# The FuturIcT Knowledge Accelerator -

## Unleashing the Power of Information for a Sustainable Future

Dirk Helbing, with the support of >200 scientists from all over Europe

*We have explored the microcosmos and the universe, and have sent men to the moon. It turns out, however, that our knowledge of society is too limited to efficiently tackle the global challenges of humanity in the 21st century. Thus, it is timely to create an ICT Flagship to explore social life on Earth and everything it relates to.*

The greatest bottleneck of ICT systems today is the difficulty in making sense and efficiently use the large amounts of data we generate.

# Challenges Humanity is Facing in the 21st Century

Lee C. Bollinger, president of Columbia University, formulated the issue as follows: "The forces affecting societies around the world ... are powerful and novel. The spread of global market systems ... are ... reshaping our world ..., raising profound questions. These questions call for the kinds of analyses and understandings that academic institutions are uniquely capable of providing. Too many policy failures are fundamentally failures of knowledge."

1. Financial and economic crisis
2. Debts and inflation
3. Stability of the European Union
4. Corruption
5. Organized crime, hooliganism
6. Extremism, terrorism, war
7. Epidemics (SARS, H1N1 pandemic)
8. Security and cyber risks
9. Migration and integration
10. Environmental change

# The Top 10 Socio-Economic Problems and their Reasons

## Problems:

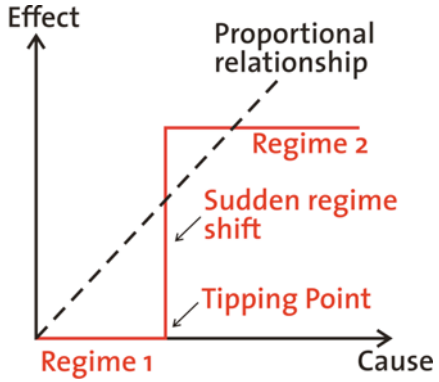
1. Demographic change
2. Financial and economic stability
3. Social, economic and political inclusion
4. Public health
5. Balance of power and conflict
6. Corruption and crime
7. Collective social behavior
8. Institutional design
9. Sustainable use of resources
10. Reliability of critical infrastructures

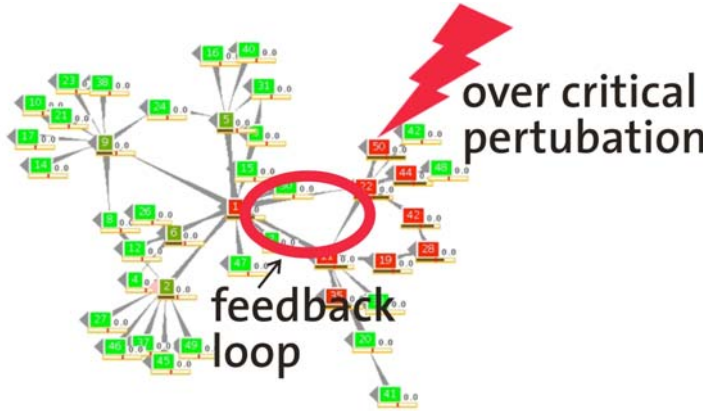
## Reasons:

1. Interdependency, interconnectivity
2. Socio-economic, ecological, and technological complexity
3. Self-organization, emergence, chaos
4. Limits of predictability and control
5. Lack of quantitative models
6. (Due to) Lack of data
7. Lack of computational power
8. Lack of systemic predictions
9. Lack of tested alternatives
10. Systemic risks

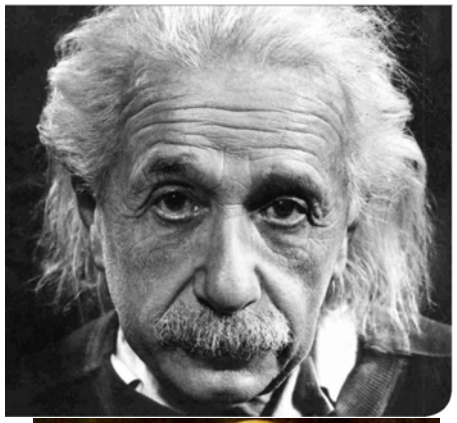
This is about to change!

