TECHNISCHE UNIVERSITÄT DRESDEN

Medienzentrum | Media Center

A new paradigm of knowledge?

How the Web transforms our comprehension of knowledge and the way of academic research

Workshop on Web Epistemics
Bielefeld, February 15th, 2012

MEDIEN ZENTRUM

Thesis:

Knowledge in Transition

Digitalization in combination with current trends in economics, politics and society transforms the principles and conventions of our knowledge culture

Reasons:

1. Theoretical model of coevolution
2. Structural changes in social diffusion of knowledge
3. E-Science

Reason 1:

Model of Coevolution

Digital Knowledge Society

Internet and Web 2.0

knowledge society

centralization, plurality of and dynamics in knowledge, but also a growing degree of fragility in epistemology

Reason 2:

Structural changes in the social diffusion of knowledge (success of the amateur culture)

The example Wikipedia

Product	**Process**
generating content	introduction and socialization
review and control	self-presentation
award and sanction	negotiation and voting
QUALITY	COMMUNITY

The example Wikipedia

„The problem with Wikipedia is that it only works in practice. In theory, it's a total disaster.“

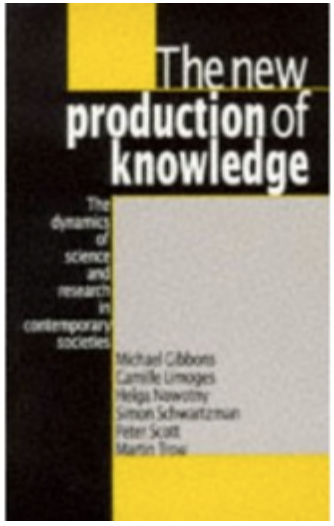
(User: Rax)

http://de.wikipedia.org/wiki/Benutzer:Rax

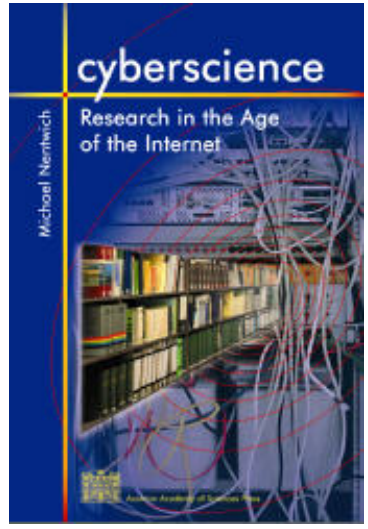
Reason 3:

Fundamental changes within the Sciences

- Science and Public (Mode 2)



- Cyberscience/ E-Science



Cyberscience (Nentwich 1999/2003)

„(1) First, the I&C technologies affect several framework conditions and virtually all forms of scholarly activity. Systematic screening reveals that both the organisational setting and the production of knowledge as well as scholarly communication and finally the transfer of academic knowledge (teaching) are directly affected. (2) On this basis, the second hypothesis argues that the many developments faced by scholars - constant use of the computer at the work place, shift of the communication with colleagues to E-mail, new electronic publication formats - do not only accelerate communication, as frequently assumed, but also have the potential to lead to qualitative changes in the scholarly system. This is substantiated by hints to actual or expected changes in the publication system (i.e. the heart of the scholarly communication system), the removal of spatial limitations of research and finally with respect to the distribution of roles in academia.“ (Nentwich 1999)

Grid and research infrastructures

D-Grid initiative of the BMBF

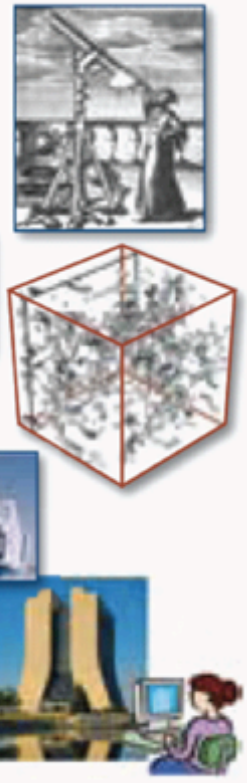
- > 20 projects
- 54 universities
- 42 institutes
- 100 companies
- 36.000 computer processors

