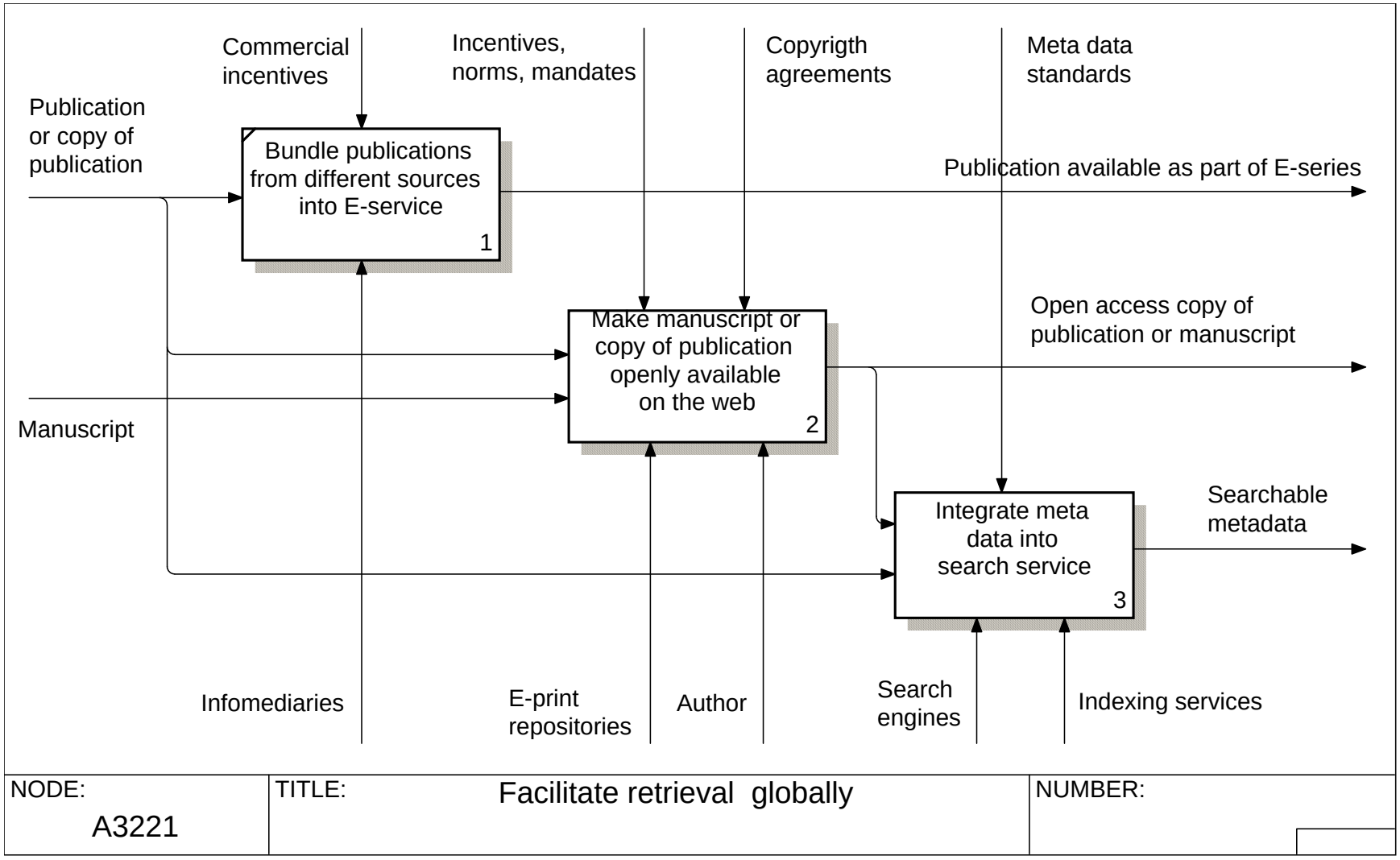
