



Social Simulation in Korea

Tokyo Workshop

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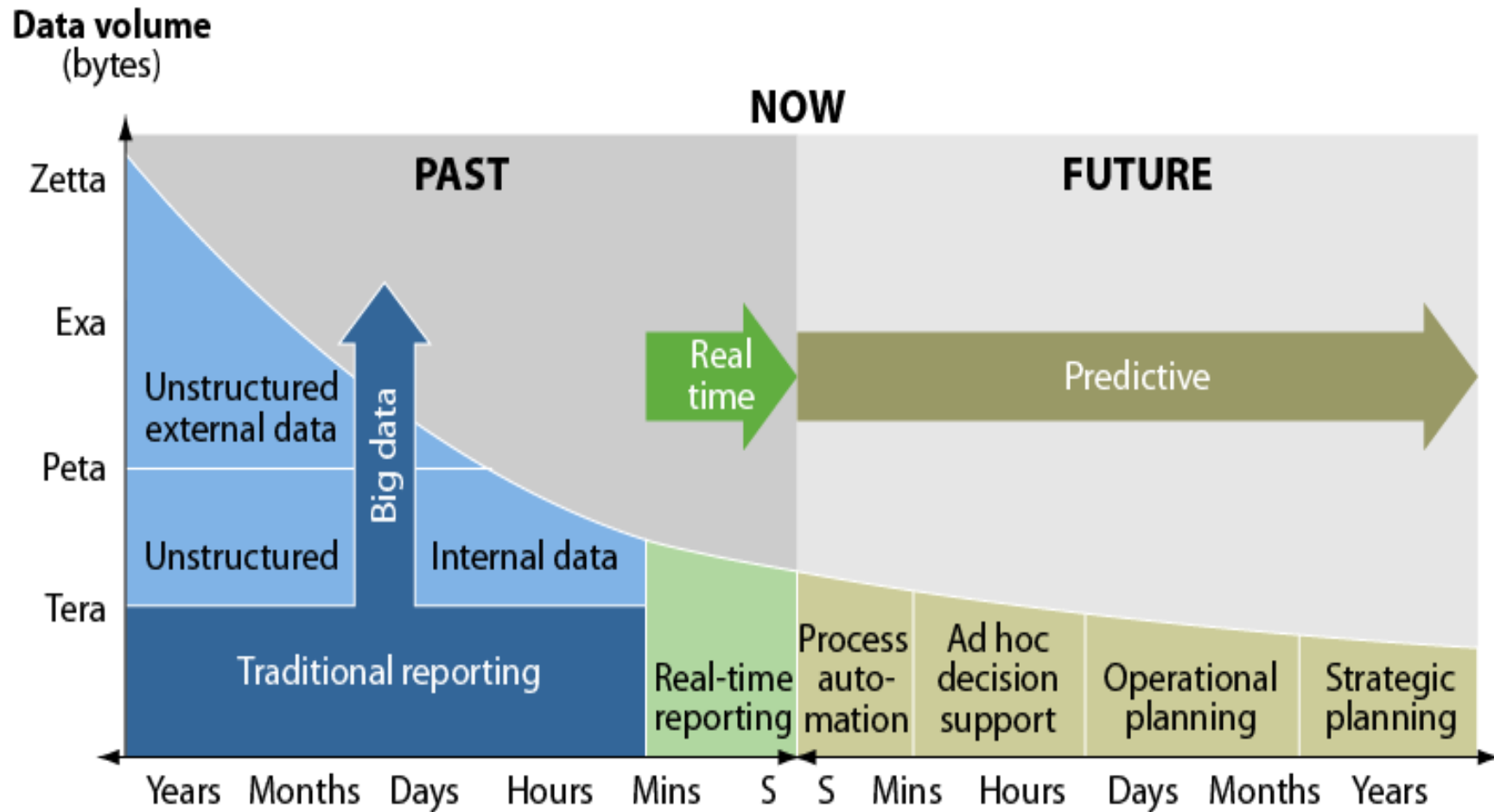


ETRI 한국전자통신연구원
www.etri.re.kr

- ❖ Korean Population Dynamics
- ❖ Social Simulation Community
- ❖ "Simulated Reality"

SOCIAL SIMULATION IN KOREA

Data → Insight → Foresight



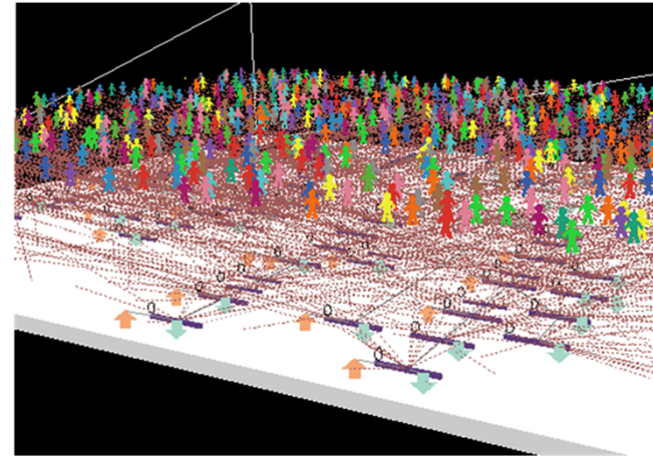
Forrester, *Understanding the Business Intelligence Growth Opportunity, 2011*

- ❖ Individual Level Modeling
- ❖ Agent-Based M&S
- ❖ Korean Population Dynamics Models

KOREAN POPULATION DYNAMICS

Microsimulation & ILM

- Model from the “bottom-up”
 - “Natural description” of the system under study



- Agent-Based Models (ABMs)
 - “Agents” are unique entities in the model – capable of self control and decision making
 - Strong emphasis on individual behavior / psychology

