



Network

e Science

<http://www.escience-sachsen.de/>

Research methodology meets policy meets economic development. The case of the eScience Saxony Research Network.

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1st International Science 2.0 Conference
Hamburg, 26.-27.03. 2014

1. Digitization & Web 2.0: insights into a changing academic practices
 - eLearning meets eScience
 - Influences
 - Terminology
2. The concept of e-science
 - Is research changing?
 - Consequences for the (social) sciences
3. Design based research
 - The eScience Research Network Saxony
 - Structures and Outcomes
 - Some data about scientists' behavior
3. The context
 - Governance & economic development
 - Issues of sustainable development

Influencing factors:

Communication

- changed the way we communicate, inform, learn or entertain ourselves
- modified the conditions and the standards for these activities
- permanent Online-presence
- network technologies and mobile computing

Collaboration

- substantial dissolution of spatial-temporal limits of our physical world experience (cp. Weinberger, 2007).
- not always visible, but still active - participation (cp. Kahnwald 2011).

Authority

- in the digital space stability, objectivity and institutional authority is replaced by timeliness, permanent availability and situational competence
- the levelling effect of computer-mediated knowledge communication leads to new structures of power, which even convert the existing organizational patterns (cf. Spears & Lea, 1994).

What can be derived:

Transformation

- societies transform towards the so-called knowledge society (Drucker, 1969; Bell, 1973; Stehr, 1994; Bittlingmayer, 2005).
- a new way of dealing with knowledge (cp. Pscheida, 2010)
- Web 2.0 (ICT in general) will eventually change our thinking itself (cp. Carr, 2011).

The World as a network of meaning

- The World Wide Web with its hyper-textually linked structures is the perfect representation of the post-modern, post industrial world of knowledge.
- Yet social circumstances are triggered as well – almost 1 billion face book users are a serious evidence.
- Subsequently the correlated influences of the knowledge society and of the networked digital nature of knowledge create the potential for a cultural change.

What does this mean for science?

What is e-science?

Term is used in a broad understanding

- open or electronic science, dealing with technologies and infrastructures
- Grid and research infrastructures
- Data-intensive science
- Networked and collaborative practices rather than individual, even open science patterns,
- Citizen science

Definition

- the eScience Research Network Saxony is describing it as the „**expansion of academic activities through the integration of information and communication technologies in all areas and disciplines of scientific research, communication and dissemination of knowledge**“.
- it is clear that **the term chosen is not a perfect concept for a dynamic agenda!**

The “eScience Research Network Saxony”

- a joint project of all universities and colleges in the German federal state Saxony,
- funded by the European Commission together with the local Ministry of Science in the period 2011 – 2014

Outcomes

- appr. 25 smaller research projects in different areas of eScience,
- Research reports, publication and networking conferences
- Counseling for the participating universities and colleges
- Sustainable implementation of new approaches and technologies in the scientific practice of the partners and beyond

Goals

- to trigger basic research on differentiated approaches and methods of eScience plus the development of appropriate tools and practices among scientists

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A brief history

- E-Science or Electronic Science describes **different methodological fields** of research and development in the context of the defining and using computer technologies in scientific research.
- While primarily in Germany and Great Britain, the term e-Science is used, in the U.S., the comparable concept of a "**Cyber Infrastructure**" or in Australia, the "e-Research" term can be found. Currently, the discussion expands under the slogan "Science 2.0" and goes in particular to digital scientific cooperative work (Weichselgartner, 2010).
- Here, the thematic range starts with infrastructures on application architectures, **grid and cloud technologies** but also extends to educational technology, so-called e-learning.
- Also e-science systems support **cooperative research** between universities and in cooperation with industry (see Ziegler & Diehl, 2009).

Consequences for the (social) sciences

1. The life takes place in a **digital lab!**
2. **Digitalization** of science and scientific work **has happened** already!
3. It is likely that **scientists are not aware** that change from a methodological point of view!

(Köhler 2011, Pscheida et al. 2012, Mohamed et al. 2013a / 2013b)

The life takes place in a digital lab!

