Steven Bishop (UCL)
Dirk Helbing (ETHZ)
Paul Lukowicz (DFKI)
The Age of Information

- Hyperconnectivity: billions of connected components
- Exascale computing
- Big data: more information generated in the next 2 years than in the past 1000 years
Implications of the Information Age

• Boundaries between the real and the digital world are increasingly blurred
  – real world events have a “digital shadow”
  – digital information drives real events
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Importantly

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  – most complex artifact in existence

We lack a proper understanding and methods for the management of both: our society and global ICT infrastructure!
The Flash Crash of May 6, 2010

600 billion dollars evaporated in 20 minutes

No criminal act, ‘fat finger’, or error but an interaction effect.
Networking is Good … But it Promotes Cascading Effects

- We now have a global exchange of people, money, goods, information, ideas…

- Globalization and technological change have created a strongly coupled and interdependent world

Network infrastructures create pathways for disaster spreading! Need adaptive decoupling strategies.
FuturICT Vision: Integrating Different Fields of Science to:

- Create new knowledge
- Create new ICT
- Leverage this to address 21st century challenges
Impact: Develop New Science

For 30 years or so have we globalized our world and pushed for technological advancements, but the global systems science to understand the resulting complex systems is lacking.

1. Science of systemic risks
2. Theory of complex systems with real-world impact
3. New data science
4. Integrated systems design to manage complexity
5. Coevolution of ICT with society
Example: Global Epidemic Spreading

CHARTING THE NEXT PANDEMIC

Thanks to our FuturlICT partner Alex Vespignani et al.
Shedding Light on the Data Shadow

twitter, blogs, mobile phones, ubiquitous sensing,....

probabilistic predictions (“credit crisis likely”)
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- data fusion, pattern analysis and reasoning

measurement of the “state of the world”
(e.g. opinion shifts, mobility patterns, ...)

- complex social models and simulations

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GPP

PNS

LES

Google-like high-level queries

adjust

present

analyze

collect
Impact: Leverage Advances in ICT and Science to Address 21st Century Challenges

- Extract useful information from **Big Data**, and gain a theoretical understanding

- Create **new ICT instruments** to manage our complex world in a more resilient and sustainable way

- **Innovations from information**: new jobs dependent on the ability to harness data and technology
Impact: Develop a New ICT Paradigm

Fundamental transformational effect on ICT and Computer Science

1. Collective awareness
2. Socially interactive systems
3. Socio-inspired, bottom-up self-organization

• Develop value-sensitive technology for our information age

• Ensure the reliability of critical ICT systems
How It Will Work

People -> Data

Data: provide data

Data: inform

Models: explore

Models: interact

People: inform

Models: create new technology
How It Will Work

What is? What for? What if?

GPP

PNS

LES

Turn data into information

Create new technology

Provide data

Turn knowledge into wisdom

Turn information into knowledge

Inform

Interact

Explore

FuturiICT
Planetary Nervous System (PNS)

Systems to sense & understand

GPP

PNS

LES

provide data

create new technology

inform

interact

explore

inform
Crowd Sourcing 3D Environments

Thanks to Marc Pollefeys et al.

contributed photos

aggregation

full 3-D model
More Sustainability and Resilience through Collective, ICT-enabled (Self-)Awareness

1. **Goal:** Measure the world’s state, ‘social footprint’ and social capital (e.g. trust) in real time, detect possible threats and opportunities

2. **Privacy-respecting data mining**

‘CERN-like’ vision: Create a measurement instrument for techno-socio-economic-environmental systems

Painting by Maurits Cornelis Escher
Living Earth Simulator (LES)

GPP

PNS

LES

Inform
Interact
Explore
Inform

Provide data
Create new technology

Models to simulate & predict
Building FuturlICT’s Living Earth Simulator

- Integrate existing models
- Scale them up to global scale
- Increase degree of detail and accuracy
Interactive Games as Experimental Platform

‘Human-Genome-Project-like’ vision: Develop interactive platforms for rapid experimenting, to better understand human behaviour

Thanks to Stefan Thurner
Global Participatory Platform (GPP)

Platforms to explore & interact

GPP

- Inform
- Interact

PNS

- Provide data
- Create new technology

LES

- Explore
- Inform
An Open, Transparent Platform for Everyone

• Goal: A ‘data, applications and model commons’, an open platform for everyone

• Potential: New services and jobs, less barriers for social, economic and political participation

• Problem: A new public good, requiring mechanisms to avoid data pollution, manipulation, misuse, privacy intrusion, cybercrime

• How to promote responsible use?

• Need to develop a trustable, self-regulating information ecosystem
The Innovation Accelerator (IA)

A platform for efficient large-scale cooperation, innovation and education
Exploratories

- Financial Systems
- Health and Epidemics
- Crime and Conflict
- Risk and Resilience
- Sustainable Cities
- Smart Energy Systems
- Environment and Sustainability
Usable, useful and used systems to be implemented and shared.
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FuturICT’s Benefits Scale with Societal Costs

1. Financial crisis: Losses of 2-20 trillion $
2. Conflict: Global military expenditures amount to 1.5 trillion $ annually.
3. Terrorism: 9/11 attacks caused 90 billion $ lost output of the US economy
4. Crime and corruption: 2-5% of GDP, about 2 trillion $ annually.
5. Cybercrime: 750 billion EUR/a in Europe

- Even a 1% improvement would create benefits many times higher than project investments
- Business opportunities: Facebook’s value, for example, amounts to 60-80 billion $
The FuturICT Community
Academic Institutions
Research Organisations
Businesses
Global Participatory Computing for Our Complex World

FuturiICT

www.futurict.eu