

research technology and scale

the digital curriculum 2020-21

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August 13, 2020

Outline

- 1 research it
clarification
center for humanities computing
- 2 technology & scale
“digital methods”
- 3 data management
dm at scale
standards in dm
- 4 tools
proper tooling
gui or cli
interactive computing
- 5 cloud computing
- 6 summary

research it

clarification

center for humanities
computing

technology & scale

“digital methods”

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summary



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research it supports research with a coordinated set of services across a range of computation and data analysis needs

- IS a substantial part of eScience
- NOT it department (infrastructure and maintenance of it systems)
- NOT educational it (facilitate learning through it solutions)

research it solutions tend to bleed into education as a bottom-up process

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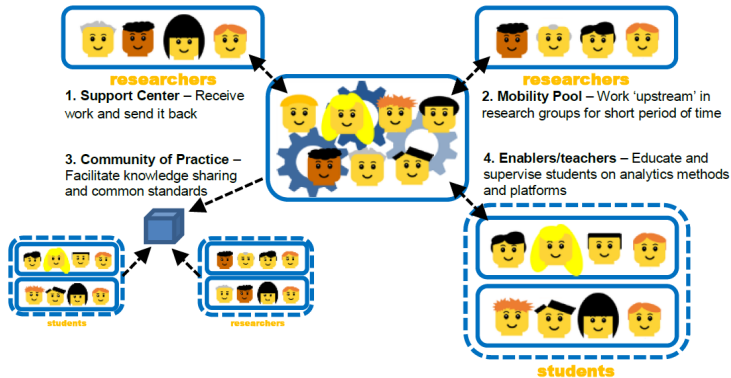
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research it at the faculty of arts, aarhus university

together with rit personnel from other dk universities, currently supports
DIGITAL LITERACY_{research} & **DIGITAL CURRICULUM**_{education}

"digital" is a methods-issue in relation to research & education



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"digital methods" ~ a question of SCALABILITY in response to digitization

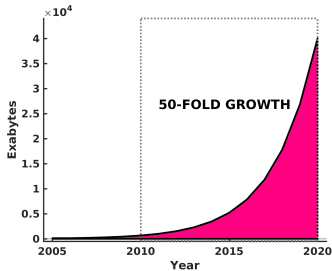
assumption :: scalability ... fundamentally changes how we do research

corollary :: scalability ... requires algorithmic automation and algorithms depend on models of structures and processes

⇒ "digital methods" are not a methods-issue ~ TECHNOLOGY

a) scale in research technology and b) scaling research technology for education

initially, 'scaling ... for education' seemed like the simple task



data management at scale

"as in other research domains, data became the promised land for humanities and arts ... three years ago a data set was measured in mbs, now 20-30gb is the standard and we are seeing many data sets on the tb-scale."

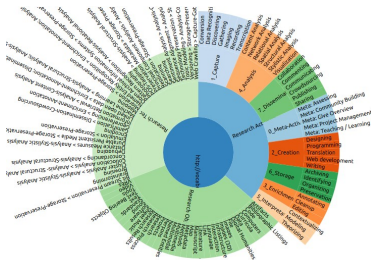
data :: large, soft & heterogeneous

dual problem :: data are sensitive & restricted access

derived problems::

- data are relatively easy to access
- no standardized procedures for risk-benefit evaluation
- research evolves at a faster scale than legal
- diversification of tools for management and analysis

data-related problems multiplies in education



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proper research practice requires **data management principles**

Findable Accessible Interoperable Re-usable

for all data sets:

F::PID & rich metadata are indexed

A::standardized and open protocol for retrieval & ++persistent metadata

I::use controlled vocabulary for metadata & references

R::described w. license, provenance & domain-relevant standards

⇒ one of two ways, revive W3C's semantic web or 'just' **implement common sense for research data**

teach operational standards for large, soft, and heterogeneous data

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proper tooling makes researchers and educators' lives *a lot* easier

⇒ demand for flexible tools is a response to tool diversification and large, heterogeneous data

flexibility/usability tradeoff :: flexible tools satisfy more requirements → complexity↑ & usability↓

SSH have historically solved the f/u tradeoff with a gui-based model

gui or cli solutions for research and education

graphical user interface ::

- visual approach to computer interaction
- fast learning curve & **usability**↑
- ‘plug-n-play’ solution with limited flexibility

command line interface ::

- text-based approach to computer interaction
- resource efficient & **flexibility**↑
- expert-friendly solution with limited usability

interactive solutions (flexibility↑ & usability↑) are gaining traction in research

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interactive computing in a dual sense

- tools that allows users to enter commands and data interactively
- tools that users develop and run collaboratively



jupyter :: interactive environment that combines visual and text-based approaches with storytelling

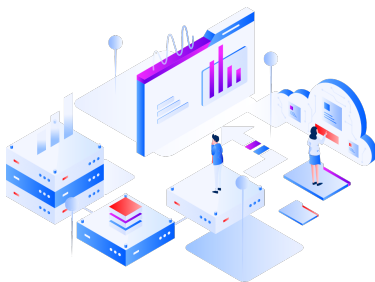
goal to offer cloud-based interactive computing to researchers and students

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cloud-based it-infrastructure provides on-demand services and resources via the internet

- universities provide access to commercial cloud vendors
- deic will provide access to interactive computing in the cloud

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- research-it support for project development
- support use of research technology in class
- scaling to n students is *the challenge*
- proper data management practice should always be included
- prioritize solutions that utilize interactive computing
- work towards a cloud-based solution

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THANKS

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SLIDES

http://knielbo.github.io/files/kln_tscale.pdf

OR



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technology & scale
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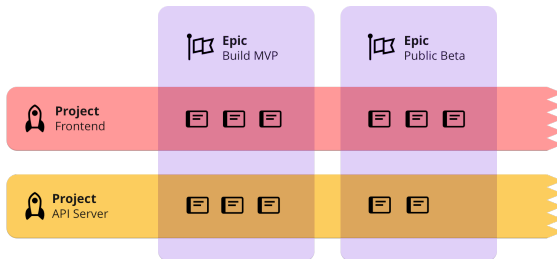


Figure: Managing multiple research (sub-)projects

Research projects are **thin** (composed of relatively few epics & stories) and **fuzzy** (projects bleed into each other)

- maximize **tool re-use** between within epics (research phases) → invest in flexible tools
- **share resources** between projects → research collaboration
- accept **functional divisions** → construct a common vocabulary

and, TOOLING makes your life a lot easier

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