- For the first time communication is entirely taking place in form of digital text – an advantage that is invaluable.
 - So far with any observation or data collection process encountered the problem to collect ‘complete’ data in a qualitative sense. However, every attempt will always be only an approximate solution. Reference is made in this by ‘Transscription rules’ and ‘observer training’.
 - The investigation within computer networks, however, allows an automatic logging of all interaction occurring, (insofar as it is uttered). This 1:1 relationship between log and setting again is unique.
 - Its importance lies in the possible extraction of socially relevant communication or interaction from a complete social situation.
 - From an experimental perspective it is important to notify that possibly existing pre-knowledge of communicators can be excluded at least in the case of new group members / research subjects (Köhler, 2003) .
- The practical result is the overcoming of the traditional divide between laboratory and field, i.e. the **digitality kills the divide!**

Digital life takes place in the lab!

Digitalization of science and scientific work has happened already!

- Digital libraries
- Open access Publications
- Digital Dissertation Servers
- Online surveys
- Online conferences / - conference management
- Online appointments etc.
- Online exams, assessments, BA/ MA thesis submissions
- Virtual labs
- Digital texts for scientists daily communication (email, blogs, twitter, etc.)
- Digital videography, software based content analysis

→ Academic work has completely arrived in the digital world!

(cp. Köhler 2011)

Lack of focus

- scientists only marginally consider the methodological dimension:
- Just a few (social) scientists discuss methodological issues of digitalization.
- There doesn't seem to be clear standards of good research practice in a digital world.

Your perspective

- Do you select your web2.0 tools **after serious methodological consideration?**

What to do?

- We need both, **empirical** (i.e. data) **and theoretical** (i.e. analytical) **awareness.**

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The eScience - Research Network

- Joint project of all Saxon state universities and colleges
- Interdisciplinary group of researchers
- Research focus on:

- new methods
- new processes
- new technologies
- new practices
- new players
- new skills



- <http://www.escience-sachsen.de/>

Direct outcomes of the eScience-Research-Network Saxony

- 3 thematic clusters jointly steer focused developmental projects
- Research focus on: eLearning, eBusiness and eSystems
- Almost 30 projects were developed and will be completed by 06/2014
- Researchers use a joint platform which is presented at the Science 2.0 conference -> presented by Dr. Tontchev
- Network monitored the eScience behavior of scientists throughout Saxony in 2012/13 (cp. Pscheida et al., 2013)
- Network monitored the eScience behavior of scientists of the Leibnitz 2.0 Network in 2013/14 -> presented by Dr. Albrecht & Dr. Pscheida (cp. Pscheida et al., 2014)
- Network will held a conference in Leipzig in June with proceedings to be published by Springer in English language (deadline 31.03.2014)

Thematic cluster E-Learning

- Taking into account a sufficiently broad definition, we are using a concept of e-learning that includes the technological aspects of the various processing steps as well. Thus, e-learning are all kinds and forms of learning and teaching in basic education, advanced training and self-education using digital materials and/or information and communication technologies to arrange, create, organize and implement processes (Köhler & Ihbe 2006).
- However, comparing the extent of adoption of media technologies at the Saxon universities, but also within the major universities of the Free State of Saxony, a high degree of heterogeneity between the individual departments can be found.
- Within the Saxon Education Portal, but also beyond the higher education landscape of Saxony, the Technical University of Dresden (TUD) is known as one of the e-learning pioneers (see Buch & Hener 2006; Saupe et al. 2009). Overall during the last few years various initiatives and measures were taken in Saxony, which should lead to a stable and sustainable situation for e-learning in academic education and training.

