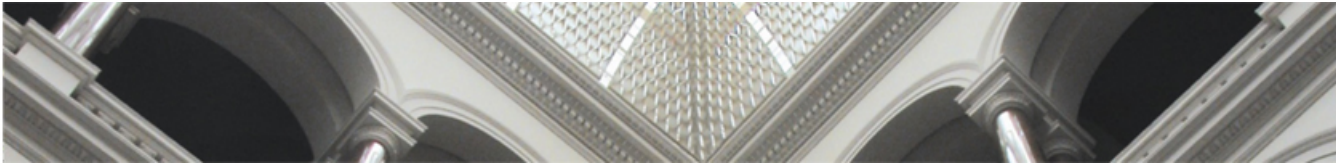


Digitalization@TU_Berlin: A Sketch of the Big Picture

30.05.2018

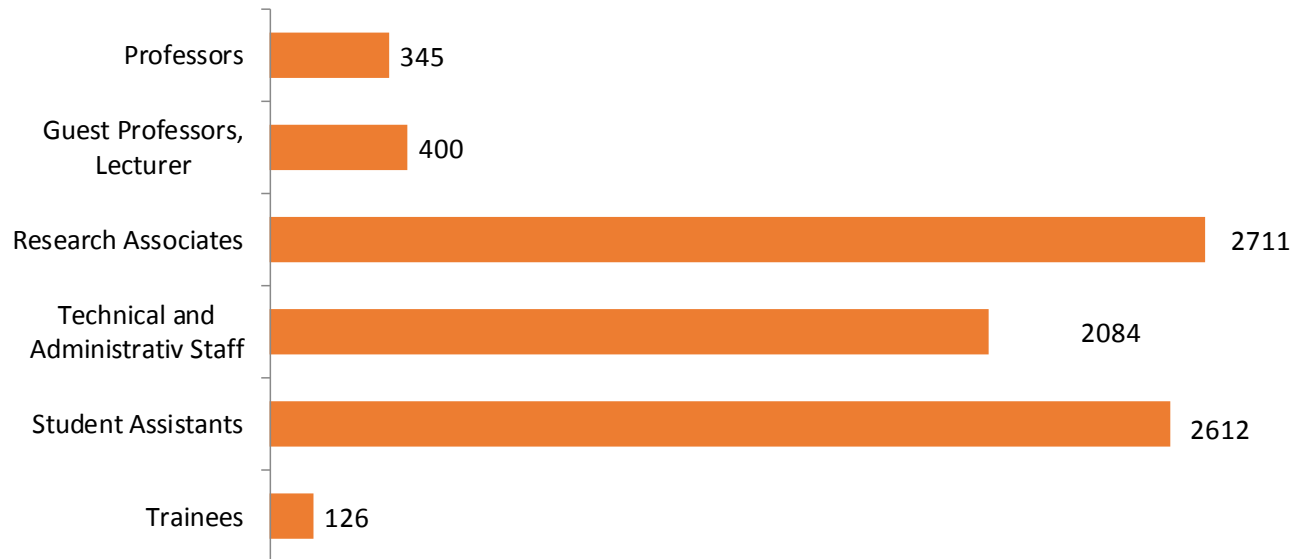
Hans-Ulrich Heiss

VP Education, Digitalization and Sustainability, TU Berlin



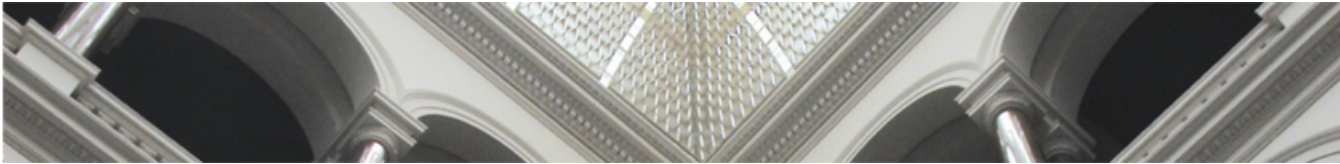
TU Berlin in numbers

- **public funds from regional government: 321 million euros (2017)**
- **additional third-party expenditures: 176 million euros (2016)**
- **35,000 students (Winter Semester 2017) in 135 degree programs**
- **8,356 employees (incl. 78 Professors emeritus):**

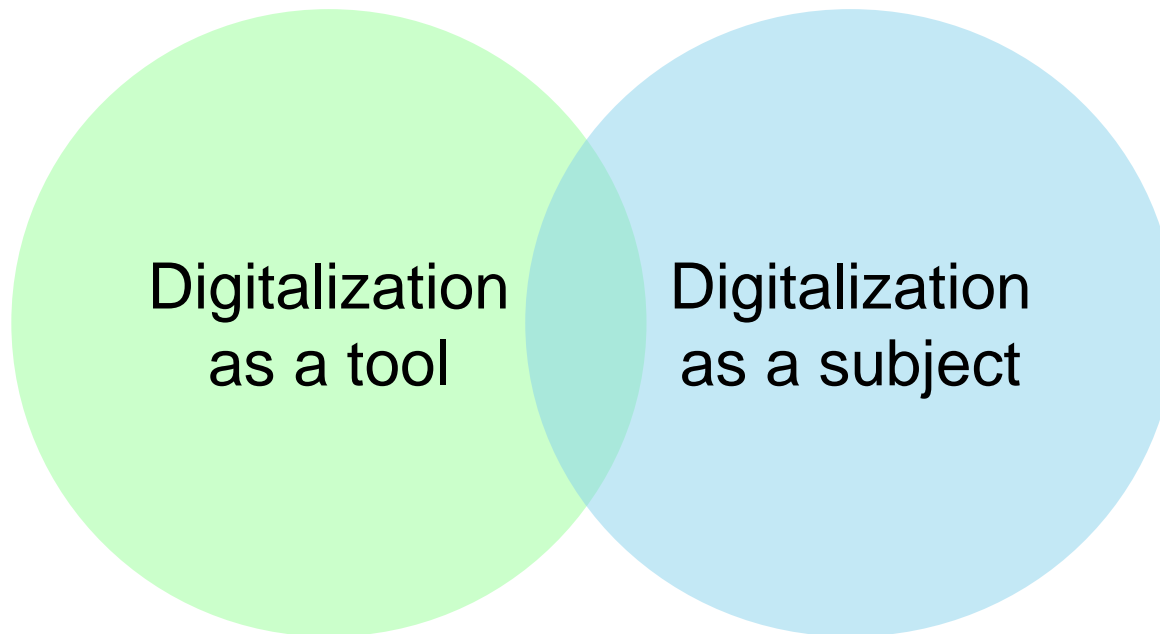


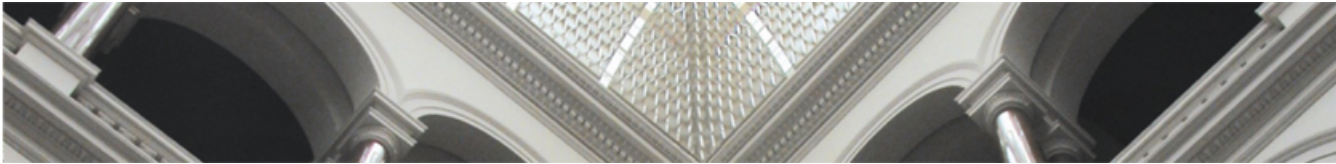
Data as of: September 2017





Digitalization: Differentiation





Remark

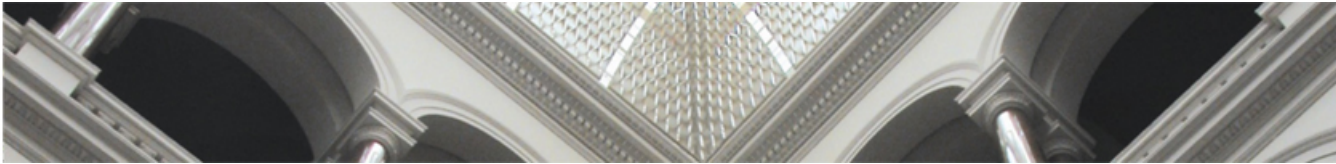
The Digital Strategy of TU Berlin is still in its infancy.

Goals (Digitalization as a tool):

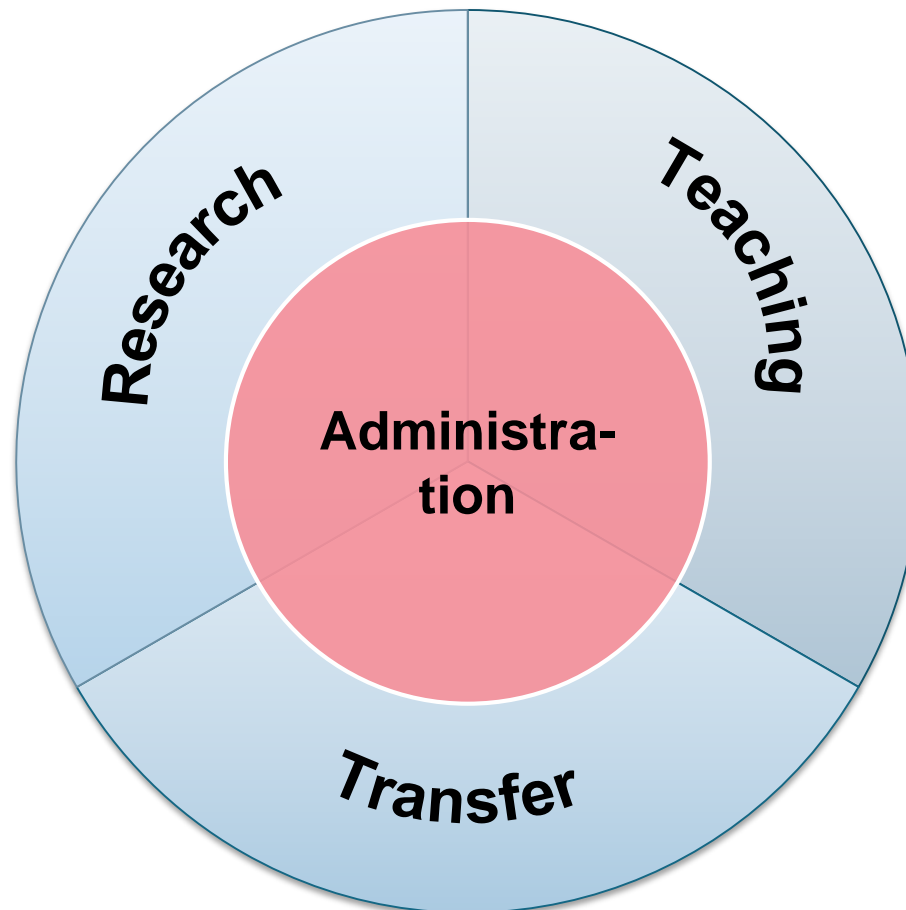
- IT-Support for all fields of activity and user groups of university
- Improve quality
- Increase efficiency
- Create transparency

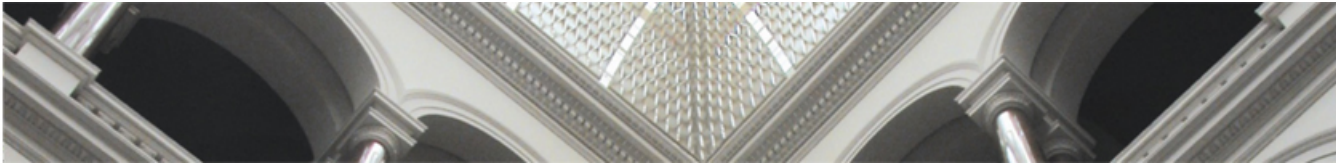
Goals (Digitalization as a subject):

- Enhance the state of the art
- Further develop structure and governance of organization
- Foster critical dialogue with society
- Prepare graduates for the Digital Transformation



I Digitalization as a tool

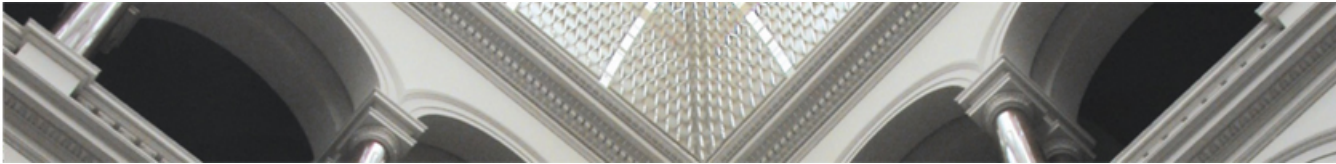




Digital Tools in Administration

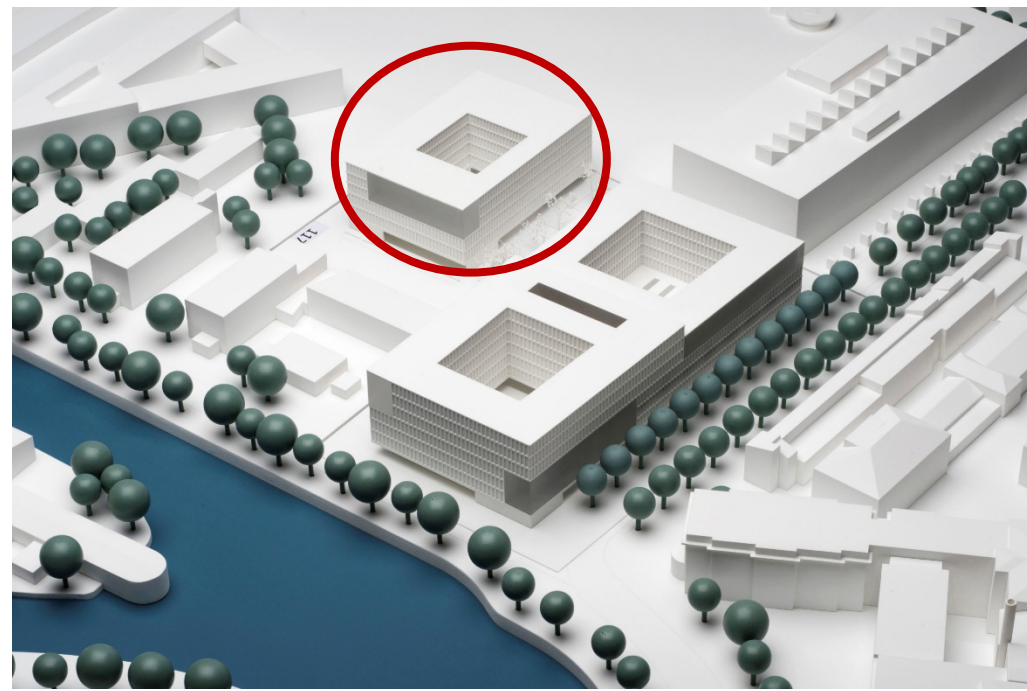
New Campus Management System

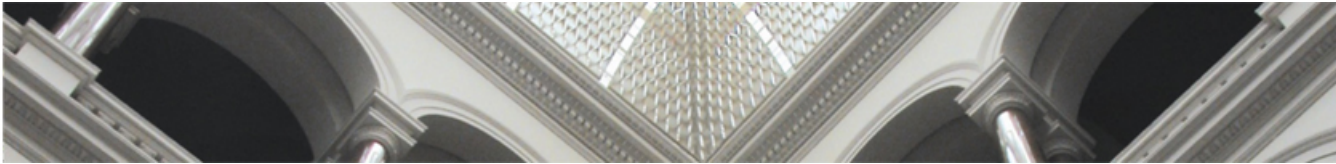
- Integrated system based on SAP-Software
 - Enterprise Resource Management (ERM)
 - Student Lifecycle Management (SLM)
- Start 2012 (preliminary projects)
- More than 100 consultants (external, accumulated)
- More than 200 TU employees involved
- More than 2000 pages requirements description
- Stepwise GoLive until 2020



Digital Tools in Research

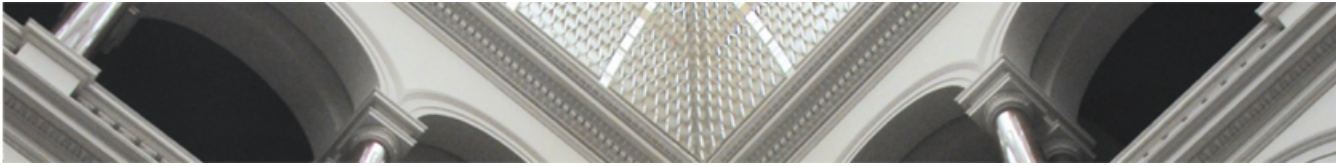
- Digital Models and Simulation are state of the art in almost all disciplines
- Provision of increasing HPC capacities
- New Interdisciplinary Center for Modelling and Simulation (IMoS)





Digital Tools in Transfer: Open Science

- Open Data:
 - Meta data management, curating of research data
- Open Access
 - Open Access Strategy in place: Provide Infrastructures for OA publication
- Open Source
 - Widely used
- Citizen Science
 - Individual projects
- Open Educational Resources: little done so far

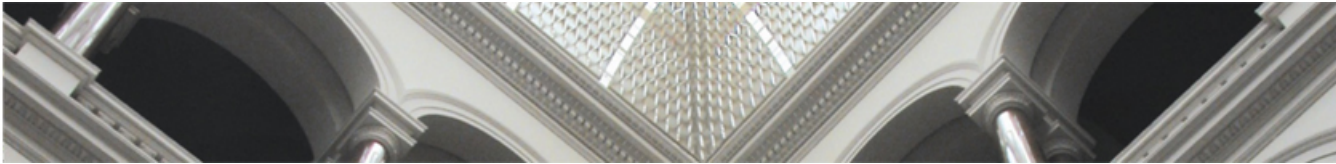


Digital Tools in Teaching

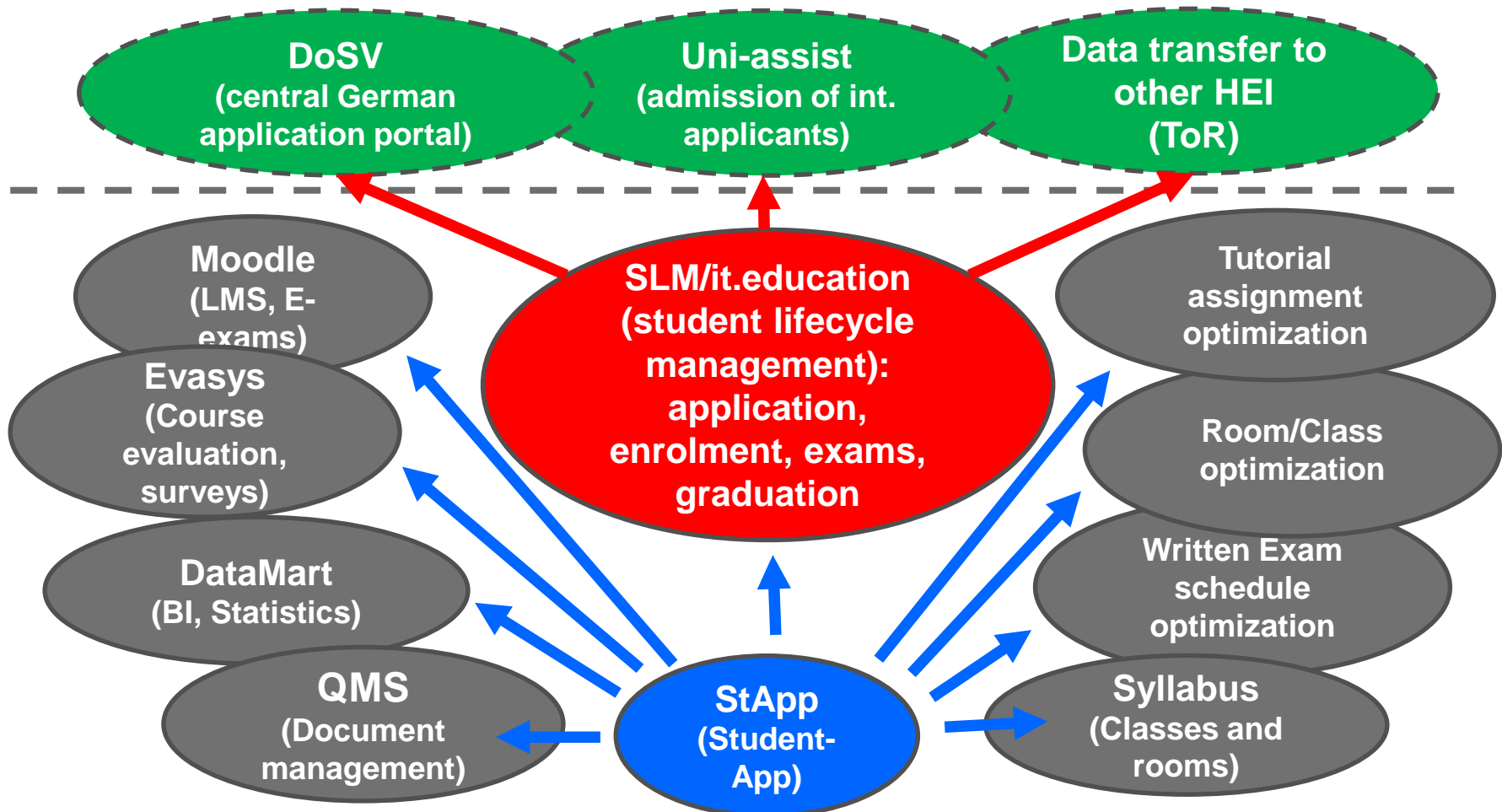
- Learning Management System (Moodle)
- Support by Online-Teaching-Team (7 FTE + 5 student assistants)
 - Courses and Workshops
 - Individual counseling (technically und didactically)
 - Recording studio + Equipment to lend
- MOOC production
- Flipped Classroom
- E-exams

Consequences for campus and building development

- 
- **Lecture Halls**
 - **Teaching-/Learning spaces**



IT-Systems in Teaching



II Digitalization as a subject

Research:

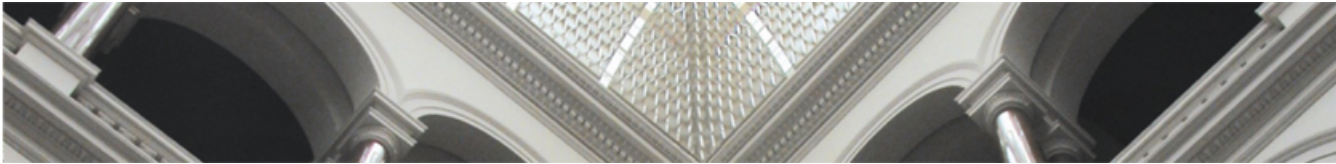
- New Topics
- New disciplines
- **New institutions**
- Interdisciplinarity

Administration:

- New Org. Entities
- Strat. Planning
- Change Mngmnt

Transfer:

- Reach out to the public
- Start dialogue with society



Digitalization as a Research Topic

- Several Collaborative Research Centers
- Several Research Training Groups (Graduate Schools)
- Research Campi

New Institutions:

- Berlin Big Data Center
- Competence Center for Machine Learning
- Einstein Center for Digital Future (ECDF)
- Weizenbaum Institute for the Networked Society

EINSTEIN CENTER DIGITAL FUTURE

- Ca. 40 Mio for 6 years
- More than 50 new (junior) professorships

PRIVATE-PUBLIC PARTNERSHIP

Donors'
Endowment

Matching
funds

Collaboration
funding

Einstein Center Digital Future
Collaborative projects, professorships,
infrastructure, master program, labs,
public approach, show cases

Technische
Universität
Berlin

Charité
Berlin

Freie
Universität
Berlin

Humboldt-
Universität
zu Berlin

Universität
der Künste
Berlin



RESEARCH PROGRAM

**Digital Humanities &
Society**

Digital Health

**Digital Industry
and Services**

design, improve, adapt, methods, models, infrastructure

New insights with digital methods, models infrastructures

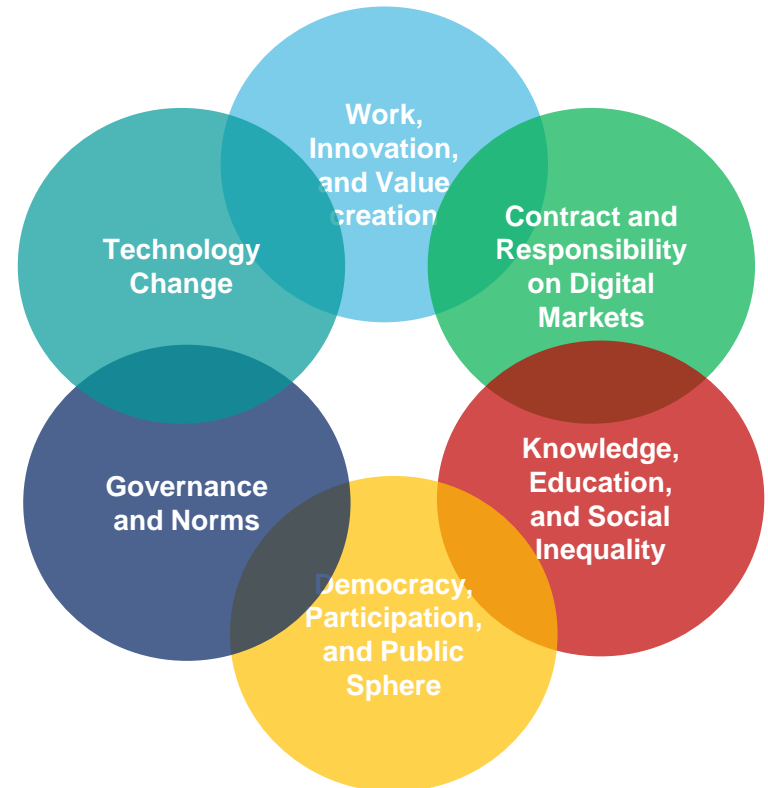
Digital methods, algorithms, infrastructures

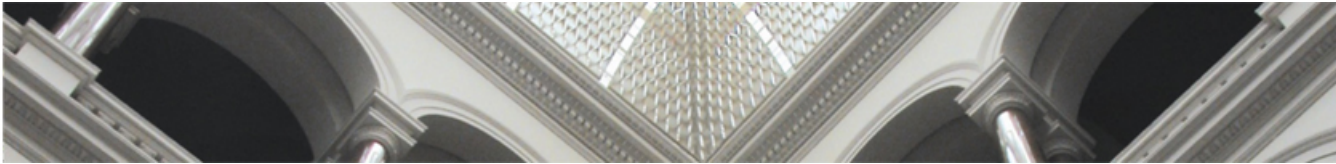


Weizenbaum Institute for the Networked Society

The German Internet Institute

Funded by the
Ministry of Education and Research
with 50 Mio € for 5 years





Digitalization as a subject

Research:

- New Topics
- New disciplines
- New institutions
- Interdisciplinarity

Teaching:

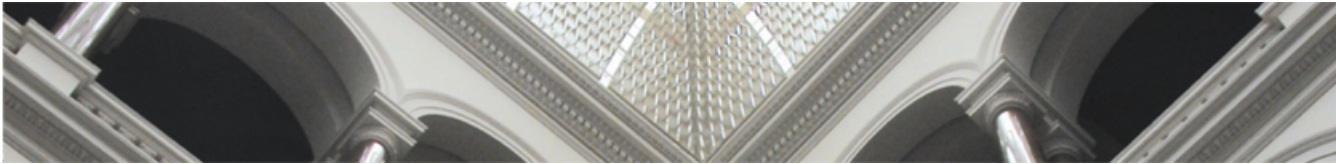
- Update curricula
- New study programs
- New educational offers for continuous education

Administration:

- New Org. Entities
- Change Mngmnt
- Strat. Planning

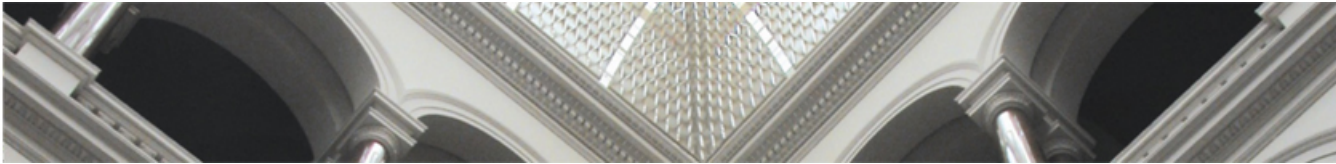
Transfer:

- Reach out to the public
- Start dialogue with society

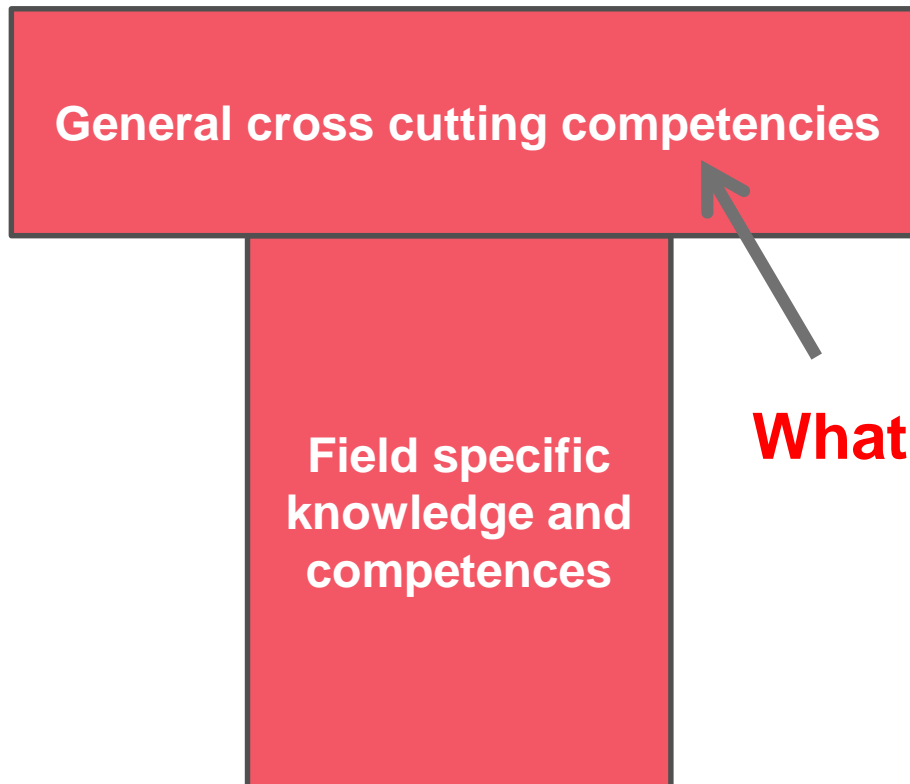


What we already have (dedicated programs)

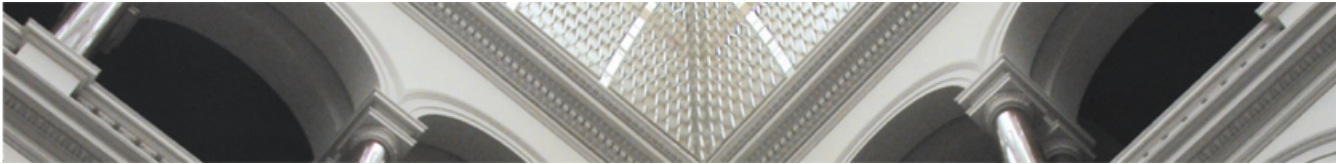
- Computational Engineering Sciences (BSc, MSc)
- Digital Media and Technology (BSc, MSc)
- Informations Systems Management (BSc, MSc)
- Scientific Computing (MSc)
- ICT Innovation (MSc, EIT Digital, with a 25% minor in „Innovation and Entrepreneurship“)
 - Autonomous Systems
 - Cloud Computing and Services
 - Cyber Security
 - Data Science
 - Human Computer Interaction and Design
 - Internet Technology and Architecture
 - Visual Computing and Communication



What we want: **Digitalization as a subject for all!**

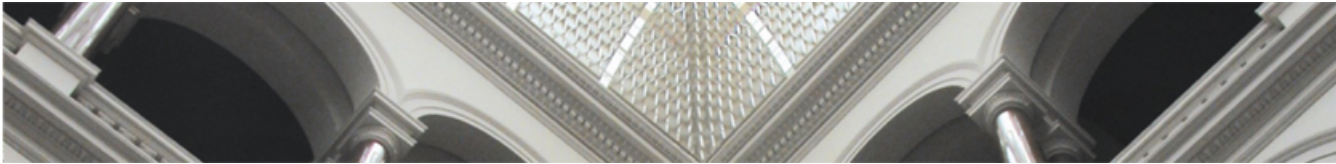


What is in here?



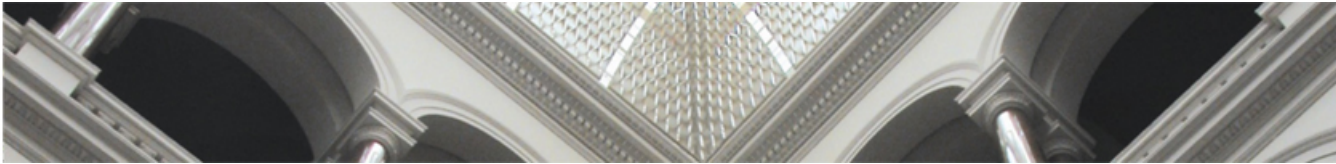
Questionnaire to all study program directors at TUB

- Ca. 135 programs
 - 45 Bachelor
 - 75 Master
 - 15 professional Master (continuous education)
- Response rate ca. 60%



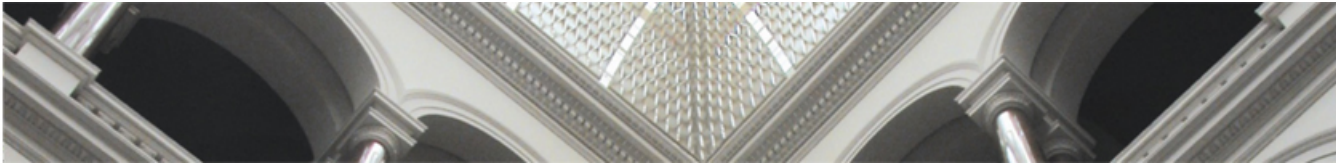
Q: How will competence profiles change?

- Analyzing huge data sets (Big Data)
- Applying complex numerical models
- Familiarity with statistics tools
- Machine Learning
- Simulation models
- Design and conduct of experimental investigation
- Logistics
- More general competences
- Critical approach to automated analysis tools



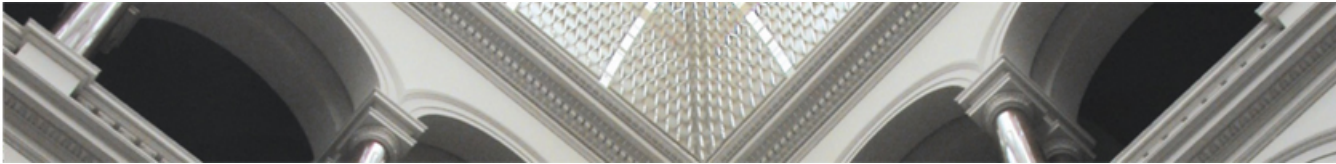
Q: New science areas?

- Big data in XY
- Additional applied informatics areas
- Societal / ethical / safety related consequences of digitalization
- New types of models
- Digital innovations
- Digital business models
- Autonomous Driving
- Additive Manufacturing (3D printing)
- Digital History



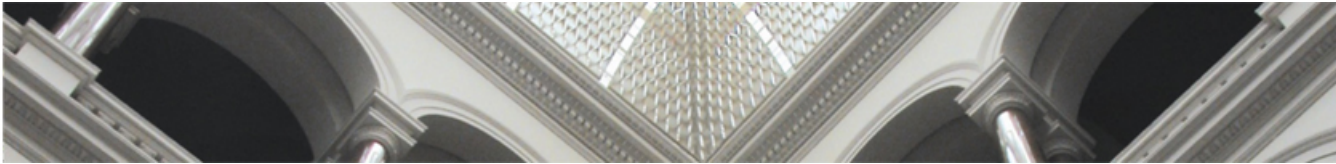
Summary of Survey

- Some recent changes in curricula already in place
- Central course offer „Data Science“ highly welcome
- Little willingness to change compulsory core of programs
- New courses to be placed in electives catalogue
- Programming courses for all desirable, but unclear:
 - Service from CS department or own production?
 - Which language: C, C++, Java, Python, Scala,,...?



Action 1 Lecture Series Digital Future (WS 2018)

- Overview of current technologies, applications and research topics from different disciplines
- Taught by professors from all disciplines
- Target group 3./4. semester bachelor (all students)
- Offered each semester
- 3 ECTS, E-assessment



Topics of Lecture Series

Signal Processing

- analog/digital interfaces, QR-Codes and RFID, representation of digital data (encoding, ..)

Communication Networks

- internet protocols and architecture, wireless communication

Methods of Digitalization

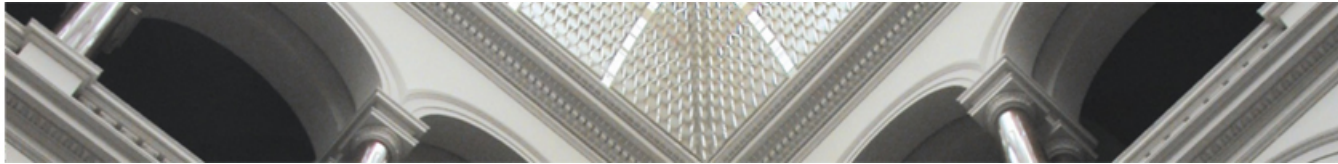
- statistics, data science, programming, algorithmic/computational thinking, simulation, digital twins, machine learning (with neural networks), cloud/fog/edge computing

Areas of Digitalization

- Measurement and control, health, manufacturing (industry 4.0), internet of things, traffic planning, autonomous driving, logistics, environment and sustainability, humanities

Consequences of Digitalization

- business models, privacy and security, legal frameworks



Action 2

Certificate program: Digitalization (WS2019)

**Fundamentals
of Data Science**

Compulsory

Machine Learning

**Privacy and
Security**

**Algorithmic
Thinking
(Progr., Alg&DS)**

Electives

Big Data Science

**Digital Business
Models**

**Internet
Architecture**

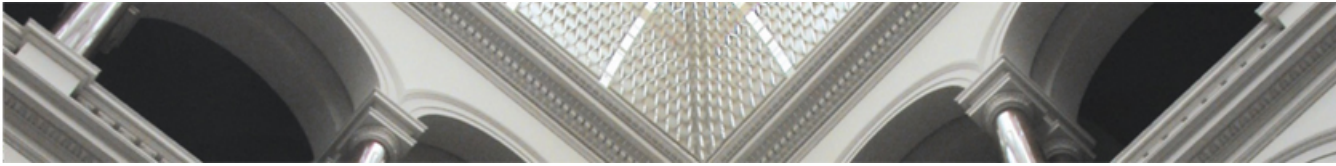
Action 3

MASTER PROGRAM „Digitalization“

Involving the participation of all ECDF partner universities
International master program

Using the ECDF structure to ensure interdisciplinarity and cross-digitalization:

“digitalization beyond borders”		
ECDF Core area <i>Digital Infrastructure, Methods, and Algorithms</i>		
ECDF Innovation areas		
Digital Industry and Services	Digital Humanities and Society	Digital Health
Joint Degree		



Conclusion

- Digitalization at universities is a complex topic
- Comprehensive integrated campus management not available
- Stepwise Integration of existing „islands“ based on a general core data management (single point of truth) and clear goals
- Digitalization as a tool and Digitalization as a content are interdependent and need to be developed further in parallel
- Revision/enhancement of curricula urgent
- New study programs coming up
- No restructuring of university so far



Thank you for your attention!