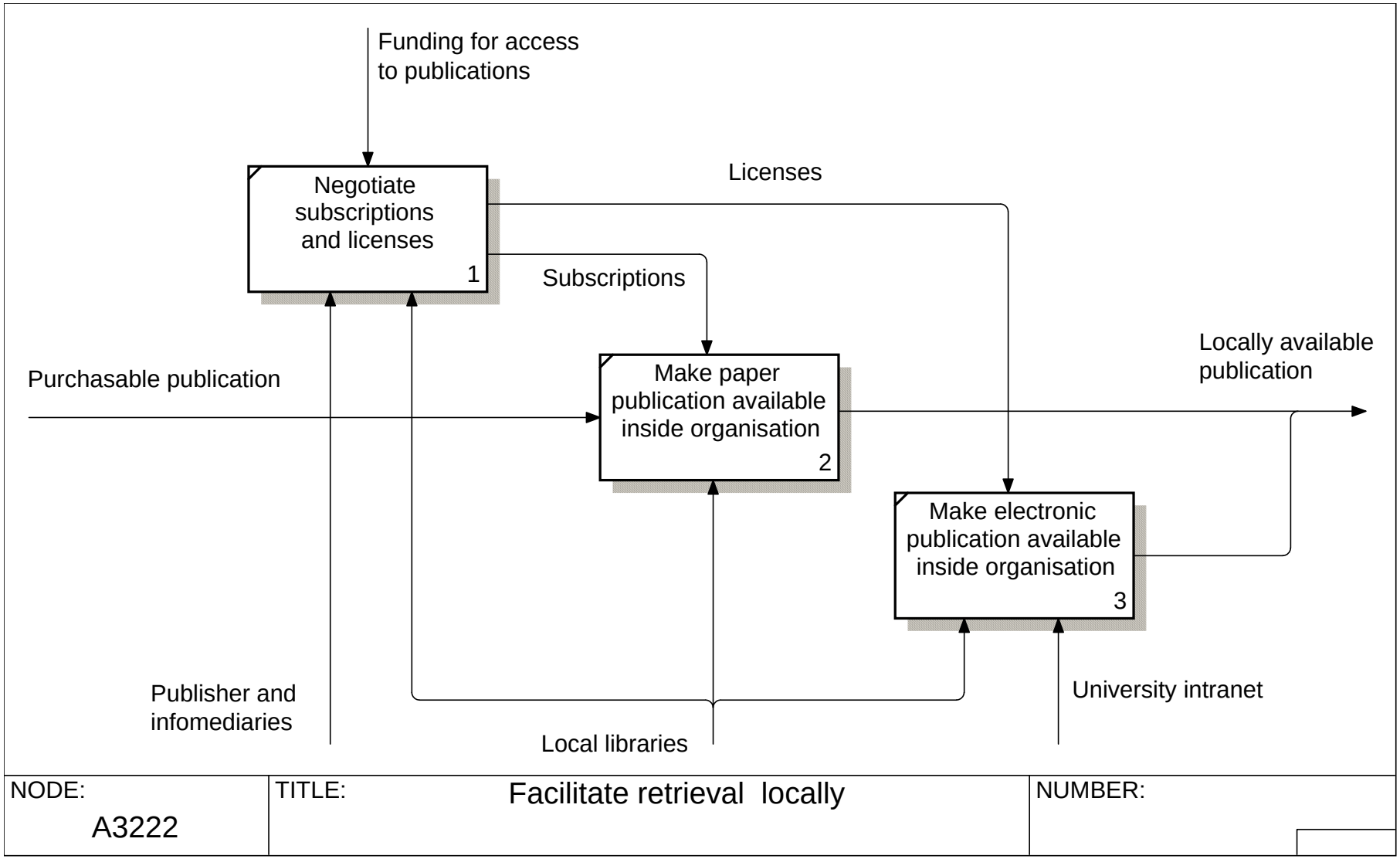
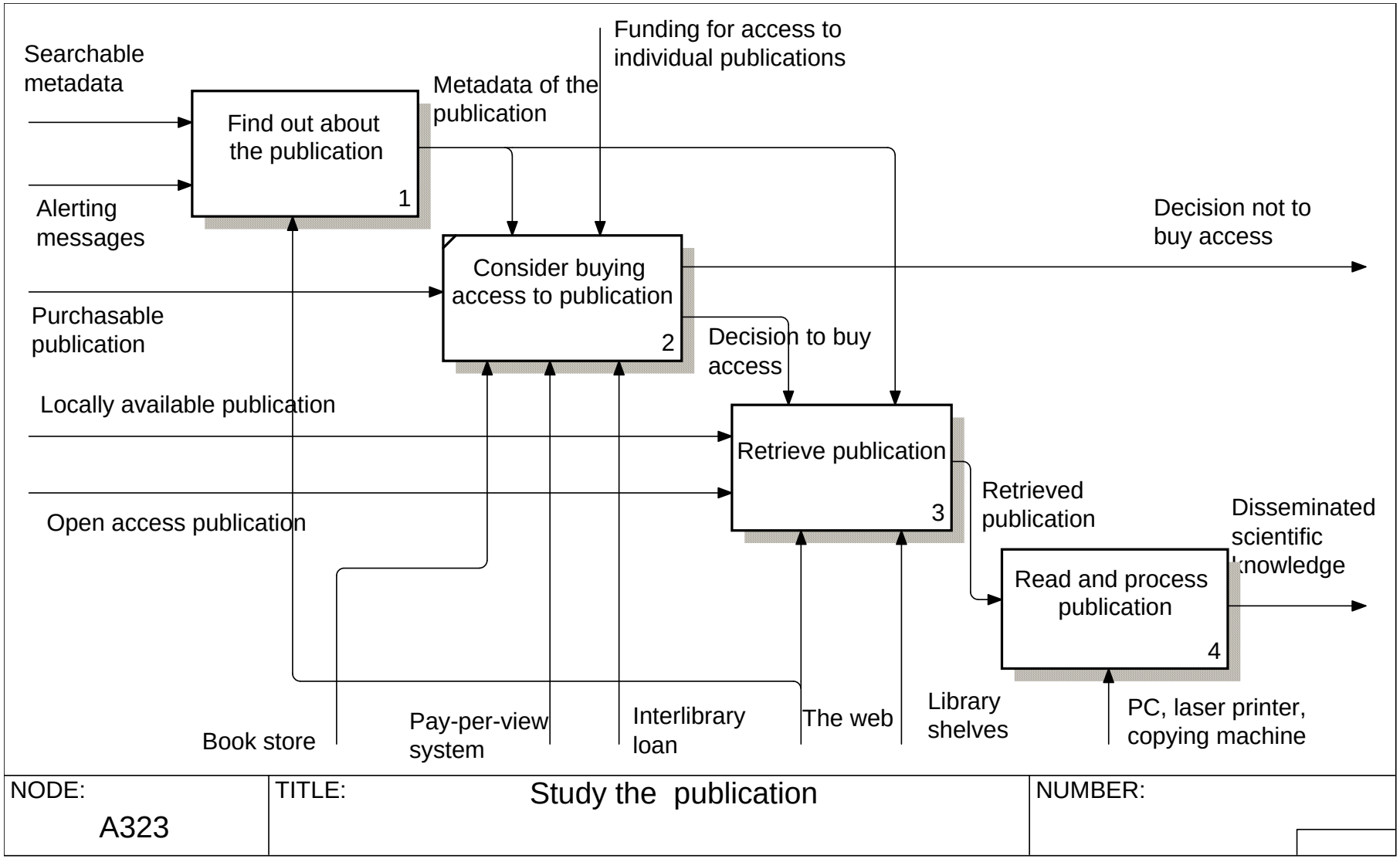
A32133344	Duplicate and distribute article	

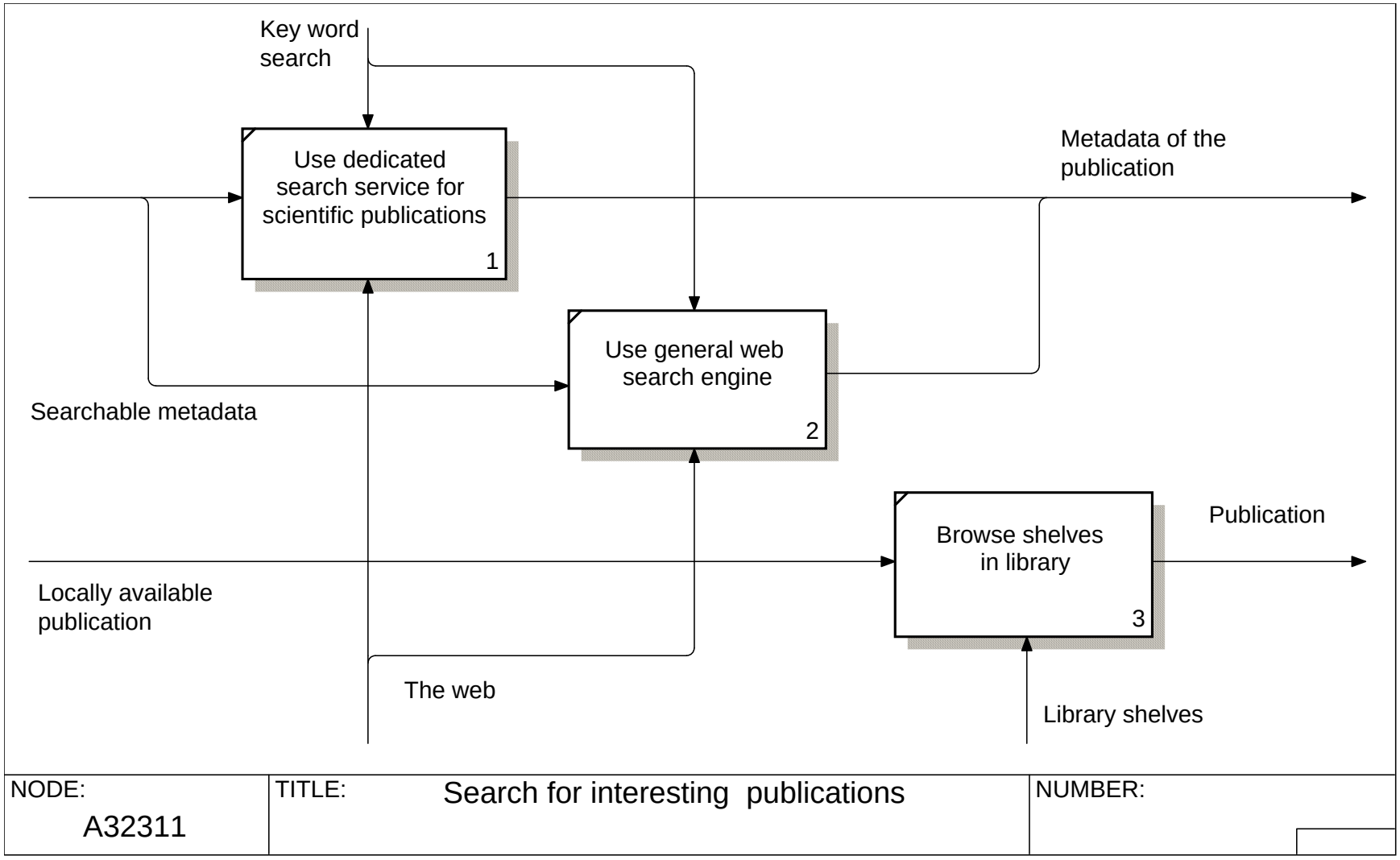


NODE:	TITLE:	NUMBER:
A322	Facilitate dissemination and retrieval	

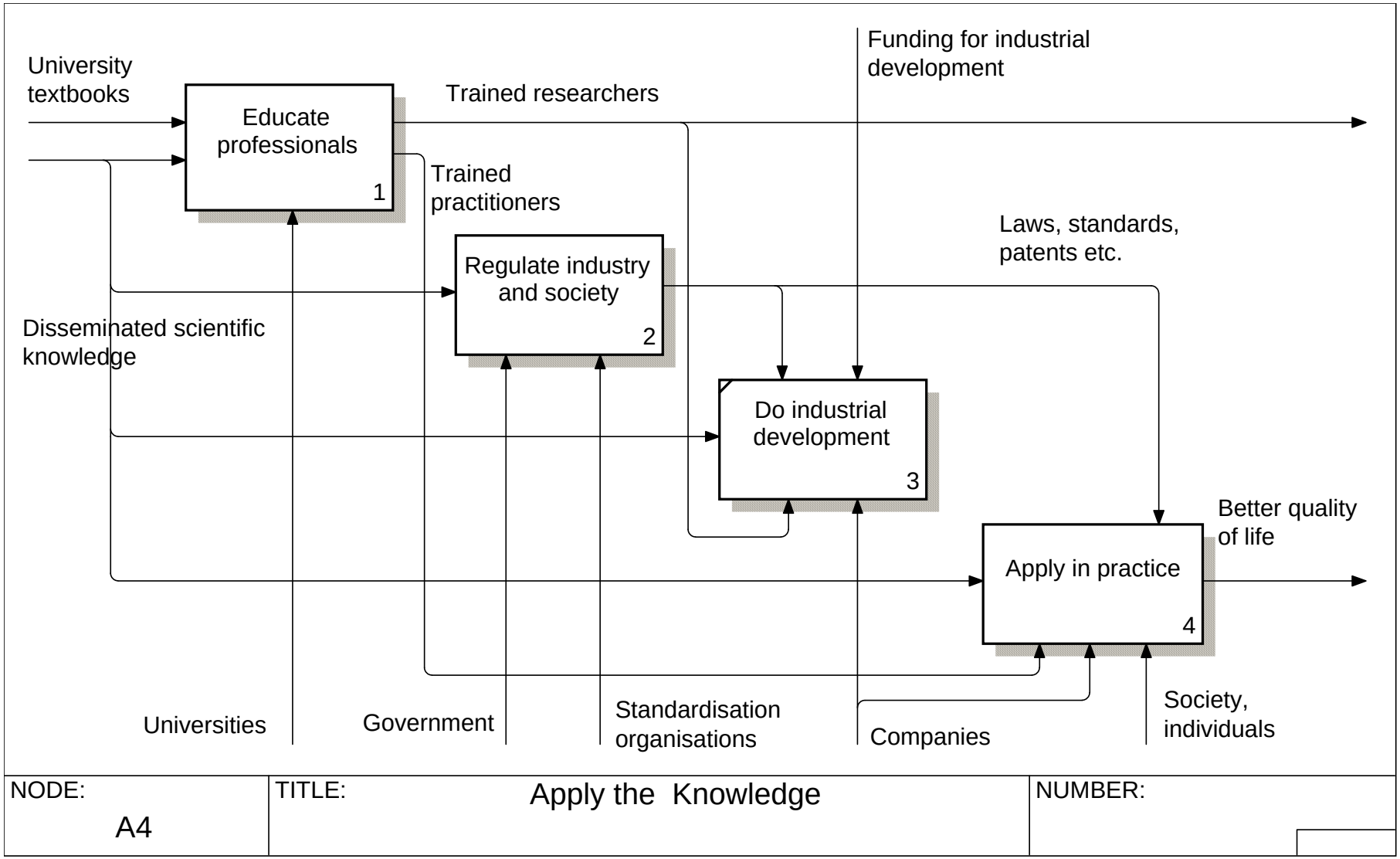

Commercial incentives
Incentives, norms, mandates
Copyrigth agreements
Meta data standards
Publication or copy of publication
Bundle publications from different sources into E-service
1
Publication available as part of E-series
Make manuscript or copy of publication openly available on the web
2
Open access copy of publication or manuscript
Manuscript
Integrate meta data into search service
3
Searchable metadata
Infomediaries
E-print repositories
Author
Search engines
Indexing services
NODE:
A3221
TITLE:
Facilitate retrieval globally
NUMBER:


Funding for access to publications
Negotiate subscriptions and licenses
1
Licenses
Subscriptions
Purchasable publication
Make paper publication available inside organisation
2
Locally available publication
Make electronic publication available inside organisation
3
Publisher and infomediaries
Local libraries
University intranet
NODE:
A3222
TITLE:
Facilitate retrieval locally
NUMBER:

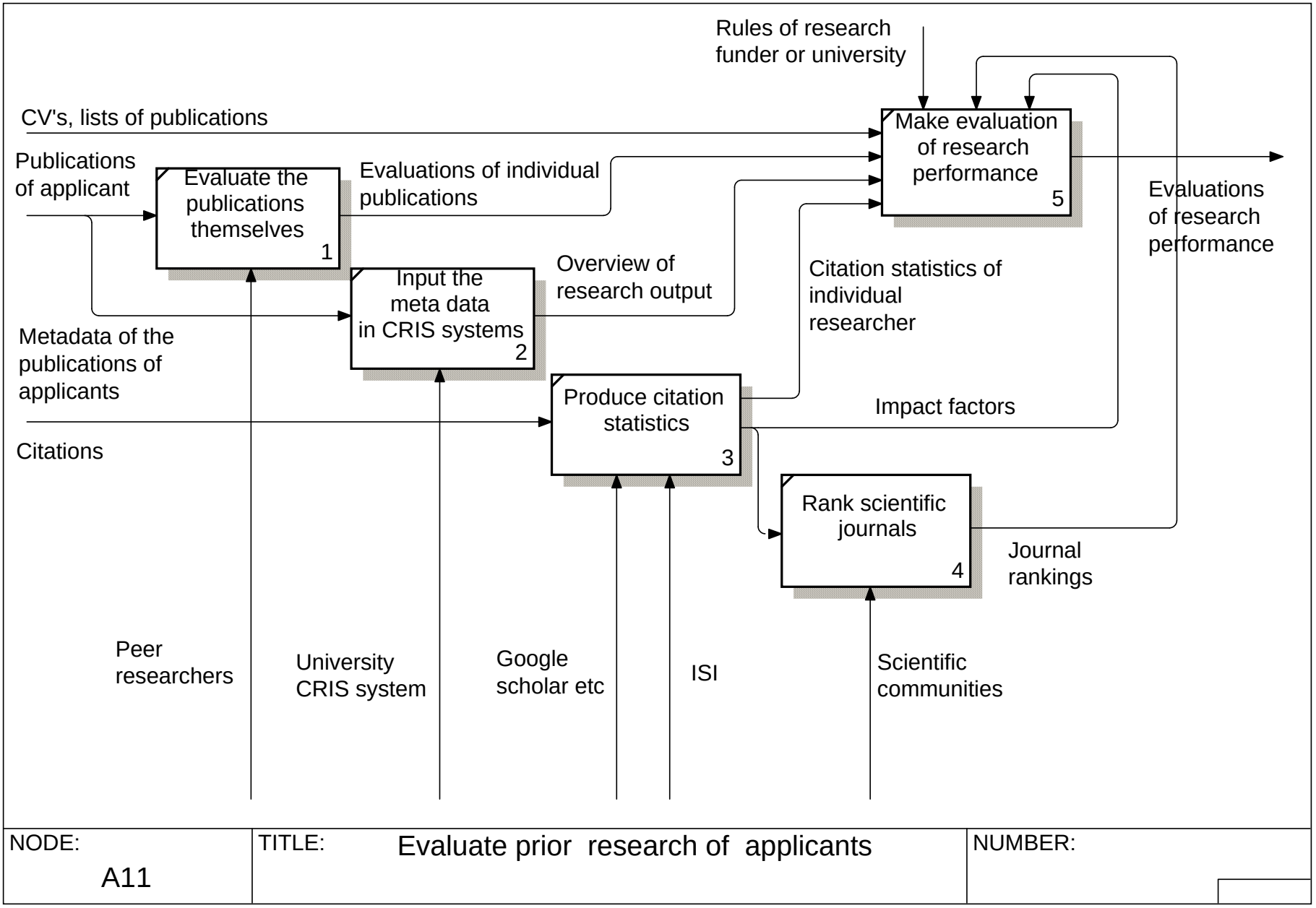

Searchable metadata
Alerting messages
Find out about the publication
1
Metadata of the publication
Funding for access to individual publications
Decision not to buy access
Purchasable publication
Consider buying access to publication
2
Decision to buy access
Locally available publication
Open access publication
Retrieve publication
3
Retrieved publication
Disseminated scientific knowledge
Read and process publication
4
Book store
Pay-per-view system
Interlibrary loan
The web
Library shelves
PC, laser printer, copying machine
NODE:
A323
TITLE:
Study the publication
NUMBER:



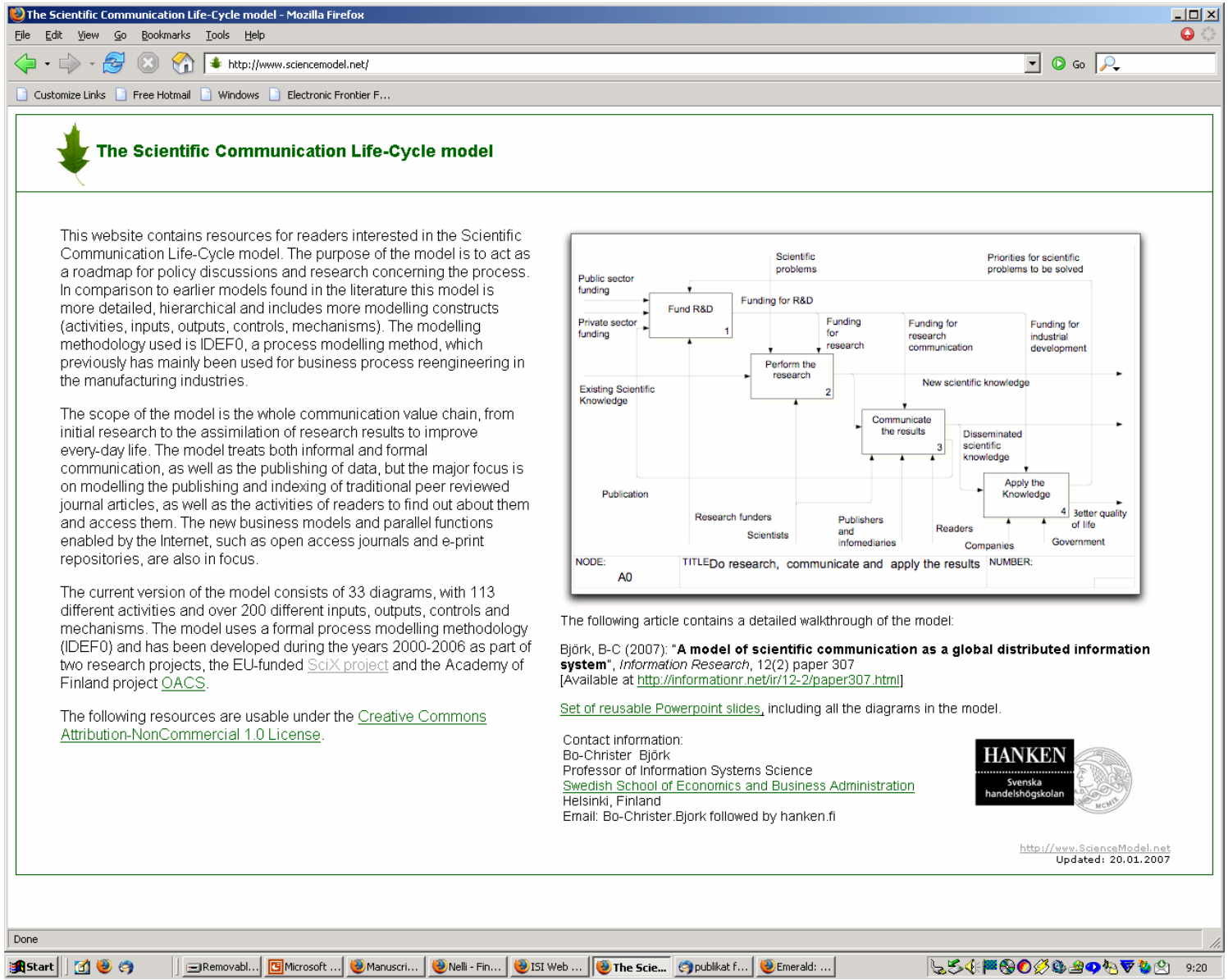
NODE:	TITLE:	NUMBER:
A32311	Search for interesting publications	



NODE:	TITLE:	NUMBER:
A4	Apply the Knowledge	


Rules of research funder or university
CV's, lists of publications
Publications of applicant
Evaluate the publications themselves
1
Evaluations of individual publications
Make evaluation of research performance
5
Evaluations of research performance
Overview of research output
Citation statistics of individual researcher
Input the meta data in CRIS systems
2
Metadata of the publications of applicants
Produce citation statistics
3
Impact factors
Citations
Rank scientific journals
4
Journal rankings
Peer researchers
University CRIS system
Google scholar etc
ISI
Scientific communities
NODE:
A11
TITLE:
Evaluate prior research of applicants
NUMBER:

Conclusions

- The model can be useful in structuring comparisons between different business models
- It can also help in positioning different OA-initiatives and their effects
- There is no one ”right” model, that could be formally validated
- The criteria for judging the model is weather it is perceived as useful

Reference: http://www.sciencemodel.net/