Cluster E-Learning - funded projects:

- The Social Map of Activities and Collaborations
- Veränderungen des E-Learning unter dem Einfluss von eScience – Eine Untersuchung anhand von Early Adopters unter Geistes- und Sozialwissenschaftlern an Sächsischen Hochschulen
- E-Portfolio als Werkzeug des Wissensmanagements – Eine Evaluation von E-Portfolio-Arbeit am Beispiel der medienbezogenen Ausbildung von Lehramtsstudierenden
- Modeling e-Research in Academia: Towards Best Practice for Developing a Socio-Technical Concept for Online Knowledge Performance
- KoviLern: Kooperationskripts in videographischen Lernmedien
- CELePro: Collaboration in E-Learning Projects. Eine Bestandsaufnahme an sächsischen Hochschulen
- Benutzergeneriertes Assessment in der Hochschullehre – Eine Analyse unter besonderer Berücksichtigung eines wettbewerbsorientierten Paradigmas in verschiedenen Kontexten der Lehre
- Barrierefreie Online-Prüfungen

Thematic cluster E-Systems

Coordinated by HTWK Leipzig

- Within the “eScience – Network” we characterize e-systems as a scientific discipline focused on analysis, adoption and development of local and distributed hardware and software systems, associated application scenarios and organizational structures to create an efficient environment for collaborative cross-university research.
- Similar to the “lifelong learning” in the field of educational technology, this is about a continuous monitoring of various process phases, which are often still treated separately.
- The ‘real’ research in its diversity shall be considered along with upstream activities such as resource mobilization, problem identification and calculation, downstream phases such as the transfer of results into economy and the evaluation of research performance, as well as with accompanying phases such as public relations and teaching.

Cluster E-Systems - funded projects:

- „IQ-4D“ Informations-Quellen mit 4D-Bezügen
- Aufbau eines webbasierten RDF-Visualisierungsframeworks und Instanzierung als sächsischer Publikations-Visualisierungsdienst
- CrowdLearn: Leveraging the Creativity of the Crowd for the Creation of rich, deep-semantically structured eLearning Content
- Entwicklungsmethoden für prozessorientierte und komposite Mashup-Anwendungen
- eService-Sicherheitskonzept
- Linked Data Web
- Portal-basiertes Management von Ontologien und ihrer Evolution
- RENEVIZ

Thematic cluster E-Business

Coordinated by TUBA Freiberg

- Due to the variety, value and vulnerability of resources the move to e-science is much more difficult than to the World Wide Web. It is based on new software mechanisms for the distribution of resources as well as a substantial increase in communication networks performance. Thus, this step will not only give a strong pulse to science, but promote the sharing of resources in business, administration, and finally also in the private sector.
- E-business in this context demands distributed problem solving processes and a distributed support in decision-making, so that concepts such as knowledge discovery in databases, data warehousing and multi-agent systems in the context of e-business applications can be adopted in order to cope with future challenges.
- With the World Wide Web a system was created, that changed not only the private sector, but also strongly influenced business processes and their scientific analysis. Nowadays value chains are electronically linked; globally distributed project teams work together to develop and sell products or services. That led to cost savings for companies on the one hand, and to increased revenues on the other. Though there is great potential of integrated analysis of the complex phenomena in terms of e-science and thereby the e-science itself – in order to achieve a gain in knowledge, which then might flow back positively into the economy.

Cluster E-Business - funded projects:

- Why do people begin to yawn when I start to talk? Digital presentations for enhancing scholarly communication.
- Wissensvernetzung durch E-Science: Empirische Analyse von Kommunikationsstrategien und -instrumenten für die Forschungsplattform unter Berücksichtigung von Web 2.0-Werkzeugen und -Technologien
- in2logy-U – Usability for Ontology: Entwicklungsmethoden und Architekturen für komplexe Wissensmanagementsysteme mit intuitiv ausgerichteten Benutzeroberflächen
- Kooperations- und Kommunikationstechnologien zur Bearbeitung interdisziplinärer, interpretativer 3D-Rekonstruktionsprojekte zu geschichtswissenschaftlichen Sachverhalten
- in2logy-S – Systems for Ontology (Entwicklung, Implementierung und Optimierung komplexer Wissensmanagementsysteme mit intuitiv ausgerichteten Benutzeroberflächen)
- VisEDat: Web 2.0 basierte visuelle Entscheidungsunterstützung bei komplexen dynamischen Datenfeldern
- Variabilität von Prozessmodellen
- Support of Analytical Tasks based on XBRL Documents – Integrating Structured and Unstructured Data