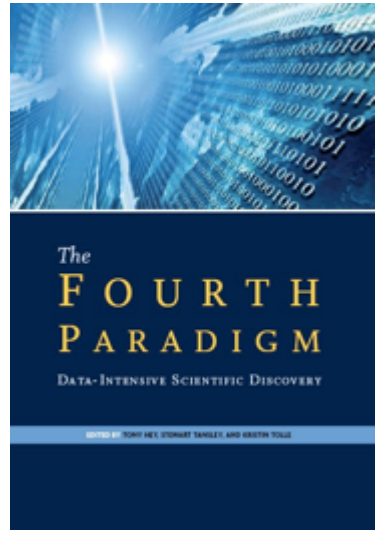
The fourth paradigm (Hey et. al 2009)

Science Paradigms

- Thousand years ago:
  science was **empirical**
  describing natural phenomena
- Last few hundred years:
  theoretical branch
  using models, generalizations
- Last few decades:
  a **computational** branch
  simulating complex phenomena
- Today: **data exploration** (eScience)
  unify theory, experiment, and simulation
  - Data captured by instruments or generated by simulator
  - Processed by software
  - Information/knowledge stored in computer
  - Scientist analyzes database/files using data management and statistics

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{4\pi G\rho}{3} - K\frac{c^2}{a^2}$$





Data-intensive Science...

„The world of science has changed, and there is no question about this. The new model is for the data to be captured by instruments or generated by simulations before being processed by software and for the resulting information or knowledge to be stored in computers. Scientists only get to look at their data fairly late in this pipeline. The techniques and technologies for such data-intensive science are so different that it is worth distinguishing data-intensive science from computational science as a new, fourth paradigm for scientific exploration.“ (Gray 2009(2007), xix)

... as a challenge

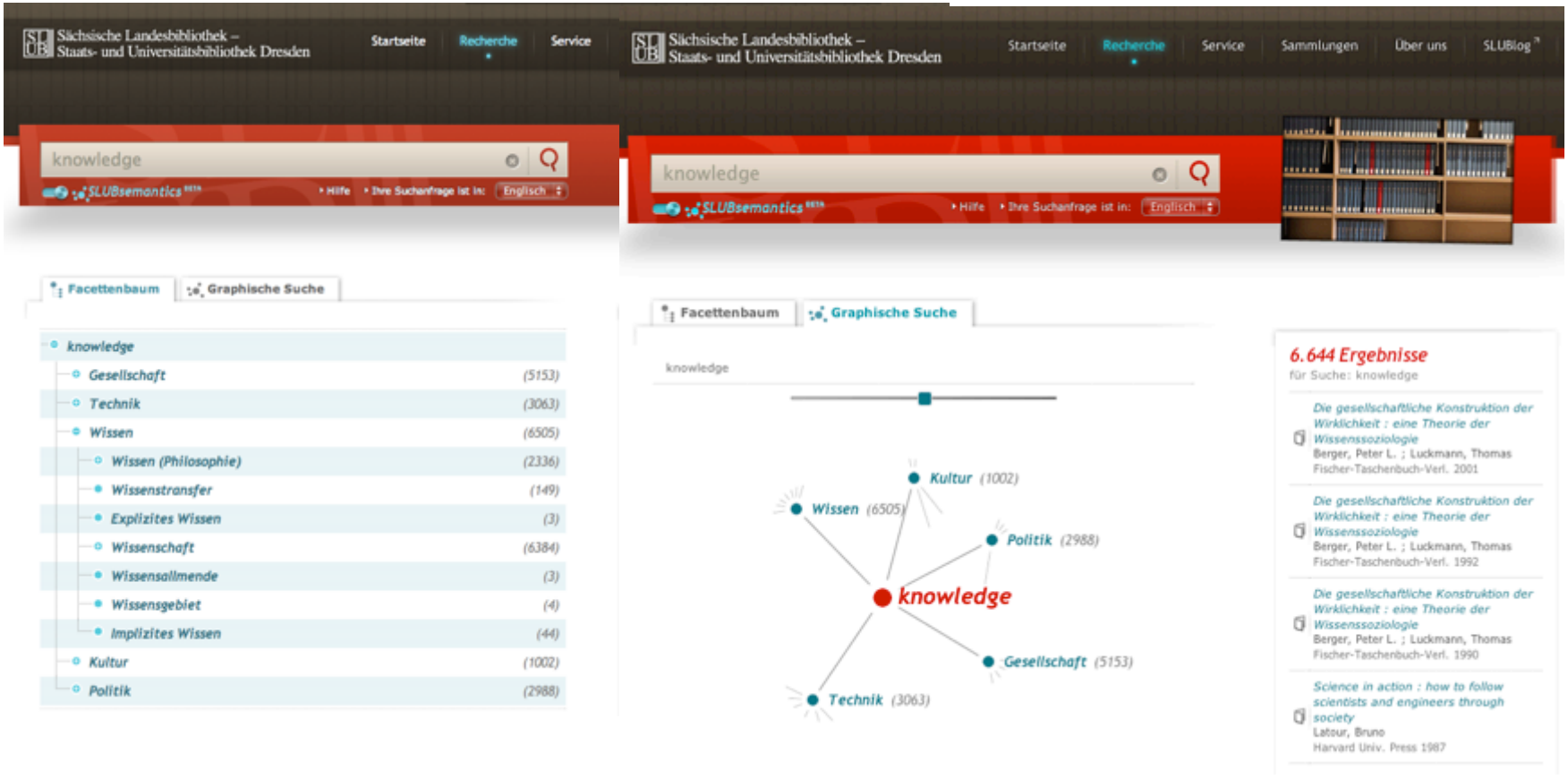
„eScience is where ‚IT meets scientists.' Researchers are using many different methods to collect or generate data—from sensors and CCDs to supercomputers and particle colliders. When the data finally shows up in your computer, what do you do with all this information that is now in your digital shoebox? People are continually seeking me out and saying, "Help! I've got all this data. What am I supposed to do with it? My Excel spreadsheets are getting out of hand!" So what comes next? What happens when you have 10,000 Excel spreadsheets, each with 50 workbooks in them? Okay, so I have been systematically naming them, but now what do I do?" (Gray 2009(2007), xviii)