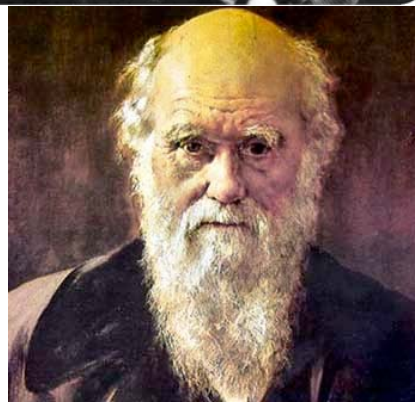
Cascade failures/ avalanche effects:
Epidemic spreading, congestion spreading, failure of interbank market, breakdown of former GDR

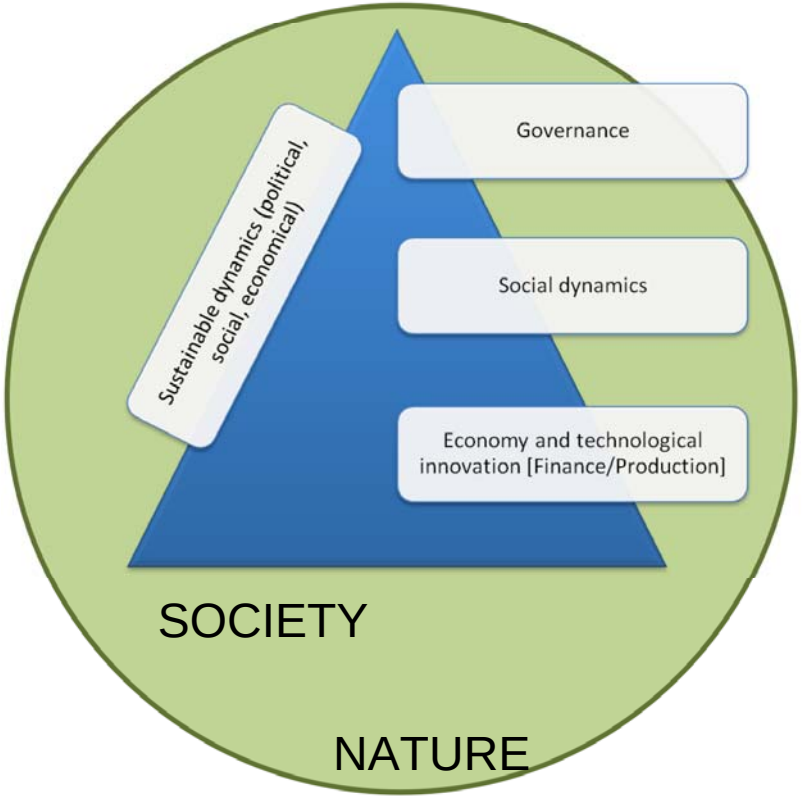


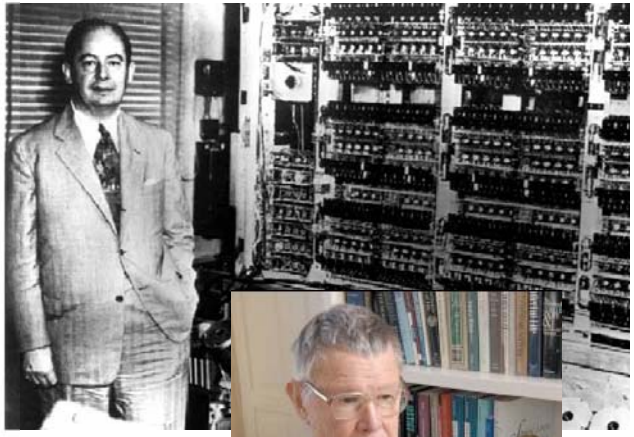



# The Need of A Knowledge Accelerator



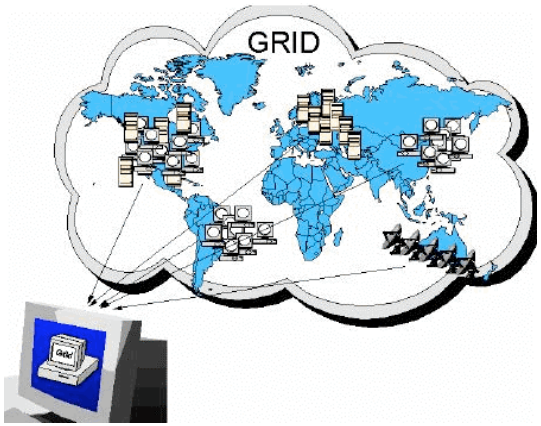




We need to create a techno-socio-economic-ecological knowledge accelerator - a kind of multi-disciplinary Apollo project that uses current and future ICT developments to address the challenges of humanity, involving natural scientists and engineers

# Ambitions of FuturIcT




Living Earth Simulator

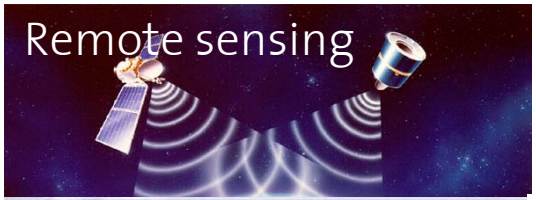
## Fundamental ICT Challenges

- Exascale Computing
- Highly Decentralized and Peer-to-Peer Systems
- Zero-Delay Reality Mining
- Swarm Computing
- Social Computing
- Social Information Theory

## Applied ICT Challenges

- User-Oriented ICT Systems
- Data Collectors
- ICT-Empowered Systems Modeling
- Evaluating ICT Systems
- Reasoning ICT Systems
- Creative ICT Systems

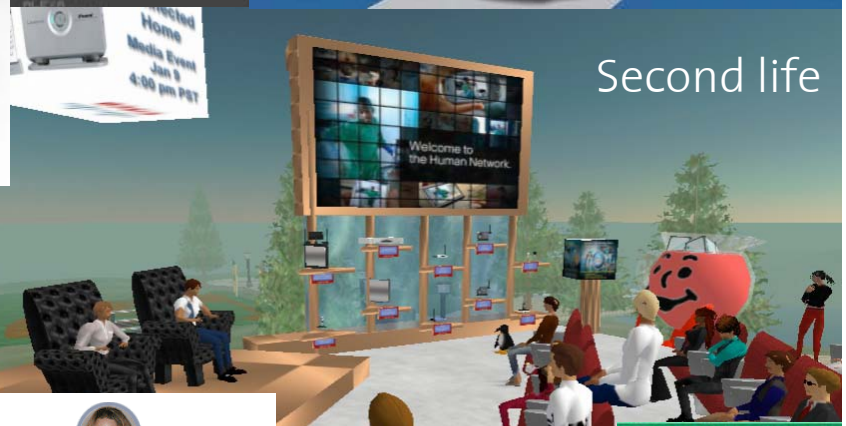
# New ICT for Socio-Economic-Ecological Reality Mining + Simulation

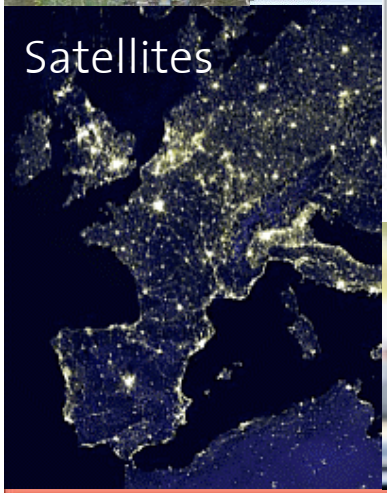




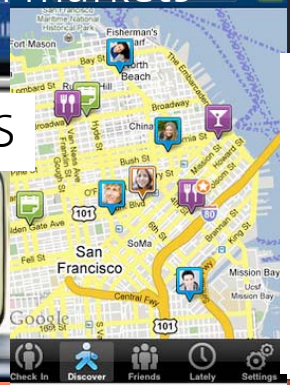






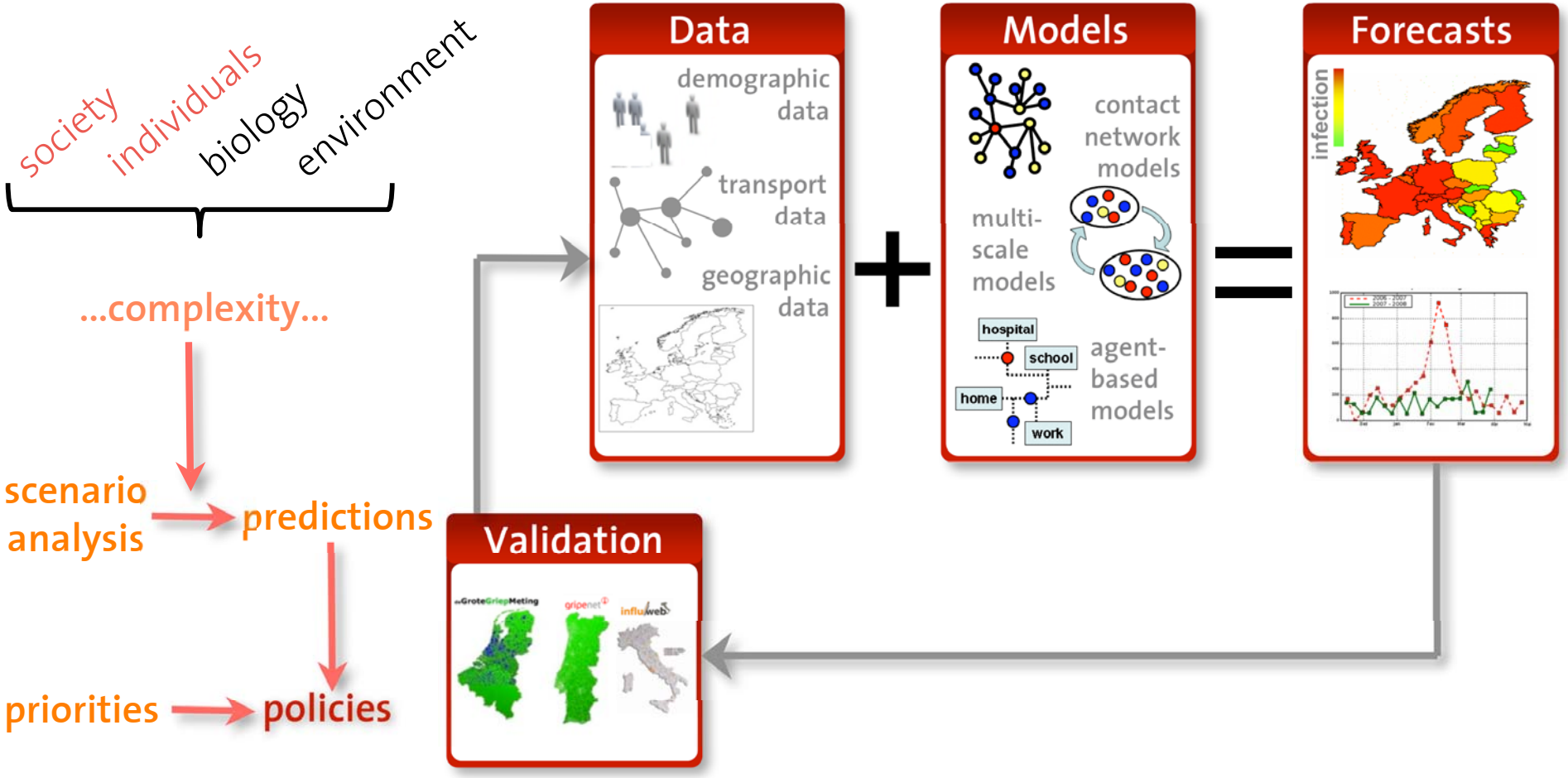







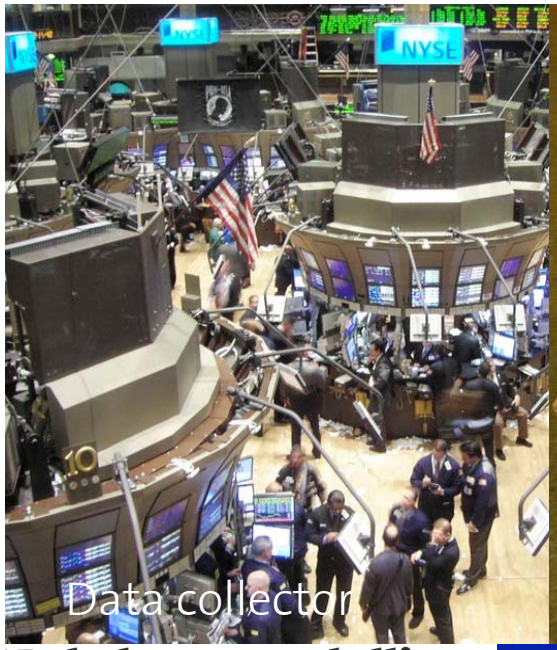


# Global-Scale Simulation of Socio-Economic-Environmental Systems




(thanks to Alex Vespignani)

# Policy Making Decision Support through FuturIcT

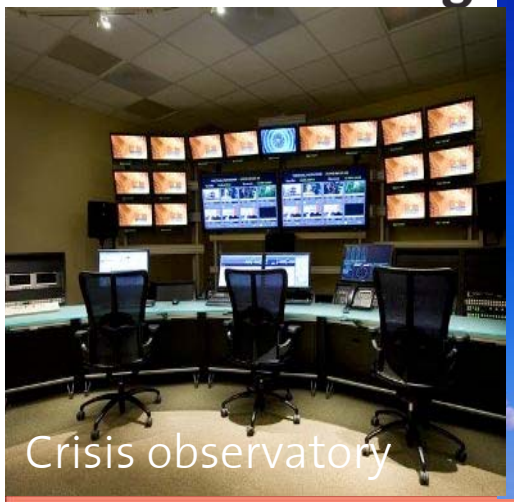


Data collector


Testing of alternative solutions

Decision theater

Meltdown modelling


Crisis observatory


European-scale, multi-disciplinary effort is needed!