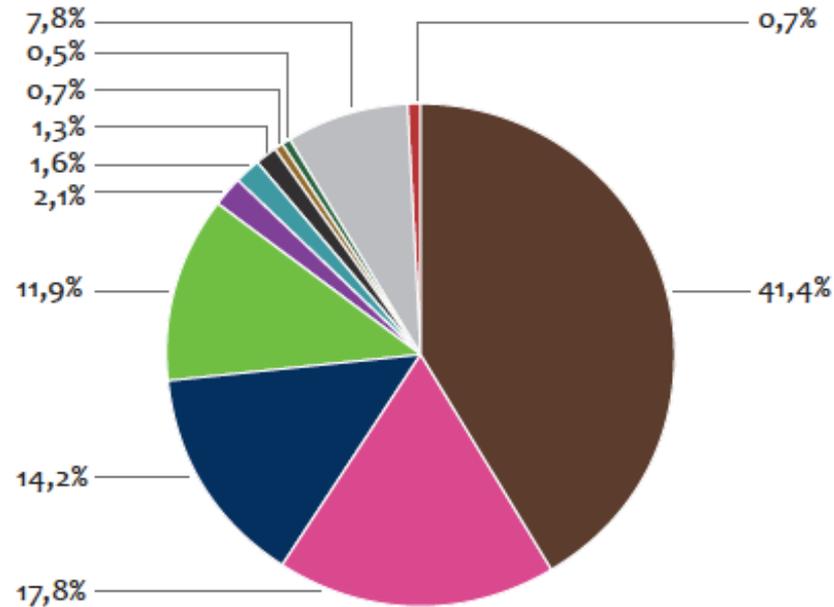
Data collection

- Online survey in Unipark
- May 2012
- Target group: Scientists of all disciplines at Saxony's state universities and colleges (~ 16.500 persons)
- Total sample: n=1.178 (response rate: 7%)
- Completed: n=765 (completion rate: 65%)
- Contact: mailing via data center, human resources department, deanery of research, faculties

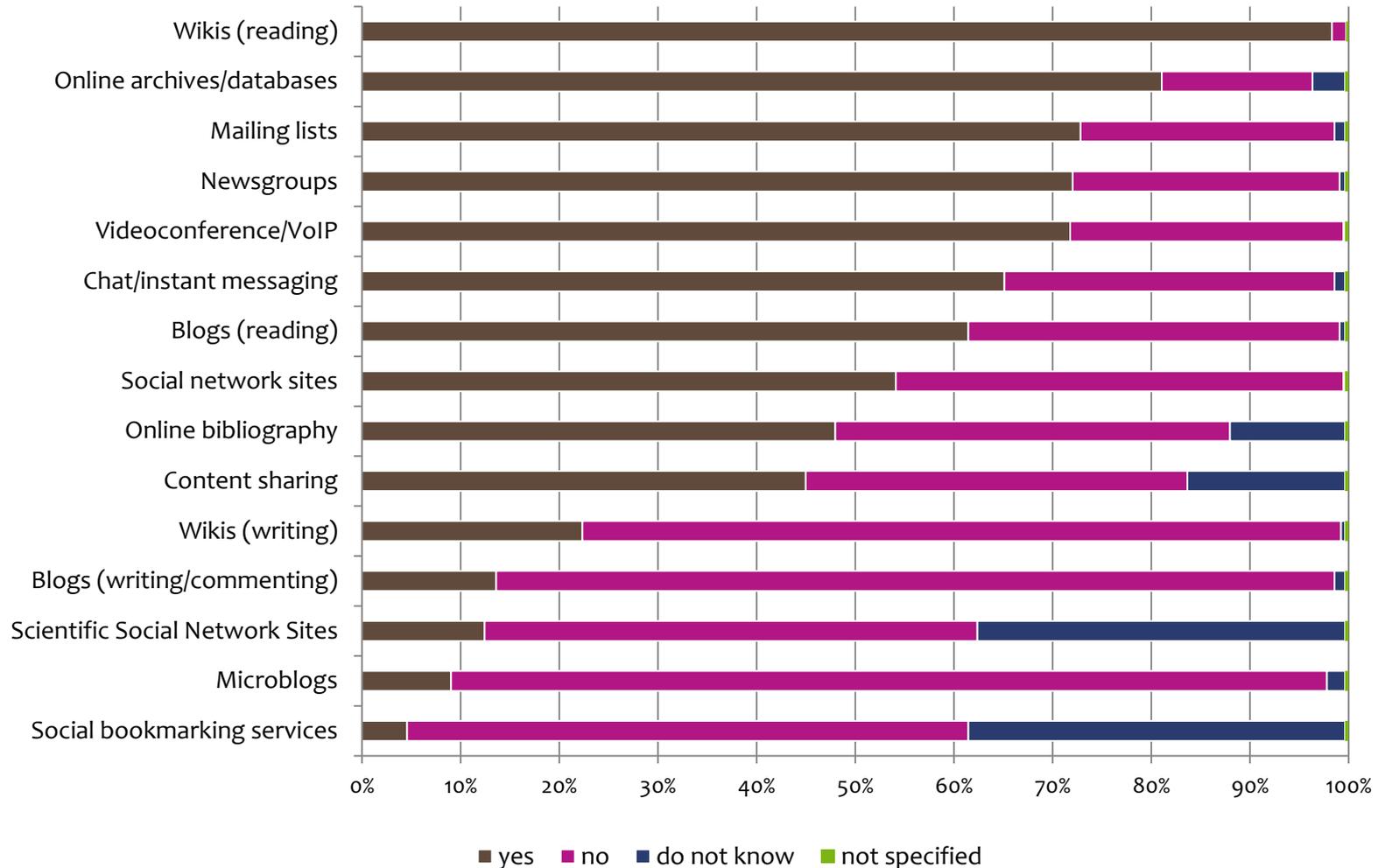
cp. Pscheida et al., 2013 for the complete report – which is available as well via www.escience-sachsen.de.

Data

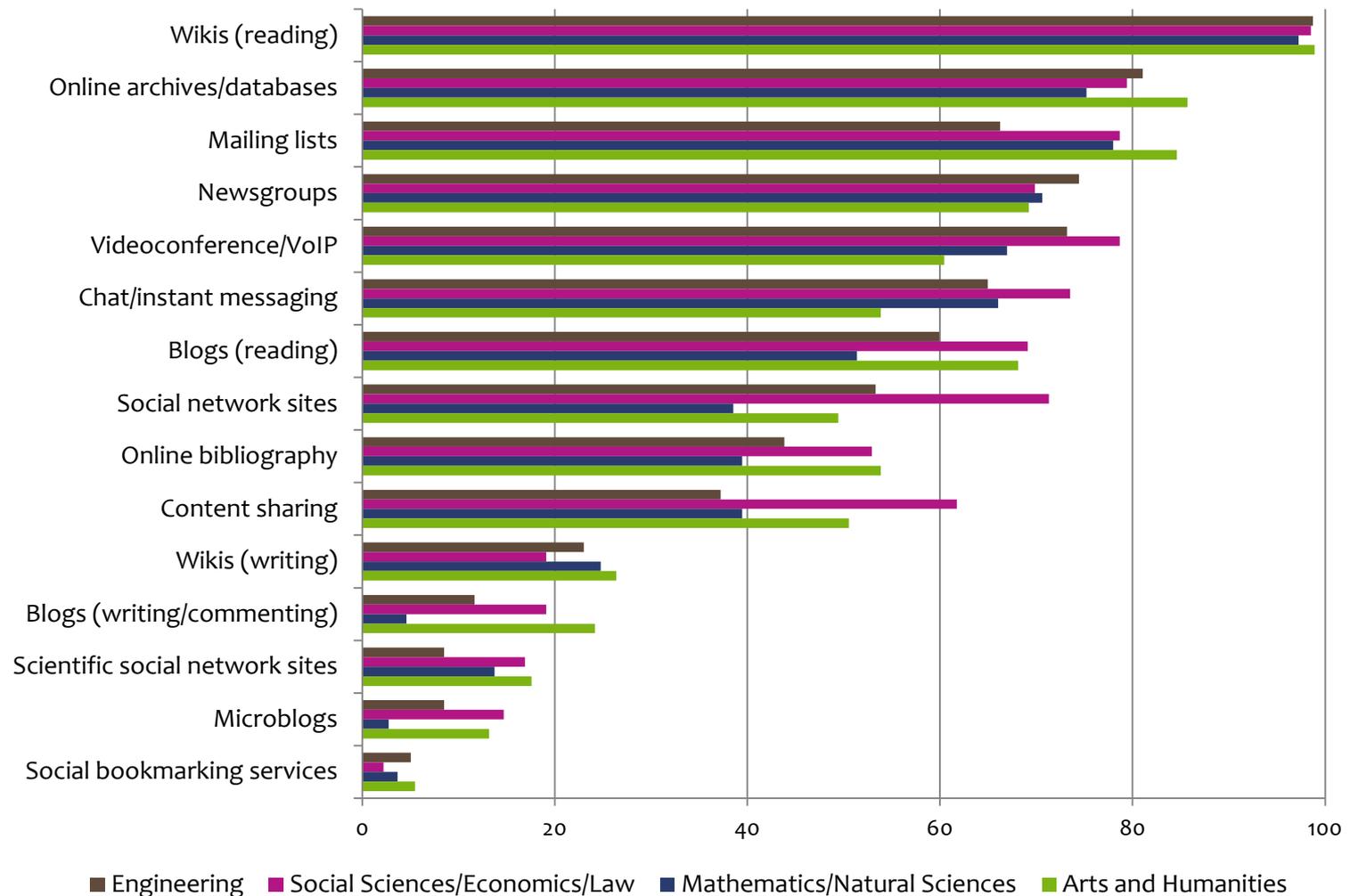
- Gender: 275 female (35,9%)/ 473 male (61,8%)
- Age: 25-29: 225 (29,4%)/ 30-34: 224 (29,3%)
- Background: 669 (87,5%) from universities
- Research fellow: 537 (70,2%), PhD: 275 (35,9%), professor: 97 (12,7%), Post-Doc: 64 (8,4%)
- Discipline:



Data: Usage of Web 2.0 applications



Data: Usage of Web 2.0 by discipline



Data: Correlations and regression

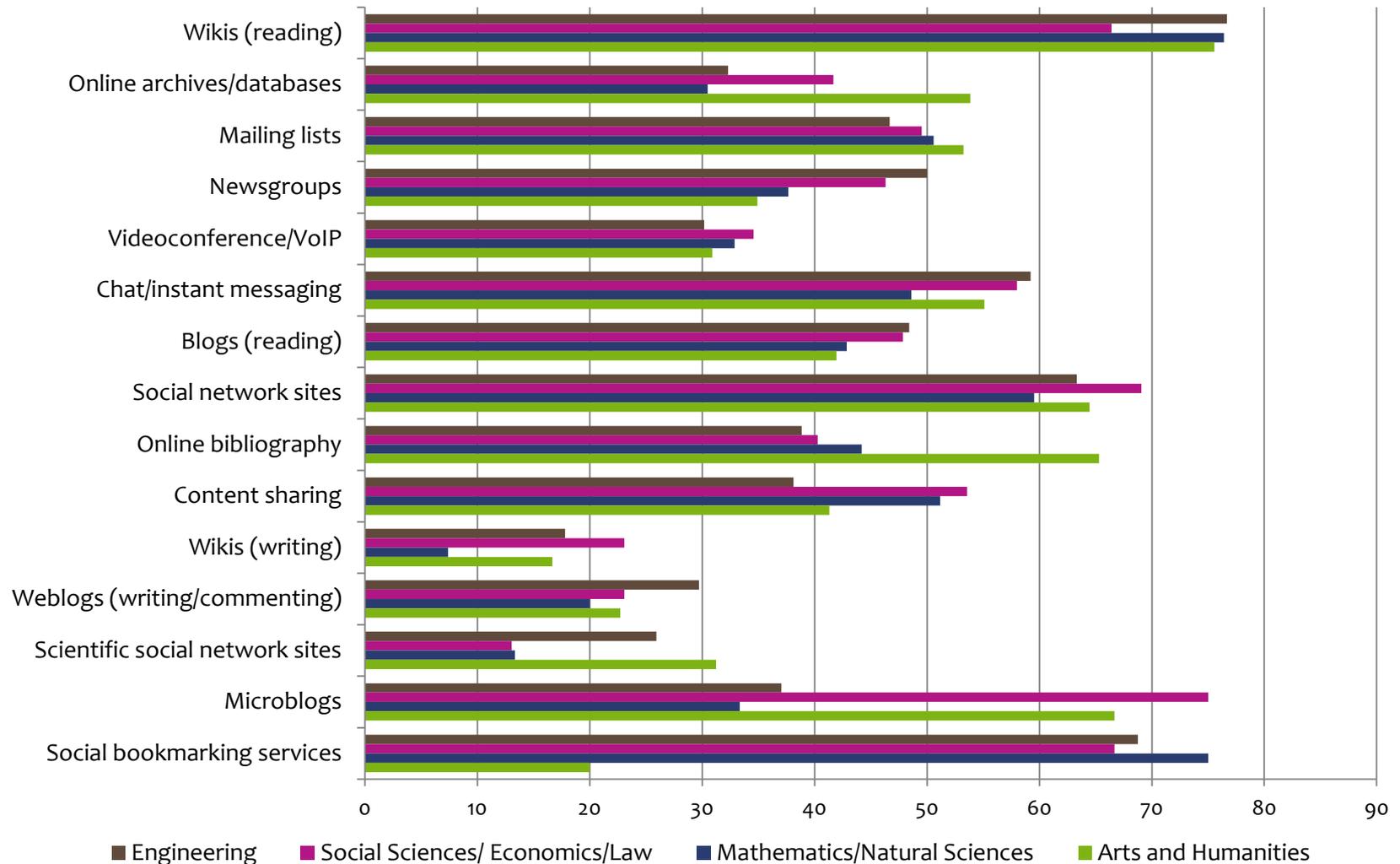
- SNS: Social Sciences/Economics/Law (.161) vs. Mathematics/Natural Sciences (-.127)
- Content Sharing: Social Sciences/Economics/Law (.157) vs. Engineering (-.131)
- Blogs (writing): Arts and Humanities (.113) vs. Mathematics/Natural Sciences (-.107)

Significance: influence of the subject on the probability of use:

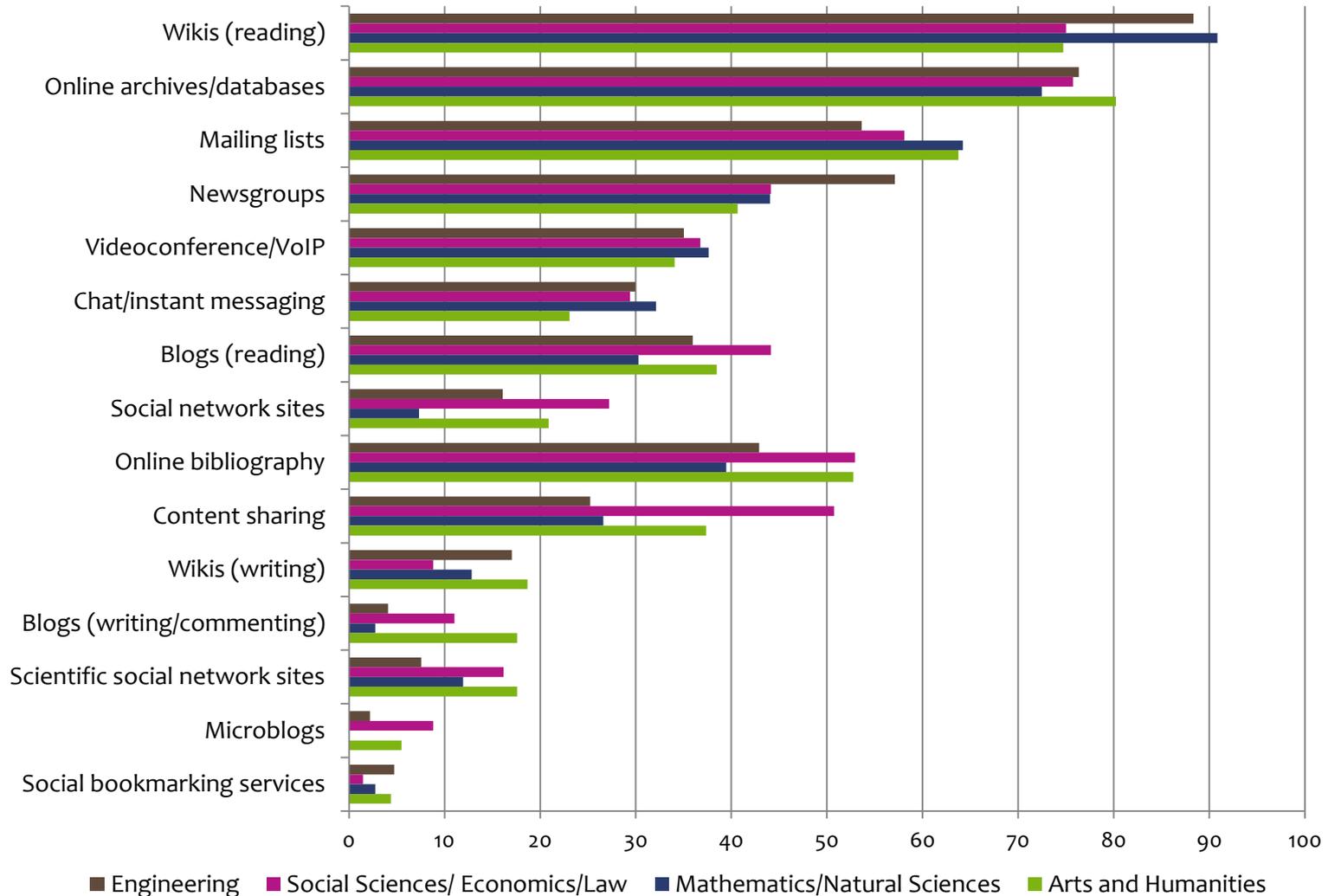
- SNS: Social Sciences/Economics/Law (OR 2.079) and Mathematics/Natural Sciences (OR .524)
- Content Sharing: Social Sciences/Economics/Law (OR 1.798)
- Mailing lists: Social Sciences/Economics/Law (OR 2.397)
- Online bibliography: Engineering (0.586) and Mathematics/Natural Sciences (.489)

→ Weak but significant correlations

Data: High frequency use by discipline



Usage in academic context by discipline



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The Task Force

- 2006, the rectors and chancellors of HEIs in the Free State of Saxony came to an understanding with the Saxon Science Minister, how they would strategically proceed with the development of the “Saxon Education Portal” and declaring their willingness to actively take part in a collective initiative.
- 2007 the States Higher Education Conference set up the e-learning task force to serve the HEIs as an instrument for reaching these strategic goals by giving recommendations toward long-term e-learning efforts by using a local funding programme.
- Overall it is intended to strengthen the institutions' competitiveness in the national and international education market and to continually raise the quality of higher education and the effectiveness of learning processes.

- Strong commitment of all colleges and universities in the state toward joint strategy
- Direct support of the local ministry

Innovation by networked R&D projects

- Currently, this university association is increasingly becoming the incubator of other innovations for the teaching and research activities of the universities of the Free State in the form of higher education across strategically designed collaborative projects:
- collaborative project SECO: authoring of eLearning modules
- collaborative project Q2P: quality in postgraduate online education
- collaborative project LIT: didactic training of academic staff
- collaborative project eScience: cp. above

→ Identification of relevant areas

→ Handing over responsibility to experienced partners

→ Competitive funding programmes

Conclusion: Change and need for support

- Universities and research institutes need to stay on the ball!
- Only ongoing impulse may create awareness among researchers, academic teachers and university administrators!
- In particular, state universities fail to establish eLearning-related quality standards in teaching!
- It requires an active positioning of each faculty in the rapidly changing higher education landscape of the Internet Society - which is often not perceived!
- With use of digital online media, the differences between teaching, research and knowledge-intensive work are losing importance!
- To deal with these challenges require the universities and research institutes continue a demanding but enthusiastic support from the federal government and the states.

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I appreciate your inquiries.

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