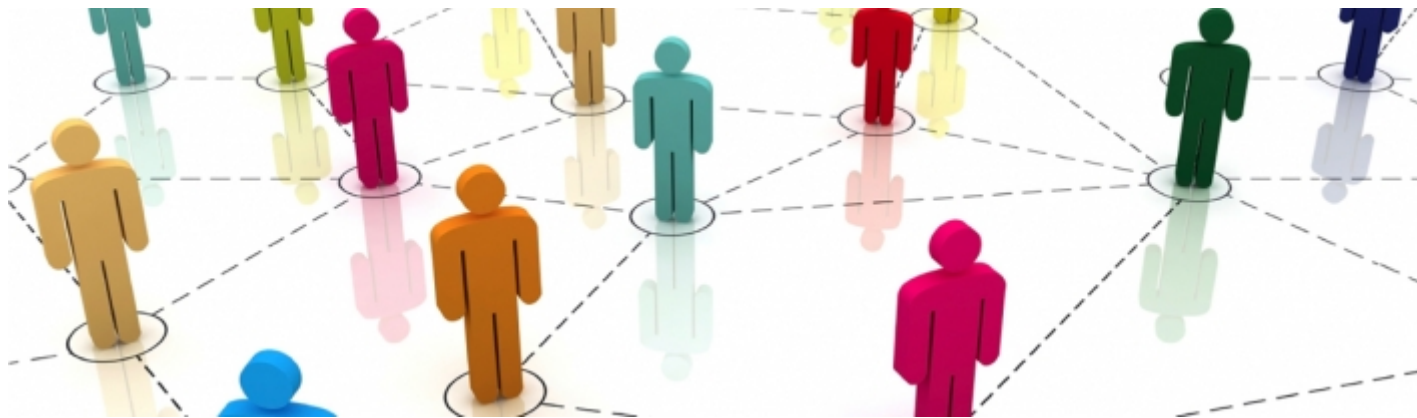
Why ILM? (Individual-Level Model)

- Emergence
 - Patterns at one level arising from lower level effects
 - Simple rules -> complex patterns
 - Not intended by the individuals
- Individual-level models provide a *natural description* of the system



ABM (Agent-Based Modeling)

- Autonomous, interacting agents
- Focus on behavior, psychology, autonomy
- Represent individuals or groups



ILM – Pros

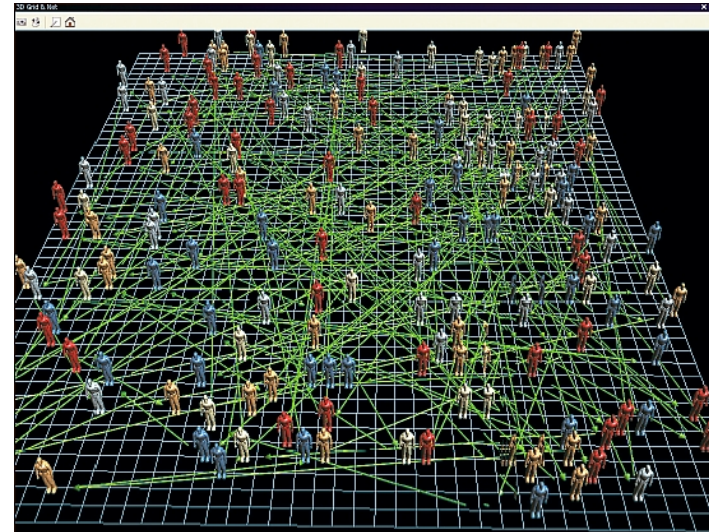
- More “natural” for social systems than statistical approaches
- Dynamic history of system
- Can include physical space / social processes in models
- Designed at abstract level: easy to change scale
- Bridge between verbal theories and mathematical models

ILM – Cons

- Computationally expensive
 - Lots of agents, lots of iterations, lots of computation!
 - Models often stochastic so single model run reveals a theorem, but no information about robustness
 - Sensitivity analysis and many runs required
 - (High performance computing – e.g. National Grid Service – can help)
- Small errors can be replicated in many agents
- “Methodological individualism”
- Modelling “soft” human factors

ILM is Possible?

- Barriers
 - Data → Big-Data Era
 - Methods → ABM&S
 - Computation → HPC (GPGPU, Ultra-Mini)
- **Full-Scale ILM (ABM)**
 - Why Not? But...
 - Data ↔ Methods ↔ Computing
 - Verification & Validation

