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WOCOSS: Workshop on Contributions to Open Source Software by Public Institutions

Why do contributions make sense: Digital sustainability within open source projects

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- March 2016 to present: PhD Student (Reserach focus: Digital Sustainability) at the Institute of Information Systems and Head of the technology center of information systems (TEWI)
- Experience:
  - 2015 Junior Assistant at the University of Bern
  - 2014 - 2015 PostFinance, Compliance US-Team
  - 2012 Swiss Financial Market Supervisory Authority, IT Support
  - 2010 - 2013 Binder Corporate Finance/ Manuela Gurtner/ Sozialmedizinisches Zentrum Oberwallis, Assistant of the Management Committee
  - 2007 - 2012 Swisscom IT Services, IT Support
- Education:
  - 2014 – 2016 Master Business Administration, focus on Information Systems (University of Bern)
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Main question

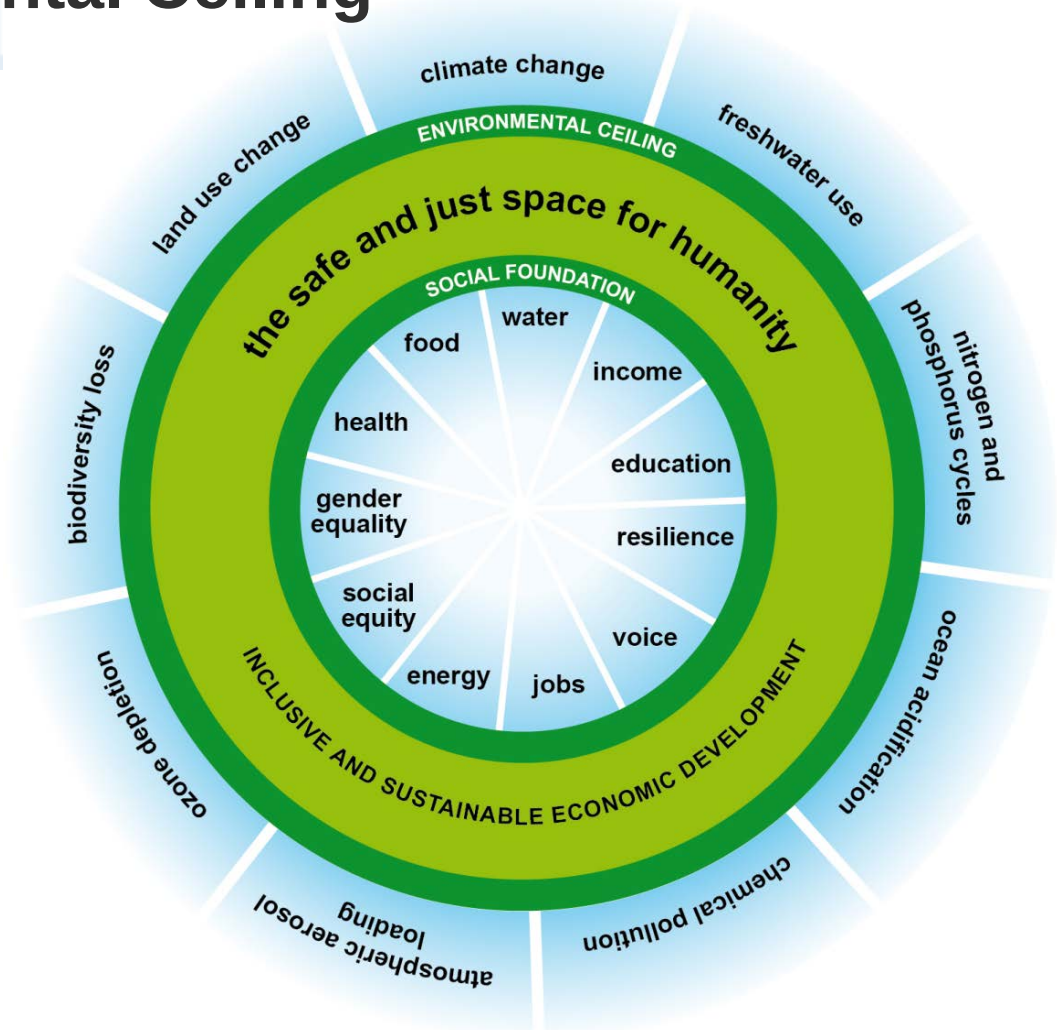
How do public institutions spend money for information systems in a wisely way?

Wisely means to the benefit of society.

Agenda

1. Sustainability and digitalization
2. **"Private-Collective" Innovation Model**

Social Foundation & Environmental Ceiling



Source: Raworth, K., 2012. A safe and just space for humanity: can we live within the doughnut.

Enhancing the state of technology

Source: United Nations Department of Economic and Social Affairs, 2015

Goals related to technology

- 9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020
- 17.6 (…) access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms (…)
- 17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms (…)
- 17.8 Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology

Source: United Nations Department of Economic and Social Affairs, 2015

The reason of the importance of technology: Knowledge

Data ~ Information ~ Knowledge

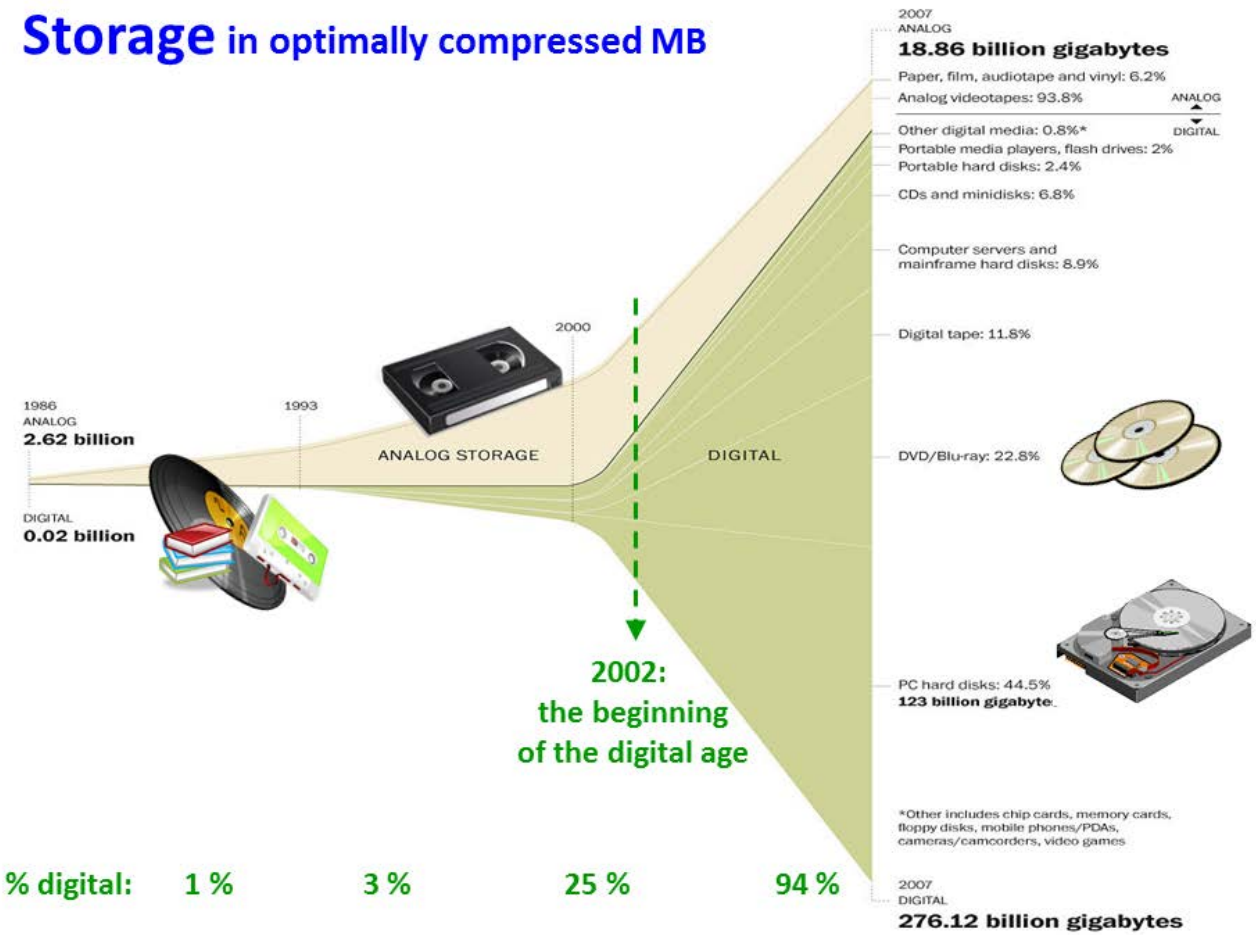
Digital goods

Digital goods

Data	Information	Knowledge
raw unprocessed facts	processed data in context	applied information
name & address on envelope	sorted list of names & addresses organised in house order	the postman organises his delivery round to make his job easier
sales figures for bread at a supermarket	sorted into how much is sold each hour/day	this information is used to plan the baking/purchasing
name & telephone number	sorted in area groups	used for annoying telesales people to waste out time
rain gauge records rainfall	average rainfall for different areas	predict rainfall - weather forecast
milk produced by a cow & fodder/cake eaten by cow	sorted in production figures per cow/day/week/month	amount of feed we require daily/weekly useage and ordering profit from the milk

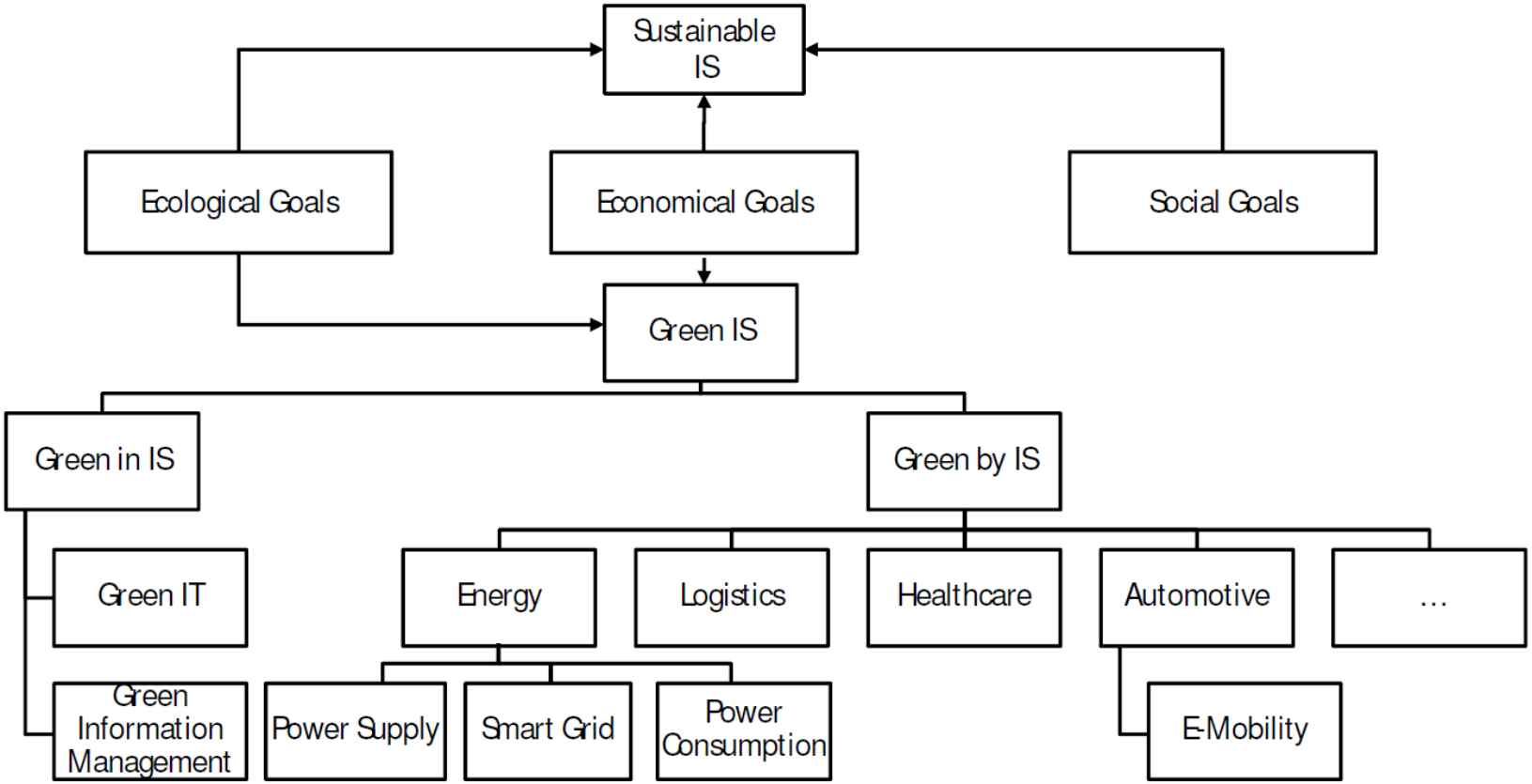
Source: http://www.chloe.pupil.me.uk/stock%20control%20systems.html, 2016

Data is usually digital



Source: Hilbert and Lopez, 2011

Possible Impacts of digital technologies



Source: Kossahl et al., 2012

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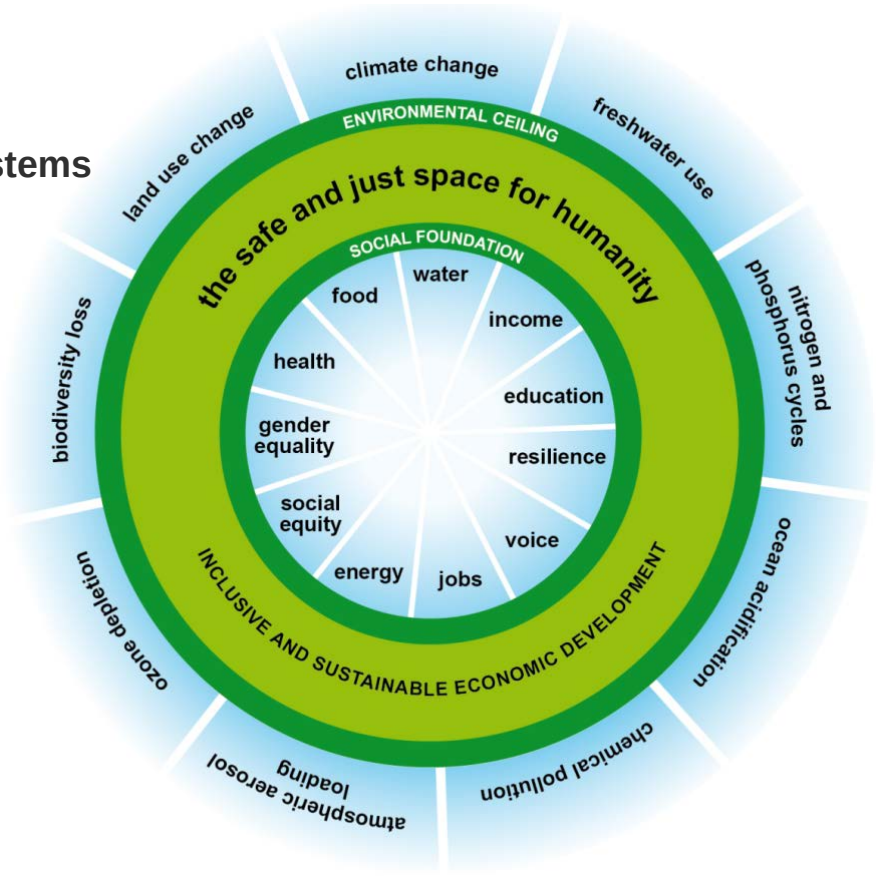
Research of Green Information Systems applied to research on Sustainability

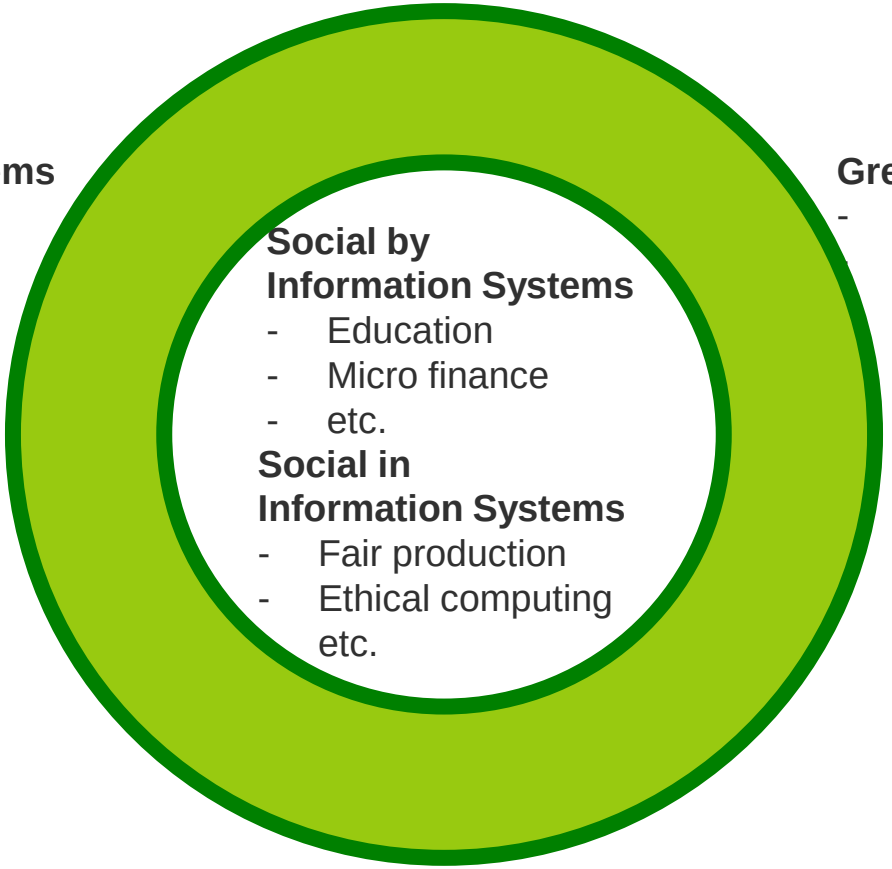
Green by Information Systems
- Smart grids (electricity)
- Intelligent logistics
- etc.



Green in Information Systems
- Energy-efficient server farms
- Reuse of raw materials
- etc.

What‘s about the social dimension?

Green by Information Systems
- Smart grids (electricity)
- Intelligent logistics
- etc.



Green in Information Systems
- Energy-efficient server farms
Reuse of raw materials
etc.

What is in the doughnut?

- So far we discussed:
  1. how technology can support the provision of social needs
  2. how digital technologies provide improvements for the environmental ability to support the social needs
- Information systems bring humanity closer to the inside of the doughnut
- Valuable knowledge is created, maintained and developed
- Additionally, people have access to knowledge

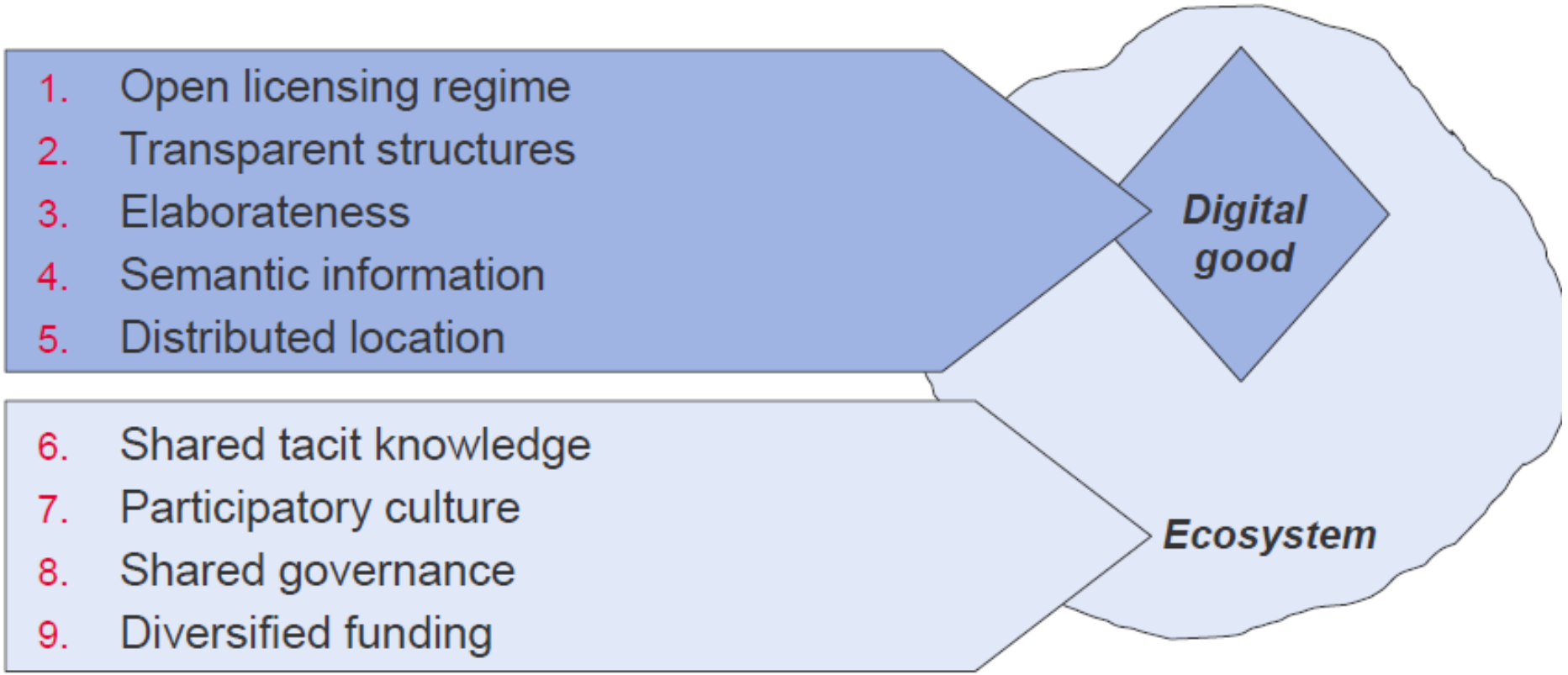
(Digital) Knowledge as a resource

	Natural resources	Digital resources
Creation Maintenance Development	Provided without human influence	Need for digital sustainability
Use Consumption Sharing	Need for environmental sustainability	No depletion

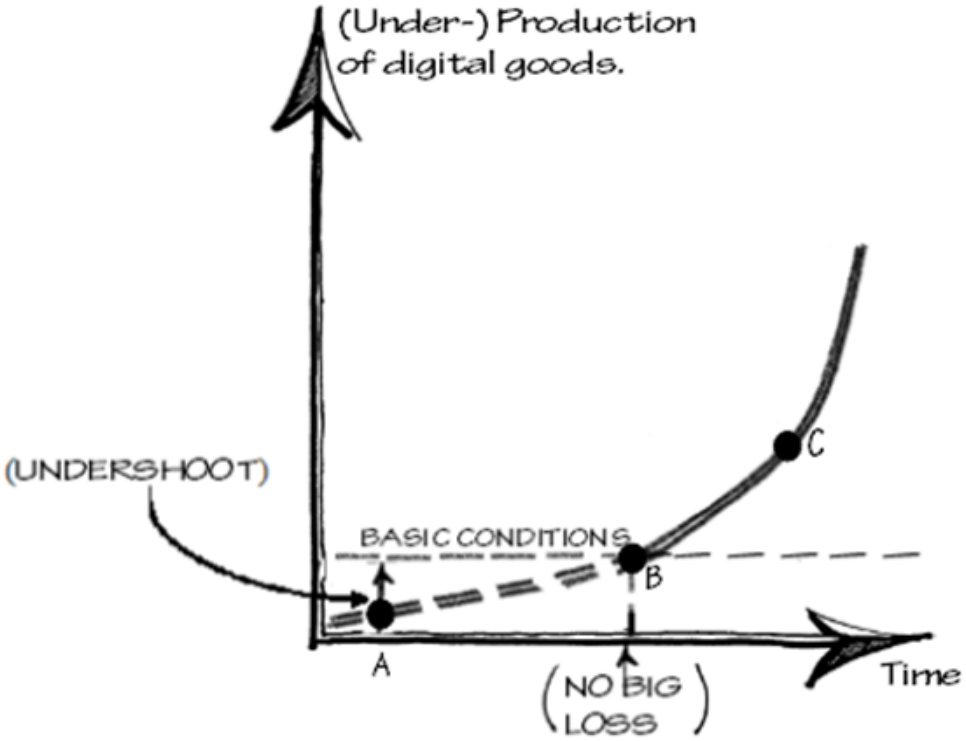
Source: Stürmer, Abu-Tayeh, Myrach 2016 “Digital sustainability: Maximizing knowledge for our society” working paper

Basic conditions

9 basic conditions for digital sustainability:



Underproduction of knowledge



A = Endangered by loss and underproduction
B = Resilient digital goods
C = Potential of digital goods is developed

What is digital sustainability?

- „Digital Sustainability creates, develops, maintains and ensures access to digital artifacts in a way that facilitates the greatest possible benefit for society.“
- Examples for digital Sustainability:

	in Information Systems	**by Information Systems**
Ecological	Eco-efficient server	Biodiversity Index
Social	Effective labour law	Tools for education
Economic/Knowledge	Comments in source code	Access to data

- Narrower sense (economic/knowledge) of digital sustainability vs. broader sense (ecological & social)

Narrower sense of digital sustainability

- Focus on digital resources:
  - How digital goods should be created
  - How digital goods should be maintained
  - How data should be made accessible for potential users
  - How digital goods can be re-used
  - Which formats guarantee long-term availability of data
  - Which devices guarantee long-term availability of data

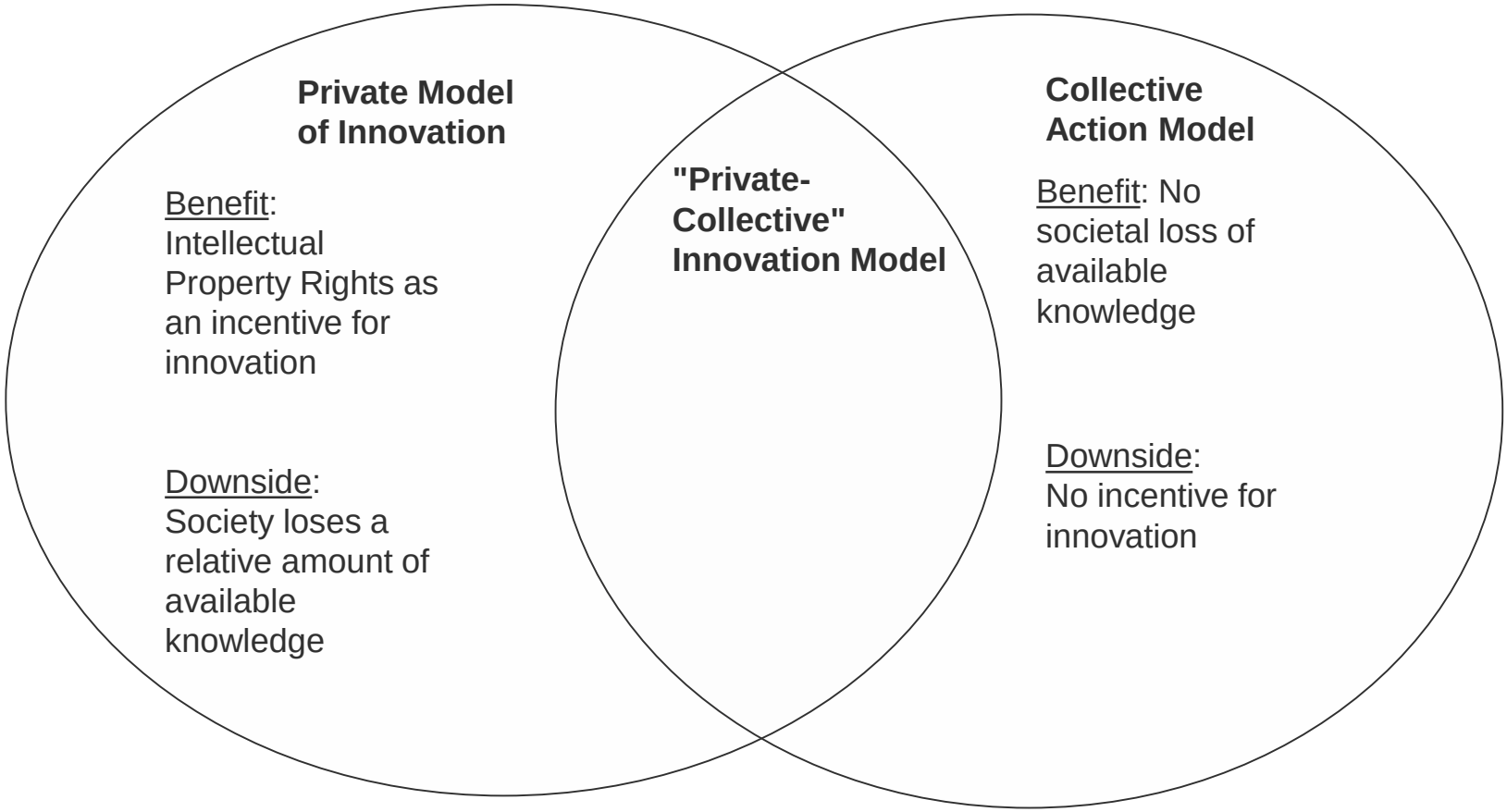
- Next: basic conditions for the narrower sense of digital sustainability

- Narrower sense does not require ecological or social benefits

Agenda

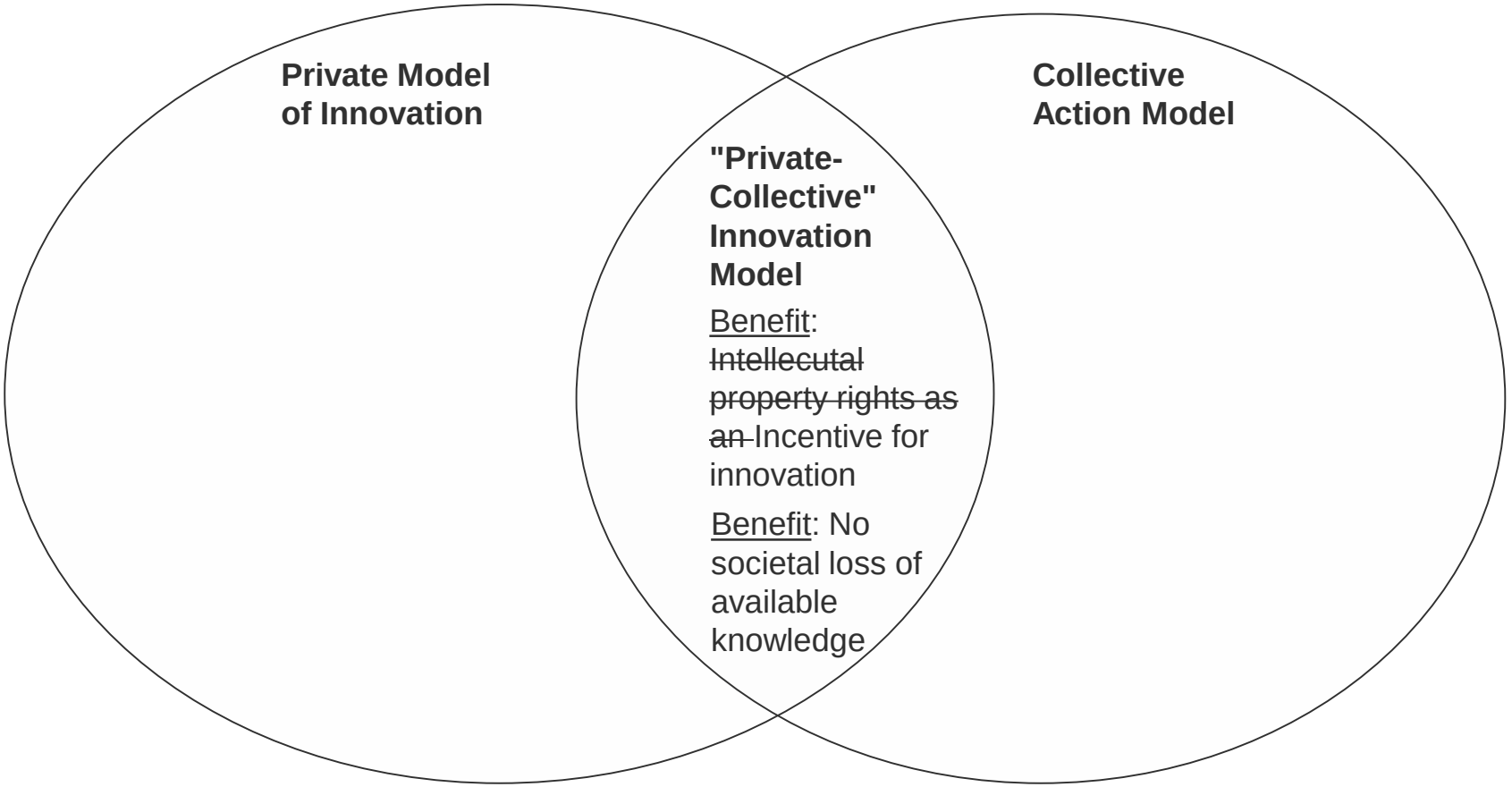
1. Sustainability and digitalization
2. **"Private-Collective" Innovation Model**

"Private-Collective" Innovation Model



Source: von Hippel/von Krogh 2003

"Private-Collective" Innovation Model



Source: von Hippel/von Krogh 2003

Benefits of the "Private-Collective" Innovation Model

Benefits
Low knowledge protection costs
Learning effects
Reputation gain
Adoption of innovation
Increased innovation at lower costs
Lower manufacturing costs
Faster time to-market (depending on the case)

Source: Stuermer et al. (2009)

Benefits of the "Private-Collective" Innovation Model

Benefits	Findings in the case study
Low knowledge protection costs	Revealing source code rather than protecting it; however, undetermined costs for revealing.
Learning effects	Collaboration with external firms and individuals
Reputation gain	Increased attraction of Nokia as an employer and for building their own developer community
Adoption of innovation	Standard setting of the platform configuration
Increased innovation at lower costs	Reuse of open source software, outsourcing of software testing and bug fixing and maintenance to open source communities. Experimentation and contributions of new applications by lead users
Lower manufacturing costs	No licensing fees for software platform
Faster time to-market	Tapping of distributed technology expertise and high flexibility of software platform

Source: Stuermer et al. (2009)