a) Semantic Web

„The primary focus of the current technologies addresses only the first part of the data-information-knowledge-wisdom spectrum. Computers have become efficient at storing, managing, indexing, and computing (research) data. They are even able to represent and process some of the information hidden behind the symbols used to encode that data. Nevertheless, we are still a long way from having computer systems that can automatically discover, acquire, organize, analyze, correlate, interpret, infer, and reason over information that's on the Internet, that's hidden on researchers' hard drives, or that exists only in our brains. We do not yet have an infrastructure capable of managing and processing knowledge on a global scale, one that can act as the foundation for a generation of knowledge-driven services and applications. So, if the fourth paradigm is about data and information, it is not unreasonable to foresee a future, not far away, where we begin thinking about the challenges of managing knowledge and machine-based understanding on a very large scale. We researchers will probably be the first to face this challenge." (Parastatidis/Microsoft, 2009, 166)

Semantic Web:

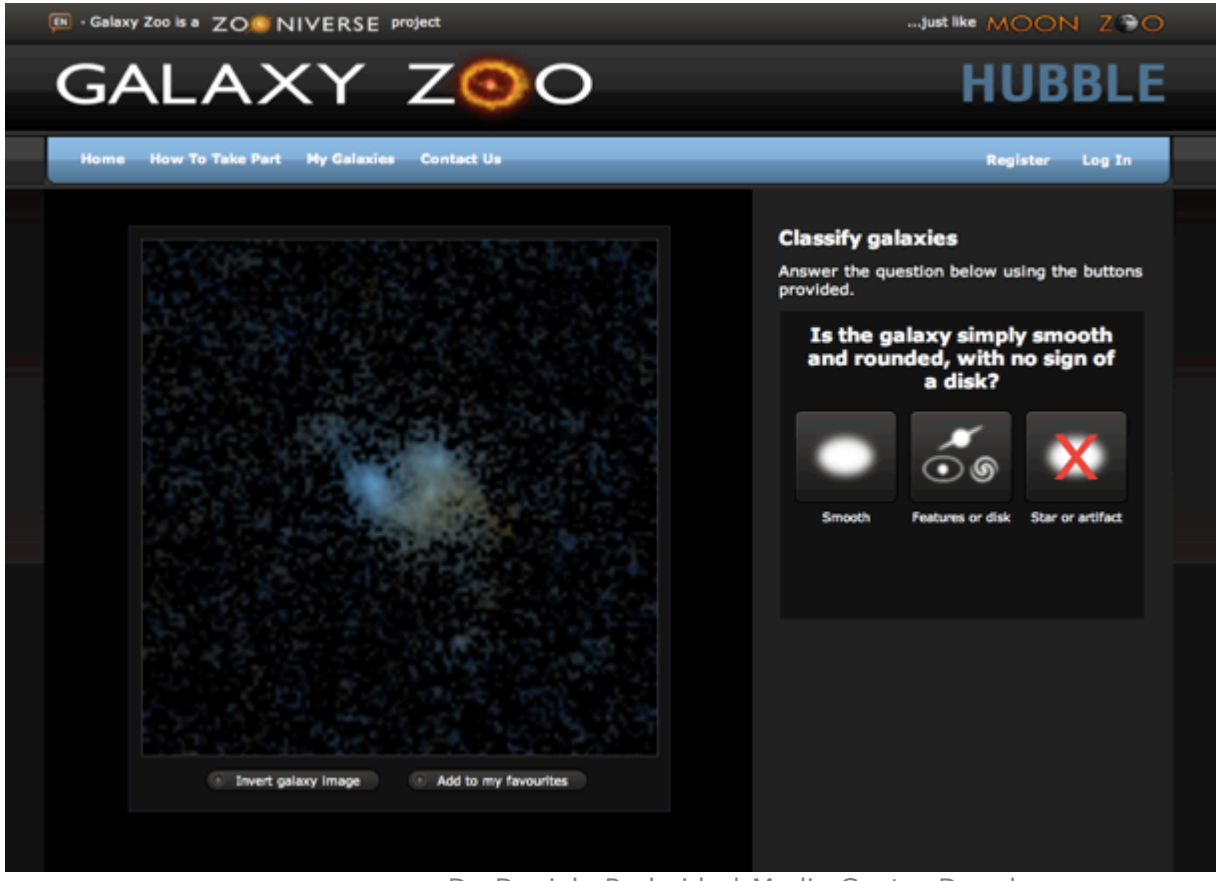
SLUBsemantics (http://www.slub-dresden.de/)



b) Citizen Science

Citizen Science:

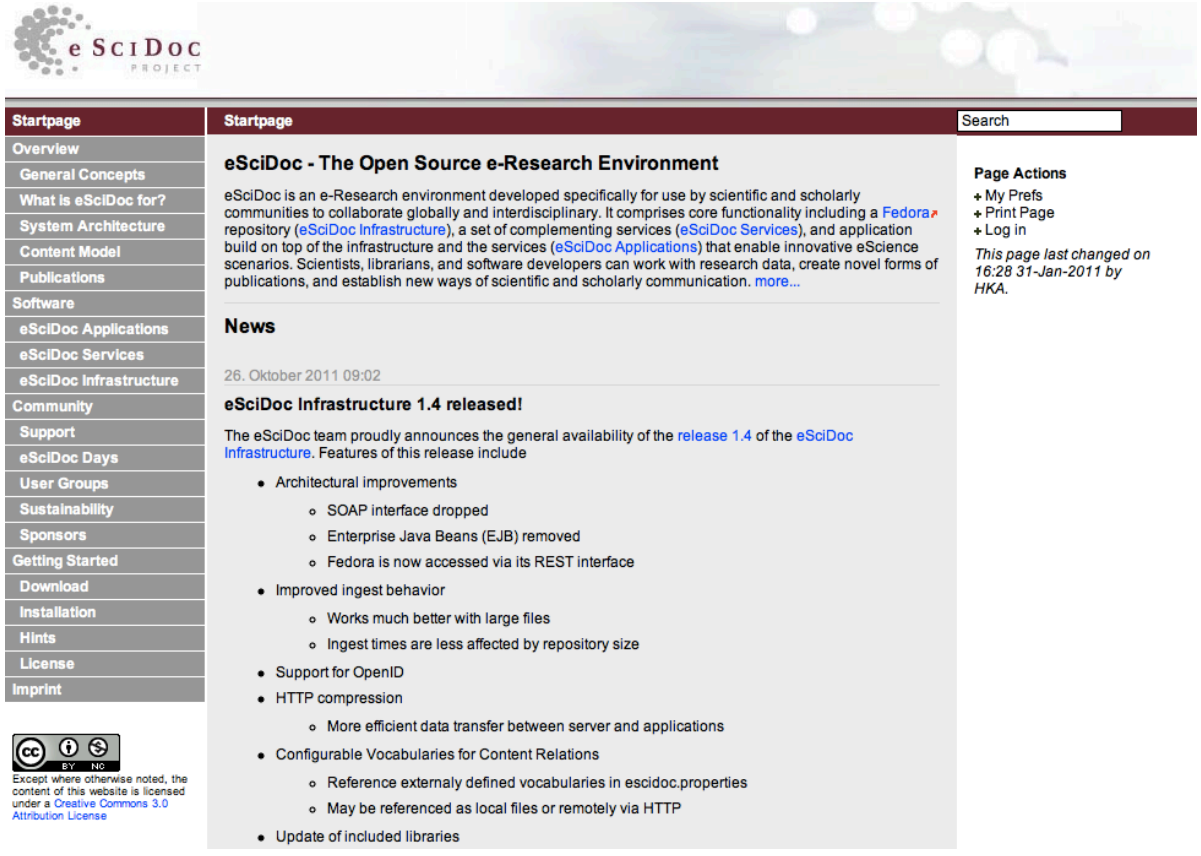
Galaxy Zoo (http://www.galaxyzoo.org/)



Citizen Science:

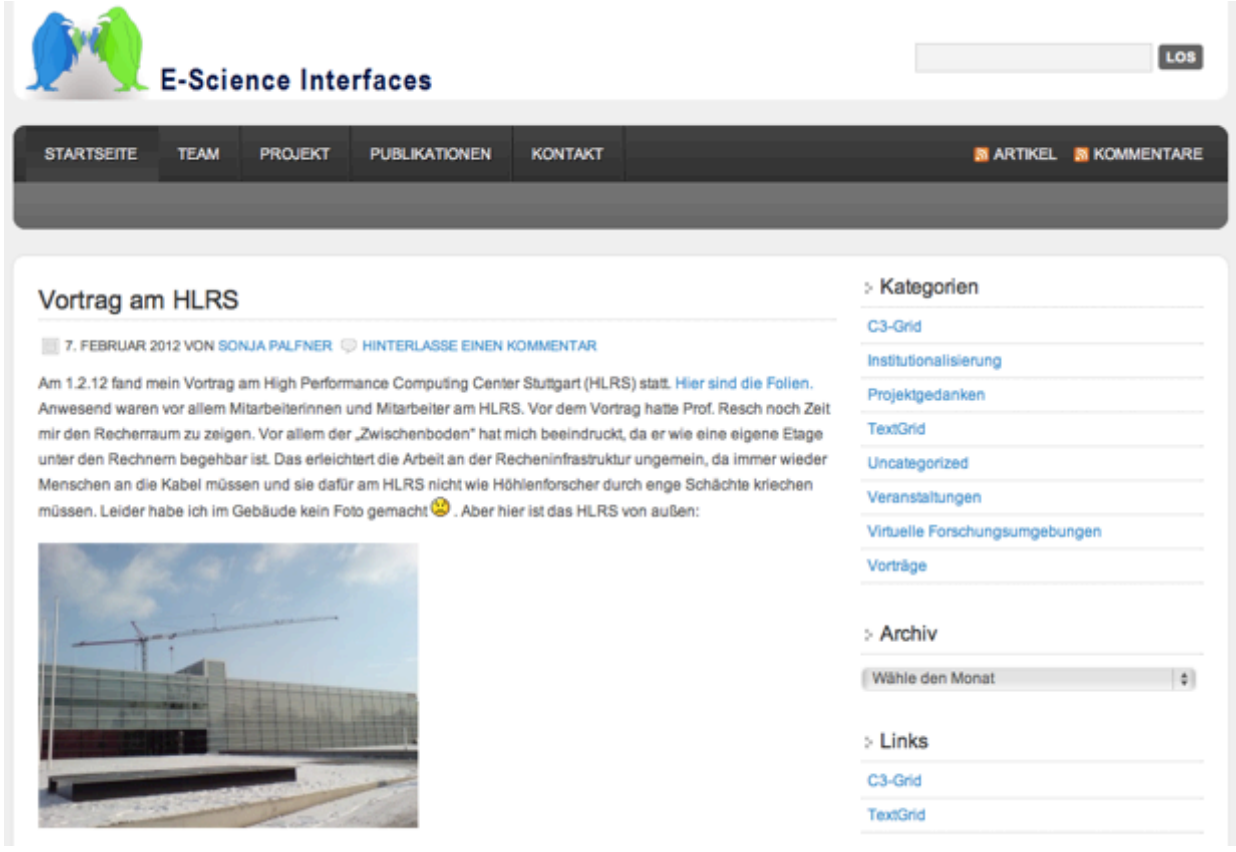
Fold it (http://fold.it/portal/)

c) Virtual Research Environments (VRE)



Virtual Research Environments:

E-Science Interfaces



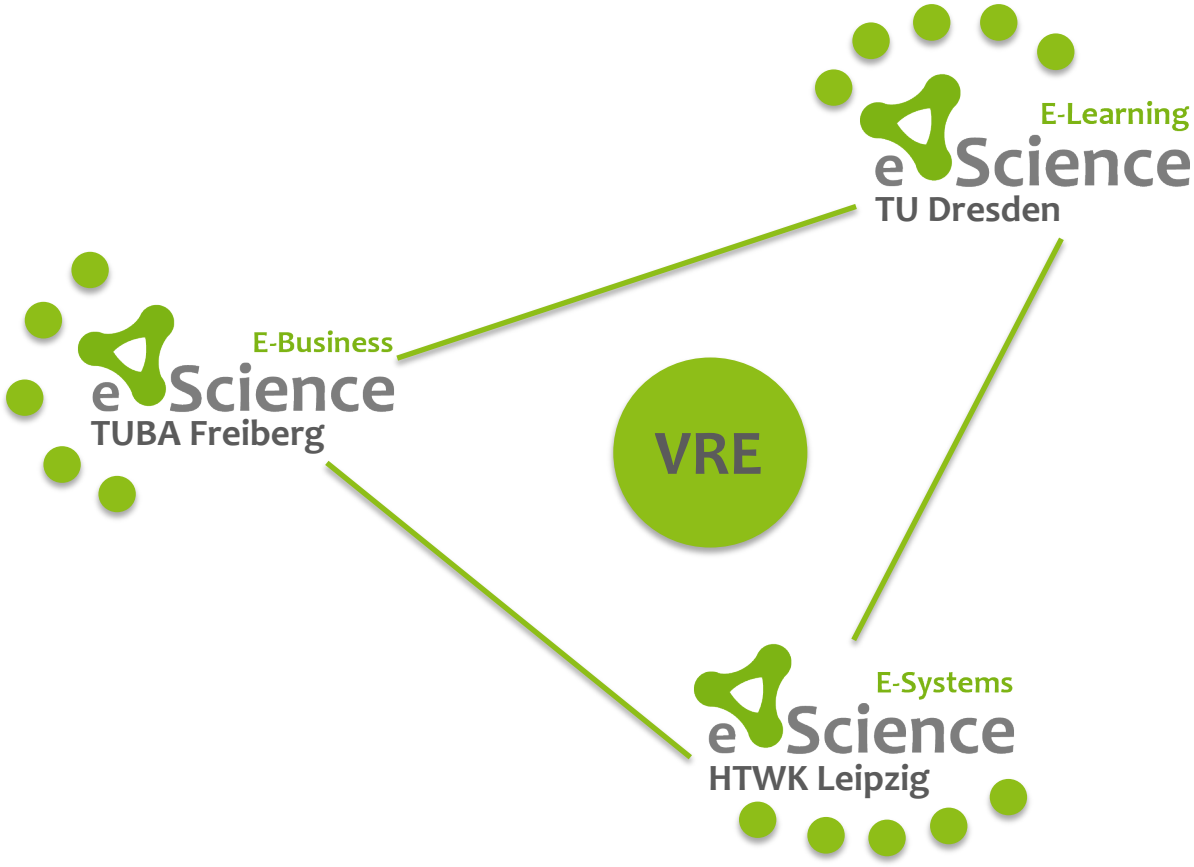
Virtual Research Environments:

E-Science Interfaces

„Virtual Research Environments and centers are the new technical and institutional interfaces of a changing topology of the science. Therefore, their design and the reflection of these processes are of central importance, since they are influencing the institutional constitution and the production of knowledge significantly.“ (Palfner 2010, 2)

Virtual Research Environments:

eScience – Network Saxony (http://www.escience-sachsen.de)



Conclusion

Fundamental changes in knowledge are taking place

- Semantic Web, Citizen Science and VREs will transform the core structures of academic work and thus propably also the principles and conventions of the understanding and management of knowledge
- Scientists will have to accept that doing e-science is not possible without changing traditional scientific roles and concepts

»Wissen schafft Brücken.«