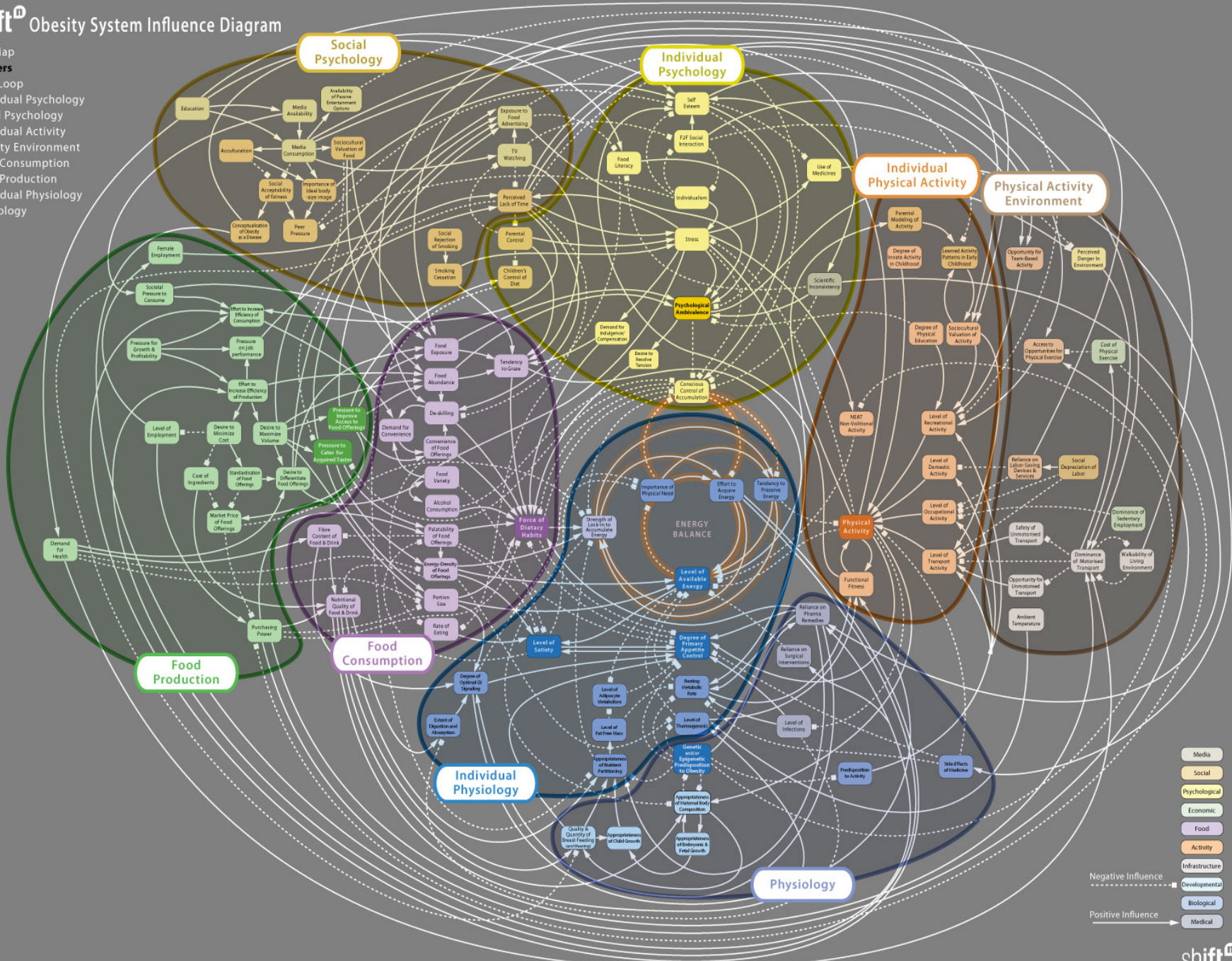


shift[®] Obesity System Influence Diagram

Full Map

Clusters

- Core Loop
- Individual Psychology
- Social Psychology
- Individual Activity
- Activity Environment
- Food Consumption
- Food Production
- Individual Physiology
- Physiology

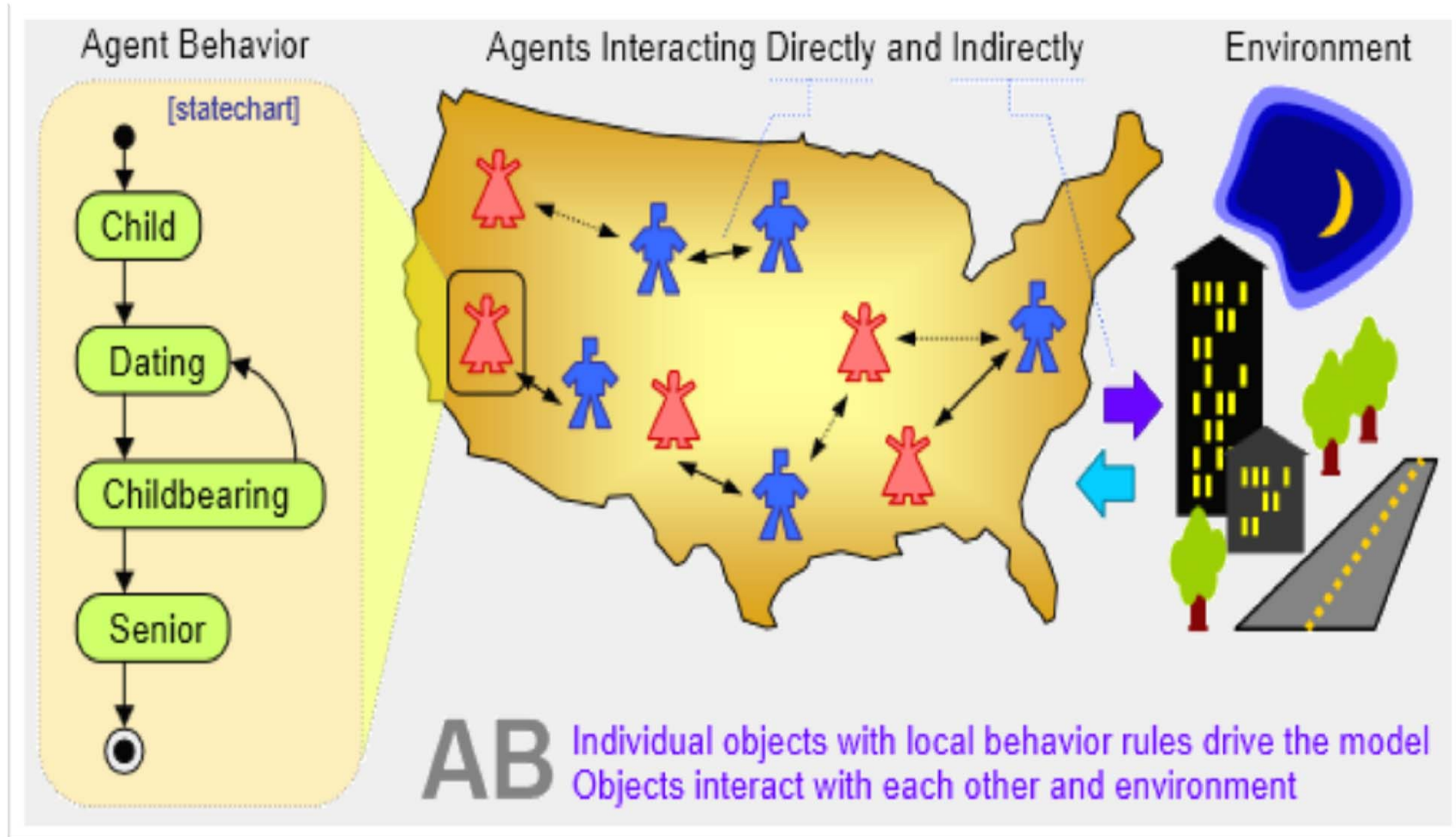


- Media
 - Social
 - Psychological
 - Economic
 - Food
 - Activity
 - Infrastructure
 - Developmental
 - Biological
 - Medical
- Negative Influence (dashed arrow)
Positive Influence (solid arrow)

ABM vs. SD

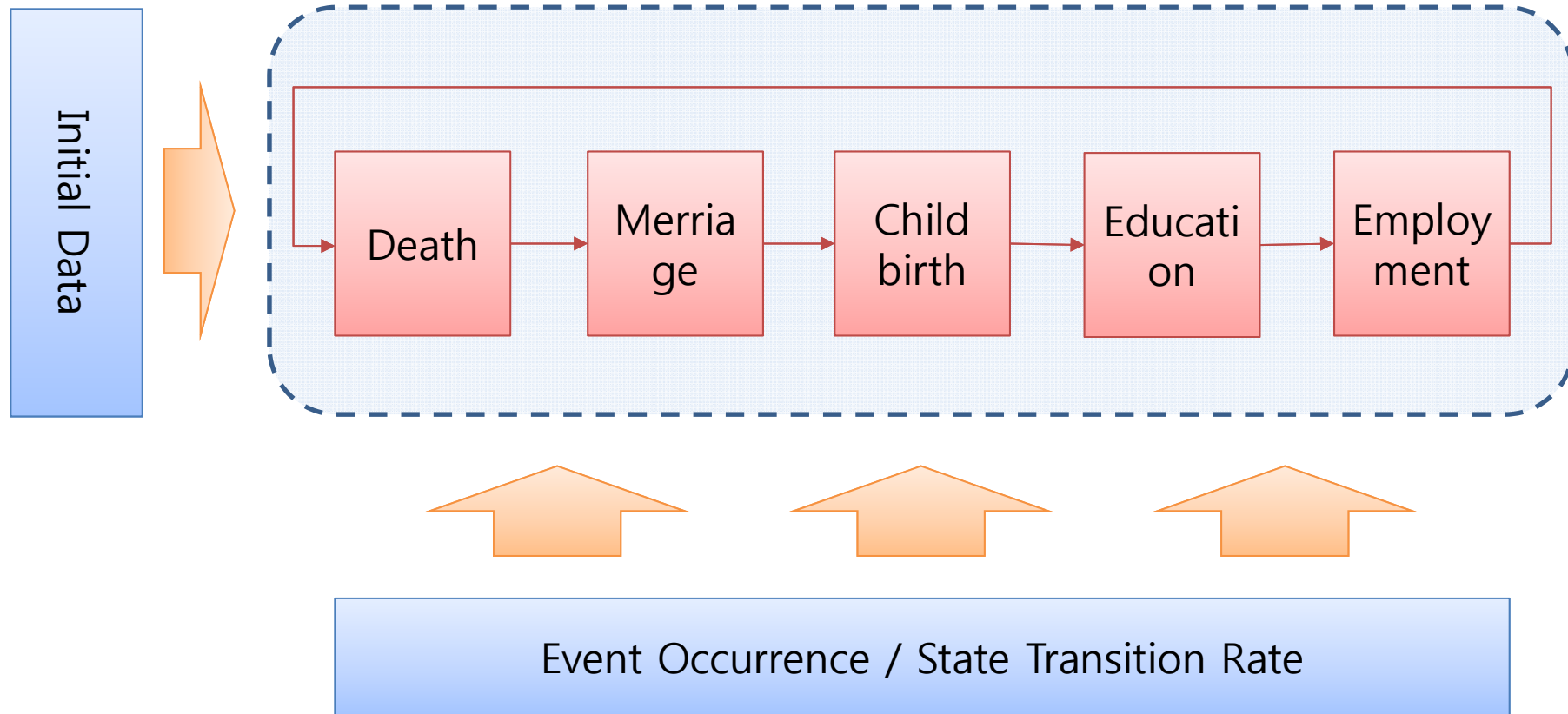
	Agent-Based Modeling	System Dynamics Modeling
Perspective	Bottom-Up	Top-Down
Main Building Block	Individual Agent	Feedback Loop
Unit of Analysis	Agent's Rule	Structure of System
Level of Modeling	Individual	Aggregate
Structure of System	Not Fixed	Fixed
Handling of Time	Discrete or Continuous	Continuous

Agent-Based/Individual-Based M&S (ABM, IBM)



☞ Borshchev, A. et al. (2004): *From system dynamics and discrete event to practical agent based modeling: reasons, techniques, tools*

Korean Population Dynamics Model

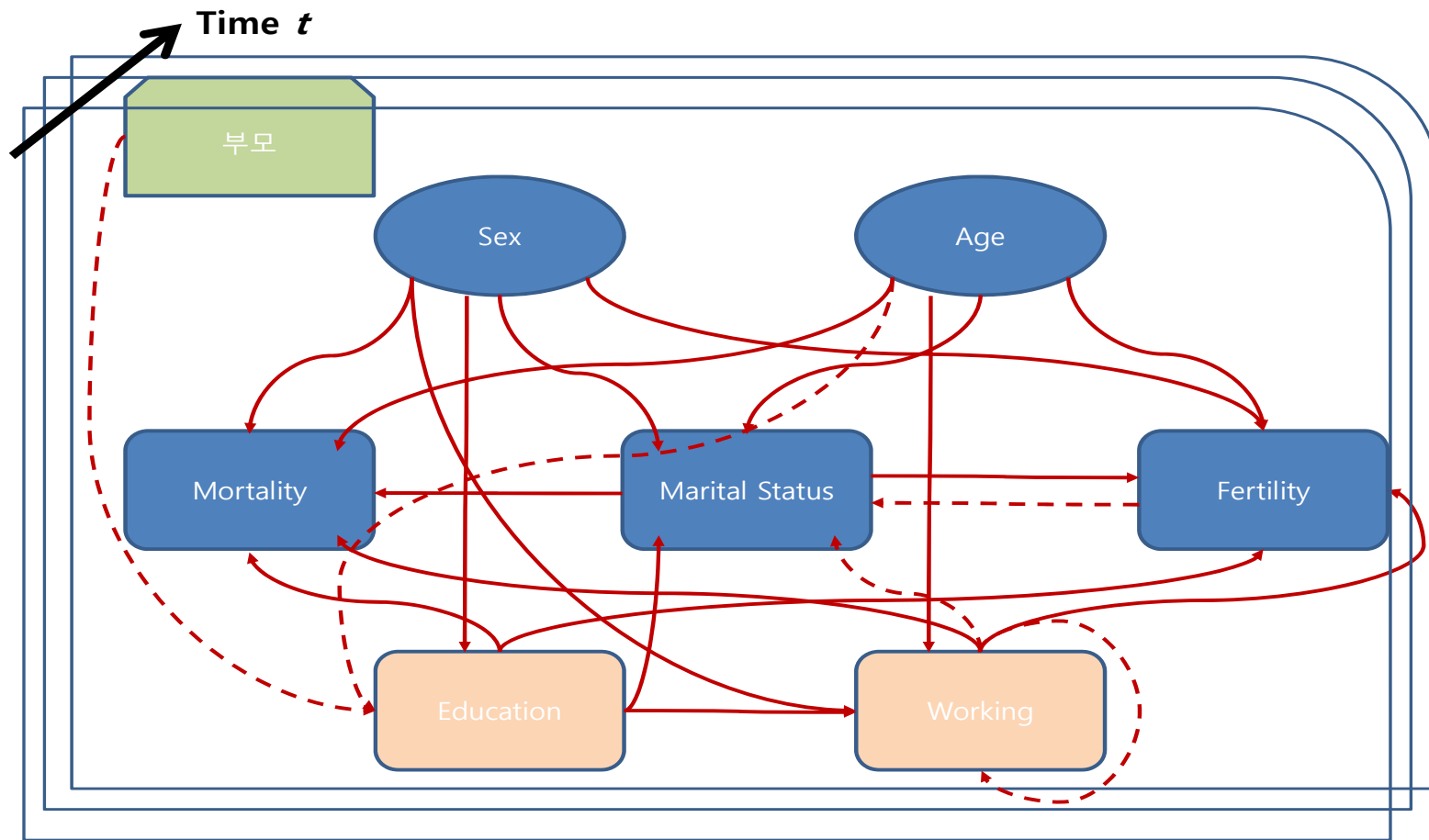


KPDM – Initial Data

- Population & Housing Census
 - 1% Micro Dataset (~ 0.5M)
 - 2% Micro Dataset and/or
 - 5% Micro Dataset (> 1M)
- Panel Study Dataset (by KiHASA)
- Administration Dataset

KPDM – Transition Rate

- Conditional Rate/Probability



KPDM – What to ABMize?

- Domestic Migration
- Coupling (Marriage)
- Childbirth

Belief-Desire-Intension Agents

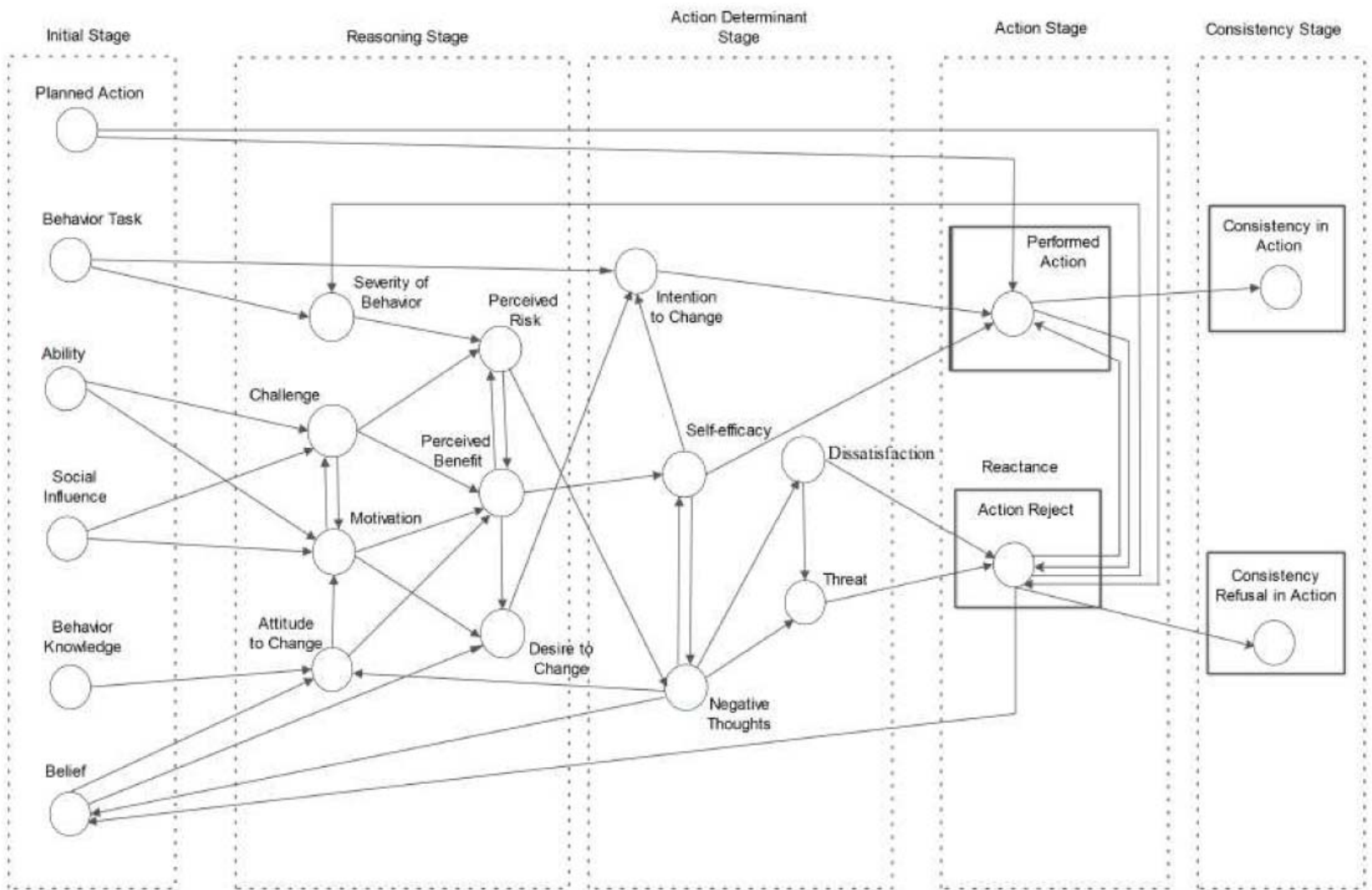
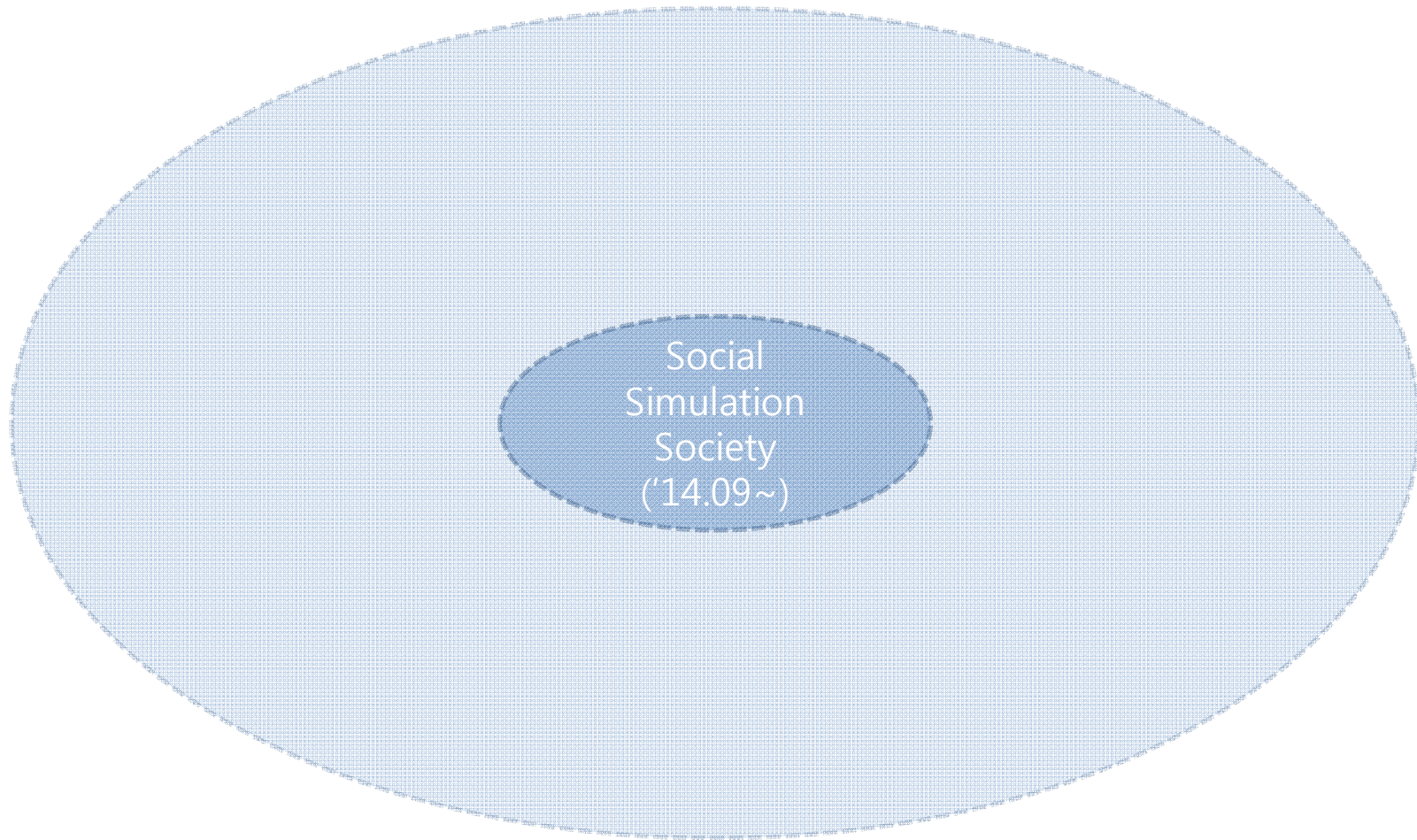


Figure 1: The BDI Agent Model

- ❖ Social Simulation Society
- ❖ Simulated Reality Cluster
- ❖ Asia-Pacific Social Simulation Workshop
- ❖ IMA Conference

SOCIAL SIMULATION R&D COMMUNITY

Social Simulation Community

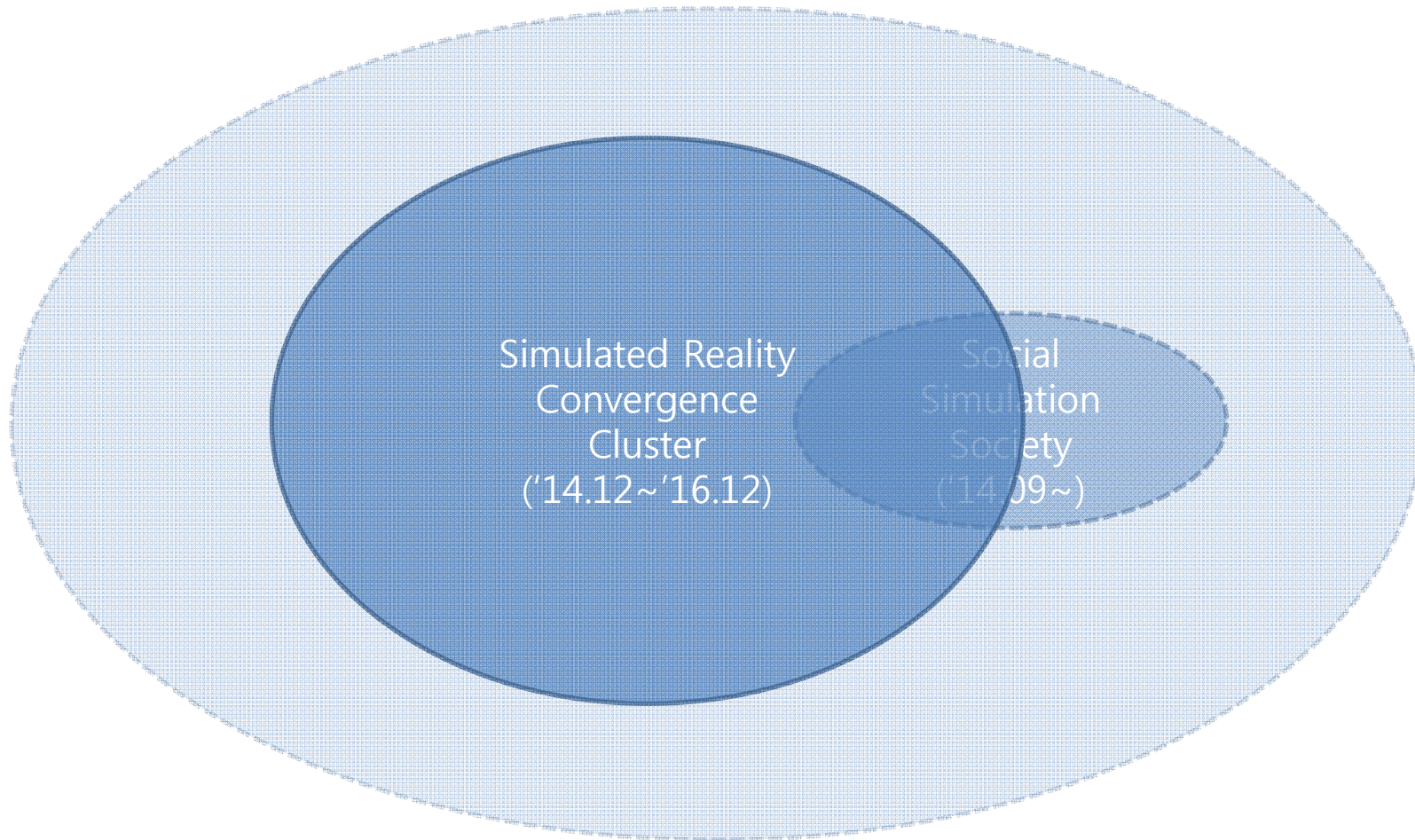


Social Simulation Society

- (2014.09) Created Research Group in KORMS (Korean Operations Research and Management Science Society)
- (2014.11) 6 Invited Talk Session in Fall Conference of KORMS (@Korea Univ.)



Social Simulation Society

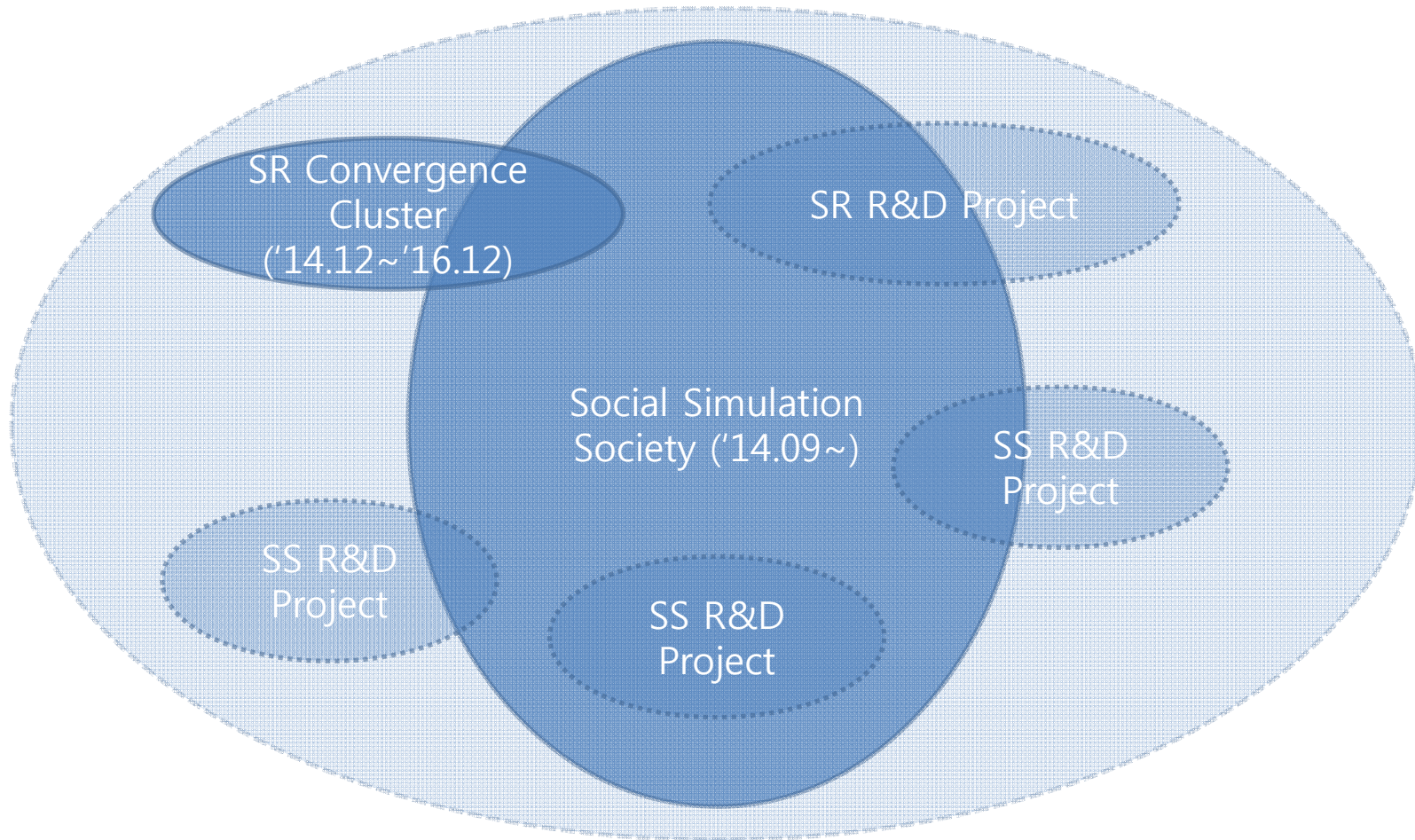


Simulated Reality Cluster

- (2015.09) Almost 70 researchers has joined
 - (WG1) Simulation Platform
 - (WG2) Techno-Socio-Economic Modelling
- (2015.01) 1st Plenary Meeting at ETRI (Monthly)



Social Simulation Society



Social Simulation Society

- Asia-Pacific Social Simulation Workshop
 - 2015's Fall Conference (KORMS Host)
 - Apr. 09~11, 2015 @Jeju
 - Prof. Cathal O'Donoghue (IMA Chair)
 - Dr. Dirk Helbing (EU FuturICT Chair)
- IMA (International Microsimulation Association) Conference 2016
 - April or May, 2016

Asia-Pacific Social Simulation Workshop

Call for Paper/Participation

Asia-Pacific Social Simulation Workshop 2015

- **Goals & Purposes**

- ✓ Building the R&D Community of Social Simulation in Asia-Pacific Region
- ✓ Creating the International Collaborative R&D Project on Social Simulation
- ✓ Hosting 2nd JaKoSS (Korea-Japan Social Simulation) Workshop

- **Date & Venue**

- ✓ Date: Apr. 9 (Thu.) ~ Apr. 11 (Sat.), 2015
- ✓ Venue: Ramada Plaza Jeju Hotel (Jeju Island, South Korea)

Asia-Pacific Social Simulation Workshop

Time	Schedule	Comments
Apr. 9th (Thu.) Convergence Cluster Project Seminar & Meeting (Korean Community Event)		
13:00 ~ 16:30	Convergence Cluster Project WG Meeting ✓ Plenary Meeting ✓ WG Meeting (WG1 / WG2)	
16:30 ~ 18:00	Reserved for Additional Session	Registration
18:00 ~ 20:00	Welcome Reception / Cultural Performance	



Apr. 11th (Sat.) Asia-Pacific Social Simulation Workshop		
09:00 ~	Social Program (Jeju Tour) ✓ Option 1 ✓ Option 2	

Apr. 10th (Fri.) Asia-Pacific Social Simulation Workshop		
09:00 ~ 10:30	Keynote Speech ✓ Prof. Cathal O'Donoghue (IMA Chair) ