

# Information and Communication Tech (ICT) & Sustainability

1. Research & Projects
2. ICT & Economic Context
3. ICT as an Instrument for Sustainability



# 1

## Research & Projects


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- ▶ SPiRIT Group Magdeburg
- ▶ Lab
- ▶ ROSI-3D
- ▶ Empirical Analytics
- ▶ Conferences

# karriereLEBEN

SocialMedia-Portal for Career- and Alumni-Development




 Bundesministerium für Bildung und Forschung

gefördert durch:

# ROSI-3D

RFID locating in consideration of moving objects in a radio field with 3D-simulation



 Bundesministerium für Bildung und Forschung

gefördert durch:

 profUnt  
Forschung an Fachhochschulen mit Unternehmen



Research group  
Science Projects in Radio and Information Technology



28/10  
2015

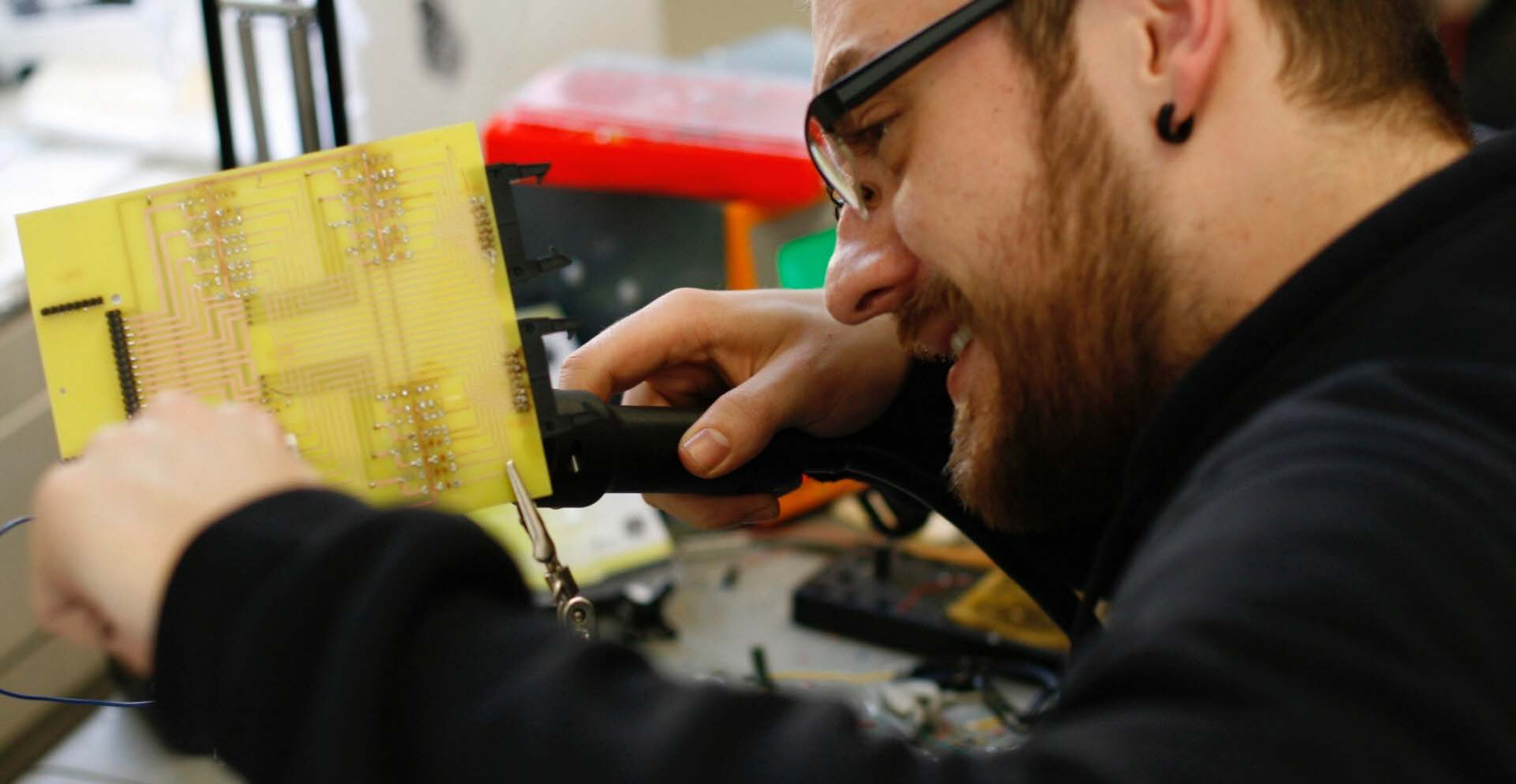
ICT & Sustainability

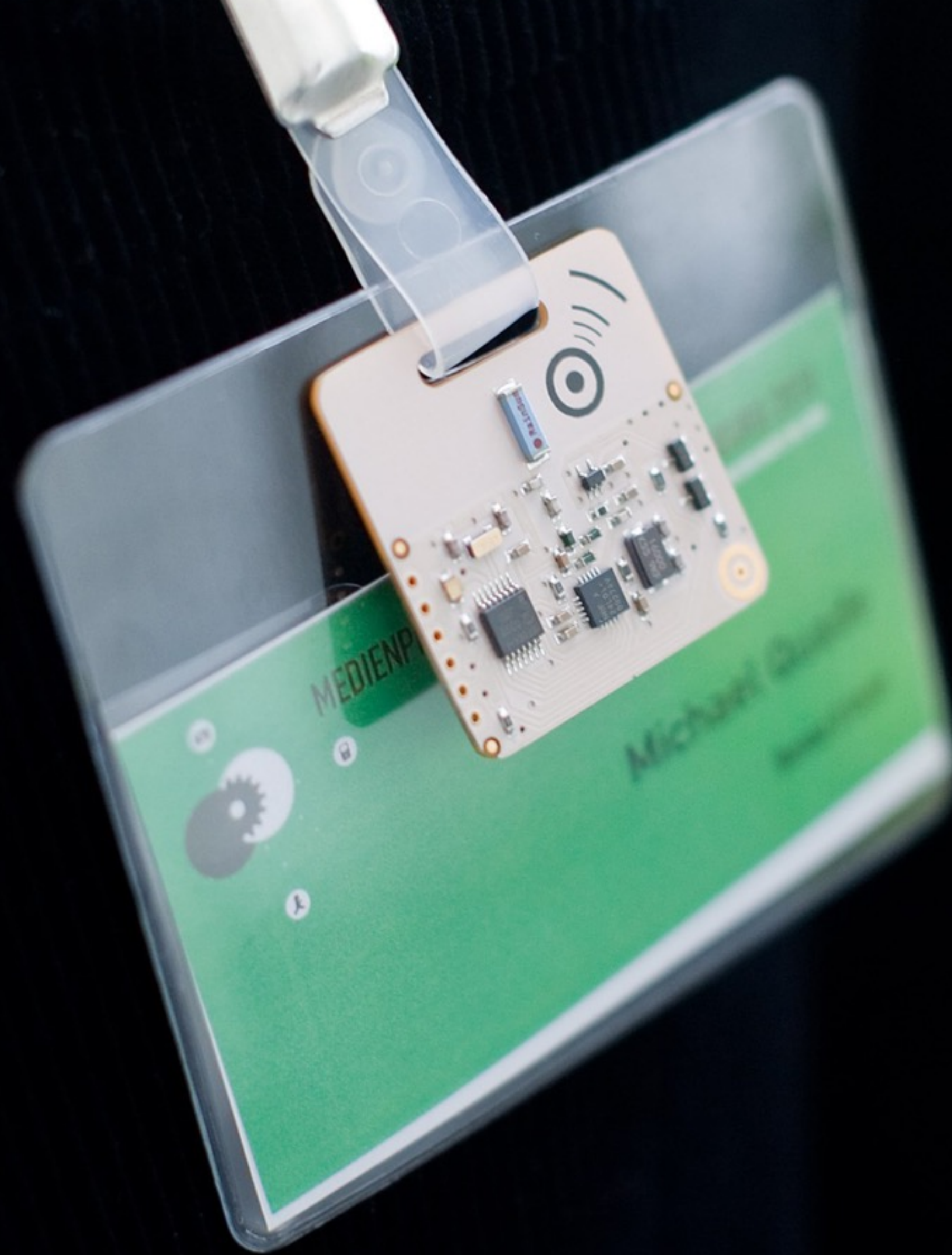
Michael A. Herzog

Research & Projects • SPIRIT













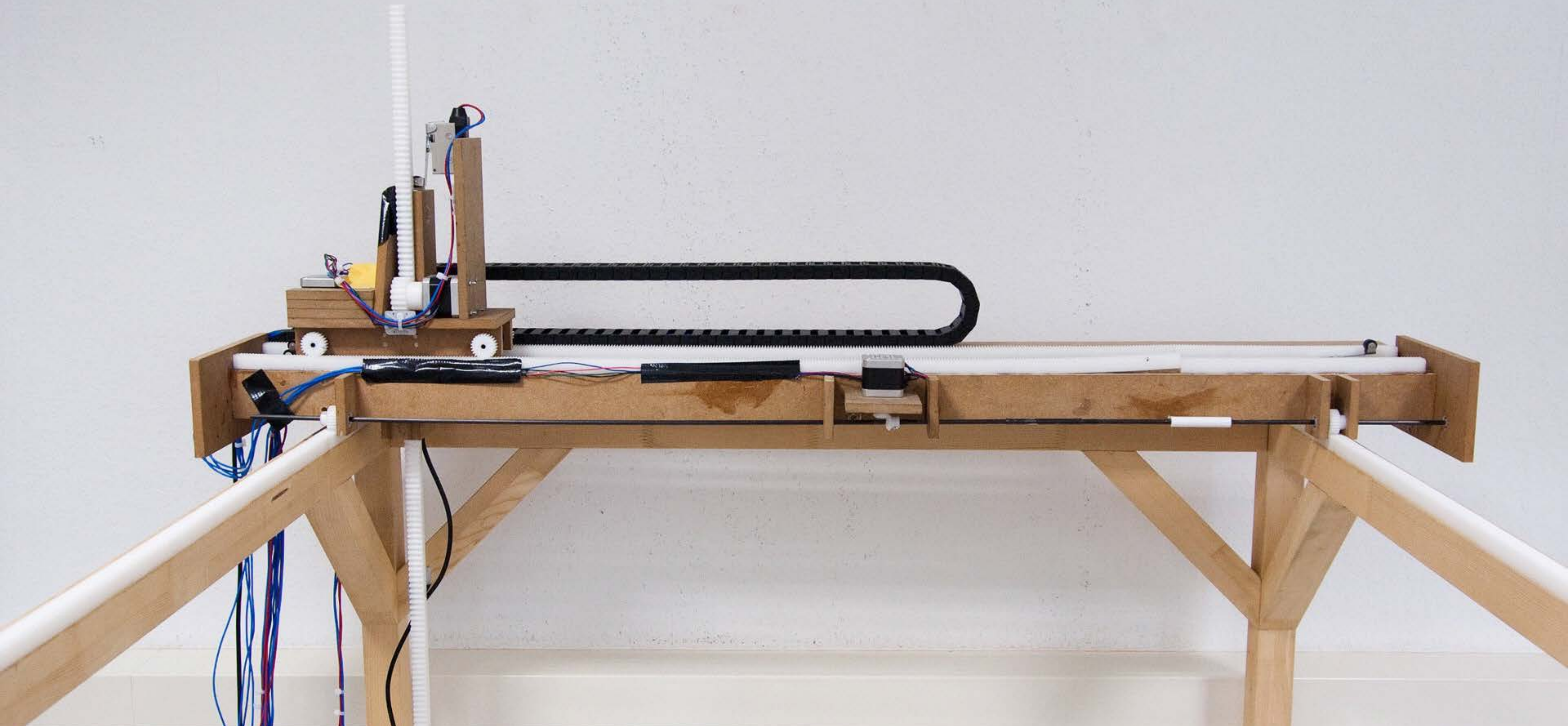


# LIVE-ANSICHT

## ALLE BENUTZER

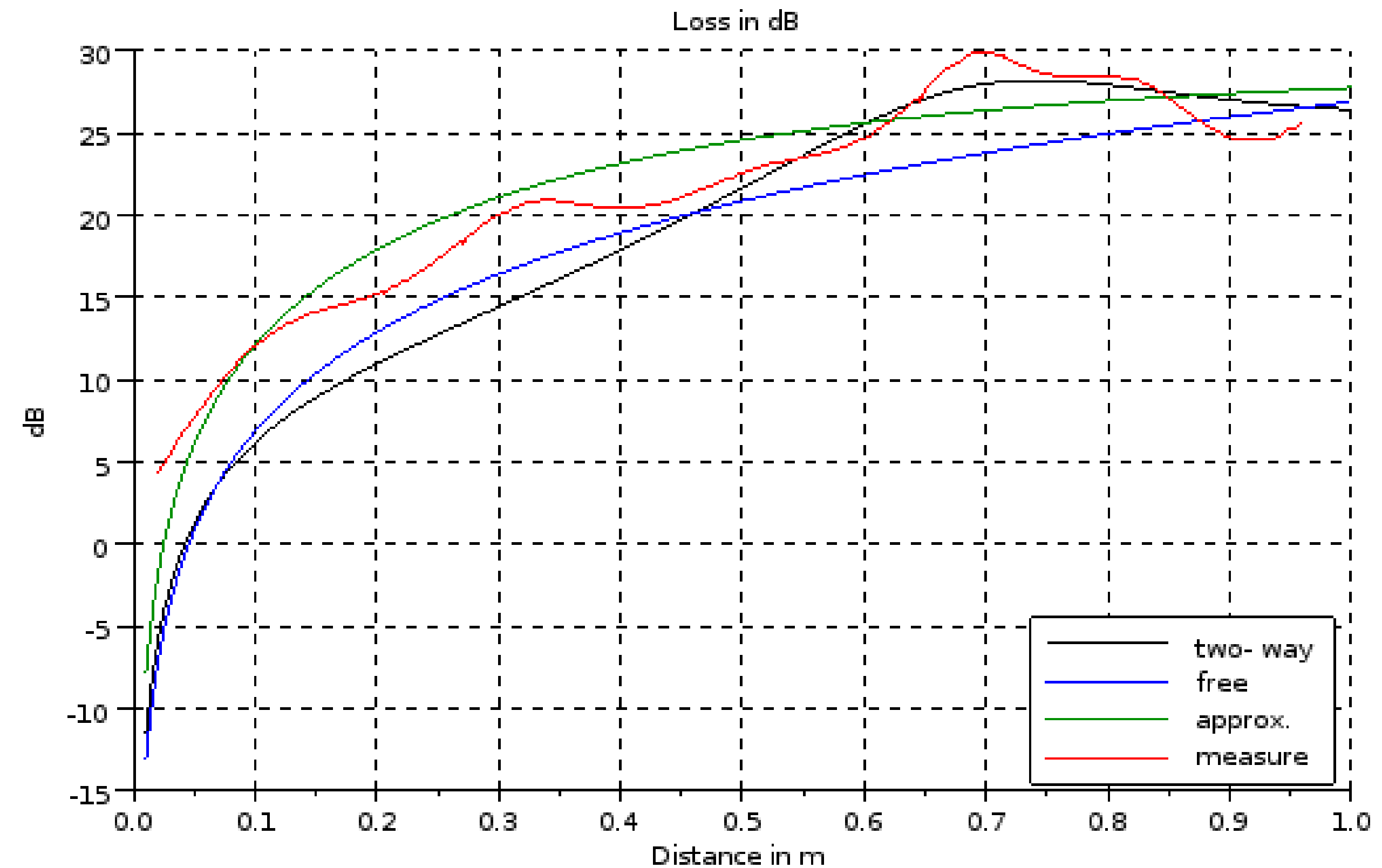
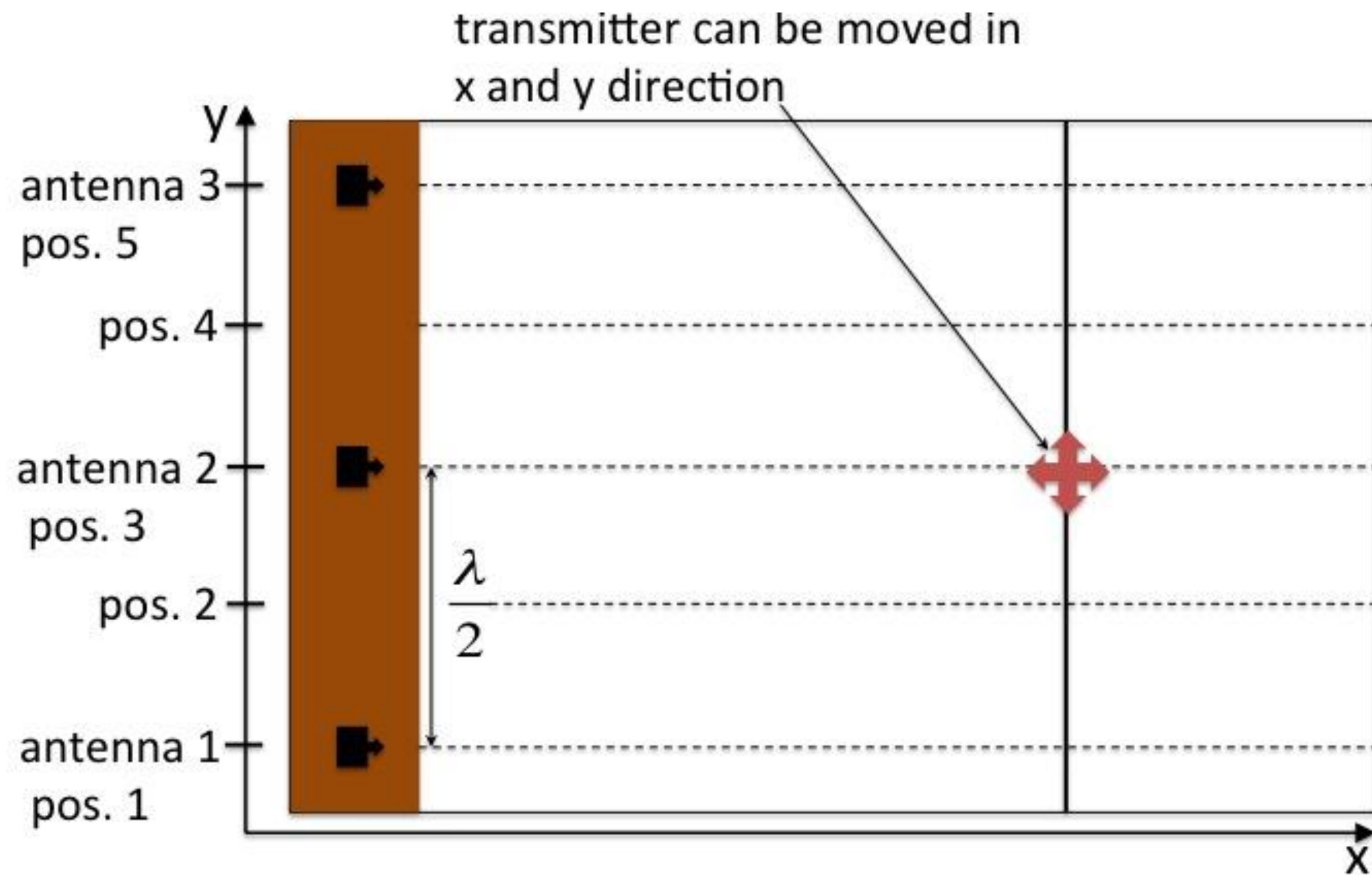


# Analysis of the Radio Propagation Model at RFID Applications

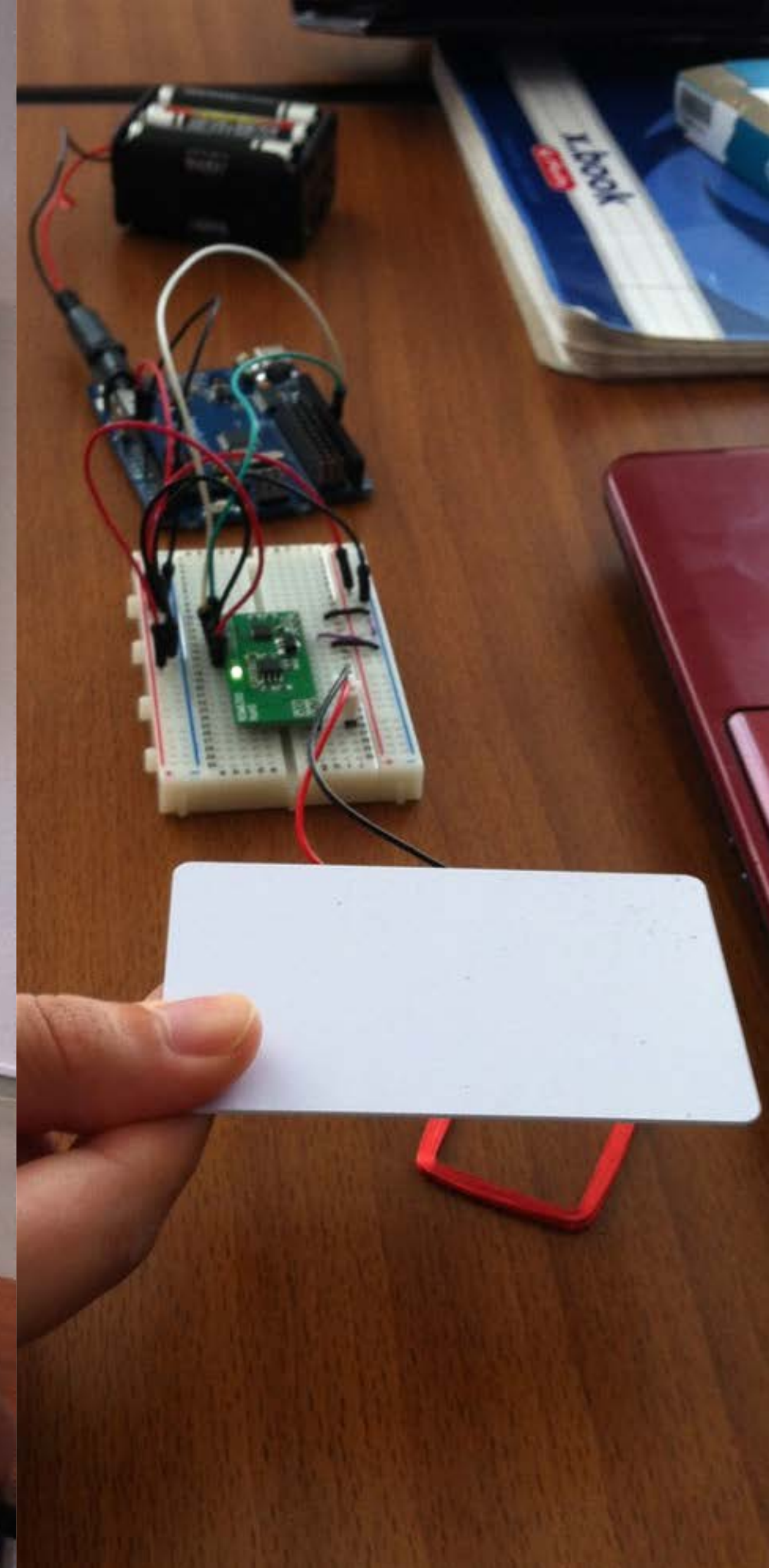


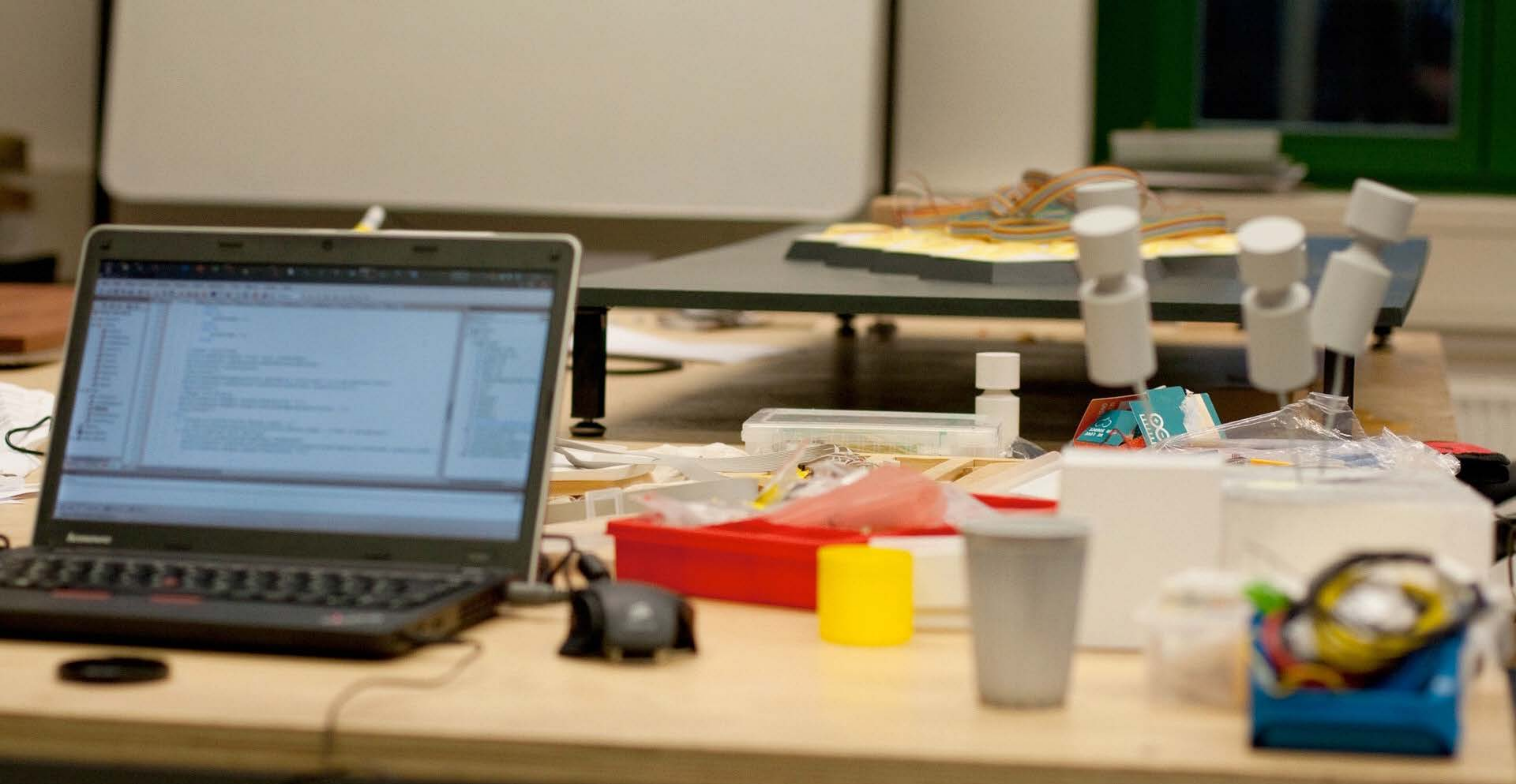
# Analysis of the Radio Propagation Model at RFID Applications

$$L_{mp} = g_s g_r \left( \frac{4\pi d}{\lambda} \right)^2 \left| 1 + \sum_{n=1}^N \Gamma_n \frac{d}{d_n} e^{-jk(d_n - d)} \right|^2$$

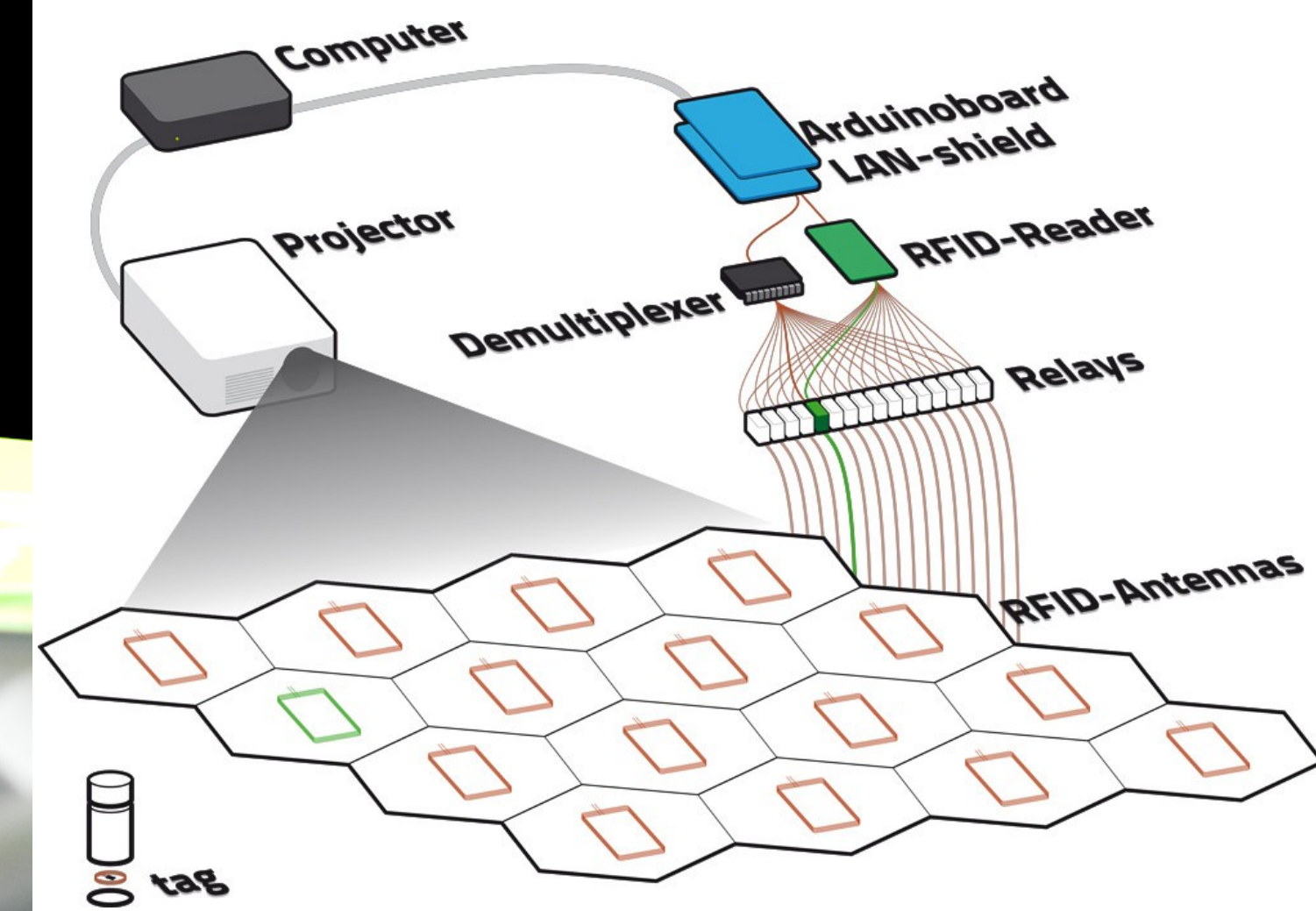
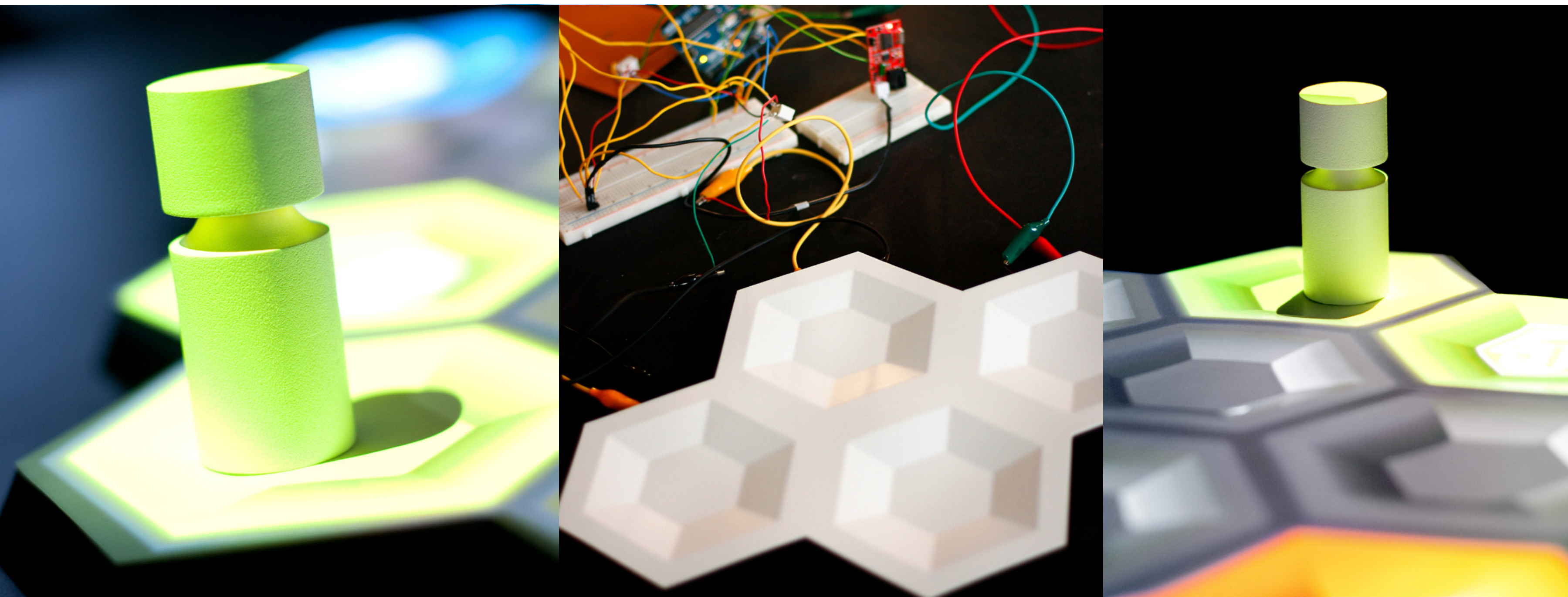


Friedewald, O., Papenbrock, J., Herzog, M.: Analysis of the Radio Propagation Model at RFID Applications  
 In: VDE ITG/IEEE European Conference on Smart Objects, Systems and Technologies, Smart Systec 2013





# DiTAG: A digital-analog interface for board games



Krause, R., Haase, M., Hatscher, B., Herzog, M., Goutrié, C.: Computerspiele zum Anfassen: Ein digital-analoger Baukasten für Brettspiele. Proceedings "Mensch und Computer" Bremen 2013



A 3D rendering of a board game board with various pieces and tokens. The board is composed of grey hexagonal tiles arranged in a circular pattern. Several colored pieces are visible: a yellow piece with a white token, a blue piece with a white token, a red piece with a white token, and a green piece. There are also several grey rectangular tiles scattered around the board. The word "Brettspiele" is written in large, white, bold letters across the center of the image.

# Brettspiele







# ROSI-3D

- ▶ RFID-Ortung unter Berücksichtigung ortsveränderlicher Objekte im Funkfeld mit einer 3D-Simulation
- ▶ 11/2012-03/2016, 330 TEUR
- ▶ 5 Partner
  - Hochschule Magdeburg-Stendal
  - Centiveo GmbH Magdeburg
  - metraTec GmbH Magdeburg
  - ifak - Institut für Automation und Kommunikation e.V. Magdeburg
  - Otto von Guericke Universität, Fakultät für Informatik (FIN), Prof. Dr. Myra Spiliopoulou

gefördert durch:

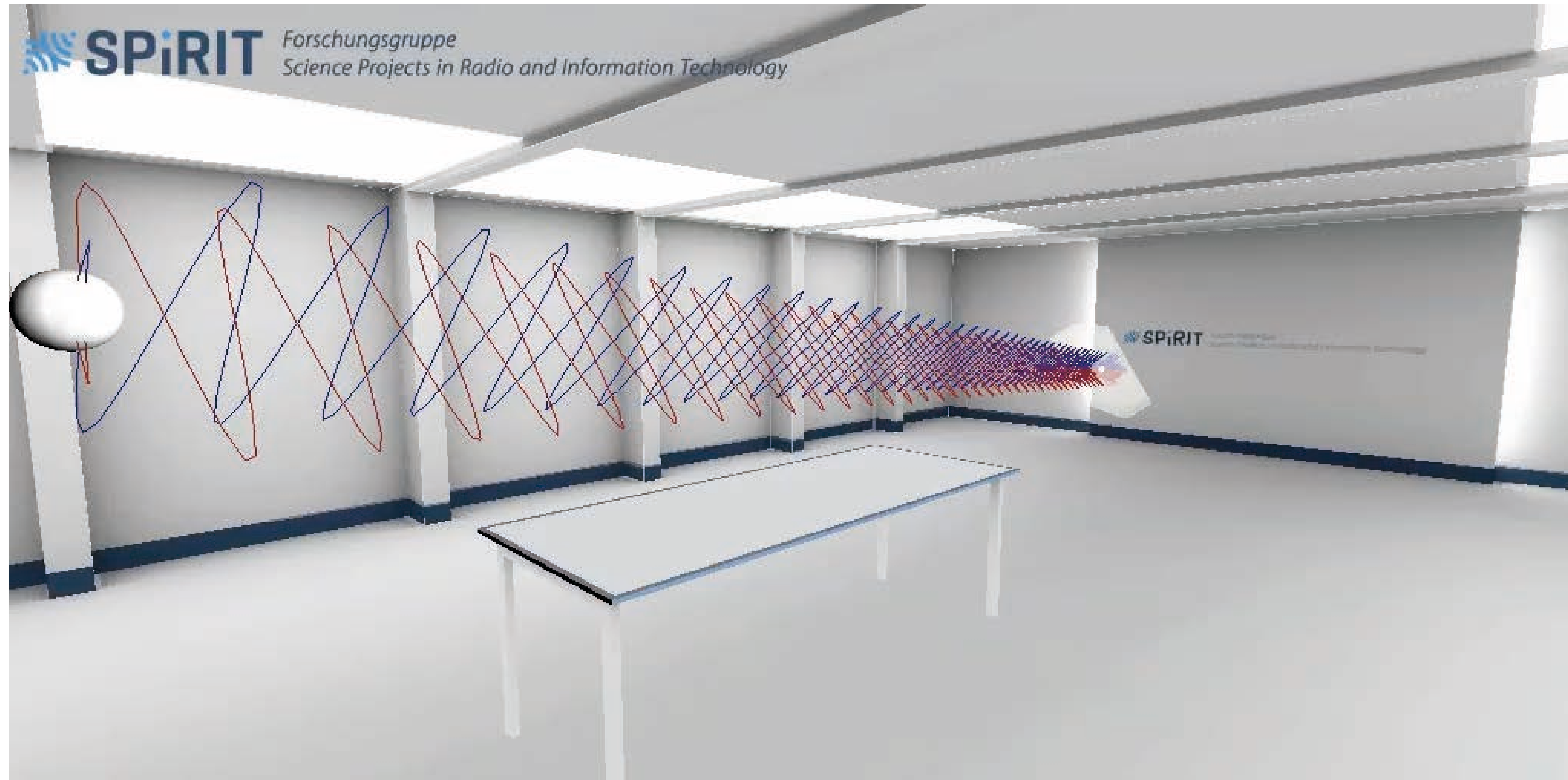


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und Forschung

profUnt 

Forschung an Fachhochschulen mit Unternehmen

# Localization and Simulation



## *ROSI-3D*

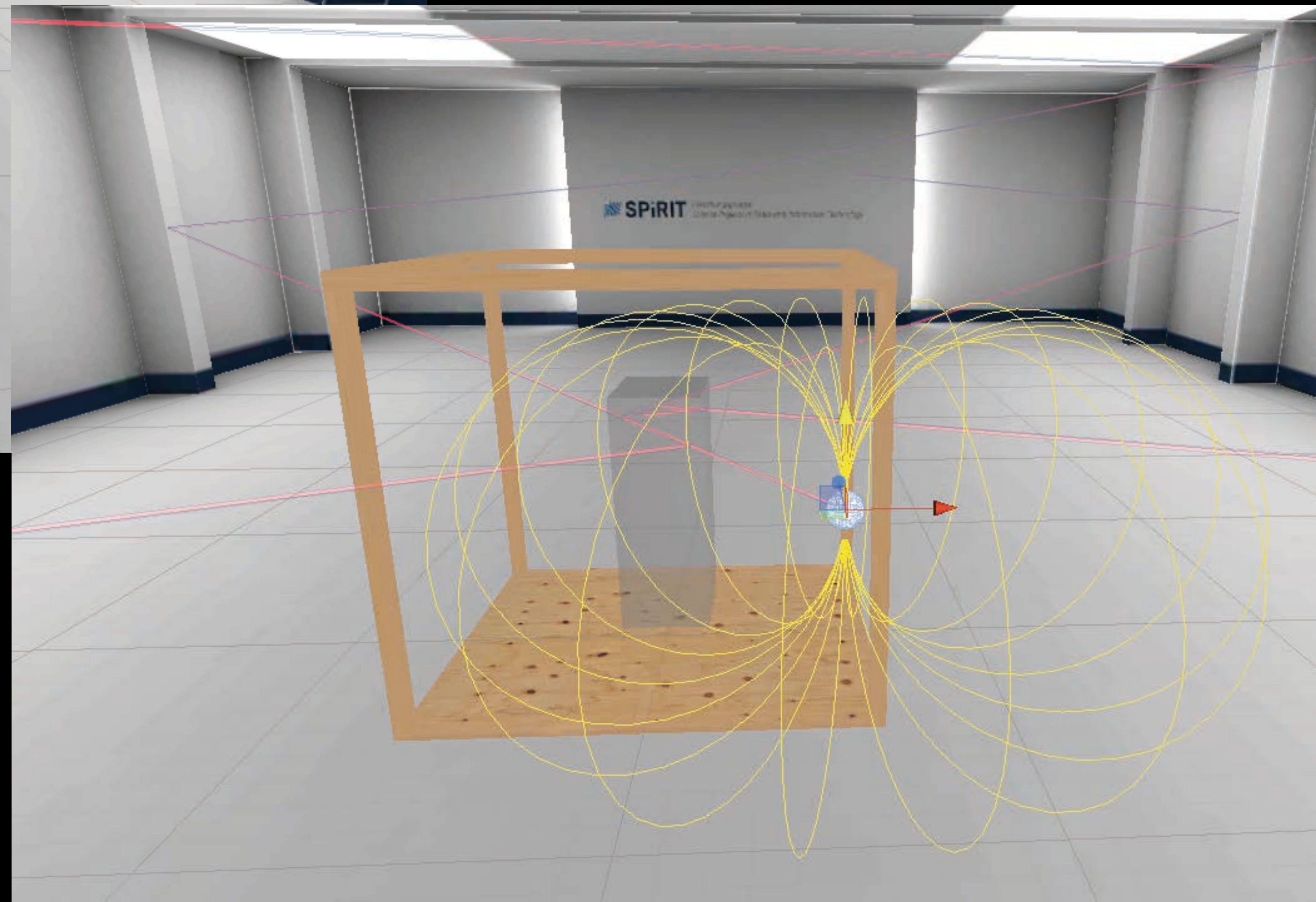
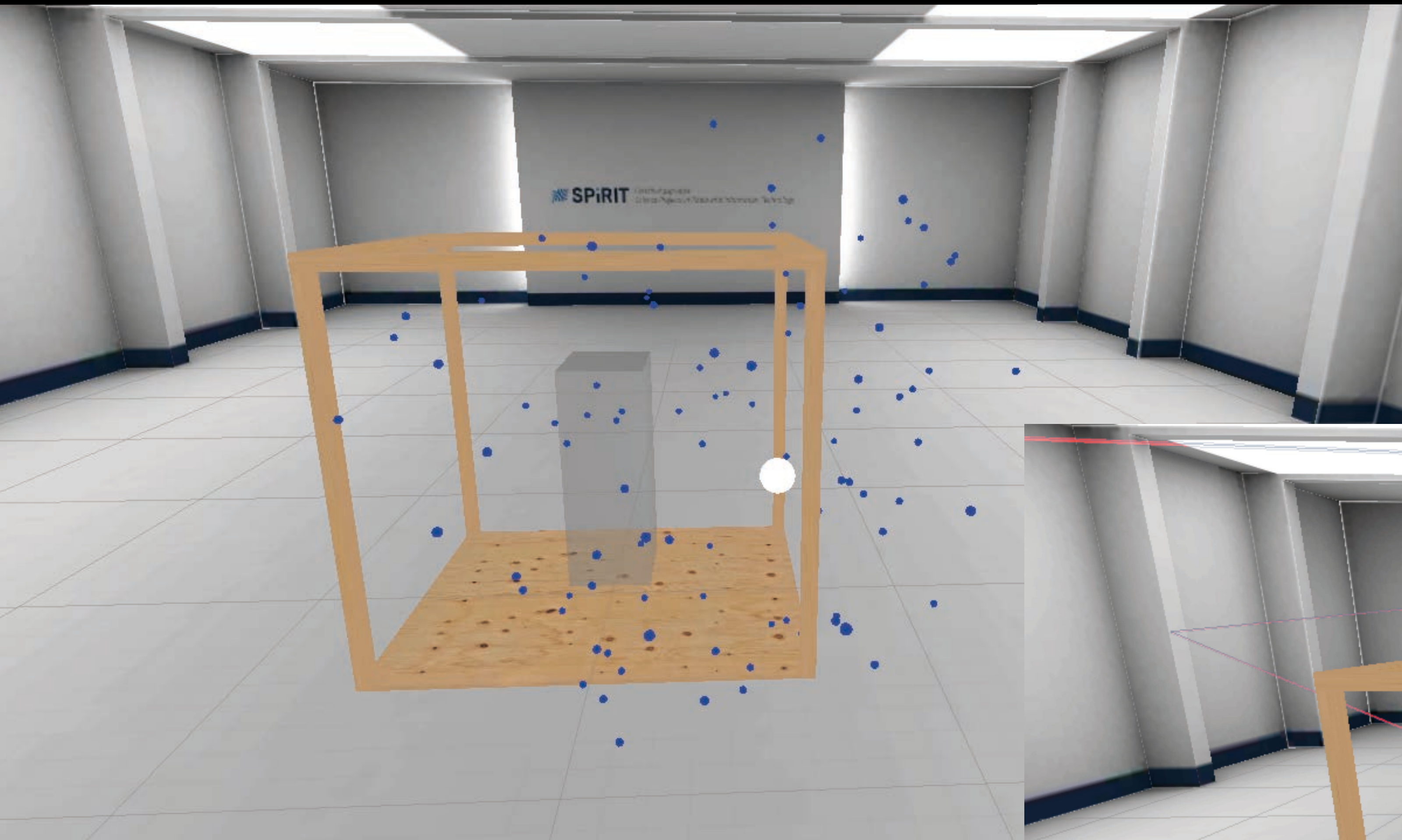
RFID locating in consideration of moving objects in a radio field with 3D-simulation

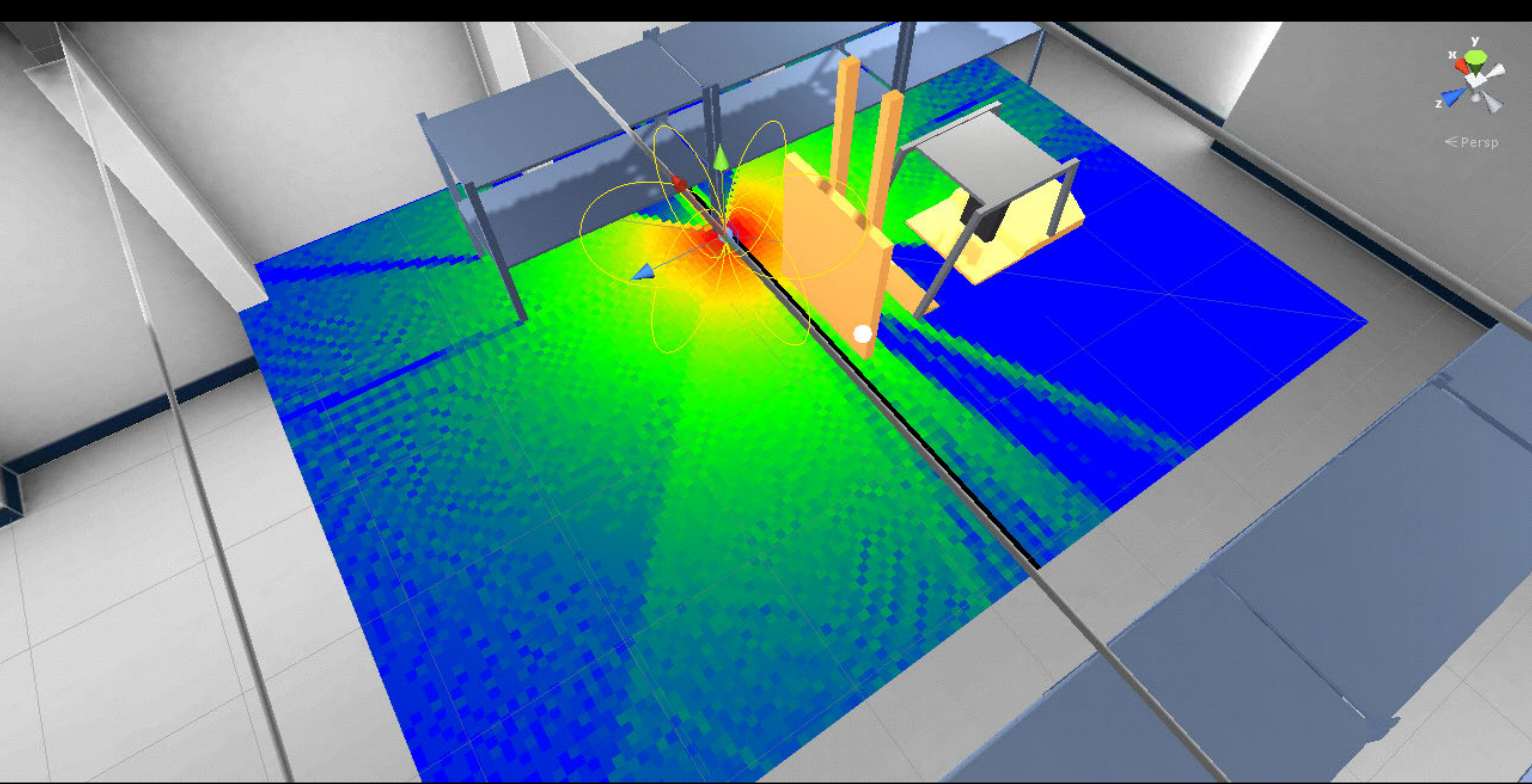


SPIRIT

h 2  
Hochschule  
Magdeburg







# Empirical Work

## ▶ SocialMedia Study Saxony-Anhalt 2012

- Sens, L., Herzog, M., Albers, E.: Chancen und Risiken sozialer Medien im Unternehmen. Eine Studie mit Schwerpunkt in Sachsen-Anhalt. In: Fischer, A.: 14. NWK, VWH Verlag 2013

## ▶ ICT Sustainability 2013

- EcoCom 2013 Konferenz, <http://eco-com.net>
- Herzog, M (ed.): Economics of Communication. ICT driven fairness and sustainability for local and global marketplaces. GITO Verlag 2015 (to be published)

## ▶ AutoID Study Automotive 2014 (cancelled)

## ▶ AutoID + IoT Study Health 2015/16 (In progress)

## ▶ CrossTeaching Survey, a cooperation with Linz University (JKU) since 2010

- N>660, 12 Publications, etc.
- Katzlinger, E., Herzog, M.: Wiki Based Collaborative Learning in Interuniversity Scenarios. In: Ciussi, M. (ed): The Electronic Journal of e-Learning EJEL, Volume 12 Issue 2, pp 149-160, ECEL, Academic Publishing International, May 2014
- Katzlinger, E., Herzog, M.: Intercultural collaborative learning scenarios in e-business education. Media competencies for virtual workplaces. In: Issa, T., Isaias P., Kommers, P.: Multicultural Awareness and Technology in Higher Education: Global Perspectives. IGI Global Press, 2014



# The Economics of Communication Communication in Business Cycles



Web and Internet technologies initiated the fourth industrial revolution in less than 20 years since their entry into mainstream communication scenarios, significantly changing economics and society. **Digitization** and mobile technologies speed up **communication** and

The conference was held on November, 8th 2013. Location: Landesvertretung Sachsen-Anhalt in Berlin, close to Berlin Central Station.

[▶ Video statements of speakers and committee](#)

**Our Partners**

**Alcatel-Lucent Stiftung for Communications Research**, Joint Competence Center, Berlin  
**German Informatics Society (GI)**  
**Ministry of Economics and Sciences** of the State of Saxony-Anhalt



Impressionen und Bilder vom Barcamp  
Berichte im Bereich Presse



# Speed Dating: Scholarly Communication Meets Digital Archiving

Lunch lecture\*

The area of digital scholarly communication has been studied extensively over the last decade and continues to be the focus of numerous international research projects at scale. This helps to improve our understanding of, for example, relationships between scientific disciplines based on the analysis of co-authorship, shared references, and usage data.

Digital preservation efforts such as Europeana or the Digital Public Library of America (DPLA) have been initiated to preserve our cultural heritage. It is (mostly) understood that we need sustainable, scalable, and business-oriented preservation models for the vast amount of digital content we create today.

In this talk I will touch upon the nexus of these two areas. As digital scholarship is no longer just a single PDF document but is rather becoming a complex object with references to websites, datasets and software, we are in need of enhanced preservation approaches. I will provide examples to motivate this need and demonstrate pro-active solutions available today to the conscious scholar. And yes, I will talk about time travel!

7.11.2013

12:00 Uhr - 13:00 Uhr  
Hörsaal HS4, Haus 14

about Martin Klein

Martin Klein received his Diploma in Computer Science from the University of Applied Sciences Berlin (2002) and his Ph.D. in Computer Science from Old Dominion University (2011). From 2002 to 2005, he was a scientist at the University of Applied Sciences in Berlin conducting research in the realm of e Learning and mobile computing. At Old Dominion University, he was part of the Web Science and Digital Libraries Research Group and a part-time lecturer in the Computer Science Department. He currently is a Postdoctoral Research Associate at the Research Library of the Los Alamos National Laboratory. His research interests include scholarly communication, digital preservation, temporal aspects of the web, and information retrieval and extraction.



For more information see: <http://www.cs.odu.edu/~mklein/>

\* Der Referent steht bei einem gemeinsamen Lunch direkt im Anschluss für individuelle Gespräche zur Verfügung.



**SPiRiT** Forschungsgruppe  
Science Projects in Radio and Information Technology

# E-Business Financing Lehrstücke aus dem Silicon Valley

Lunch lecture\*

Was kann ein StartUp Entrepreneur über unterschiedliche Financing Modelle und Strategien vom Silicon Valley lernen? Sollte es das erklärte Ziel jedes deutschen StartUps sein von Silicon Valley Venture Capitalists Funding zu bekommen und welche Vorteile bringt das? US Venture Kapital oder Minimalfinanzierung vor Ort? Existenziell oder solides langfristig geplantes KMU?

Die Verwerfungen in der Szene sind längst nicht mehr nur durch eine neue Internet Bubble definiert das Konzept 'StartUp' erfordert ein grundlegendes Ueberdenken und neue innovative Wirtschaftsformen haben gerade in Deutschland bessere mittelfristige Chancen.

24.6.2014

14:00 Uhr - 15:00 Uhr  
Haus 14, Hörsaal 5  
Campus Herrenkrug

about Florian T. Brody

Digital media specialist | Advisor for marketing and strategy  
Brody & Partners, San Francisco

Florian Brody is an international marketing and digital media specialist with more than 20 years of experience in his field of business. He has been working as an adviser for a huge number of known companies in a wide range of industries. Moreover, he has co-founded several startups and has acquired a reputation as an internationally acclaimed speaker. Brody co-invented the first electronic books and built the multimedia market for Apple Austria. Furthermore, he teaches courses in digital media, entrepreneurship and mobile payment strategies at universities in Austria, Germany and the US. He began his career in Vienna where he studied computer linguistics, worked at the Cinéma du Francaise in Paris and as a fashion photographer.



For more information see: <http://www.brody.org>

\* Der Referent steht bei einem gemeinsamen Kaffee direkt im Anschluss für individuelle Gespräche zur Verfügung.

Moderation der Veranstaltung: Prof. Dr. Michael A. Herzog



**SPiRiT** Forschungsgruppe  
Science Projects in Radio and Information Technology

# Digital Preservation

Lunch lecture

Intro: Prof. Dr. Michael A. Herzog

18.09.2015

13:30 - 14:30

House 7, R 0.06

Campus Herrenkrug

## Web Archiving: A Brief Introduction

The Web is present in a broad range of fields of our lives including education, research, governance, news, entertainment, communication, publishing, shopping, social interactions, and many more. We collectively create and consume the Web more than ever before and are truly living in the Web era. However, the Web has a volatile nature. Very often web services disappear and content gets modified, deleted, or moved to other places. We need to preserve our trail on the Web in order for the historians of the future generations to know about us accurately. Apart from the long term preservation of the history there are other advantages and use cases of the archived Web such as personal satisfaction, storytelling, legal evidences, and many more.

In this talk we will briefly discuss the following:

- Archiving and Web archiving
- Purpose and importance of the Web archiving
- Scope of the web archiving (personal or institutional)
- Issues and challenges
- Tools and techniques
- Memento: Time Travel for the Web
- Archive X-Ray: High level summary of the archives' holdings
- Research opportunities in Web archiving
- Our Web Science and Digital Libraries Research Group

about Sawood Alam

Sawood received his B.Tech. degree in Computer Science from Jamia Millia Islamia, New Delhi, India in 2008 and his M.Sc. in Computer Science from Old Dominion University, Norfolk, Virginia in 2013. His Master's Thesis title was "HTTP Mailbox - Asynchronous Restful Communication". Sawood is currently working on his Ph.D. thesis titled, "Archive X-Ray - Web Archive Profiling for Efficient Memento Aggregation". Apart from his academic research in Web Science and Web Archiving field, he is also interested in solving technical challenges of Urdu and other Right-to-Left complex script languages.



A full list of his publications, presentations, research, and development efforts can be found at <http://www.cs.odu.edu/~salam/>.

## Using Web Archives to Enrich the Live Web Experience Through Storytelling

The web has become an integral part of our lives, shaping how we get news, shop, and communicate. When critical events occur, social media and news websites cover the stories as they break and continually revise them as the story evolves. Unfortunately, much of the content around these stories is vulnerable and prone to loss. Thus, web archives have become a significant repository of our recent history and cultural heritage. Meanwhile, "storytelling" is becoming a popular technique in social media for selecting representative tweets, videos, web pages, etc. and arranging them in chronological order to support a particular narrative or "story".

I will explain how to (semi-)automatically integrate archived collections with social media to create stories that summarize the holdings in these archived collections through identifying a set of resources that best represent the topic of the collection, then place this set of resources in an interface that users are already familiar with, such as Storify (a storytelling service that allows users to create their narratives). We can sample from the collections and provide one or more summaries or abstracts of the entire collection.

about Yasmin AINOamany

Yasmin is a researcher and Ph.D. Candidate at Old Dominion University in USA majoring in Computer Science with a focus on Information retrieval and Web Preservation. She received her Bachelor's and Master's Degrees in Computer Science from Mansoura University in Egypt. Yasmin had two internships at the Internet Archive, one of the largest and oldest public web archives in the world, in San Francisco as a software engineer in 2014/2015. She has multiple awards from the academic field, such as "the best teaching assistant award" from the college of science and "the best student paper award" in the International Conference on Theory and Practice of Digital Libraries (TPDL) in Sept. 2013. Her research interests include digital preservation, web mining, information retrieval, and digital humanities.



More information: <http://www.cs.odu.edu/~yasmin/>



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Science Projects in Radio and Information Technology



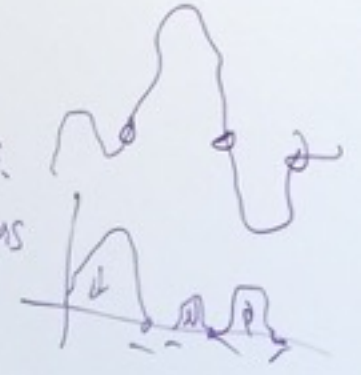


THINK

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Veranstaltung  
»Forschen, Lehren und Leben in Virginia«  
16.12.2015, 10:15 Uhr  
Campus Stendal

# 2

## ICT & Economic Context

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28/10  
2015

ICT & Sustainability

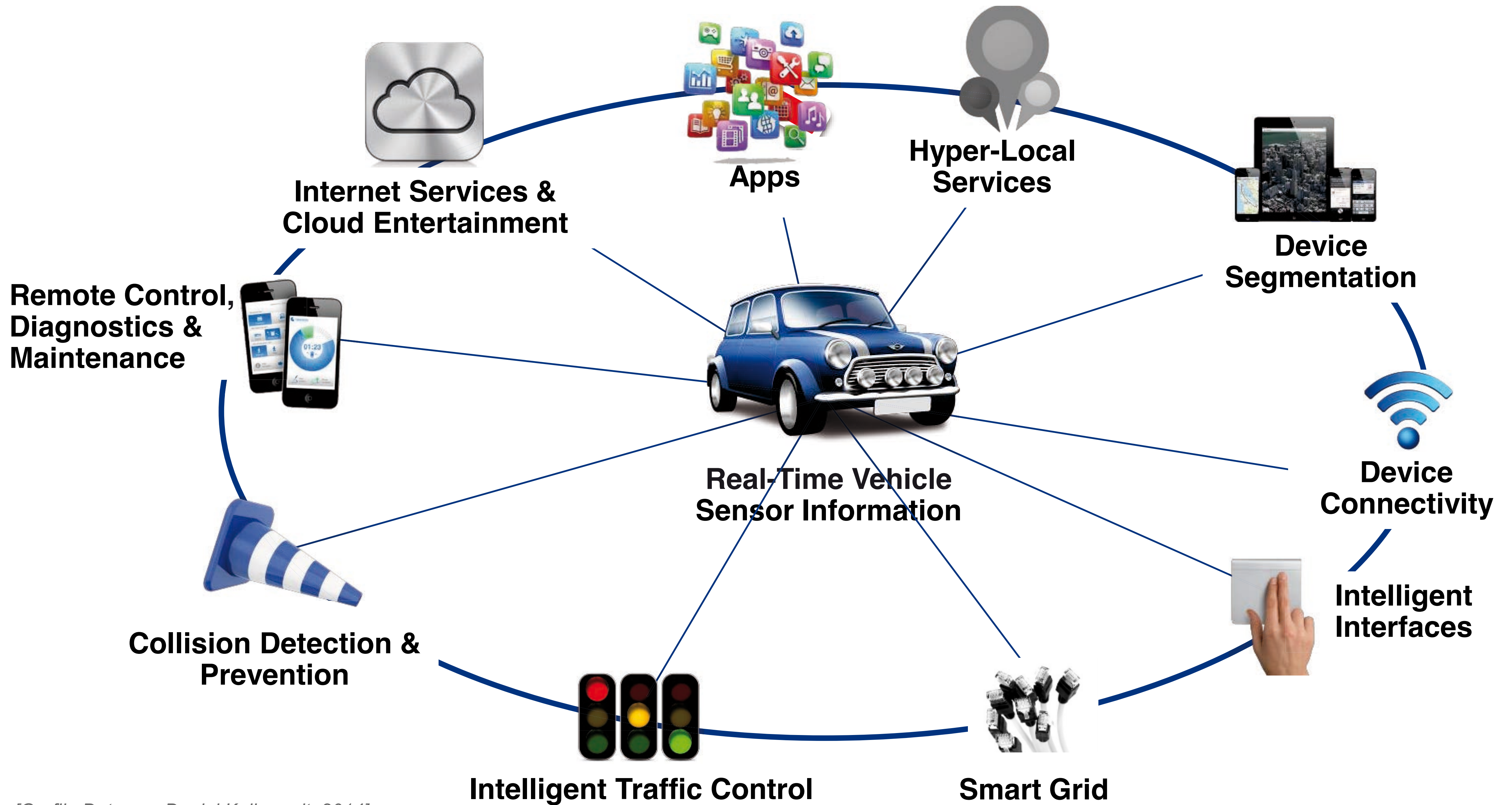
Michael A. Herzog | Research group SPIRIT | Magdeburg-Stendal University

## Device Convergence Timeline

	2005	2010	2015
Vision	<p>One Bill, Triple Play</p> 	<p>One Device, 1000s of Apps</p> 	<p>One Ecosystem, 10s of Screens</p> 
Focal Point	Network	Device	Ecosystems
Compete Based On	Price of Service	Number of Apps	Experience Roaming

[Grafik: Detecon, Daniel Kellmerit, 2014]





[Grafik: Detecon, Daniel Kellmerit, 2014]

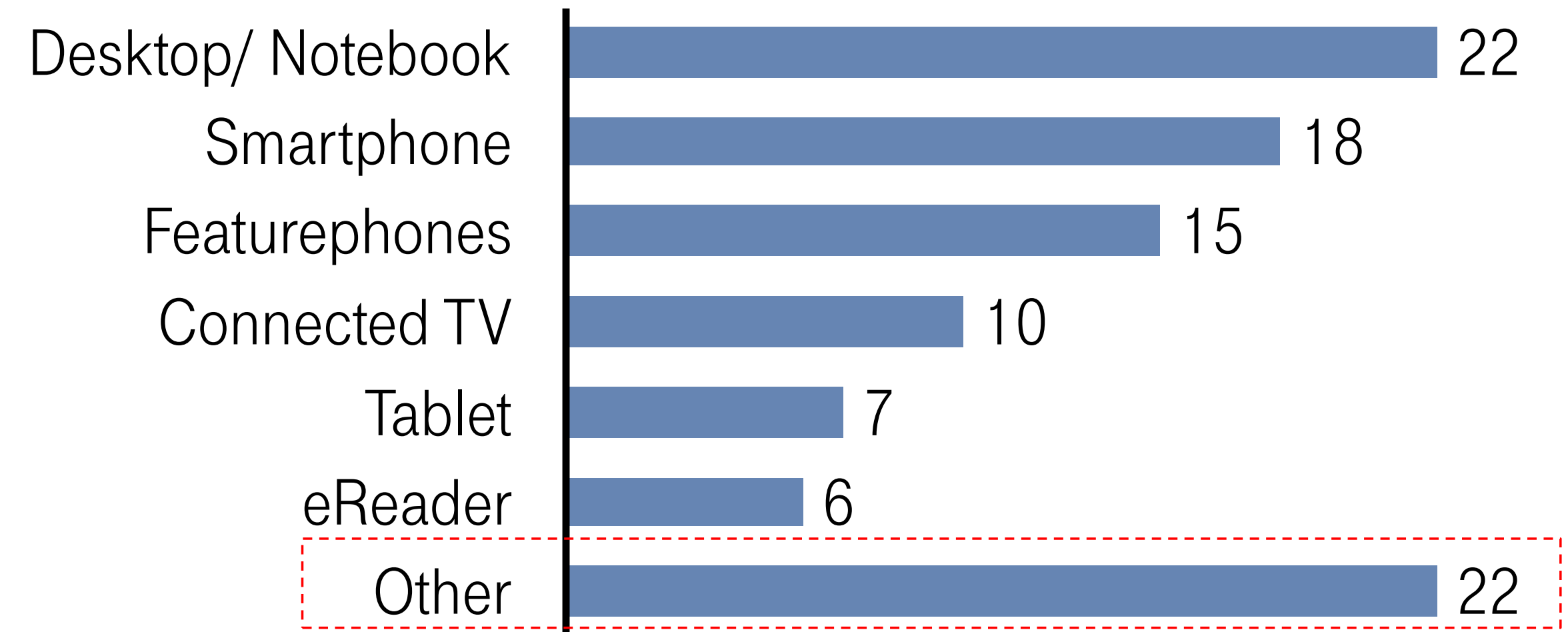
## Bluetooth

~2B Bluetooth-Enabled Devices Shipped globally in 2012E, Up 87X in 10 Years

## Wi-Fi

~1.5B WI-Fi Enabled Devices Shipped Globally in 2012E, Up 5X in 4 Years

## Connected devices in the United States in 2012, by device type



■ % of Connected Devices in US (Q3'12)

nest™



## Vacation & Real Estate Sharing



## Car Sharing



## Skill Sharing & Micro Jobs



## Everything & Anything

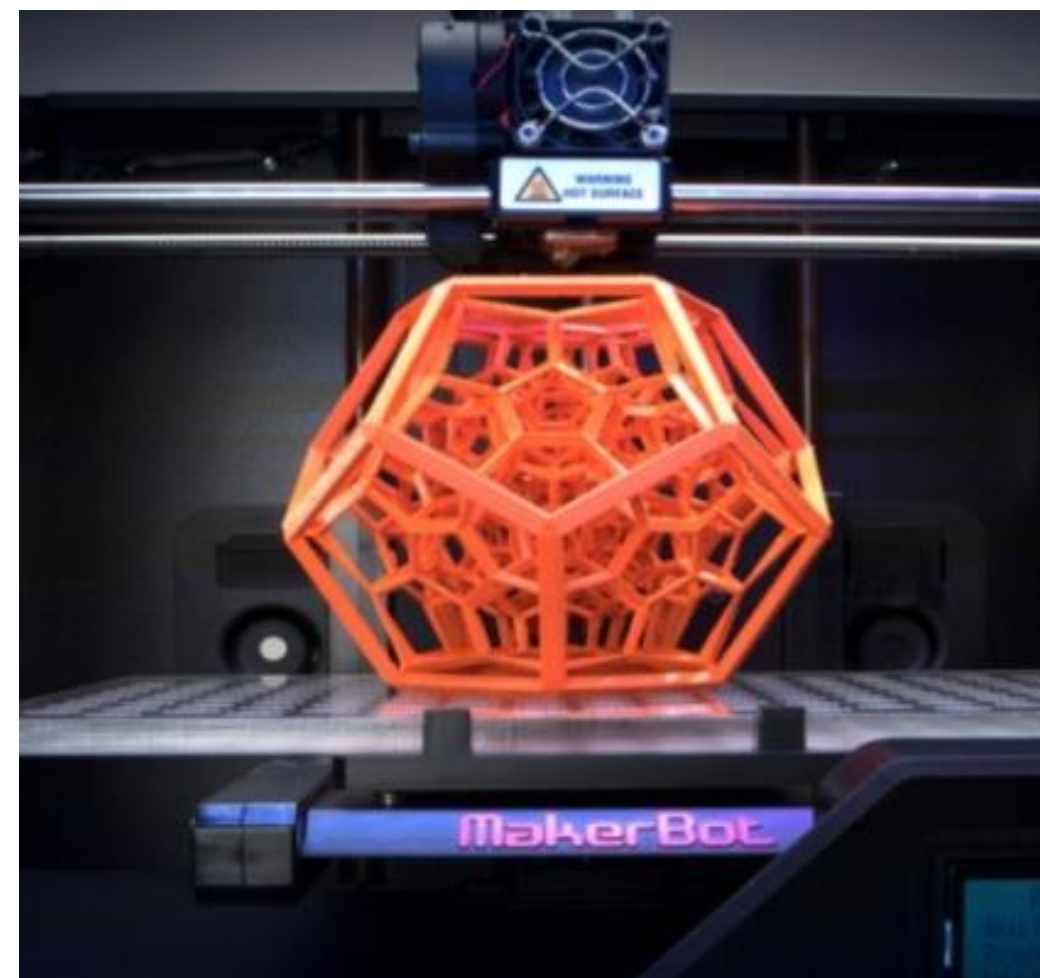


[Grafik: Detecon Analysis, Daniel Kellmereit, 2012]

## Personal Drones



## 3D printing in The Home



## Build your own Gadget



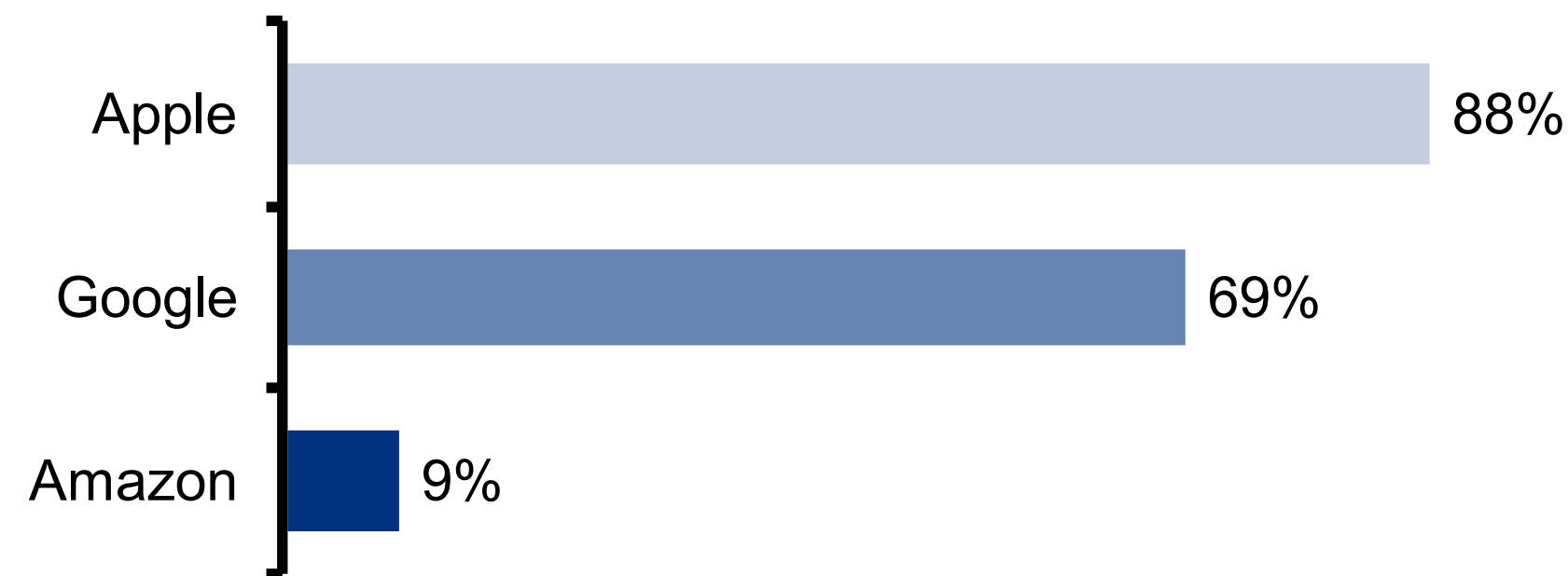
## Disruptive AI



[Grafik: Detecon Analysis, Daniel Kellmereit, 2012]

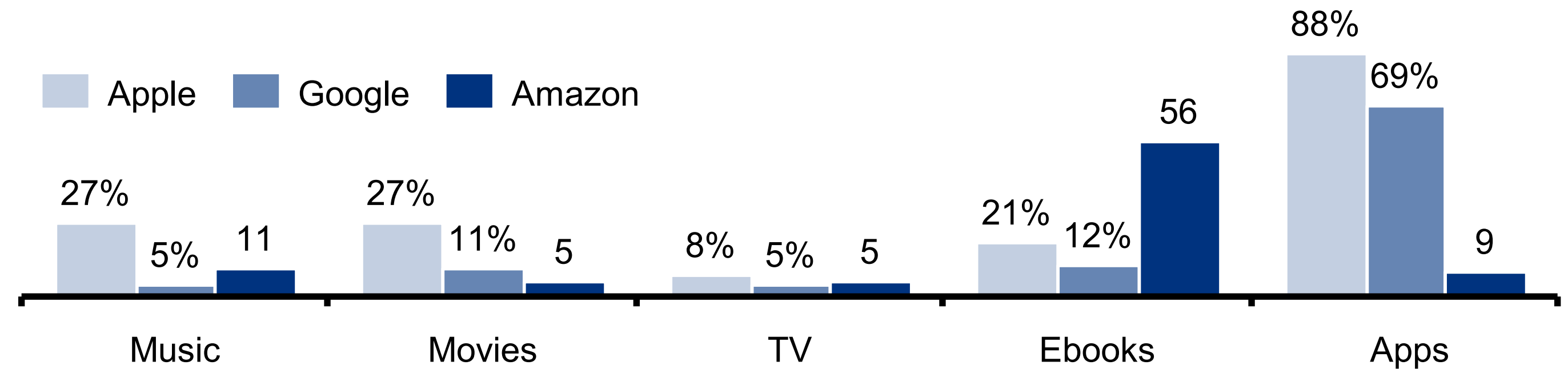


**Access to World Population**  
(% of World Population)



Source: Macstories 2012

**Access to World Population by Type of Service**  
(% of World Population)

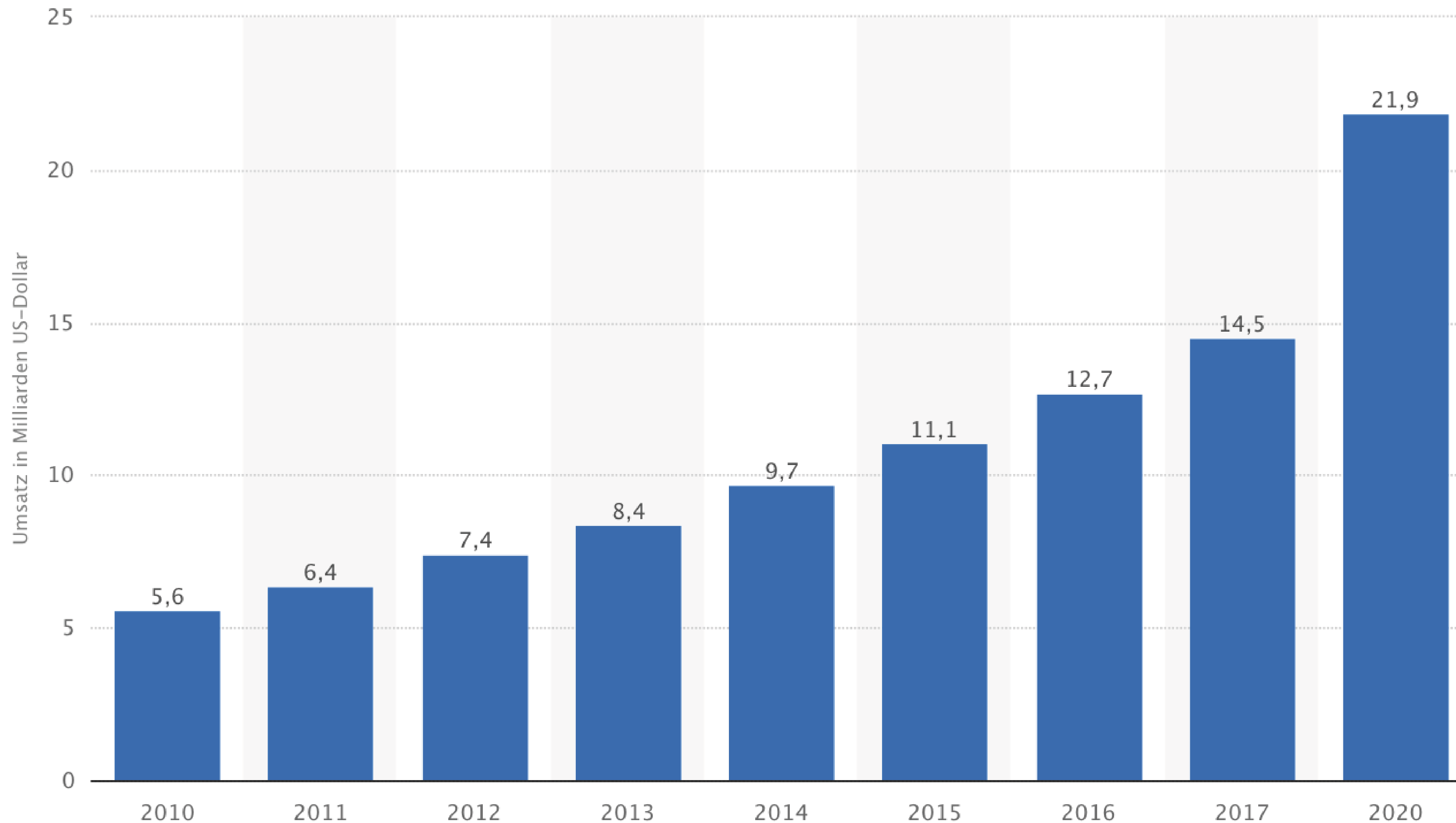


Player	Cloud Services	Connected Devices	Sales Channels and Billing	On-demand content	Value-add Services	Targeted Advertising
	●	●	●	●	●	●
	●	●	●	●	●	●
	●	●	●	●	●	●

Source: Detecon Analysis (2012)

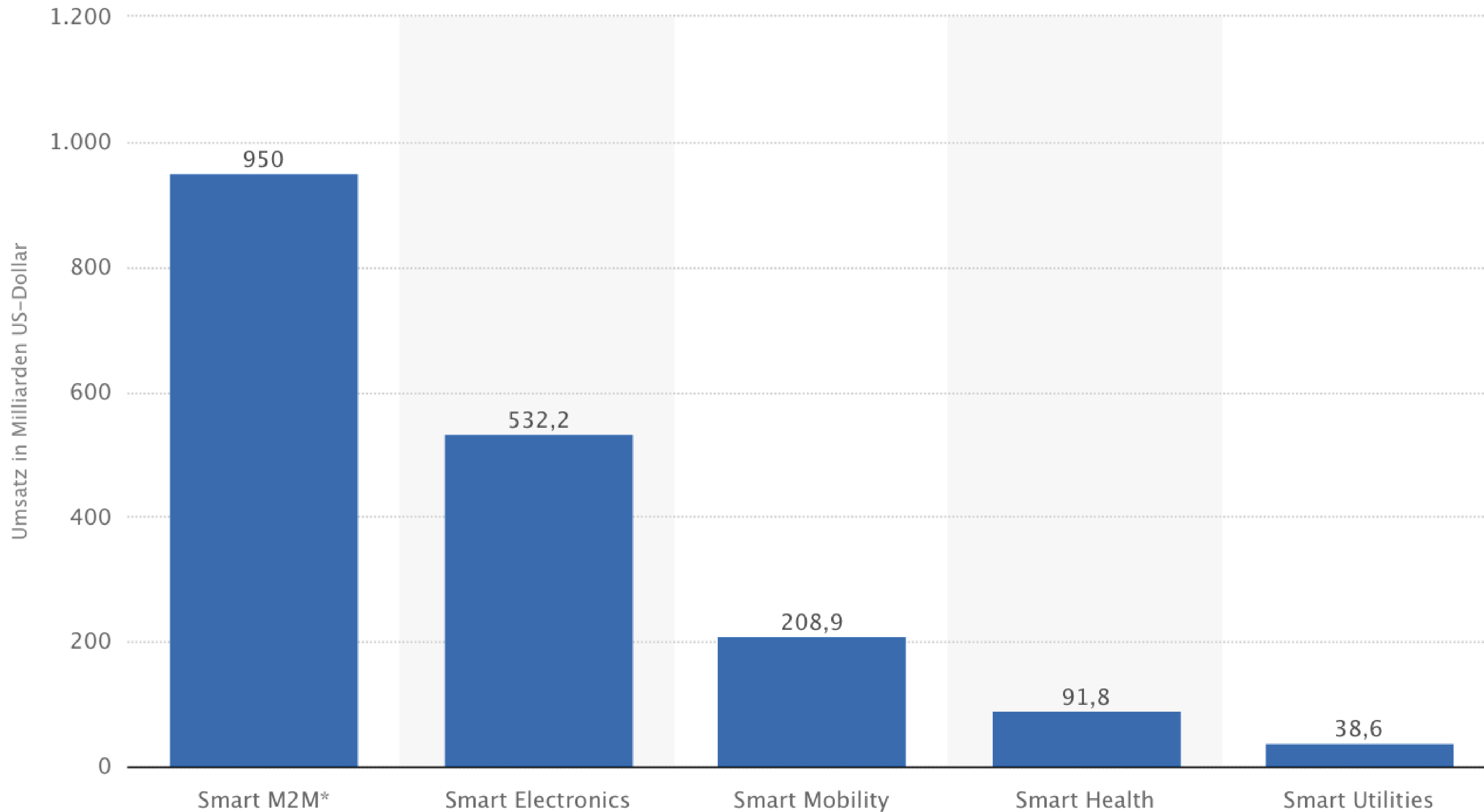


# Prognose zum weltweiten Umsatz mit RFID-Transpondern



*University of Jyväskylä.  
Internet-of-Things  
Market, Value  
Networks, and  
Business Models: State  
of the Art Report 2013,  
p 16, via statista*

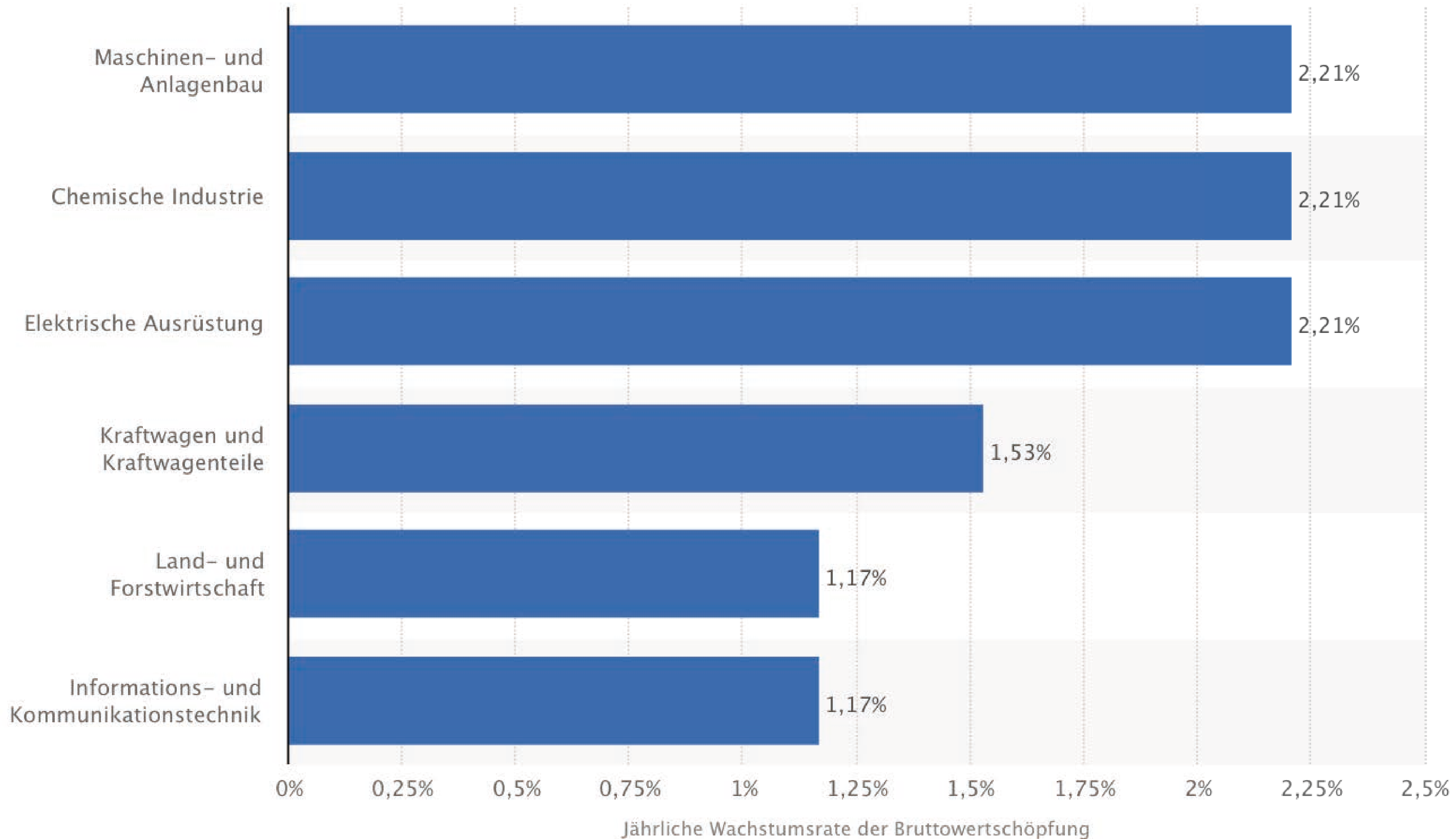
# Prognose zum weltweiten Umsatz mit vernetzten Geräten nach Sektor im Jahr 2020



*University of Jyväskylä.  
Internet-of-Things  
Market, Value  
Networks, and  
Business Models: State  
of the Art Report 2013,  
p 16, via statista*

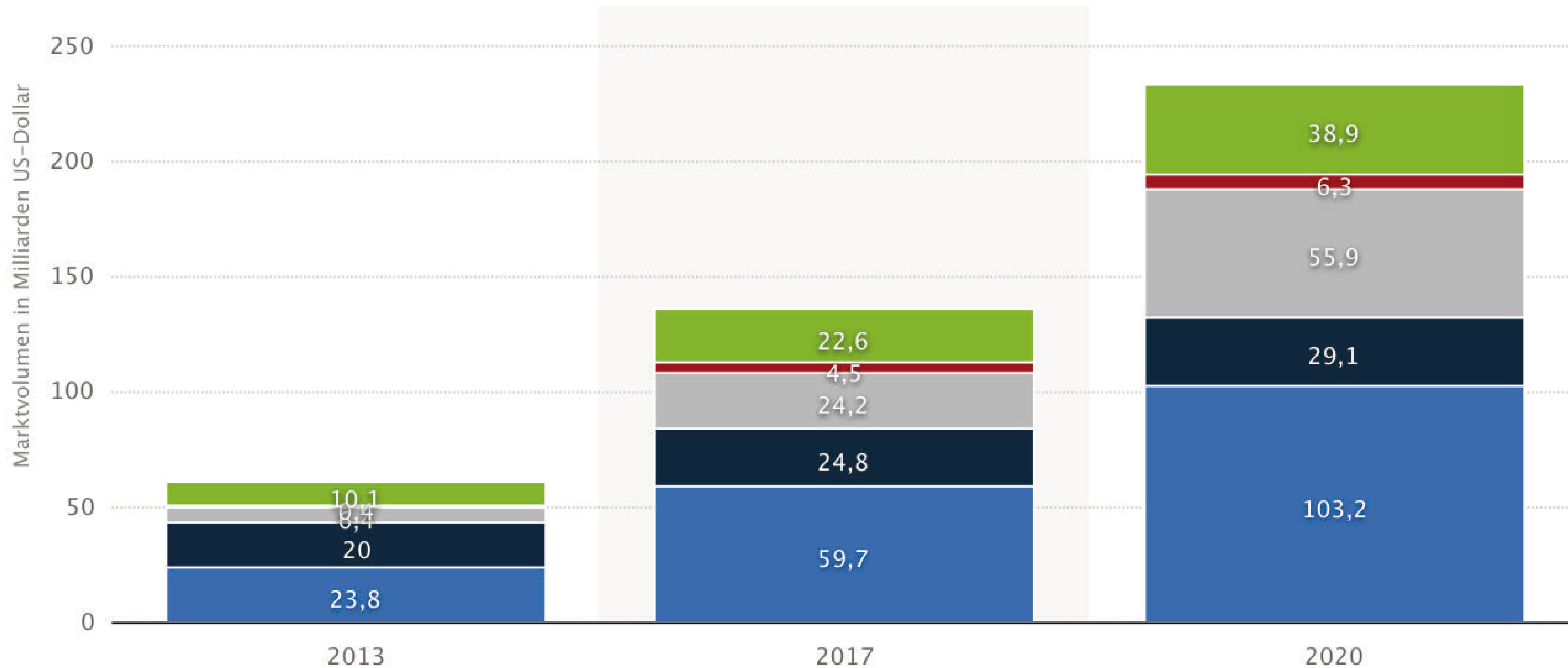


# Jährliche Steigerungsrate der Bruttowertschöpfung durch Industrie 4.0 in Deutschland, 2013 bis 2025



[BITKOM; Fraunhofer IAO: Industrie 4.0 - Volkswirtschaftliches Potenzial für Deutschland, Seite 36, April 2014 via statista]

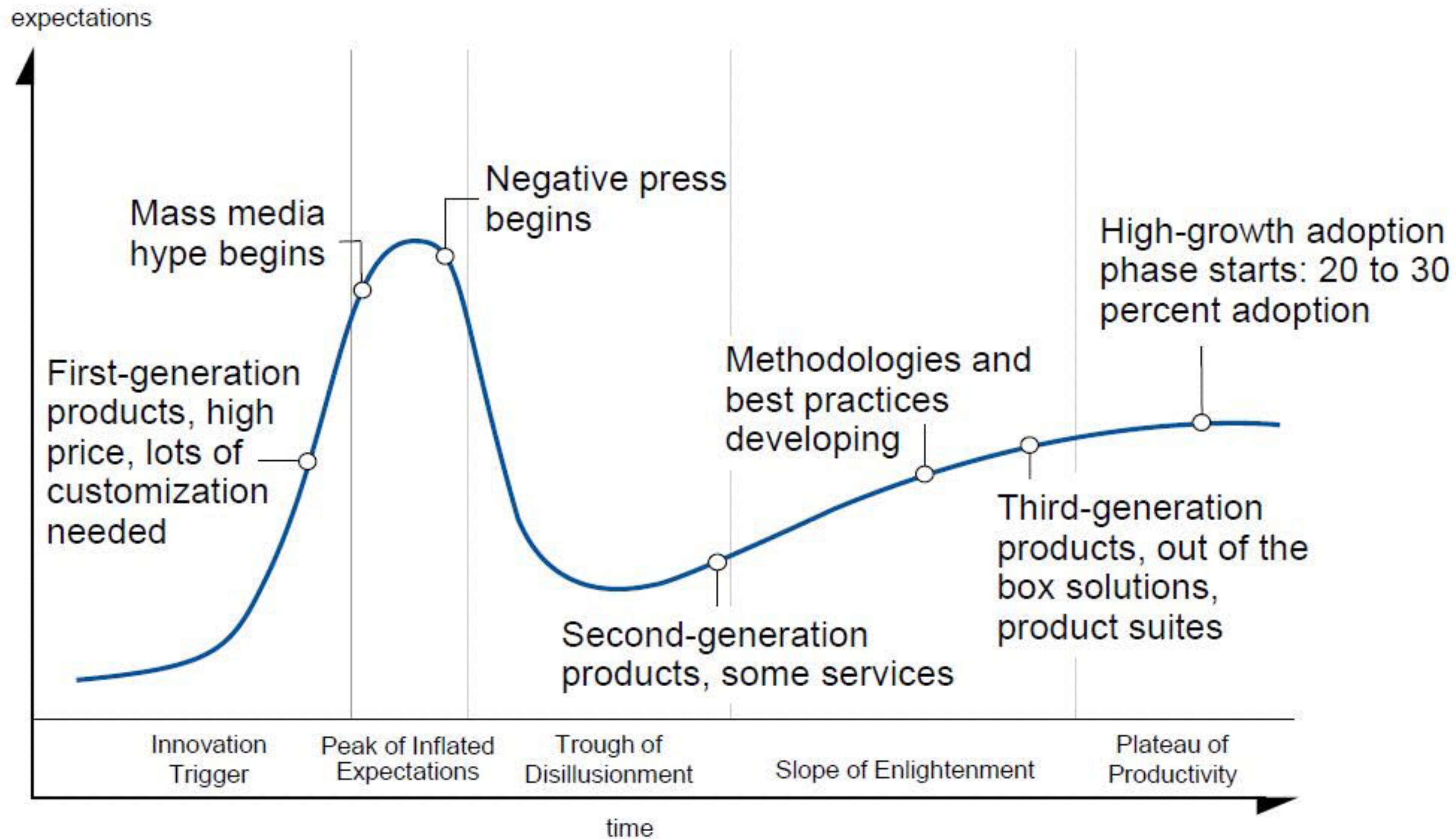
# Umsatzprognose zum weltweiten digitalen Gesundheitsmarkt



■ Wireless Health 
 ■ EHR/EMR 
 ■ Mobile Health 
 ■ Telehealth 
 ■ Andere

*[Arthur D. Little: Succeeding with Digital Health - Winning Offerings and Digital Transformation, p. 4, 7/2014 via statista]*

# The Hype Cycle of Innovation



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**Gartner**

*Gartner's Hype Cycle for Emerging Technologies: Gartner 2013*



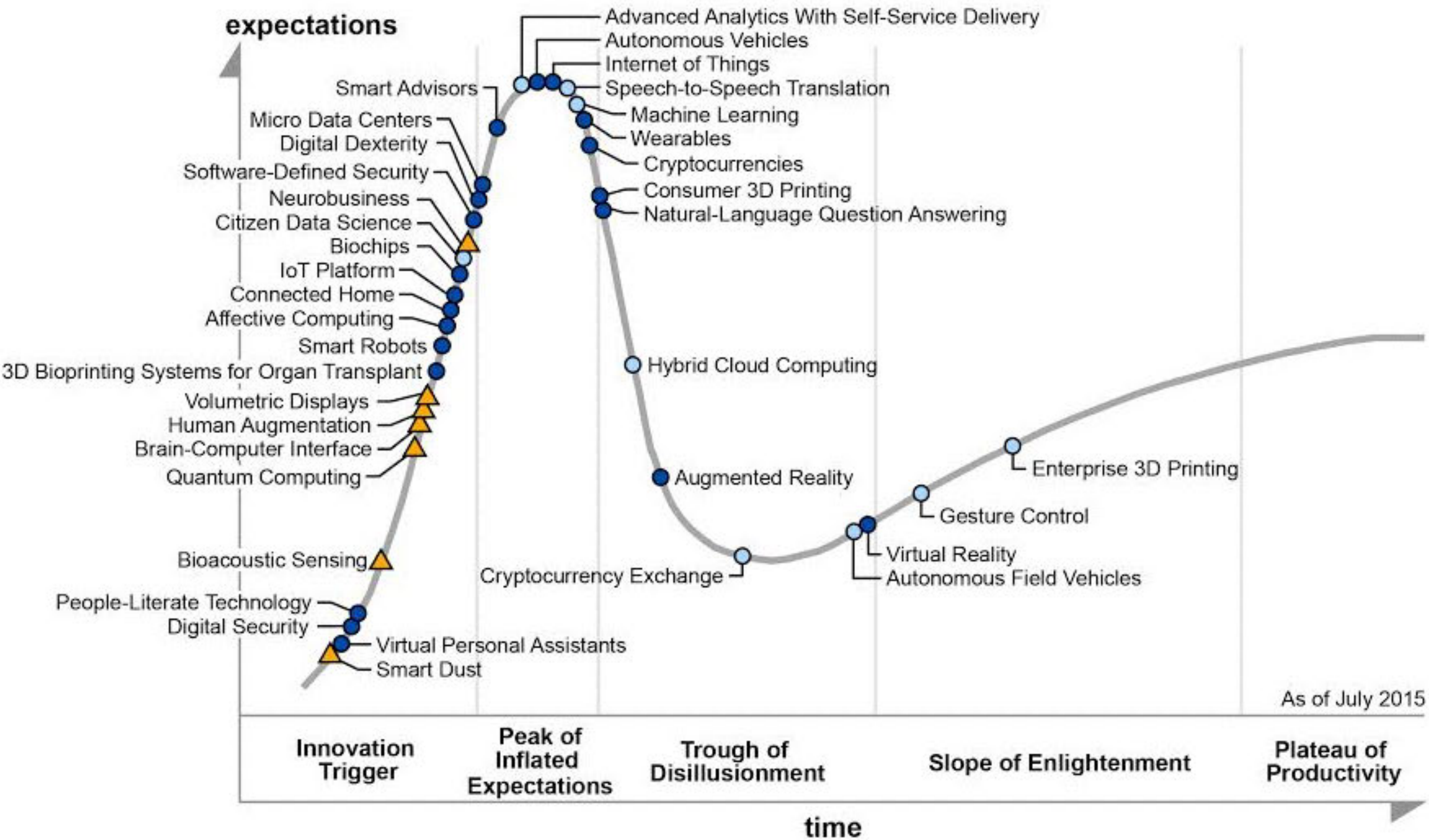
28/10  
2015

ICT & Sustainability

Michael A. Herzog

ICT & Economic Context • Gartner Hype Cycle

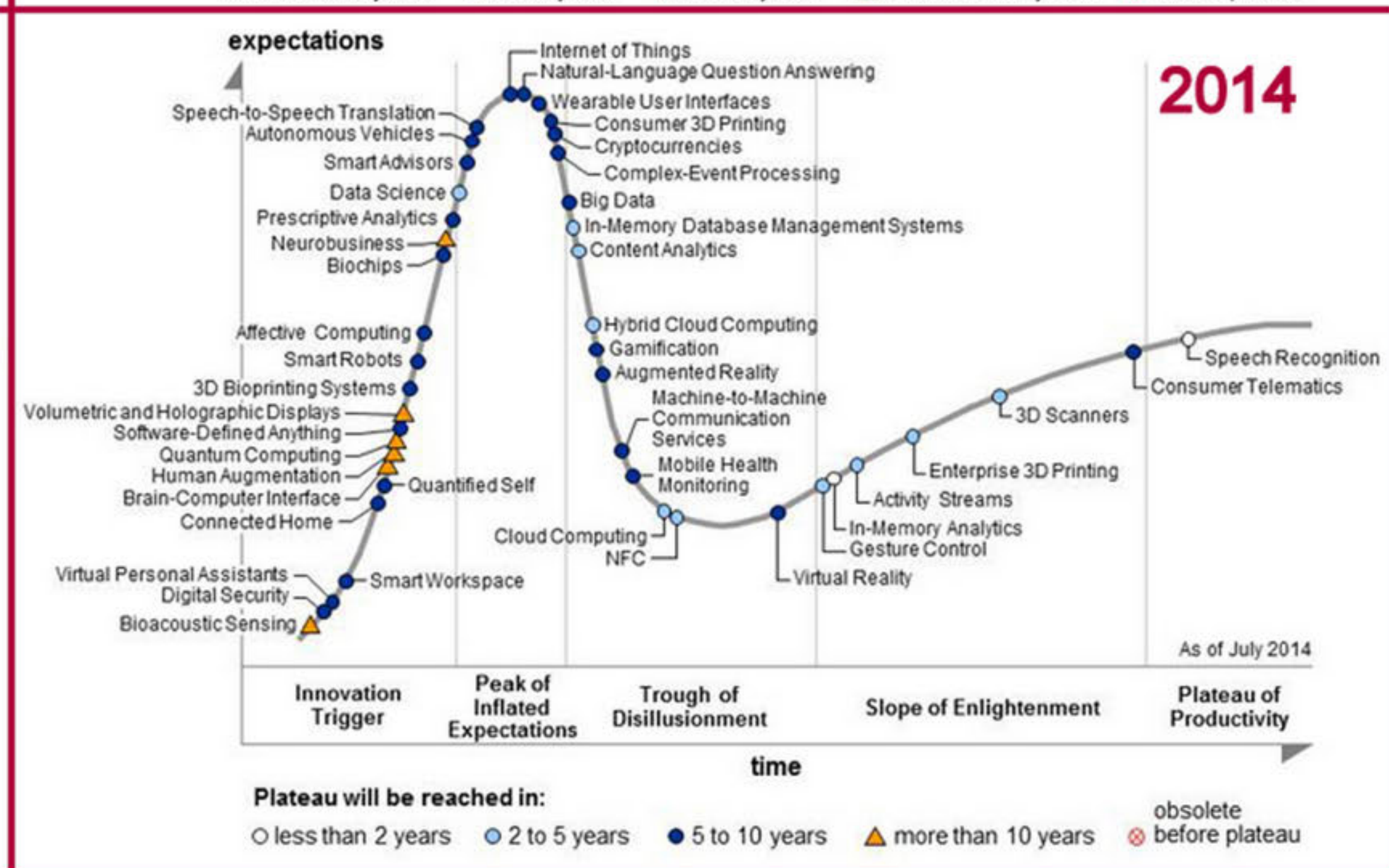
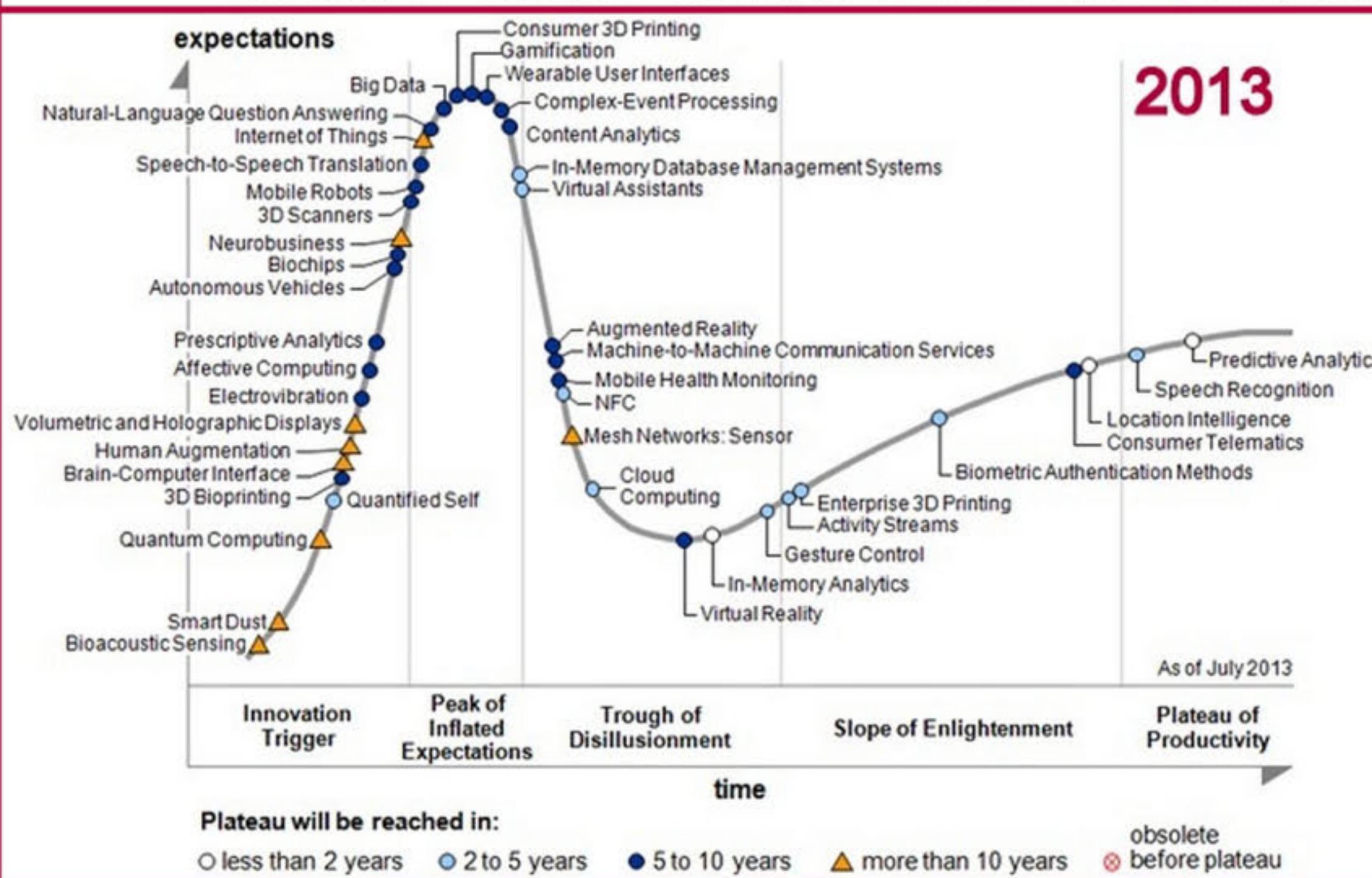
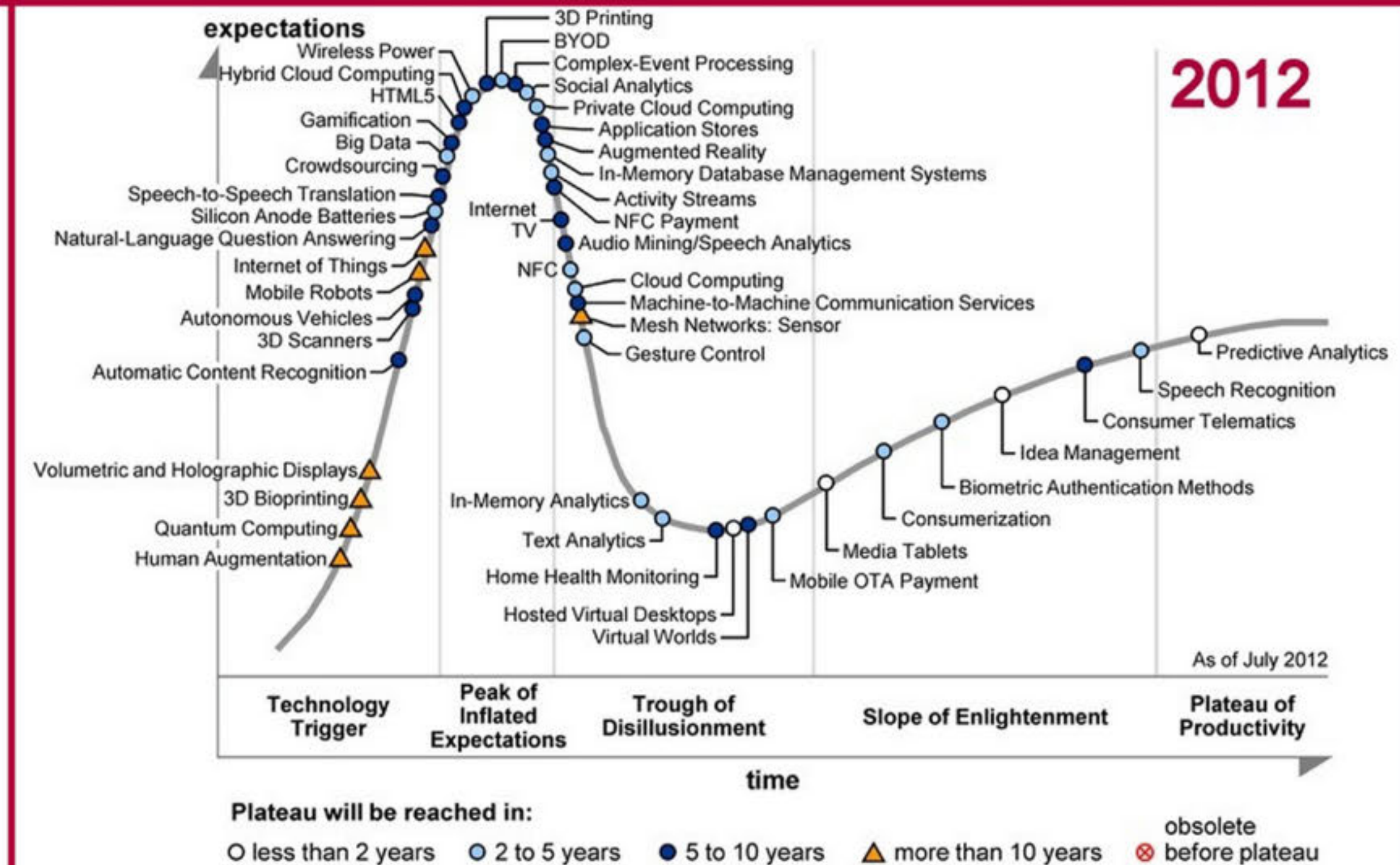
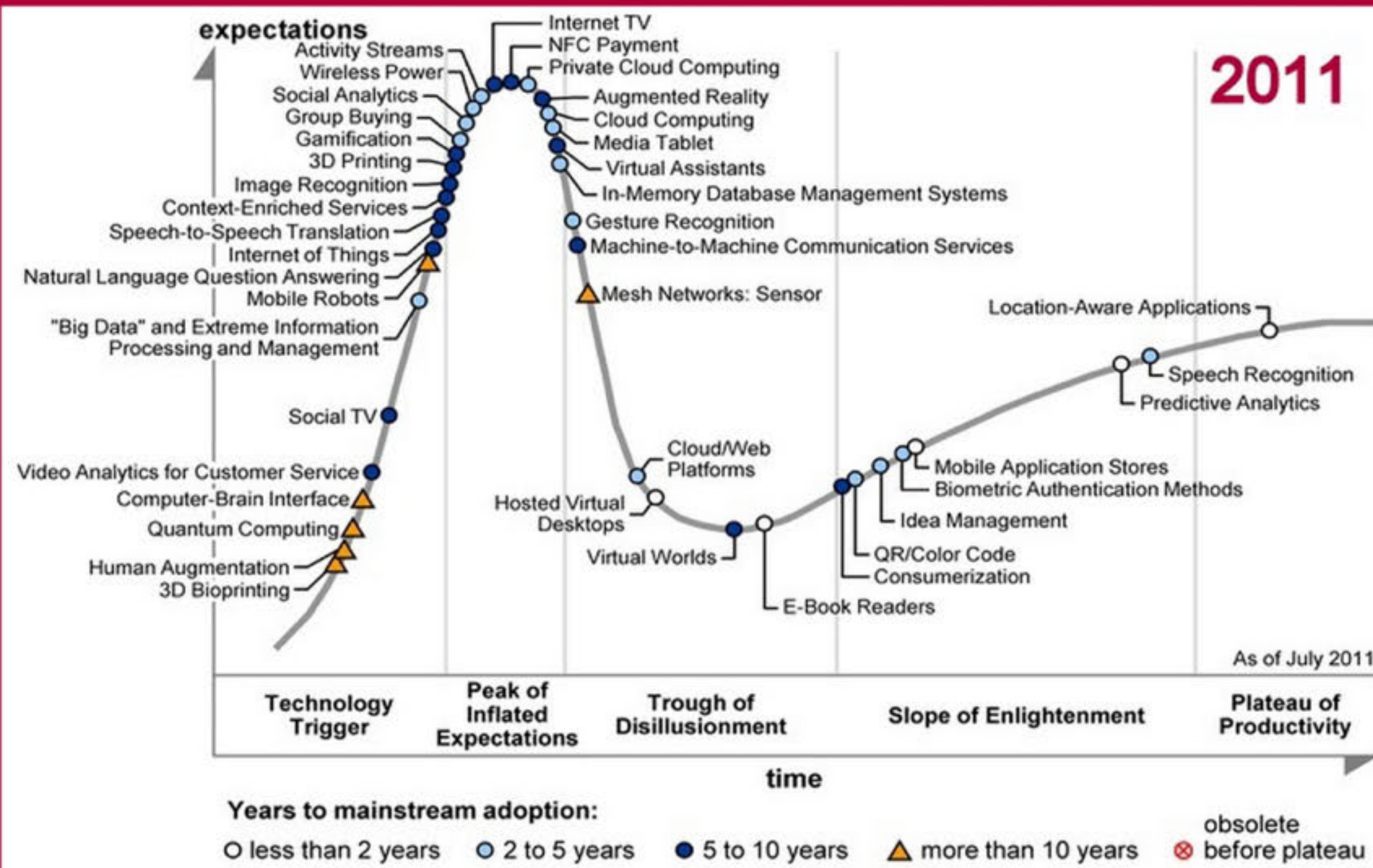
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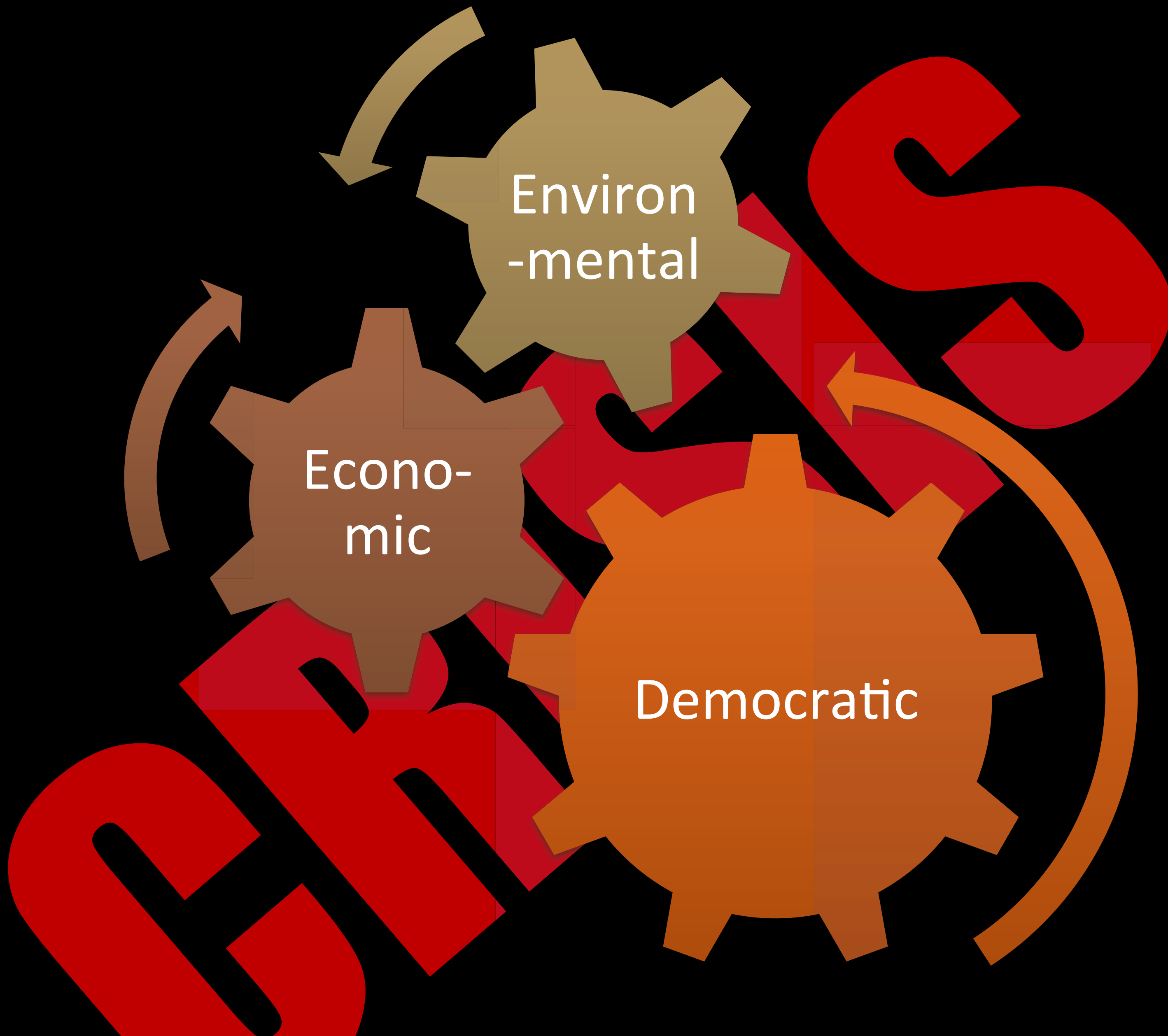
As of July 2015

**Plateau will be reached in:**  
 ○ less than 2 years    ○ 2 to 5 years    ● 5 to 10 years    ▲ more than 10 years    ⊗ obsolete before plateau

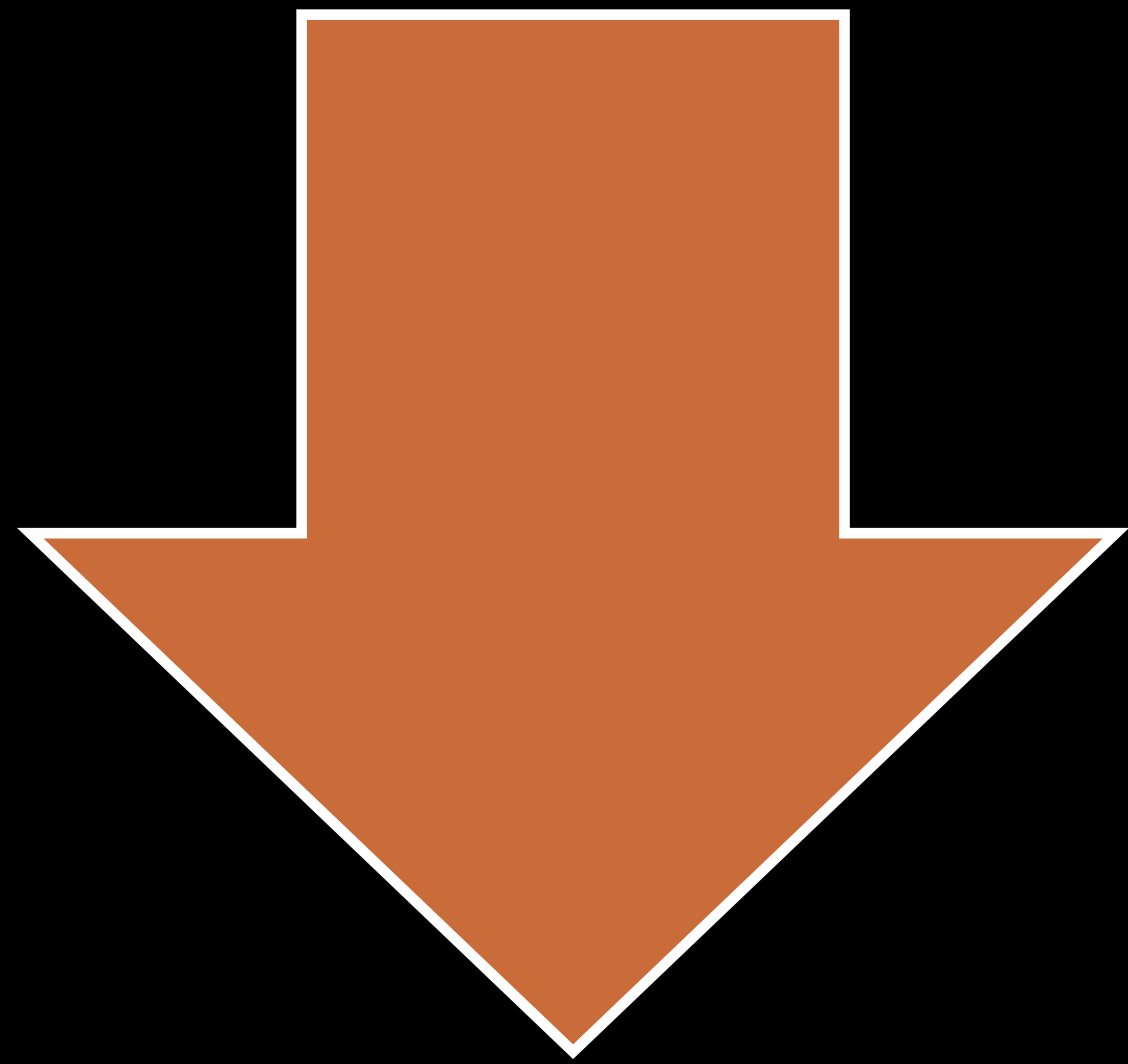
*Gartner's Hype Cycle for Emerging Technologies. Sources: Gartner 2015*



Gartner's Hype Cycle for Emerging Technologies, 2011-2014.  
 Sources: Gartner 2014

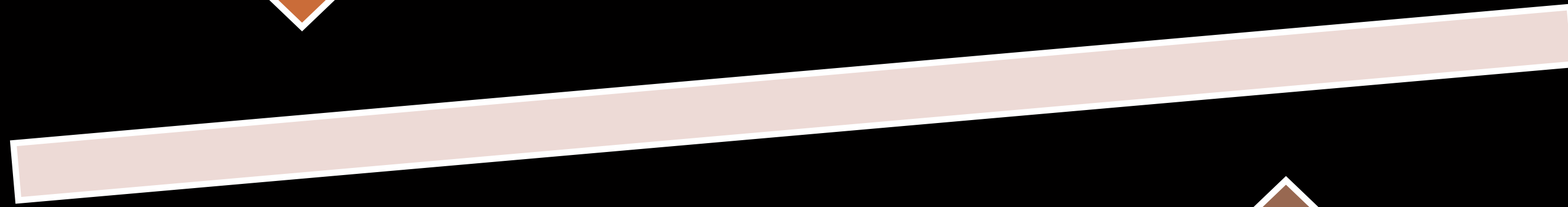


[Jesse Marsh: think virtually local ecologies of new economic models. EcoCom, 08/11/2013, Berlin, Germany]



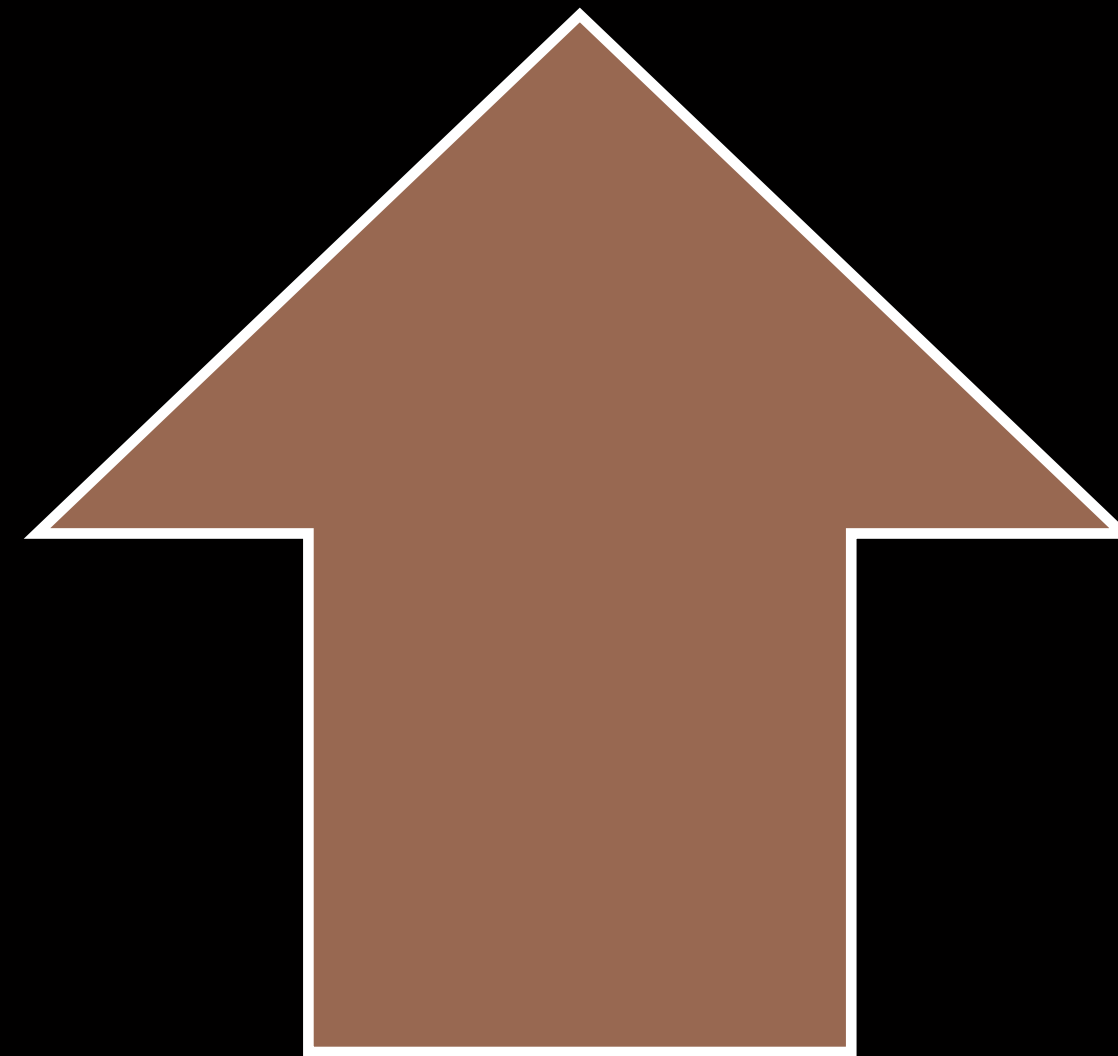
## Macro

- Globalisation
- Financialisation
- Growth imperative



## Micro

- Local economies
- De-monetisation
- Survival



[Jesse Marsh: think virtually local ecologies of new economic models. EcoCom, 08/11/2013, Berlin, Germany]

## Traditional business

- We are competing
- Market regulations

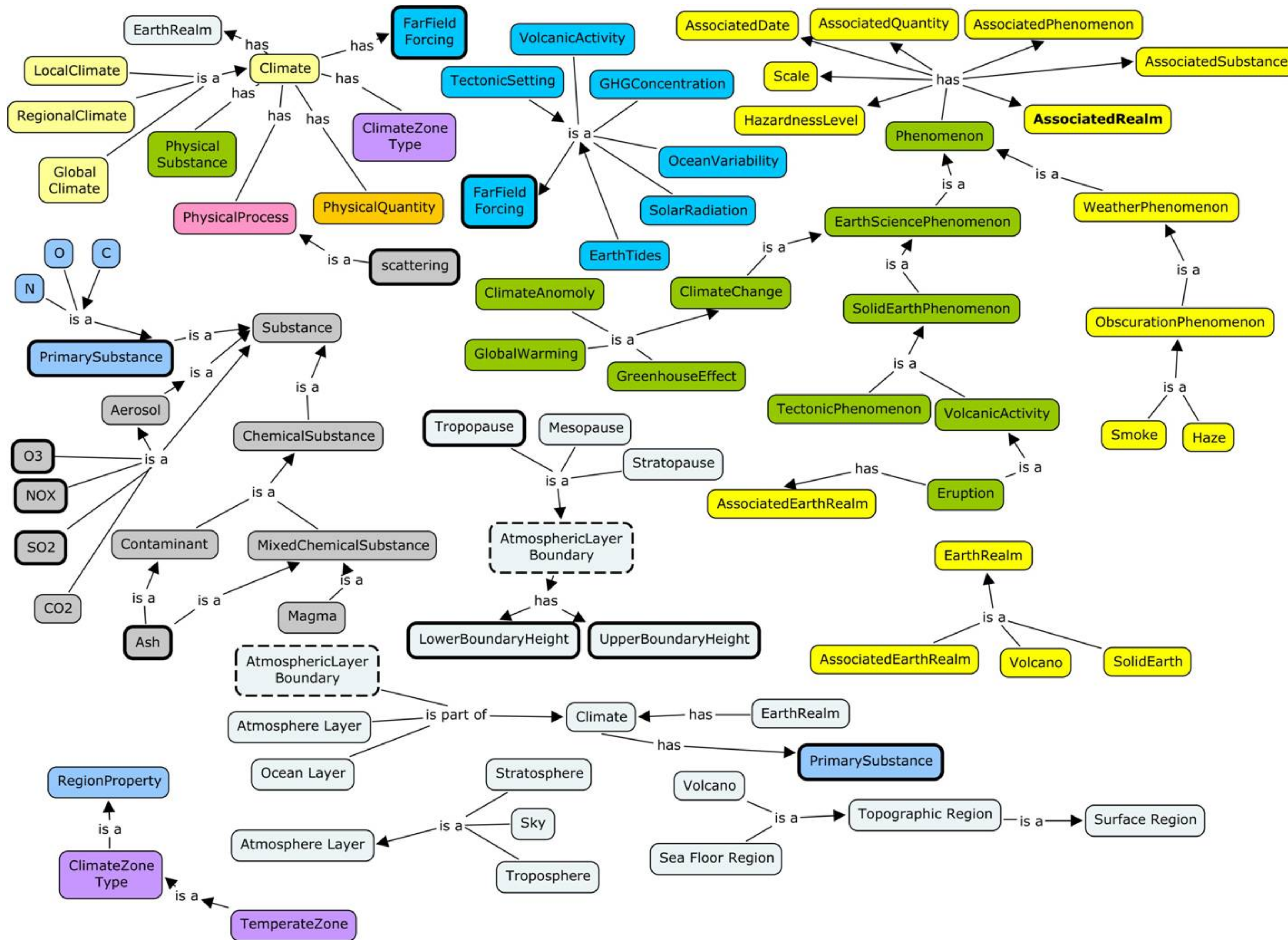
## Emergent ecosystems

- We are collaborating
- Ethical principles

[Jesse Marsh: think virtually local ecologies of new economic models. EcoCom, 08/11/2013, Berlin, Germany]

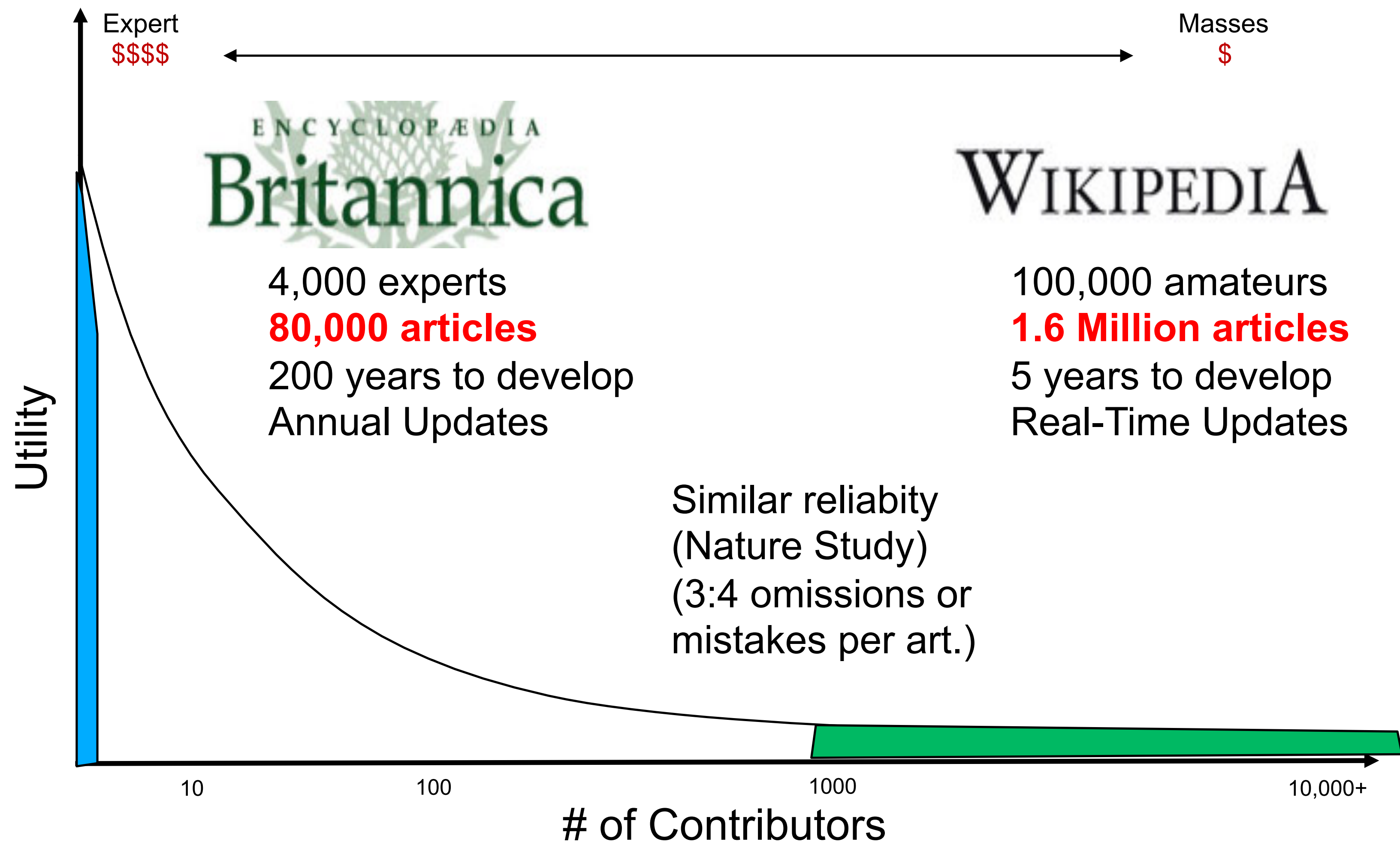


# ICT codifies knowledge to manage it



[Jesse Marsh: think virtually local ecologies of new economic models. EcoCom, 08/11/2013, Berlin, Germany]

# Economics vs. Wikinomics



Nature, 2005. Cited in: Cook (2008): The Contribution Revolution, HBR, Oct 2008, pp. 63

[Matthias Trier: Sociality of Online Market Interaction: Challenges and Implications. EcoCom, 08/11/2013, Berlin, Germany]

# New Market Mechanisms? The Contribution Revolution (Cook, HBR, 2008)

Users often expect things to cost 0 Money.



But they also often contribute for free.

## User Contribution Systems

Active

Passive

Aggregates content

Aggregates stuff for sale

Aggregates behavioral data

Aggregates resources

- From money payments to **new value streams** for your **business models**?  
→ **aggregating and leveraging** people's contributions or behaviors

[Matthias Trier: Sociality of Online Market Interaction: Challenges and Implications. EcoCom, 08/11/2013, Berlin, Germany]

# Different types of interactions

Fiske's unified framework of

## elementary forms of relationships

Money market vs. a social market

Pricing (Markets)

Sharing in Networks

Ranking (Authority)

[Matthias Trier: Sociality of Online Market Interaction: Challenges and Implications. EcoCom, 08/11/2013, Berlin, Germany]



## We even need to change our economic theories!

- ▶ 30% behaved selfish – but 50% cooperative
- ▶ Neural and even genetic evidence for cooperation
- ▶ „We can recognize ourselves in the story of rational self-interest”

Instead of controls, we need **NEW MODELS**  
relying on engagement, communication, identity, reputation and reciprocity

[Matthias Trier: Sociality of Online Market Interaction: Challenges and Implications. EcoCom, 08/11/2013, Berlin, Germany]

If money is the currency of the money market,  
what is the „currency“ of the „social market“?

▶ **TRUST**

[Matthias Trier: Sociality of Online  
Market Interaction: Challenges and  
Implications. EcoCom, 08/11/2013,  
Berlin, Germany]

# 3

## ICT as an Instrument for more Sustainability?

- ▶ Why it is not that easy



# Welche Nachhaltigkeitseffekte könnte die Informations- und Kommunikationstechnik erzeugen?



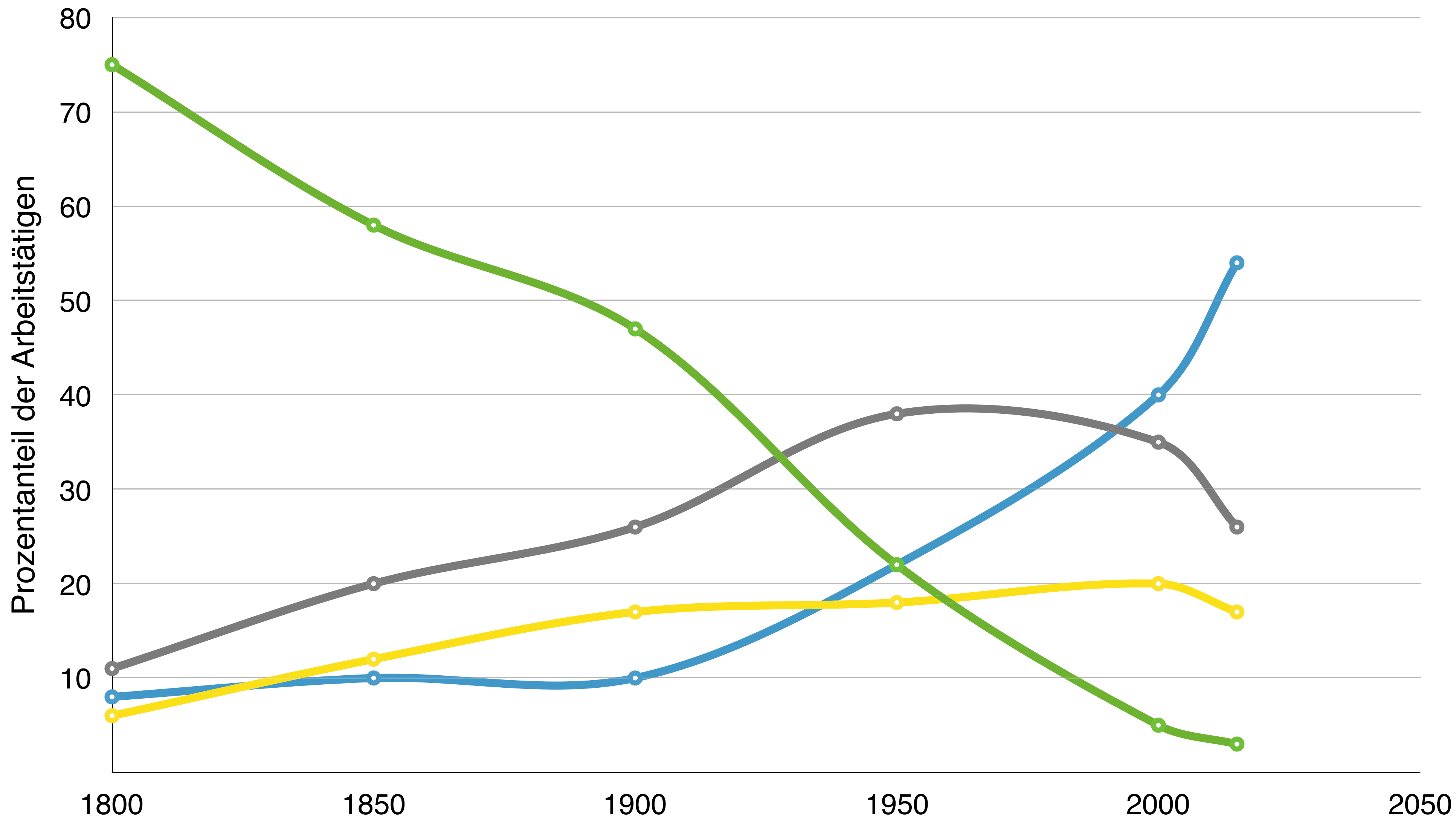
# Seit Beginn der industriellen Revolution wächst der weltweite CO<sub>2</sub>-Austoß und überschreitet 32.000 Mio. Tonnen im Jahr 2012

**Weltweite CO<sub>2</sub> Emissionen  
(in Mio. Tonnen)**



*[Arnold Picot, Stefan Hopf: ICT as an Instrument for More Sustainability: Why It Is Not That Simple. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015] GeSI (2012)*

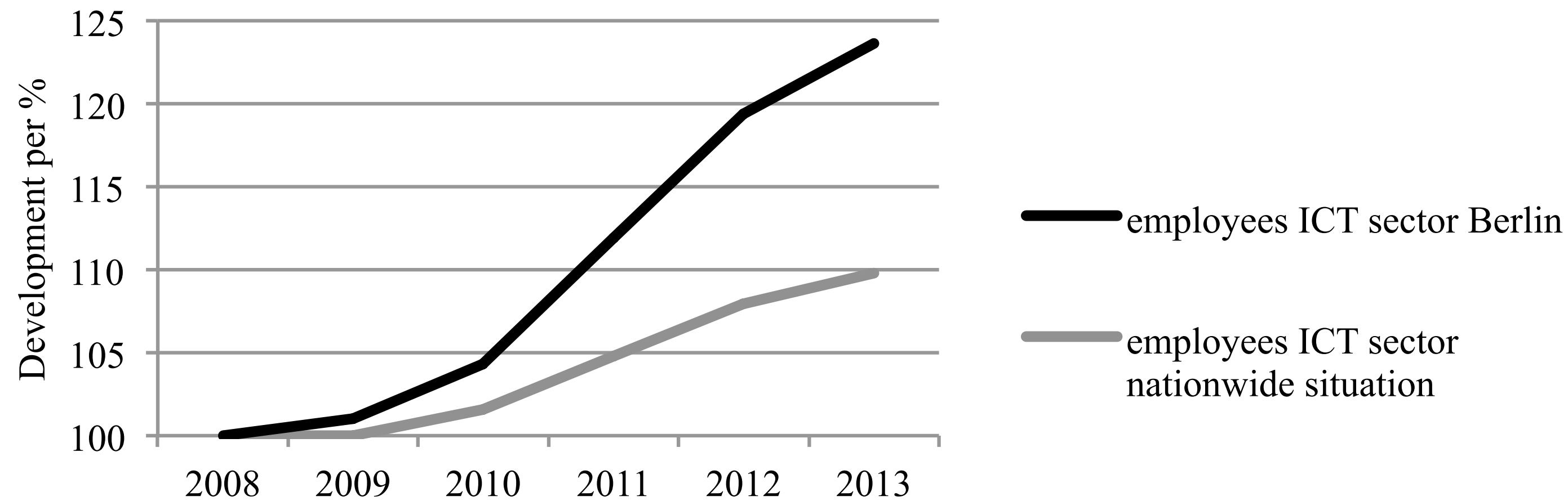
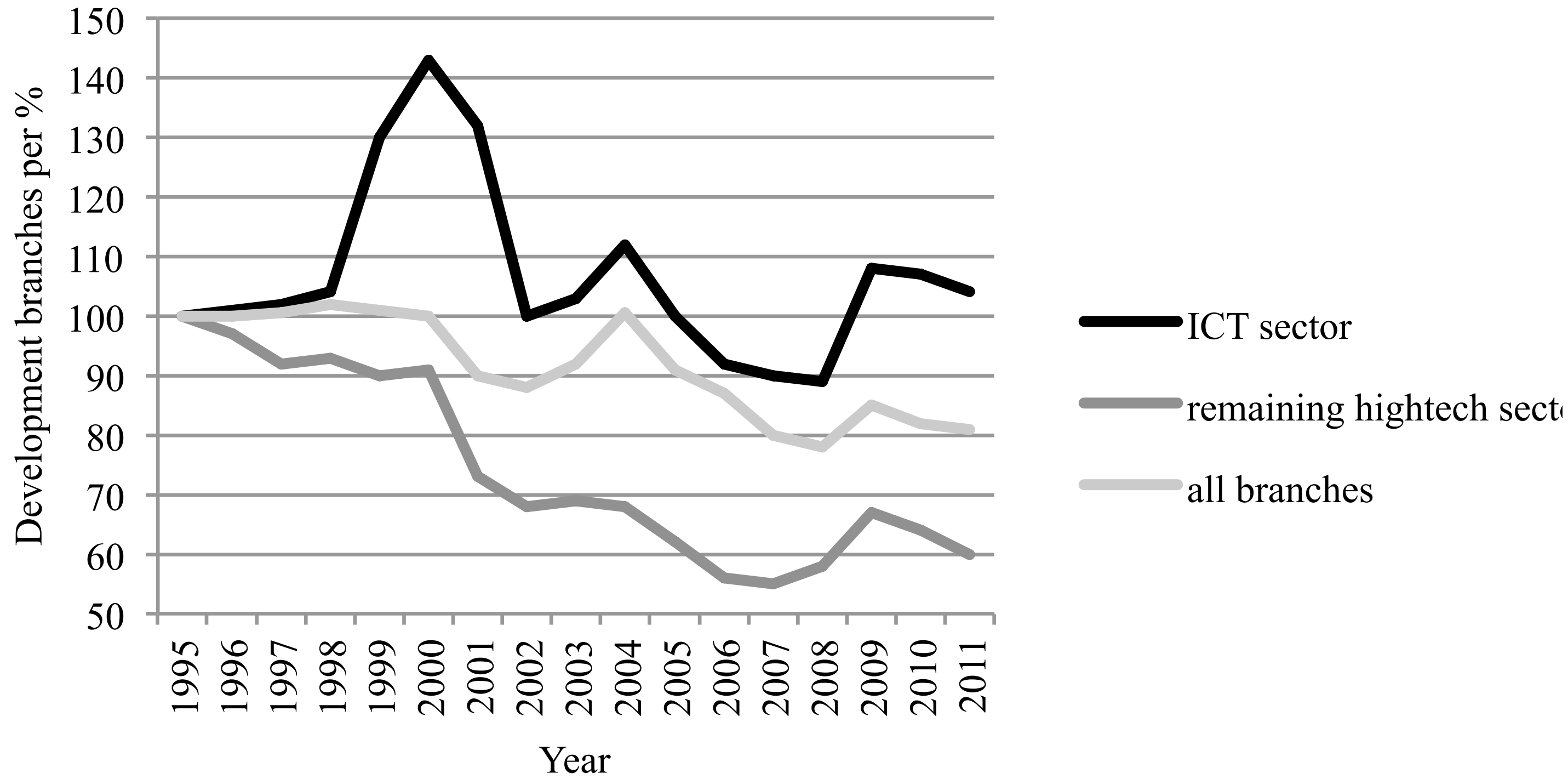
# Langfristiger Strukturwandel nach Gries



- Landwirtschaft
- Produktion
- Klassische Dienstleistung
- Informationsdienstleistung

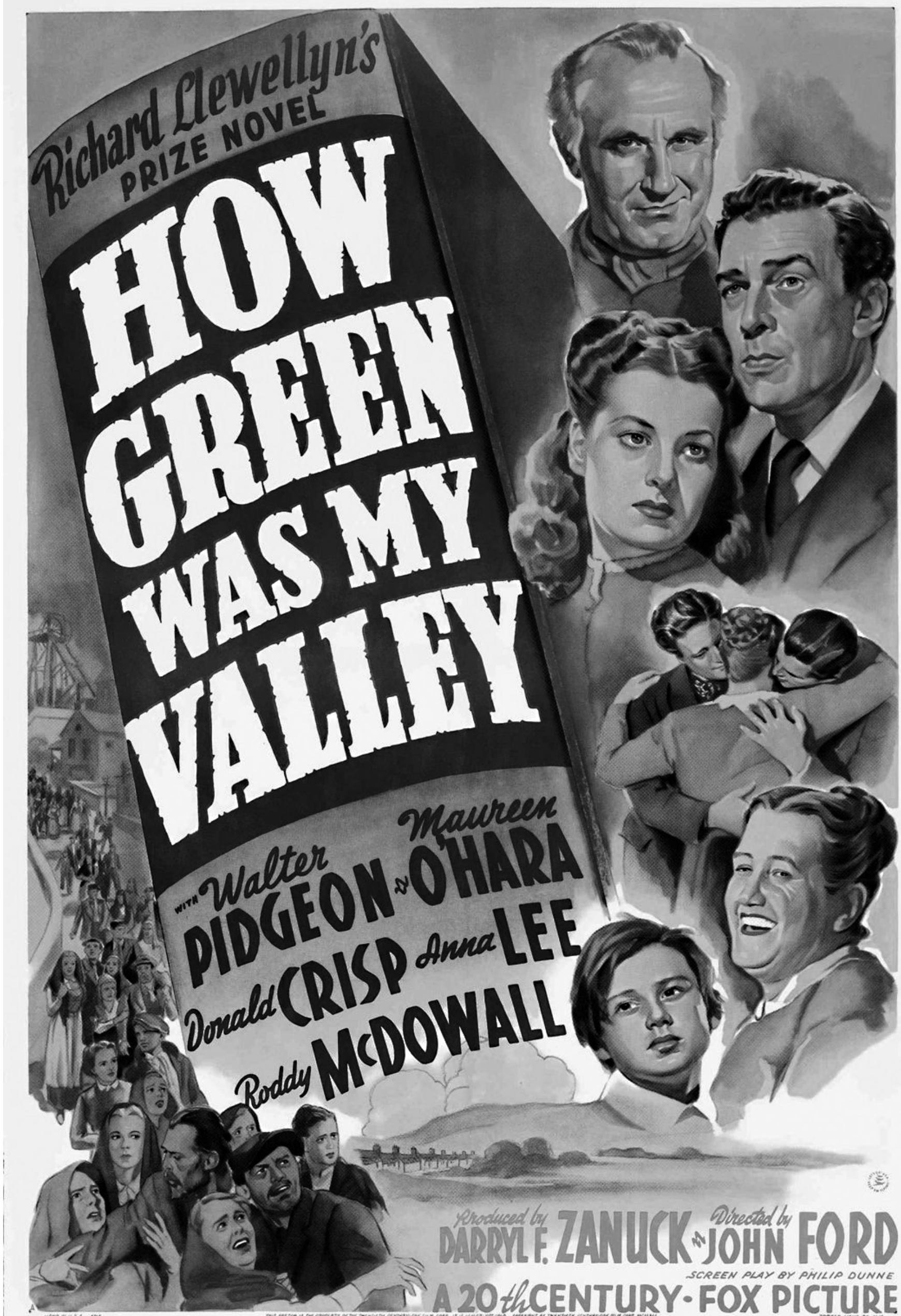
[Gries, W.: Dienstleistungen für das 21. Jh – Chancen nutzen, Risiken bewältigen. In: Bullinger, H-J. (Hrsg.): Dienstleistungen der Zukunft – Märkte, Unternehmen und Infrastrukturen im Wandel, S. 3-23, Gabler 1995]  
Ergänzt durch akkumulierte Daten des statistischen Bundesamtes vom September 2000 und September 2015

# Structure Change in Berlin area vs. Germany nationwide



*[Thomas Probian, Julia von Mandel, Michael Wiegmann ICT Sector Berlin - Paradise for Company Formations and Job Creation Machine at once. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]*





[Florian Brody: How Green is the Valley? ICT Markets Are Going Green: The Other Story from Silicon Valley. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]



28/10  
2015

ICT & Sustainability

Michael A. Herzog

60

# Wertewandel

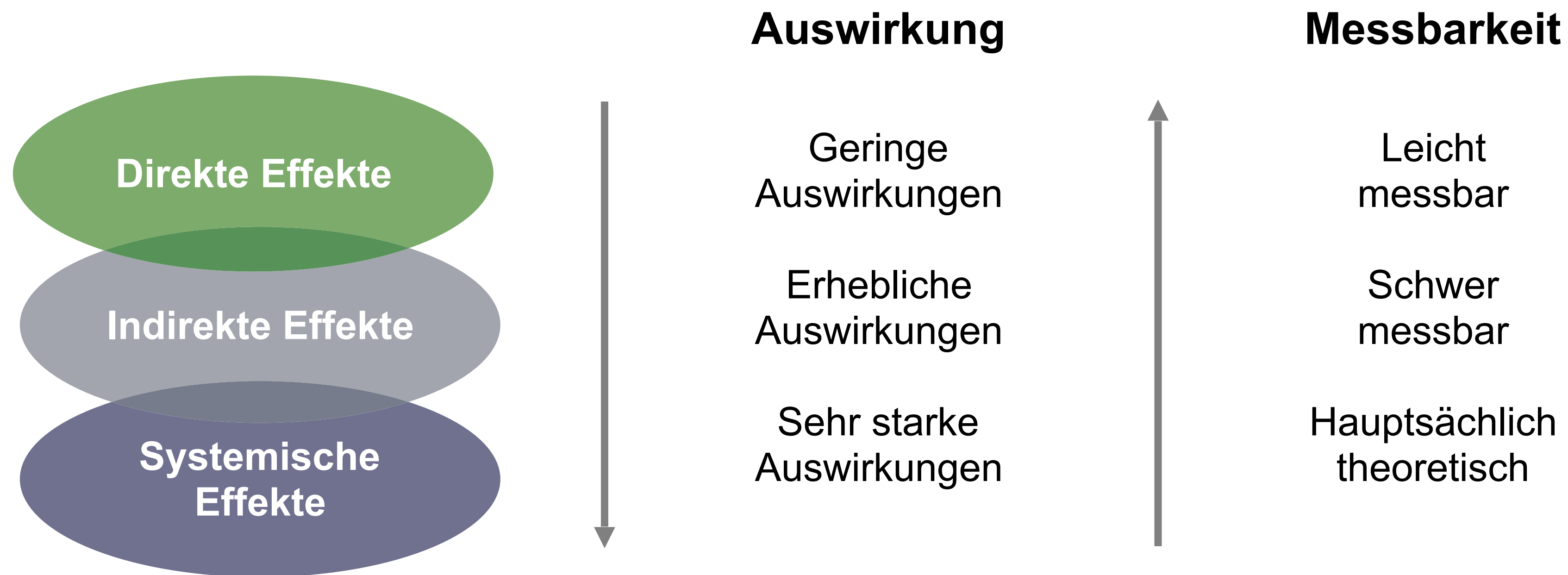


[Michael Rost 2015  
Folien Ringvorlesung:  
Mit Wachstum in die  
Katastrophe, S. 98]

# Welche Nachhaltigkeitseffekte könnte die Informations- und Kommunikationstechnik erzeugen?

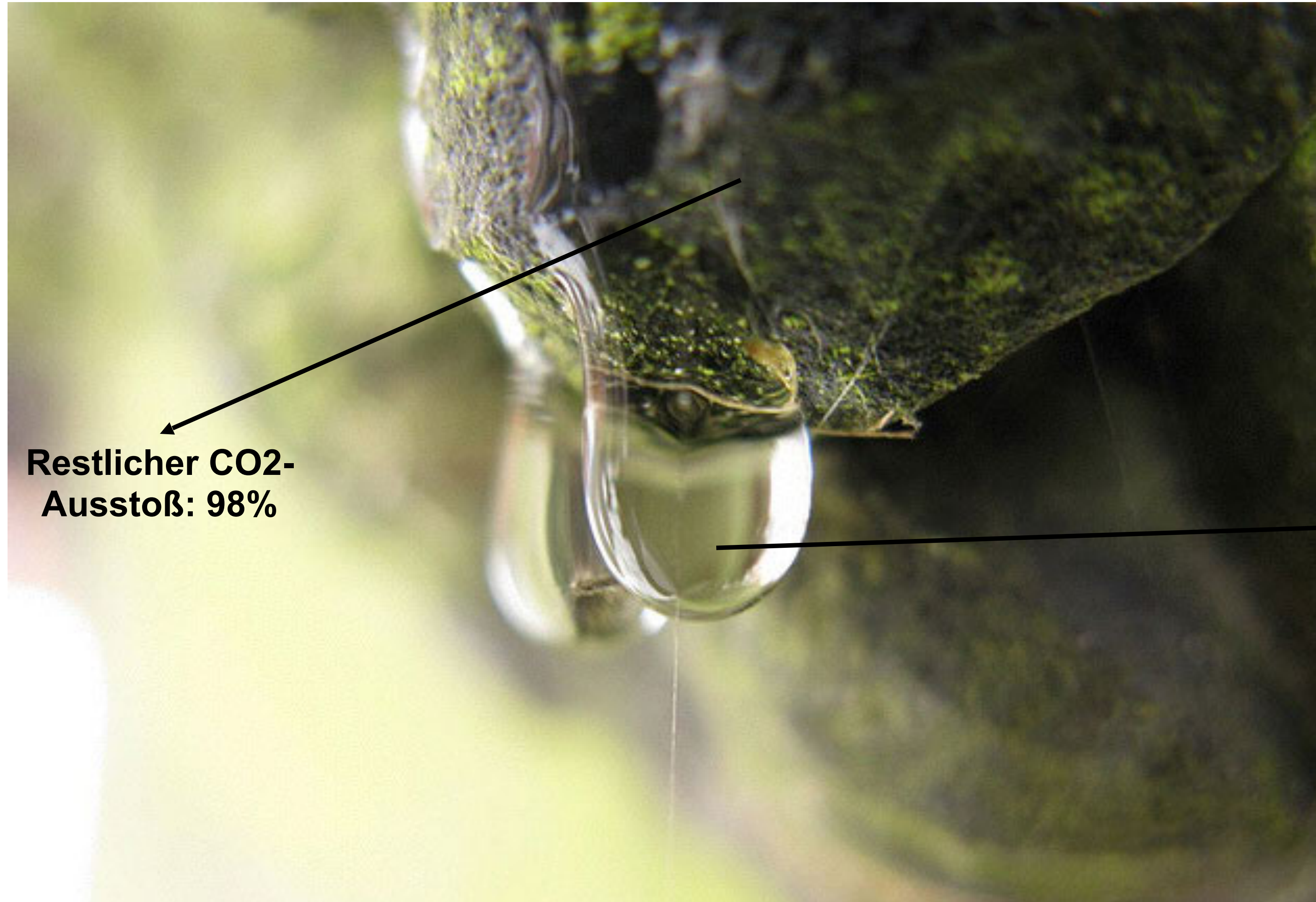
<http://pingo.upb.de/8225>

# Effekte von Informations- und Kommunikationstechnologien können anhand ihrer Auswirkungen und Messbarkeit strukturiert werden



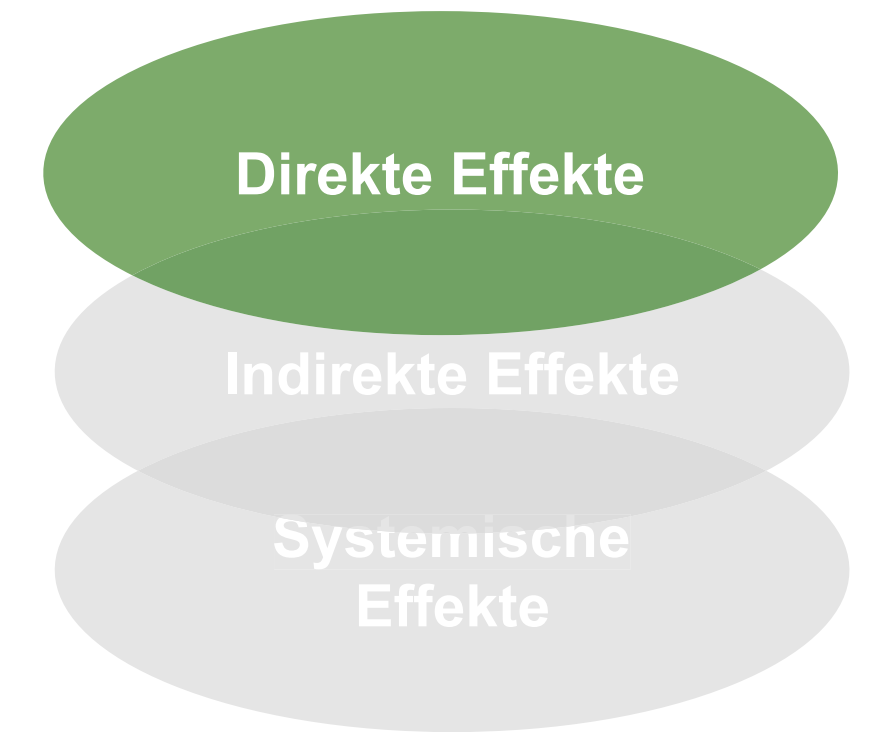
*[Arnold Picot, Stefan Hopf: ICT as an Instrument for More Sustainability: Why It Is Not That Simple. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]; Etno/WWF (2007)*

# Der Anteil von Informations- und Kommunikationstechnologien am gesamten CO<sub>2</sub>-Ausstoß beträgt ca. 2%



**Restlicher CO<sub>2</sub>-Ausstoß: 98%**

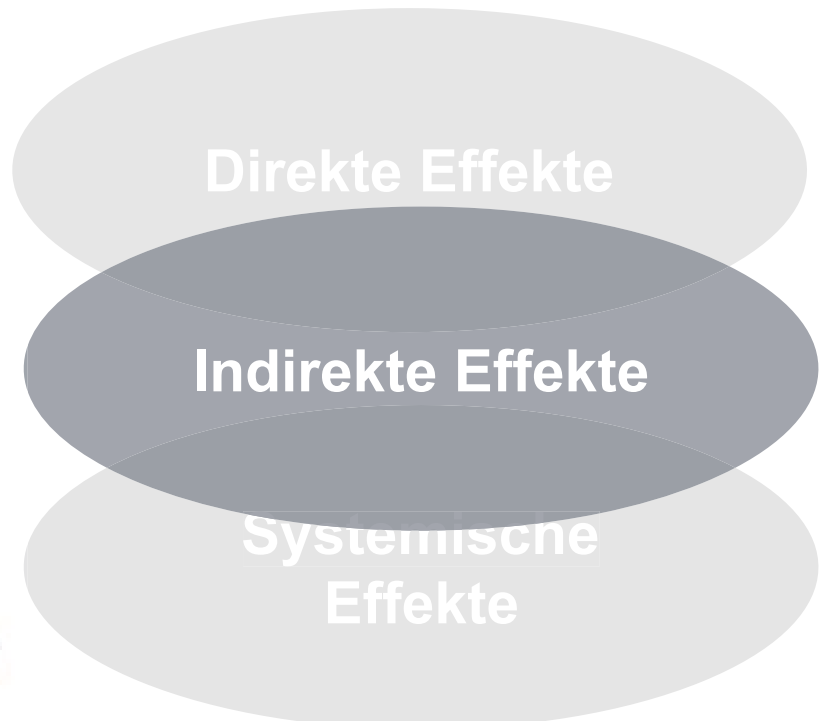
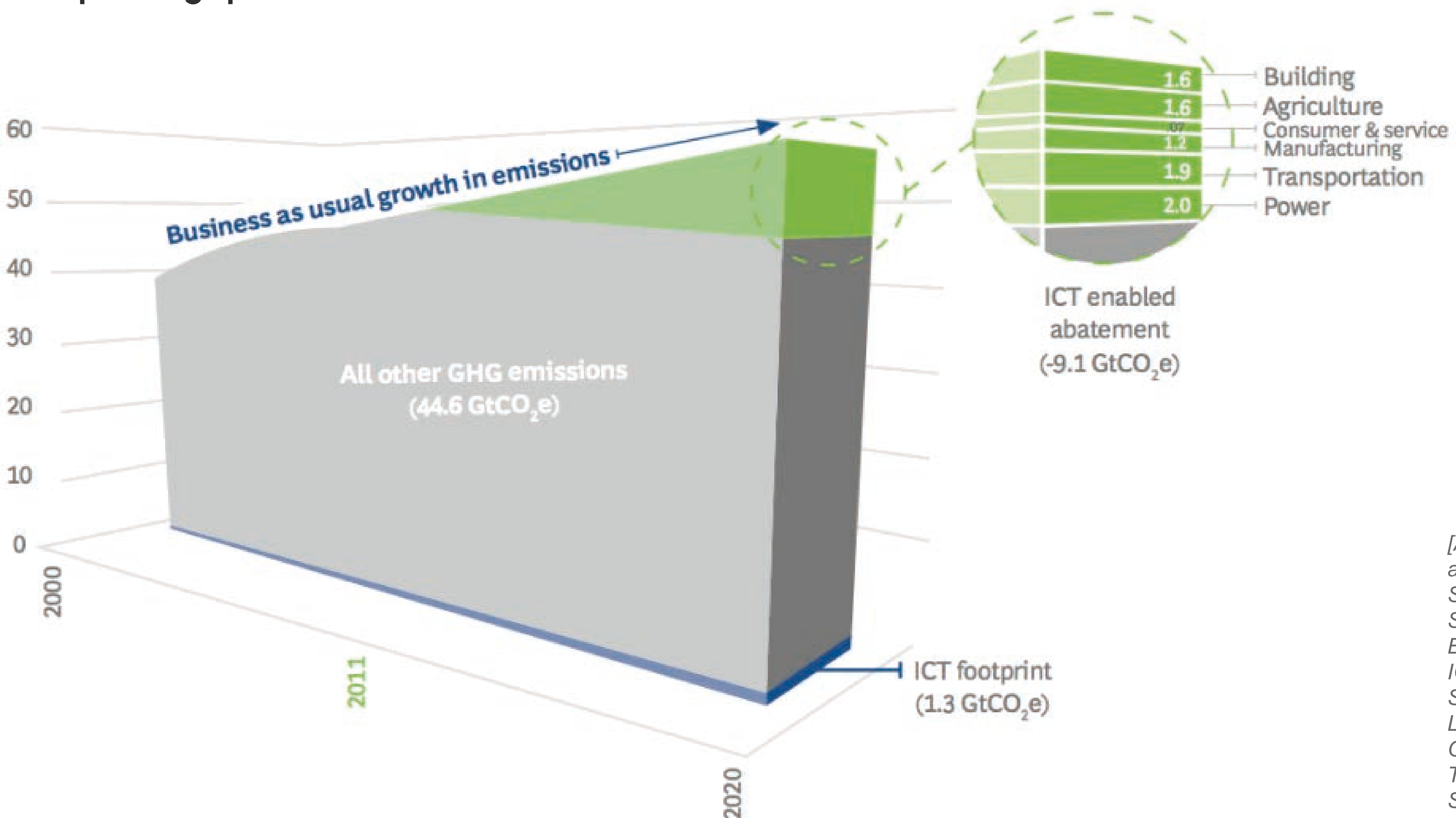
**CO<sub>2</sub>-Ausstoß IKT: 2%**



*[Arnold Picot, Stefan Hopf: ICT as an Instrument for More Sustainability: Why It Is Not That Simple. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]; GeSI (2012)*

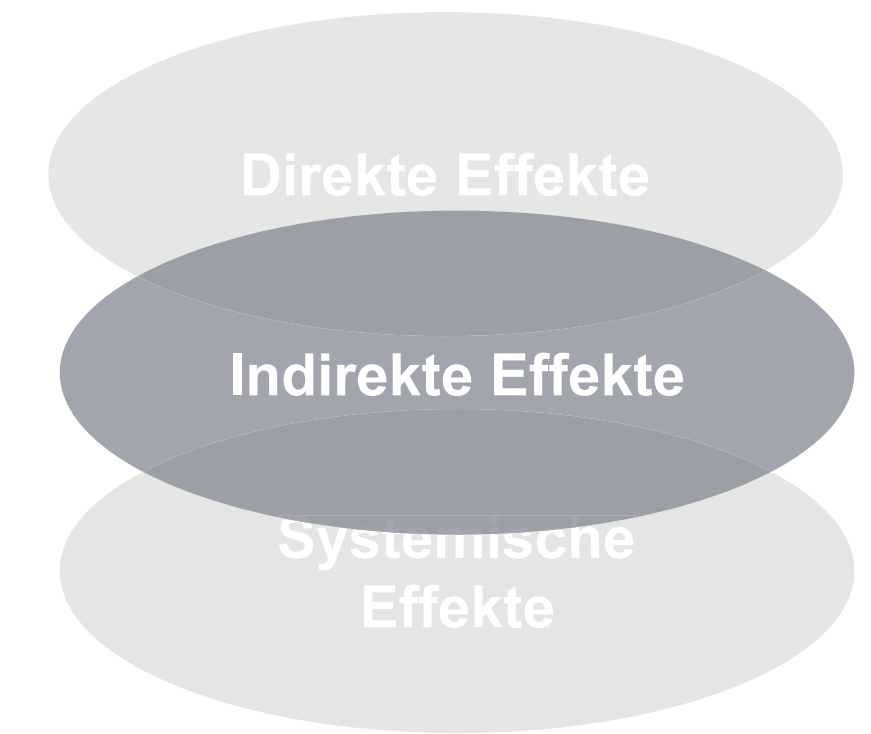
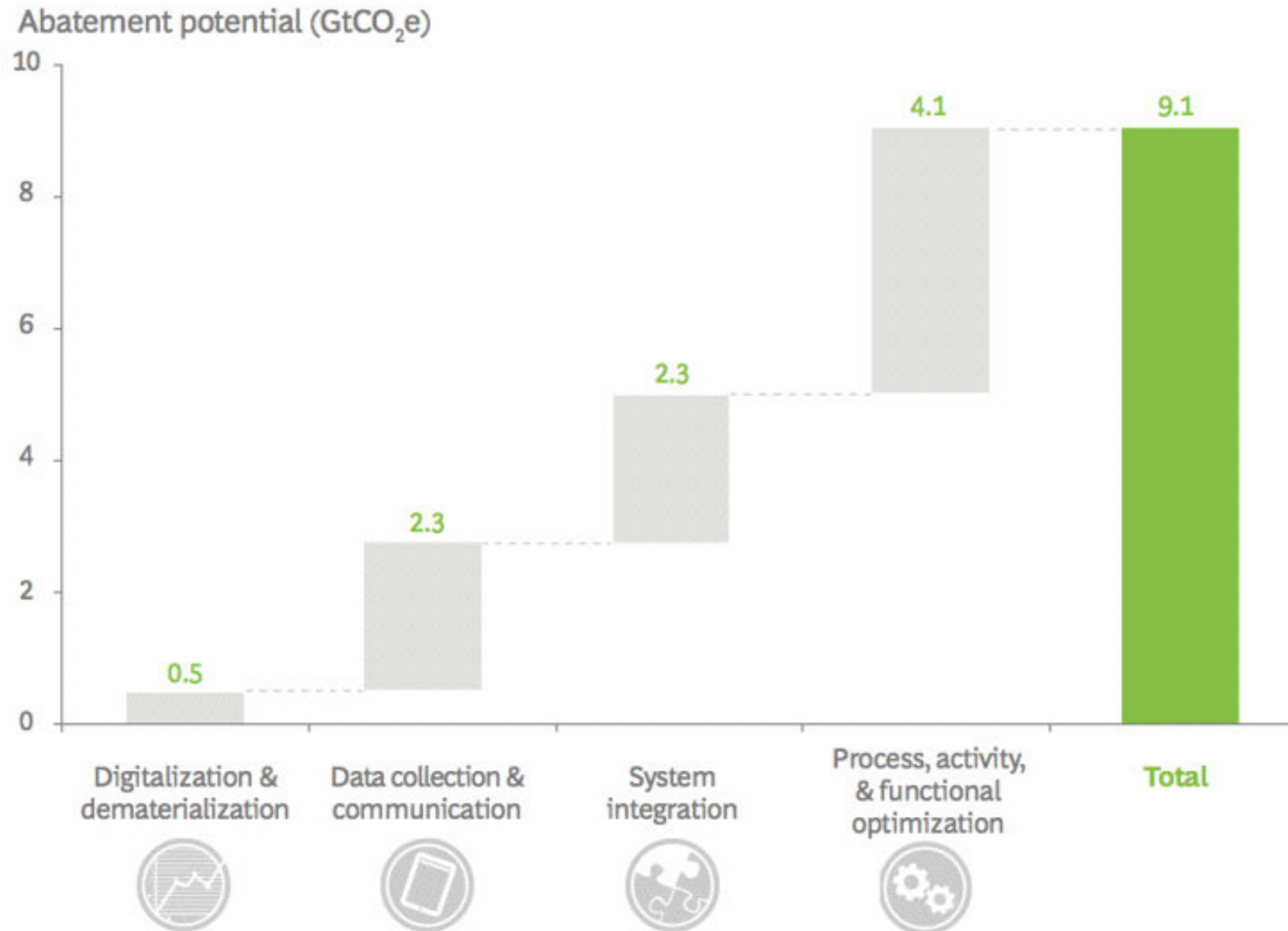


# Experten erwarten durch IKT insgesamt ein erhebliches CO<sub>2</sub>-Einsparungspotential von ca. 16,5% (9,1 GtCO<sub>2</sub>e) in anderen Sektoren



[Arnold Picot, Stefan Hopf: *ICT as an Instrument for More Sustainability: Why It Is Not That Simple*. In Herzog, M.A.: *Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces*, GITO 2015]; GeSI SMARTer2020: *The Role of ICT in Driving a Sustainable Future*, 2012, online

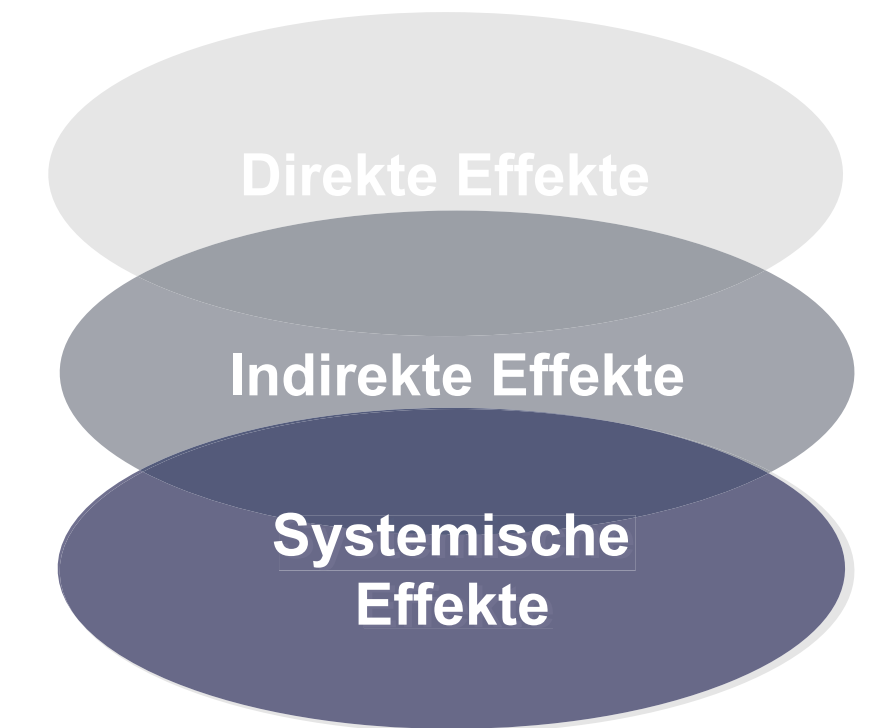
# Der CO<sub>2</sub>-Austoß kann hauptsächlich durch Virtualisierung wie z. B. Cloud Computing, aber auch durch Effizienzzuwächse verringert werden



[Arnold Picot, Stefan Hopf: *ICT as an Instrument for More Sustainability: Why It Is Not That Simple*. In Herzog, M.A.: *Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces*, GITO 2015]; GeSI SMARTer2020: *The Role of ICT in Driving a Sustainable Future*, 2012, online

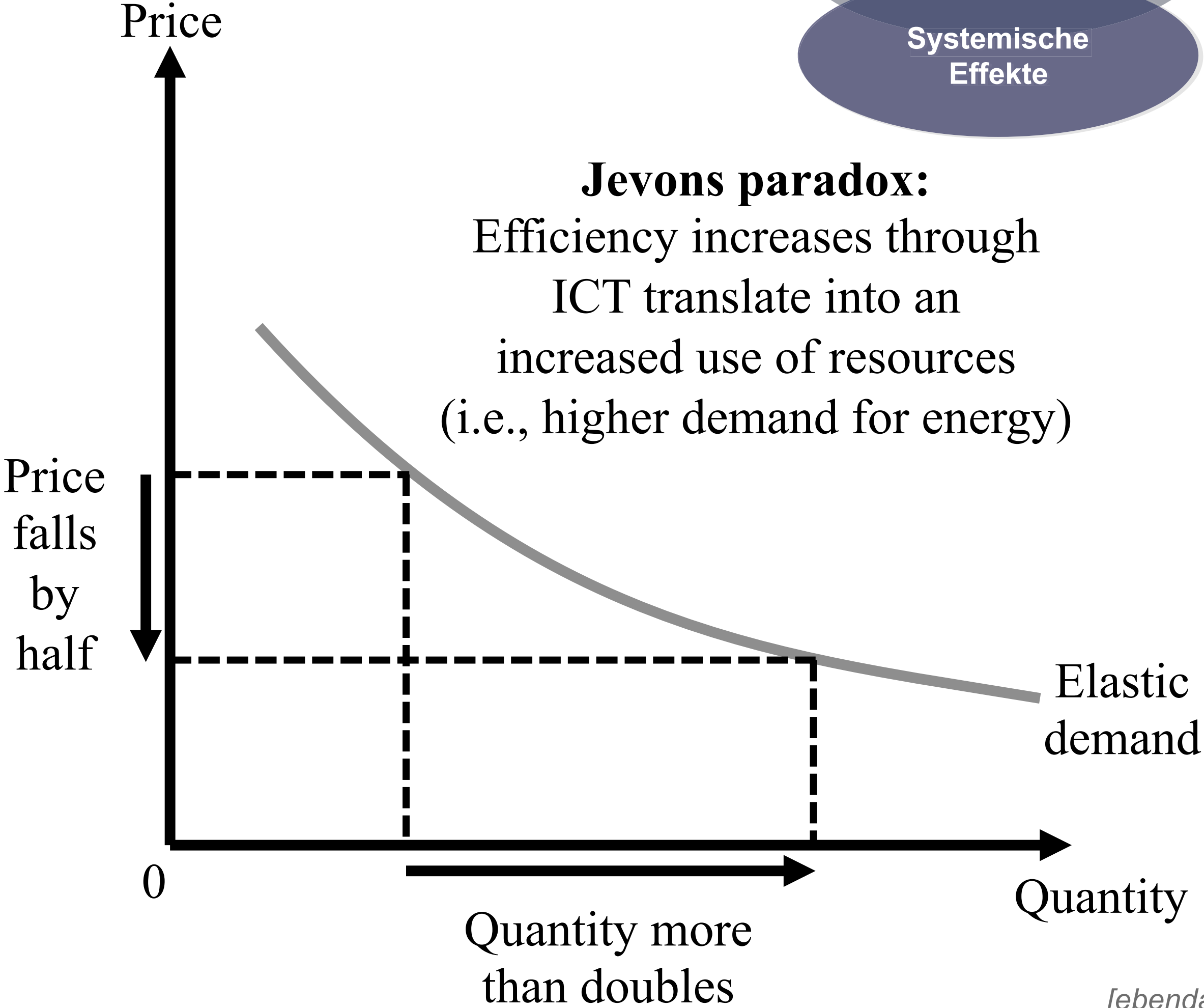
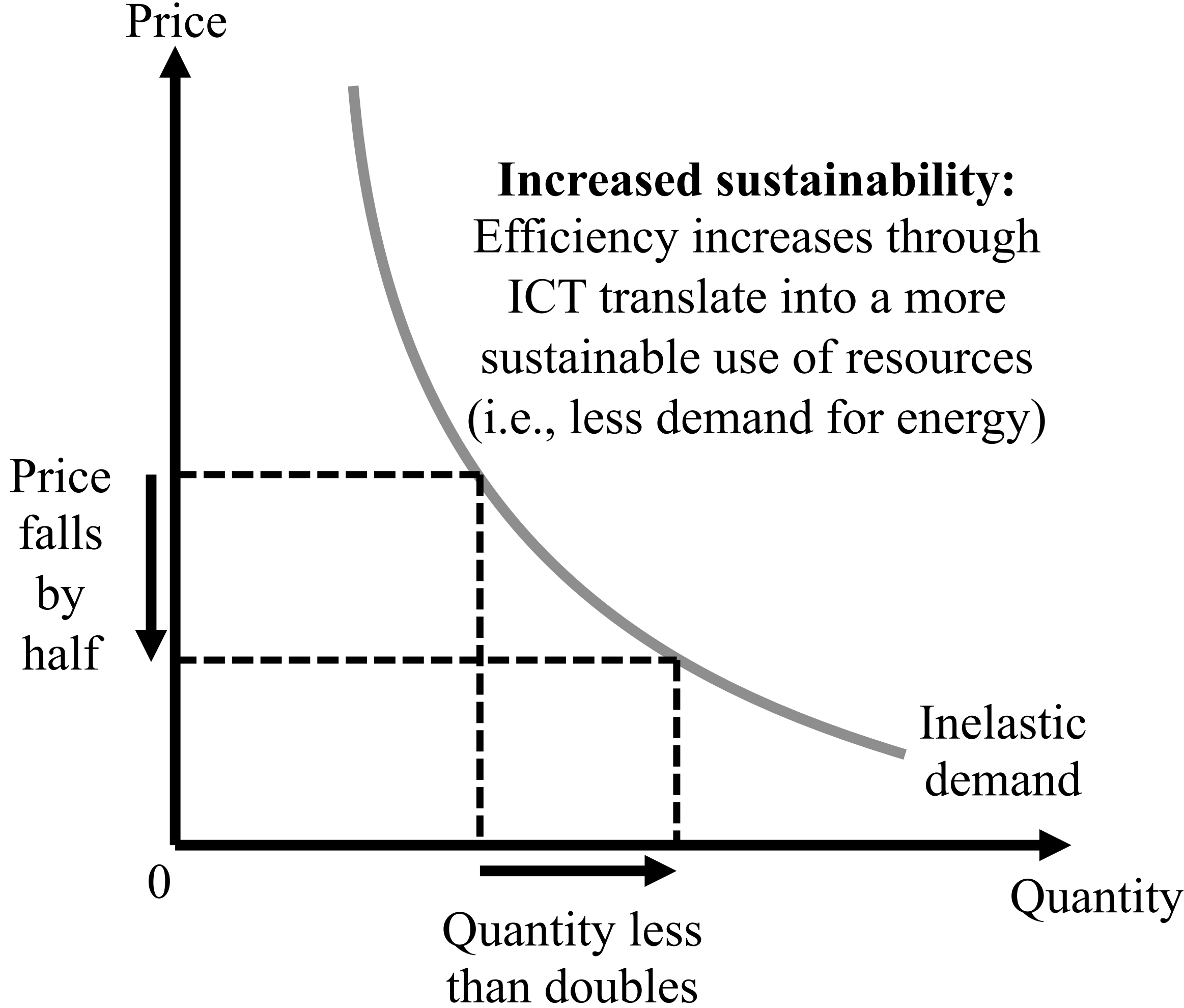
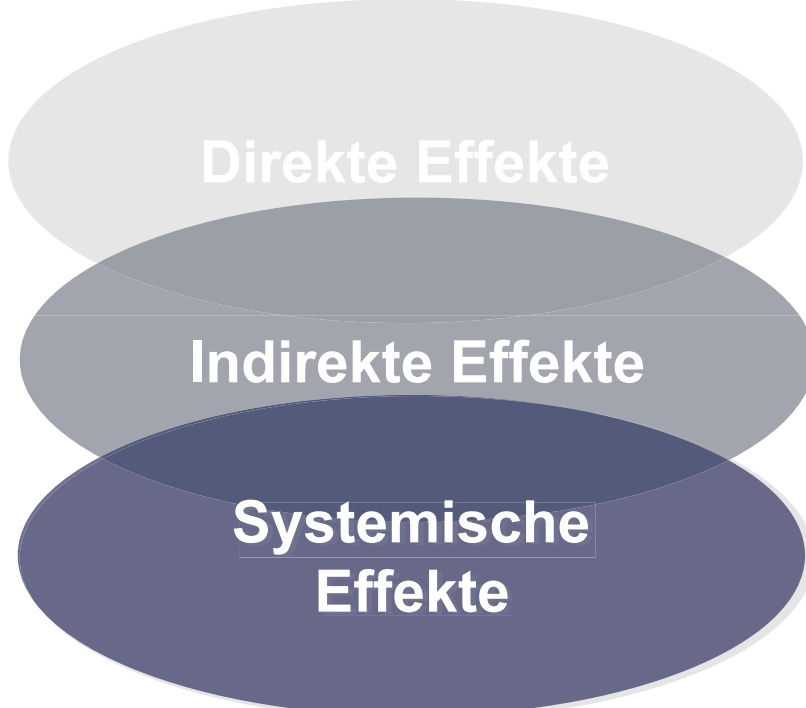
# IKT als Instrument für mehr Nachhaltigkeit: Warum das nicht so einfach ist

- ▶ Indirekte und systemische Effekte erschweren die Bestimmung des Nettoeffekts von Informations- und Kommunikationstechnologien
  - Indirekte Effekte: Erfüllung existierender Bedürfnisse durch IKT-Fortschritt
  - Systemische Effekte: Entstehung neuer Gewohnheiten, sozialer Strukturen und Konsumverhalten durch IKT-Fortschritt
- ▶ Jevons' Paradoxon: Technologischer Fortschritt, der eine effizientere Ressourcenverwendung ermöglicht, kann letztlich zu einer erhöhten Nutzung (statt Reduktion) dieser Ressourcen führen (Rebound-Effekt)
- ▶ Eine ganzheitliche Betrachtung von Nachhaltigkeit umfasst neben umweltpolitischen Zielen auch soziale und ökonomische Aspekte



*[Arnold Picot, Stefan Hopf:  
ICT as an Instrument for More  
Sustainability: Why It Is Not That  
Simple.  
In Herzog, M.A.:  
Economics of Communication.  
ICT Driven Fairness and  
Sustainability for Global and  
Local Marketplaces, GITO 2015];*

# Direct rebound effect and sustainability



[ebenda]

# Beispiel Energie

## Chancen

- Integration dezentraler fluktuierender erneuerbarer Energiequellen
- Fernwartung und Management der Netze durch Sensor- und Controllernetzwerke
- Entstehung virtueller Kraftwerke
- Flexibles Lastmanagement

## Herausforderungen

- Zunehmende IKT-Durchdringung des alltäglichen Lebens (z. B. durch Softwaresysteme, Kommunikation, Data Center, Vernetzung, Sensoren) erzeugt neuen Energiebedarf
- Steigender Energiebedarf kann (noch) nicht ausschließlich durch erneuerbare Energien gedeckt werden

**IKT verbessert u.a. die Energie-Erzeugung, -Übertragung und -Verteilung, aber verändert auch das Nutzungsverhalten und die Energienachfrage der Verbraucher**

*[Arnold Picot, Stefan Hopf: ICT as an Instrument for More Sustainability: Why It Is Not That Simple. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]*

# Beispiel Transport

## Chancen

- Heim- und standortunabhängige Arbeit durch Videokonferenzlösungen und Telecommuting
- Optimierung von Logistiknetzwerken
- Intelligentes Verkehrsmanagement
- Echtzeit Routenführung
- Car-Sharing und intermodale Transport-Angebote

## Herausforderungen

- Weltweite Vernetzung (privat und geschäftlich) führt zu steigendem Reise- und Transportbedarf
- Information organisiert und fördert Transport
- Stark wachsende Weltbevölkerung und steigende Lebensstandards in Entwicklungsländern erhöhen Netto-Mobilitätsnachfrage

**IKT ermöglicht Effizienzvorteile und substituiert teilweise physischen Transport, fördert aber durch weltweite leistungsfähige Vernetzung neue Mobilitäts- und Transportnachfrage**

*[Arnold Picot, Stefan Hopf: ICT as an Instrument for More Sustainability: Why It Is Not That Simple. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]*

# Beispiel Urbanisierung

## Chancen

- 50% der Weltbevölkerung lebt in Städten – Tendenz steigend (bis 2030 knapp 5 Milliarden Menschen)
- Volkswirtschaftliches Potenzial – Städte leisten einen überproportional hohen BIP-Beitrag
- Hohes IKT-Unterstützungspotential v.a. im den Bereichen: Energie, Wasser, Transport & Logistik und Sicherheit

## Herausforderungen

- Überproportional hoher Energie- und (66%) Trinkwasserverbrauch (60%), sowie CO<sub>2</sub>-Ausstoß (70%) in Städten
- Erneuerung und Modernisierung existierender Infrastrukturen
- Schaffung intelligenter Netze zur effizienten Steuerung und Koordination städtischer Infrastrukturen

**Ökologische Ineffizienzen durch zielgerichtete IKT-Unterstützung („Smart Cities“) abbauen und die Attraktivität der Städte durch Attraktivität des Landes („Smart Country“) kompensieren.**

*[Arnold Picot, Stefan Hopf: ICT as an Instrument for More Sustainability: Why It Is Not That Simple. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]*

# Beispiel Medien

## Chancen

- Intelligente Technologien ermöglichen eine selbstbestimmte und personalisierte Mediennutzung
- IKT-Unterstützung fördert Transparenz, Echtzeitberichterstattung und interaktiven Informationsaustausch
- Digitale Medien lösen zunehmend Druckprodukte ab

## Herausforderungen

- Veränderter Medienkonsum und neue Distributionskanäle stellen etablierte Finanzierungsmodelle auf den Prüfstand
- Digitaler Zugriff und zunehmende Finanzierungsprobleme können zu einer Verarmung des Angebots hoher qualitätsvoller Medien führen (z.B. Qualitätsjournalismus in Gefahr)

**Individuelle und flexible Mediennutzung mit breitem Angebot, aber Gefahr der Verschlechterung von inhaltlicher Qualität und Finanzierungsprobleme  
(→ erhöhter Bedarf von Qualitätsmedien als öffentliche Güter?)**

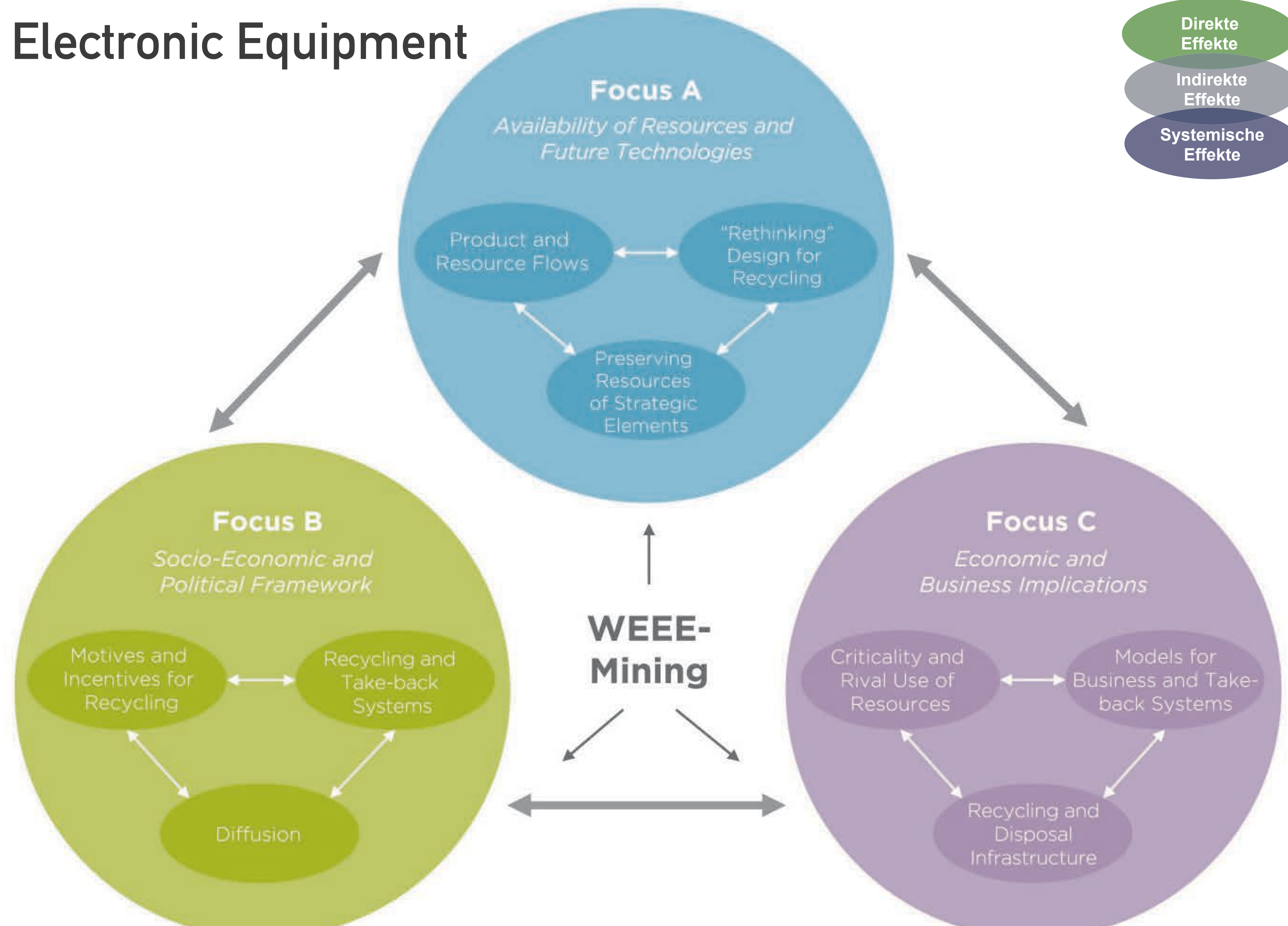
*[Arnold Picot, Stefan Hopf: ICT as an Instrument for More Sustainability: Why It Is Not That Simple. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]*





# Waste Electrical and Electronic Equipment (WEEE)

- Direkte Effekte
- Indirekte Effekte
- Systemische Effekte

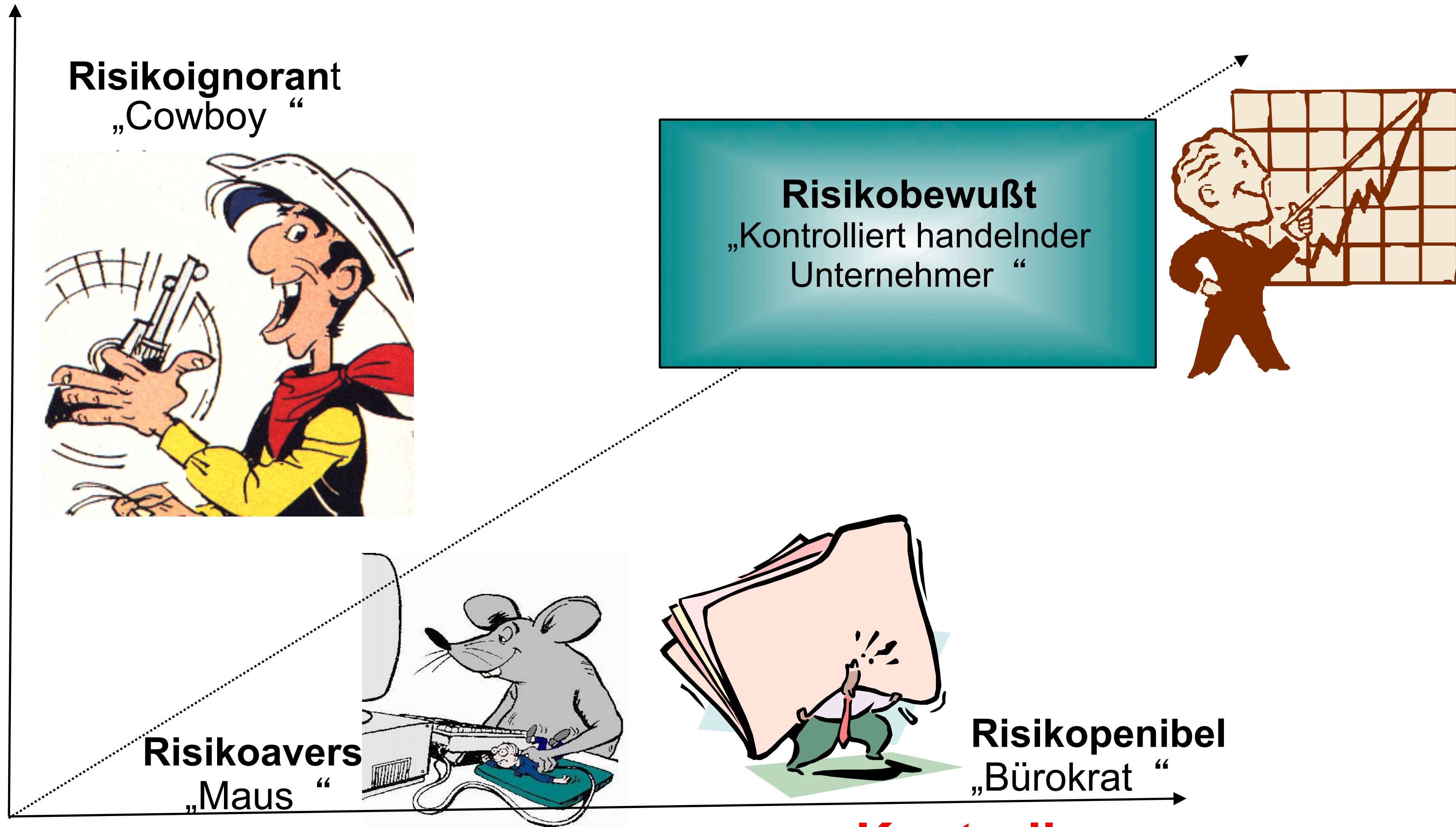


[Andreas Bühn, Silke Niehoff, Britta Bookhagen and Mario Tobias: WEEE-Mining: A Research and Stakeholder Network on Material Flows in the Anthropocene  
 In: Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]

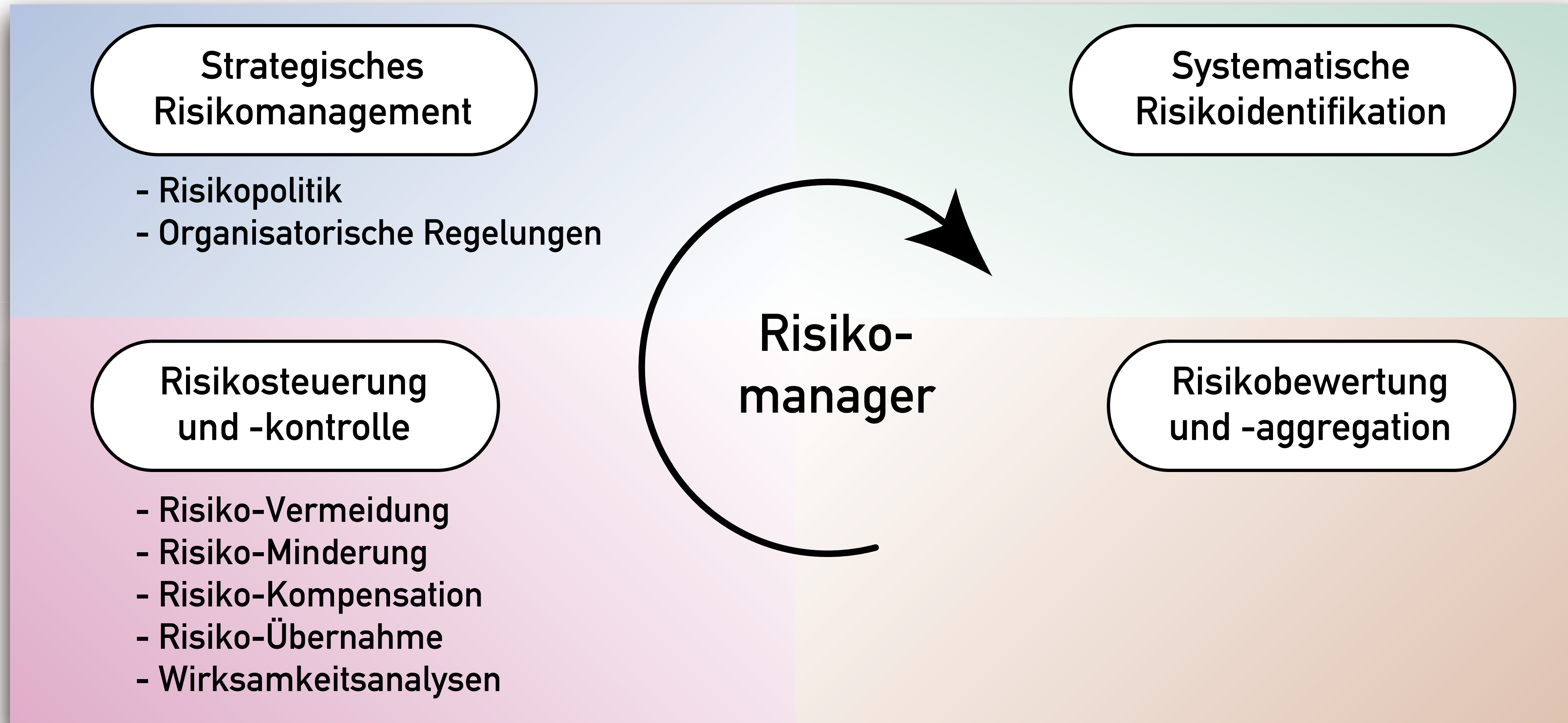
# Risikomanagement



**Risiko**



**Kontrolle**



In Anlehnung an RM-Kreislauf, M. Hoffmann: Master Risikomanagement, Präsentation 2011, Hochschule Magdeburg-Stendal

# Digital Archiving

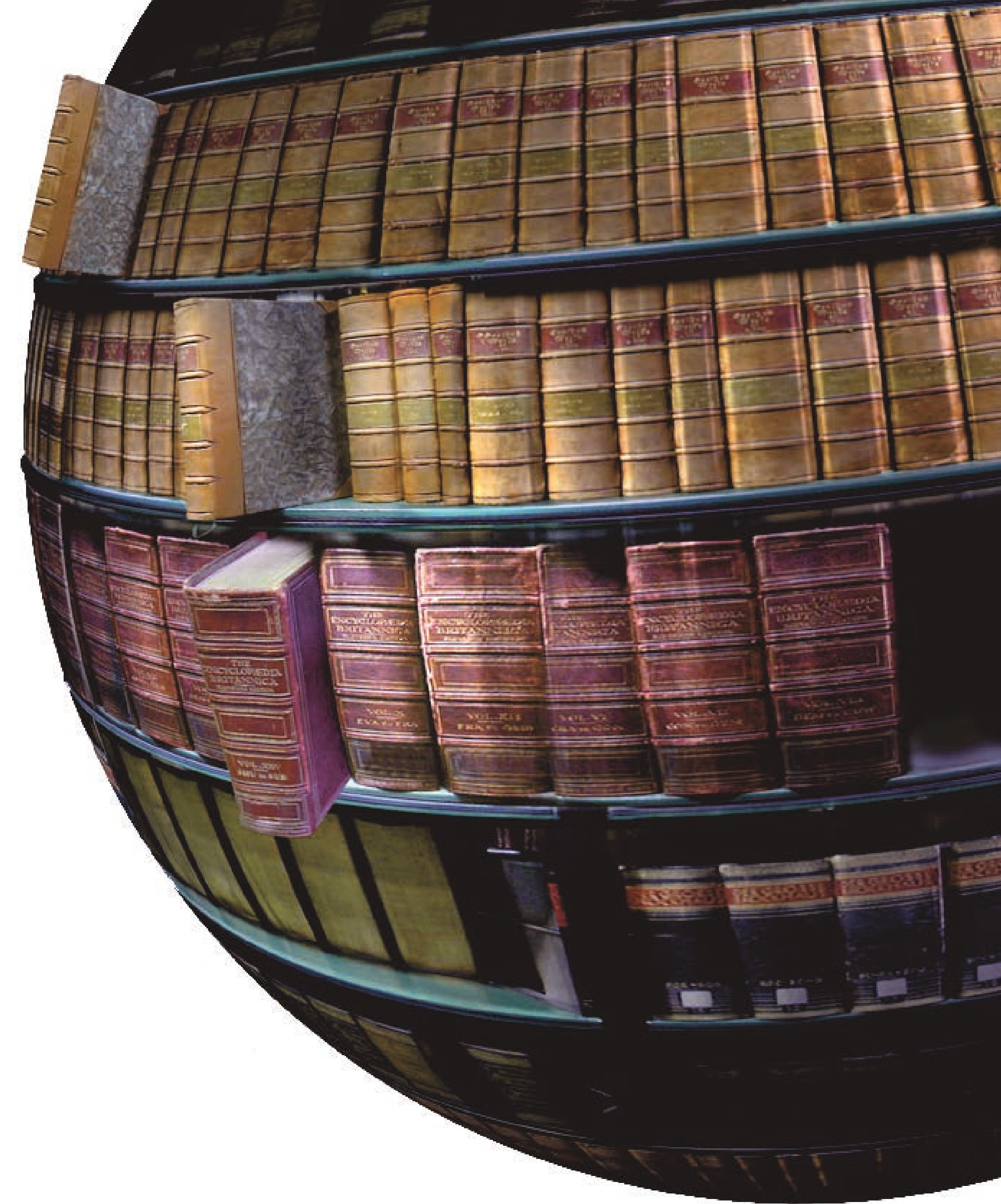
## ► Durchschnittliche Lebensdauer von Webseiten

**44 Tage**  
(Scientific American 1997)

**75 Tage**  
(IEEE Computer 2001)


**100 Tage**  
(Washington Post 2003)

*[Martin Klein: A Closer Look at  
Web Archives and Accessibility –  
Essential Ingredients for  
Sustainable Digital Data  
Preservation EcoCom,  
08/11/2013, Berlin, Germany]*



# Link Rot

W Berlin - Wikipedia, the free encyclopedia  
en.wikipedia.org/wiki/Berlin


  
WIKIPEDIA  
The Free Encyclopedia

Main page  
Contents  
Featured content  
Current events  
Random article  
Donate to Wikipedia

Interaction  
Help  
About Wikipedia  
Community portal  
Recent changes  
Contact page

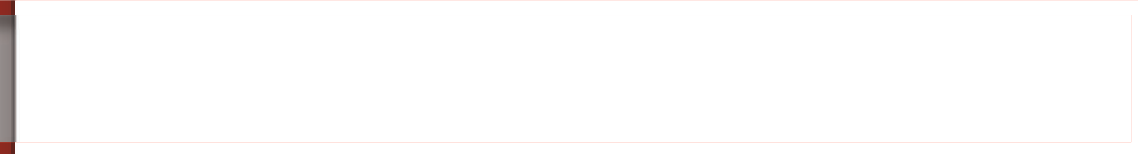
Tools

Print/export

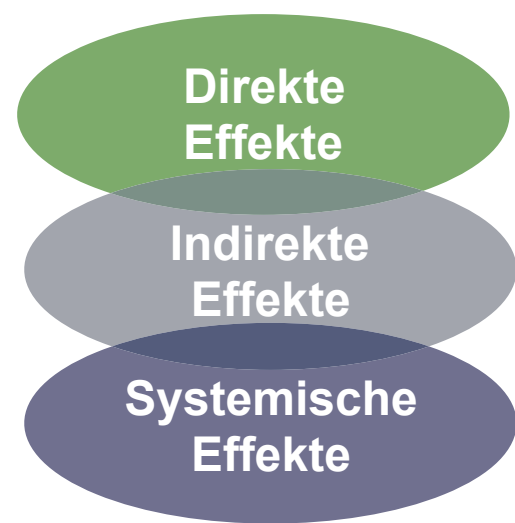
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14. [Diplomat: Berlin - Deutschland Online](#). Retrieved 7 March 2009.  
15. ^ Davies, Catriona (10 April 2010). "Revealed: Cities that rule the world – and those on the rise" [↗](#). CNN. Retrieved 11 April 2010.  
16. ^ Sifton, Sam (31 December 1969). "Berlin, the big canvas" [↗](#). *The New York Times*. Retrieved 18 August 2008. See also: "Sites and situations of leading cities in cultural globalisations/Media" [↗](#). *GaWC Research Bulletin 146*. Retrieved 18 August 2008.

# Digital Archiving – Fakten



- ▶ **Harvard Law Review**
  - 75% aller Links führen ins Nichts
- ▶ **top 1% Impact Factor Journals**
  - 10% aller Links führen ins Nichts, lediglich 15 Monate nach Publikation
- ▶ **US Supreme Court Schriften**
  - 29% aller Links resultieren in Fehler

*[Martin Klein: A Closer Look at Web Archives and Accessibility – Essential Ingredients for Sustainable Digital Data Preservation EcoCom, 08/11/2013, Berlin, Germany]*

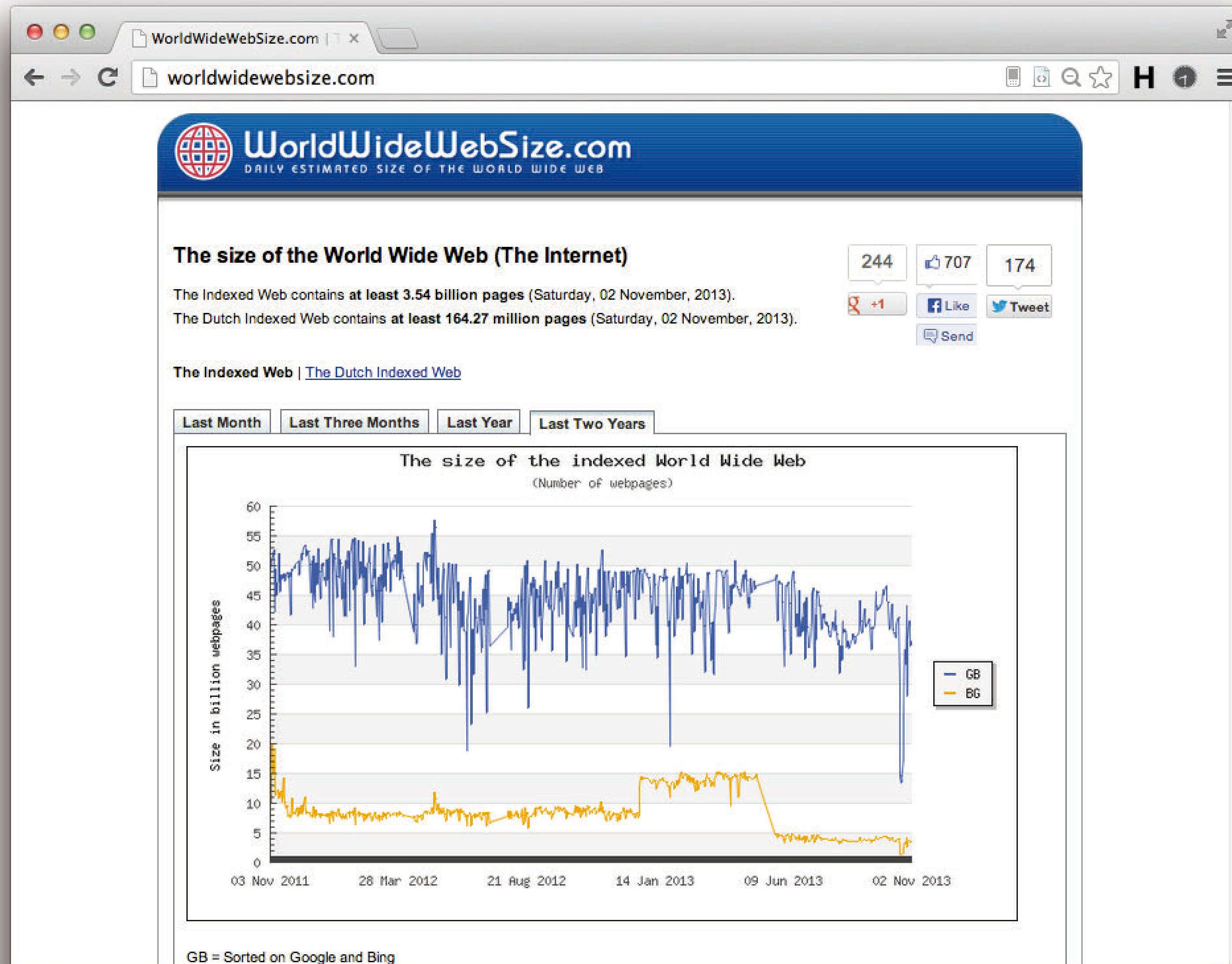


# Ist das Web archiviert?

Direkte  
Effekte

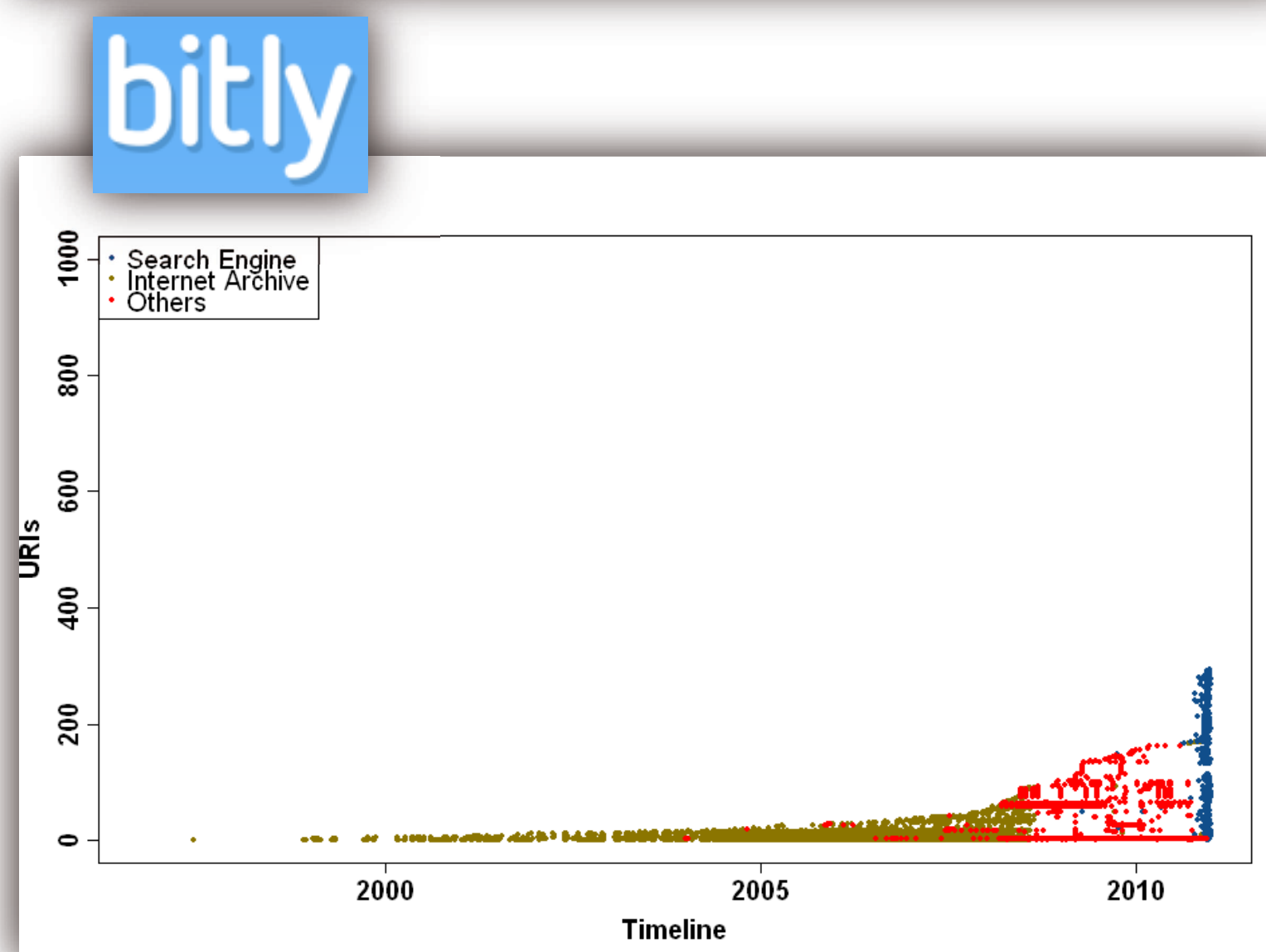
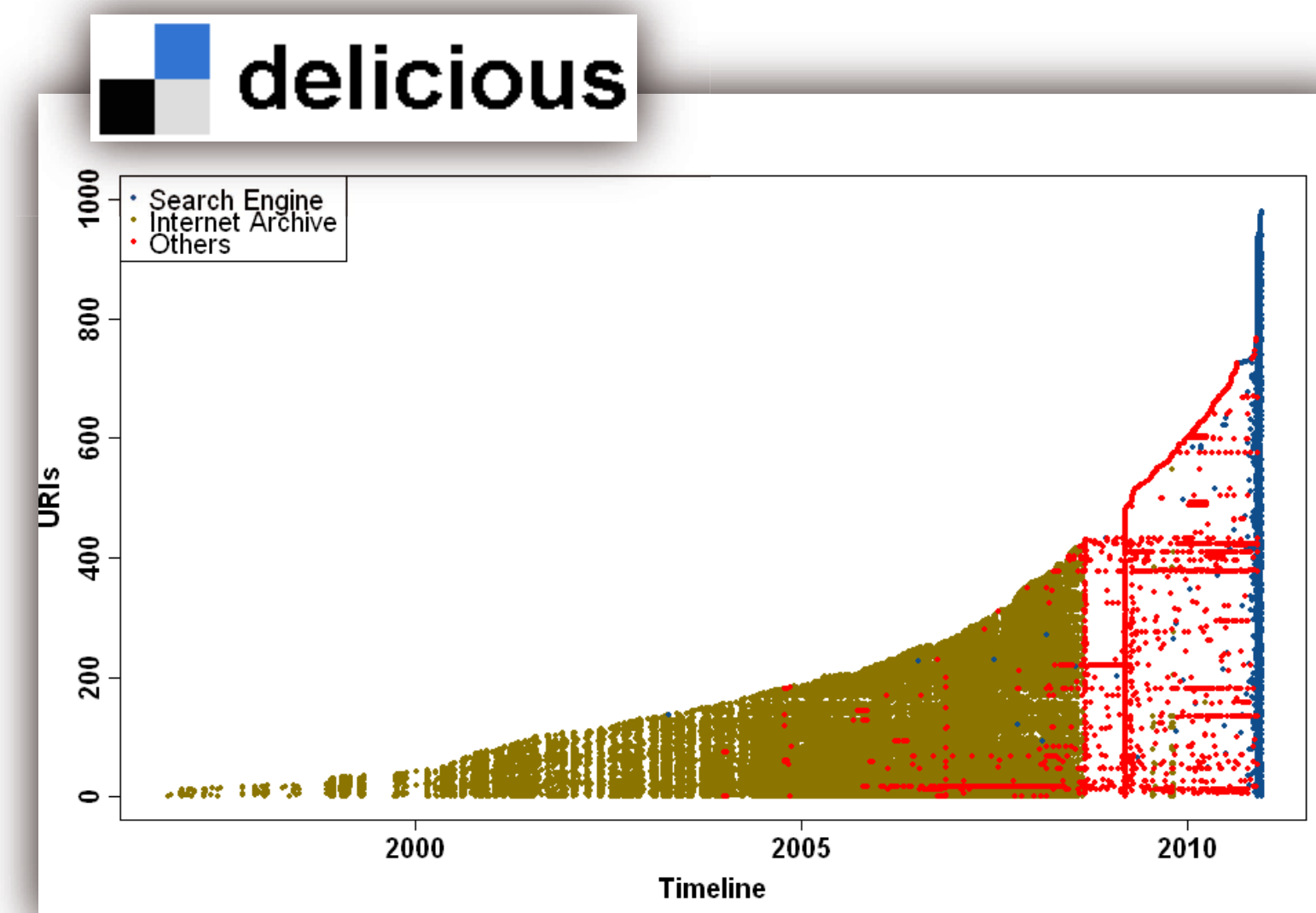
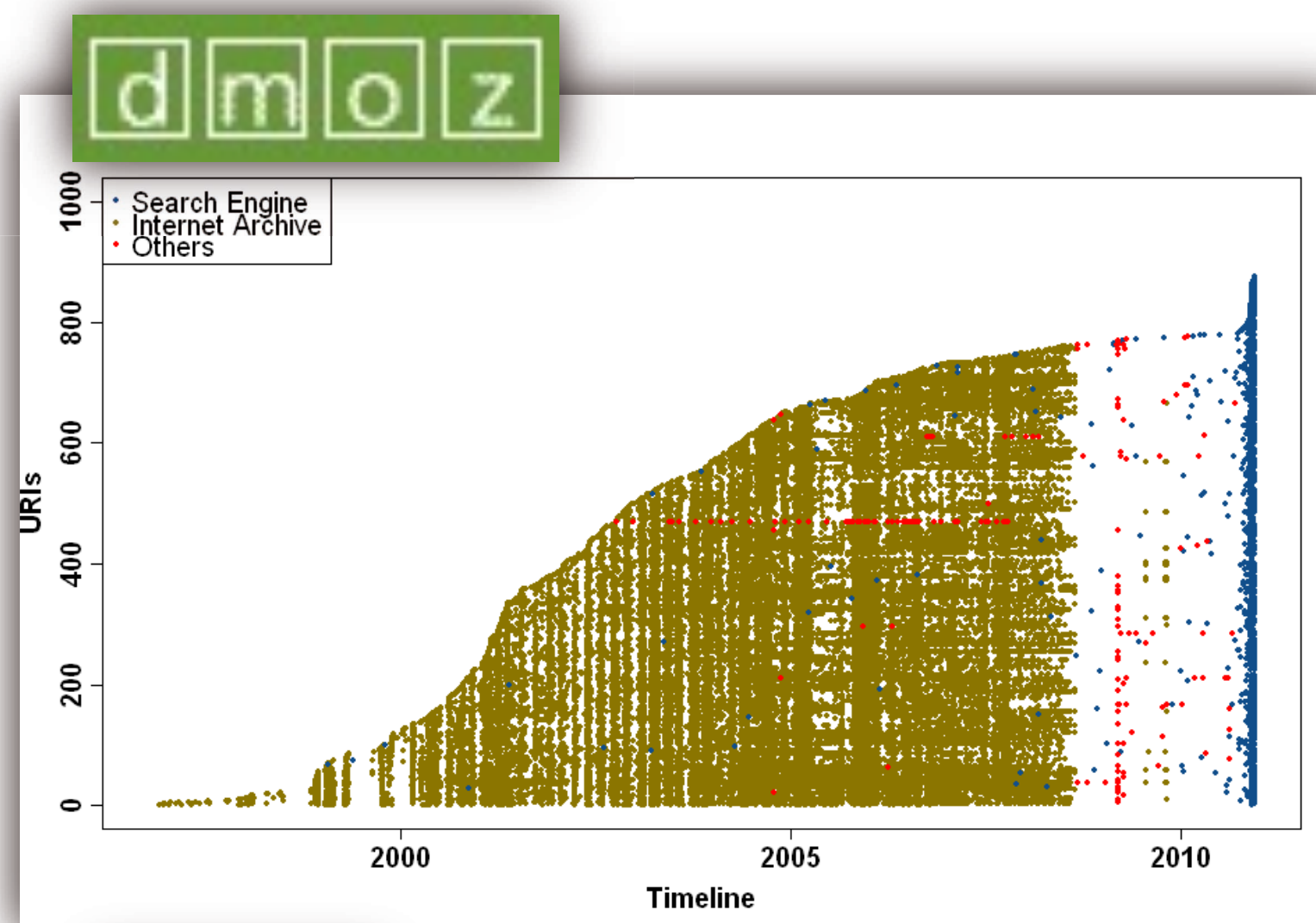
Indirekte  
Effekte

Systemische  
Effekte



[Martin Klein: A Closer Look at Web Archives and Accessibility – Essential Ingredients for Sustainable Digital Data Preservation EcoCom, 08/11/2013, Berlin, Germany]

# Wieviel davon ist archiviert?



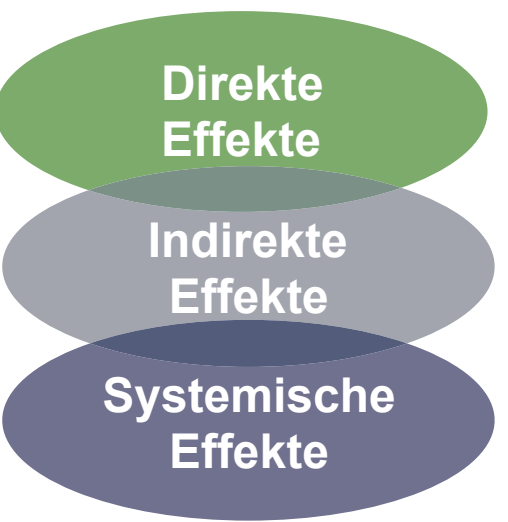
“How Much of the Web Is Archived?”

Scott G. Ainsworth, Ahmed AlSum, Hany SalahEldeen, Michele C. Weigle, Michael L. Nelson

JCDL 2011

See also: <http://ws-dl.blogspot.com/2011/06/2011-06-23-how-much-of-web-is-archived.html>

# Wieviel davon ist archiviert?



- ▶ Welches Web (DMOZ vs Bitly)?
  - 23 ... 95%
- ▶ Youtube und Facebook zusammen = 200PB pro Jahr  
Web Archive ~ 12PB total
  - 0% ???
- ▶ NSA...
  - 100% ???

*[Martin Klein: A Closer Look at Web Archives and Accessibility – Essential Ingredients for Sustainable Digital Data Preservation EcoCom, 08/11/2013, Berlin, Germany]*

# Vertrauenswürdige Archive?

Direkte Effekte

Indirekte Effekte

Systemische Effekte

Wayback Machine

Enter Web Address:  All  [Adv. Search](#) [Compare Archive Pages](#)

Searched for <http://www.dl00.org/> 56 Results

Note some duplicates are not shown. [See all.](#)  
\* denotes when site was updated.

Search Results for Jan 01, 1996 - May 03, 2005									
1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
0 pages	0 pages	0 pages	1 pages	12 pages	11 pages	5 pages	13 pages	11 pages	0 pages
			<a href="#">Oct 01, 1999</a> *	<a href="#">Jan 05, 2000</a> <a href="#">Mar 06, 2000</a> <a href="#">Mar 10, 2000</a> <a href="#">May 11, 2000</a> <a href="#">May 20, 2000</a> <a href="#">Jun 20, 2000</a> <a href="#">Jun 21, 2000</a> <a href="#">Aug 15, 2000</a> <a href="#">Aug 16, 2000</a> <a href="#">Oct 09, 2000</a> <a href="#">Oct 18, 2000</a> <a href="#">Dec 04, 2000</a>	<a href="#">Jan 24, 2001</a> <a href="#">Feb 02, 2001</a> <a href="#">Feb 04, 2001</a> <a href="#">Feb 13, 2001</a> <a href="#">Mar 01, 2001</a> <a href="#">Apr 01, 2001</a> <a href="#">Apr 05, 2001</a> <a href="#">Apr 14, 2001</a> * <a href="#">Apr 21, 2001</a> <a href="#">Aug 31, 2001</a> * <a href="#">Nov 27, 2001</a> *	<a href="#">Jan 18, 2002</a> * <a href="#">May 31, 2002</a> <a href="#">Jun 06, 2002</a> <a href="#">Nov 25, 2002</a> * <a href="#">Nov 27, 2002</a>	<a href="#">Feb 05, 2003</a> * <a href="#">May 02, 2003</a> * <a href="#">Jun 10, 2003</a> * <a href="#">Jul 30, 2003</a> * <a href="#">Aug 05, 2003</a> <a href="#">Aug 08, 2003</a> * <a href="#">Sep 27, 2003</a> * <a href="#">Oct 05, 2003</a> * <a href="#">Oct 07, 2003</a> * <a href="#">Dec 13, 2003</a> * <a href="#">Dec 17, 2003</a> <a href="#">Dec 27, 2003</a> * <a href="#">Dec 28, 2003</a> *	<a href="#">Jan 01, 2004</a> * <a href="#">Jan 03, 2004</a> * <a href="#">Jan 30, 2004</a> * <a href="#">Apr 03, 2004</a> * <a href="#">Apr 11, 2004</a> * <a href="#">May 25, 2004</a> * <a href="#">Jun 08, 2004</a> * <a href="#">Jun 09, 2004</a> * <a href="#">Jun 10, 2004</a> * <a href="#">Jun 12, 2004</a> * <a href="#">Jun 16, 2004</a> *	

ACM DL Conference

Gambling

Porn

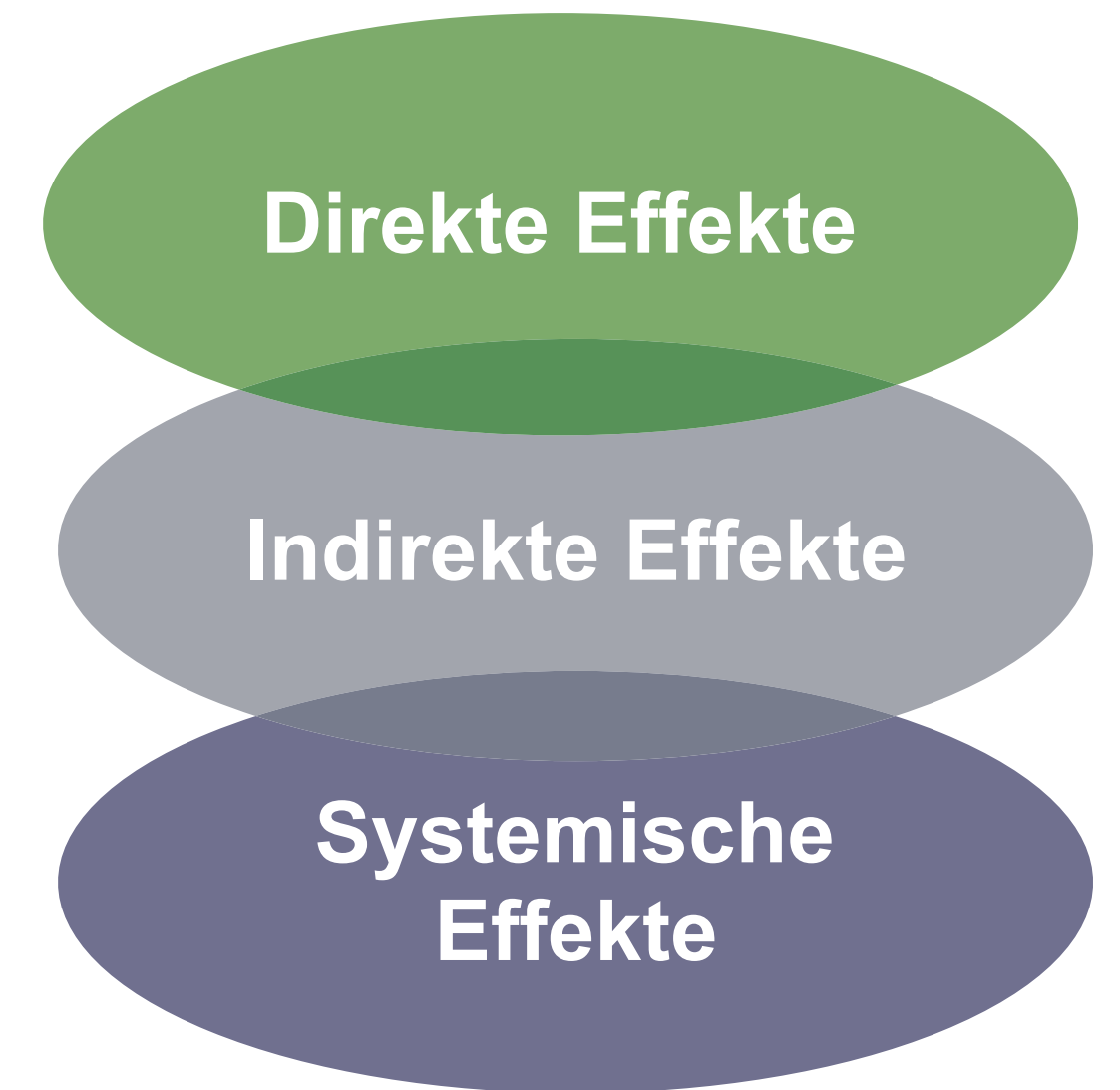
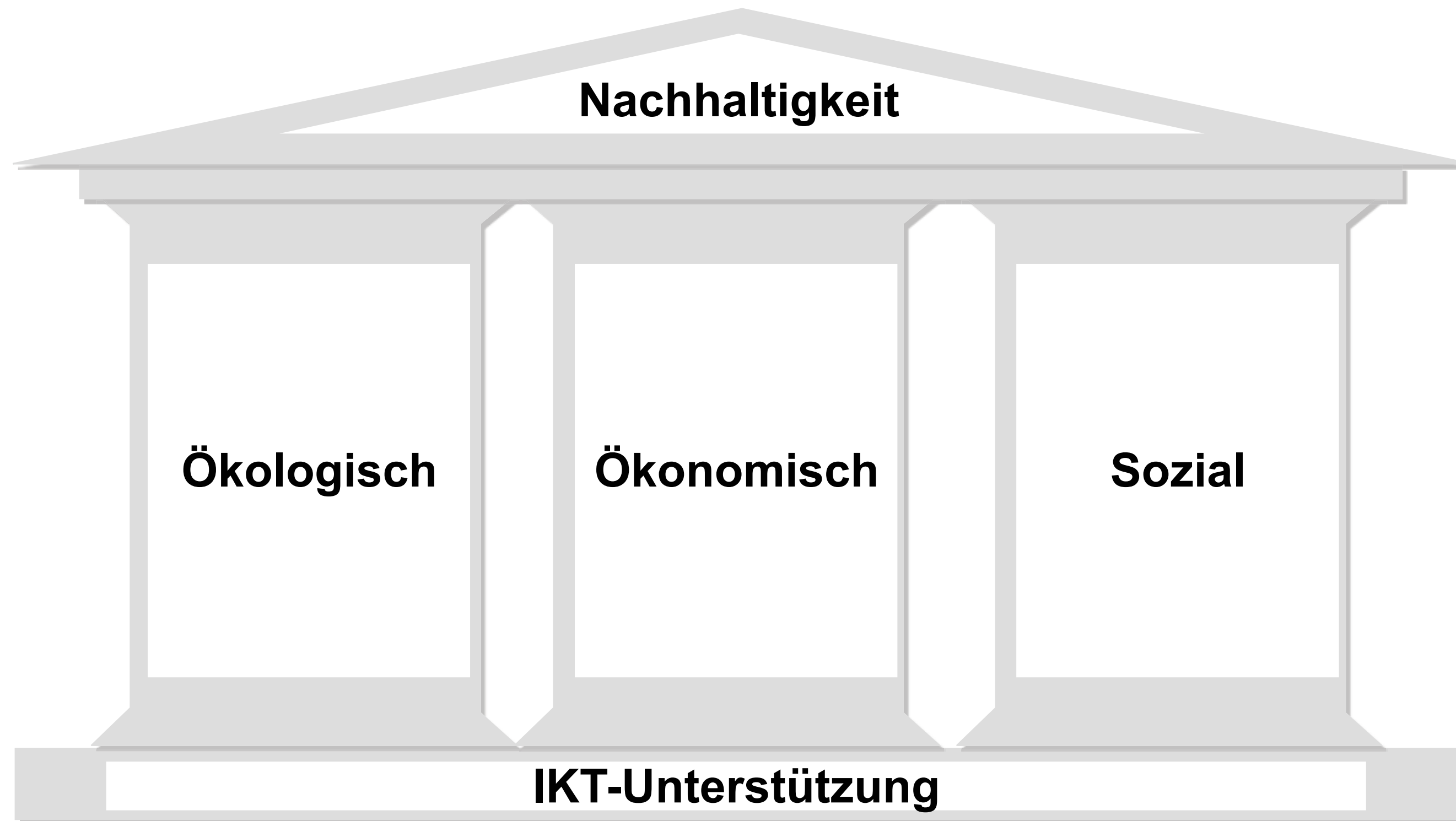
Search Engine Portal

# Wer archiviert die Archive?



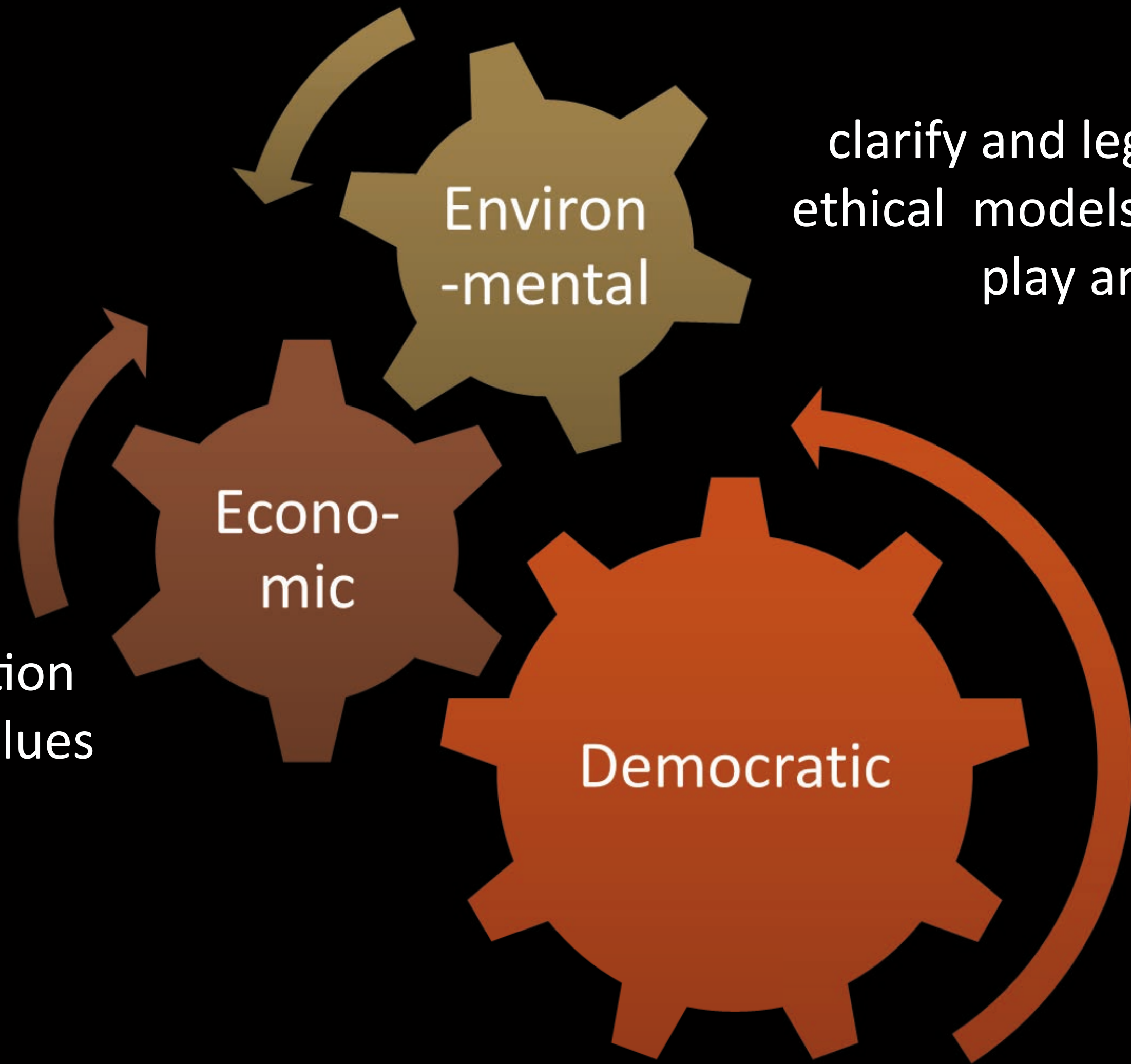
<http://richmondsfblog.com/2013/11/06/part-of-internet-archive-building-badly-burned-in-early-morning-fire/>

# Fazit



**Direkte, indirekte und systemische Effekte erschweren eine nachhaltige Gestaltung und Beurteilung von IKT-Systemen, die gleichermaßen ökologischen, ökonomischen und sozialen Anforderungen gerecht werden.**

*[Arnold Picot, Stefan Hopf: ICT as an Instrument for More Sustainability: Why It Is Not That Simple. In Herzog, M.A.: Economics of Communication. ICT Driven Fairness and Sustainability for Global and Local Marketplaces, GITO 2015]*



clarify and legitimise new ethical models for work and play and life

steer communication tools to support values that count

explore emergent multi-level governance models

[Jesse Marsh: think virtually local ecologies of new economic models. EcoCom, 08/11/2013, Berlin, Germany]



**ecoocom**<sup>13</sup>

**Ökonomie der Kommunikation**  
Kommunikation in Wirtschaftskreisläufen

<http://www.eco-com.net>



**NEW**

## Economics of Communication

ICT Driven Fairness and Sustainability  
for Local and Global Marketplaces



**GITC**

Michael A. Herzog (ed.)



28/10  
2015

ICT & Sustainability

Michael A. Herzog

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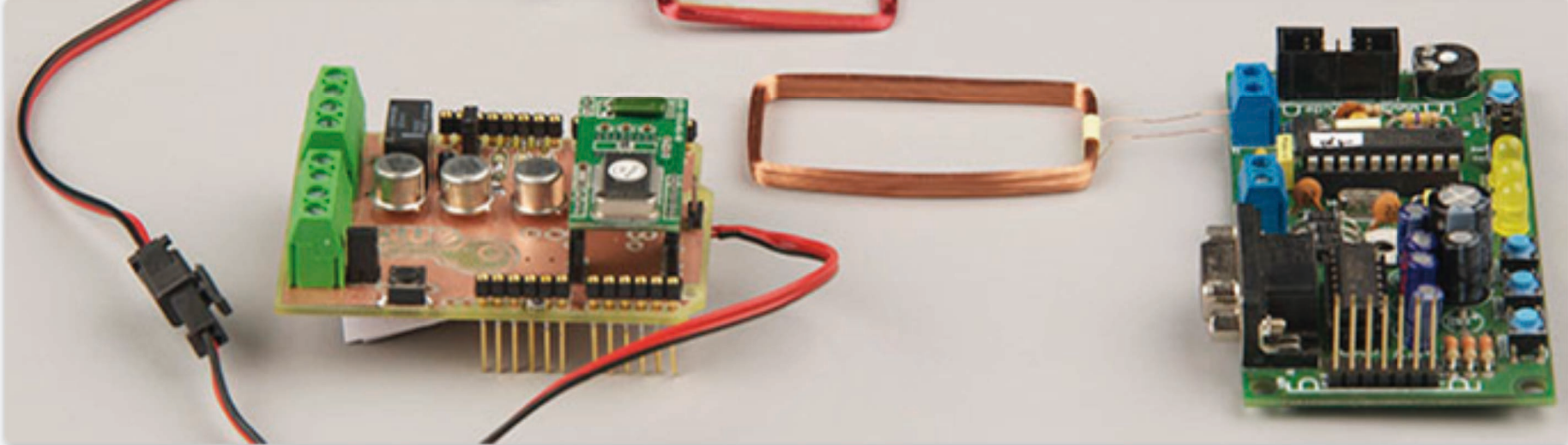
89

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# Discussion

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