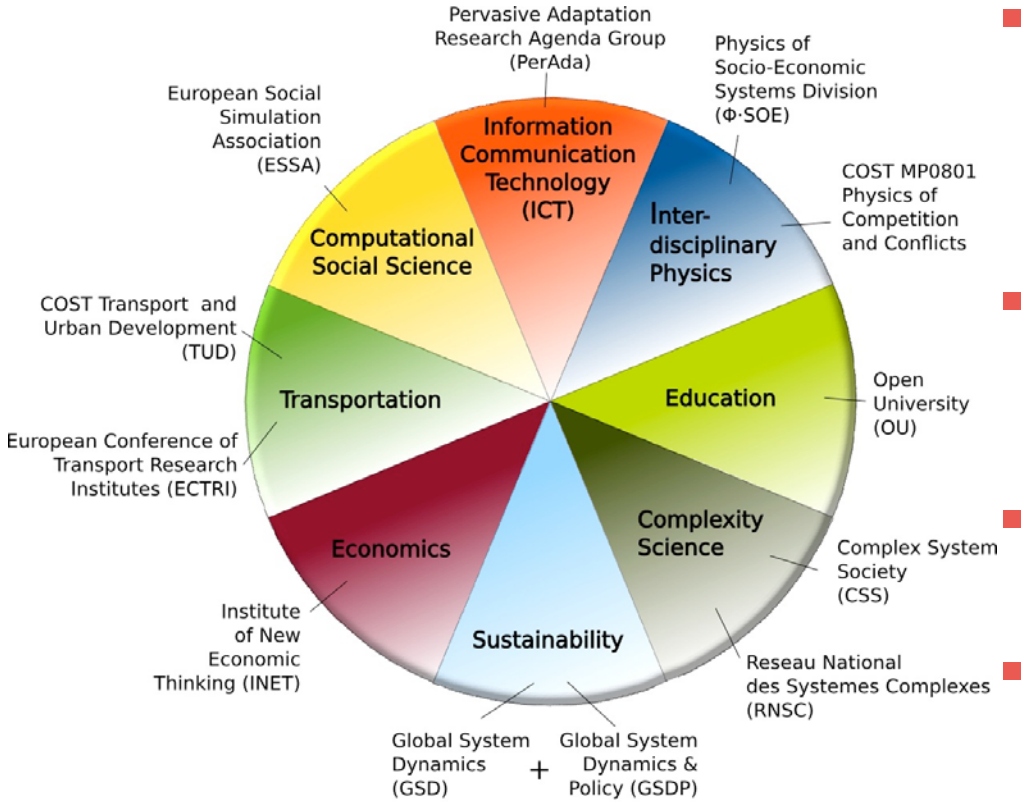

Political decision-making

# Impact on Science, Industry, Business, Administration, Governance

- Science and Education:
  - Innovation accelerator
  - Personalized education
- Public Sector:
  - Smart, sustainable cities
  - Healthcare (e.g. epidemics)
  - Crisis observatories, risk management
- Business and Industry:
  - Financial sector
  - Managing complexity
  - Transport, traffic, logistics
  - Electrical micro-generation
- Administration and Governance:
  - eGovernance
  - Institutional design
- Consultancy:
  - Customized information services


# Plausibility of FuturIcT

## Related Projects




The FuturIcT Knowledge Accelerator integrates the best of all relevant knowledge

- Europe managed to be leader in social simulation, but US military and homeland security now invest huge sums into many projects
- EU projects on techno-social systems: QLectives, Cyberemotions, Epiwork, Socionical
- Science of Science: HITIME, VIVO, GAPMINDER, GLOBALHUBS, CREEN…
- Large-Scale Multi-Agent Simulation: EURACE, Agent-Based Macro-Financial Model
- EURACE, EMIL, PERPLEXUS, PATRES, MMCOMNET, EVERGROW, DELIS, EC-AGENTS, PACE, CREEN, IRRIIS…

# Completed Steps and On-Going Preparations for FuturIcT

- Build-up of networked multi-disciplinary community
- Linking with global system dynamics and sustainability community (GSDP project)
- Identification of Grand Challenges, Hilbert Program for the socio-economic sciences
- Elaboration of suitable institutional settings (Visioneer):
  - Social data-mining and crises forecasting capacities
  - Innovation accelerator
  - Social simulation capacities
  - Integrative systems design centers


News in all major languages!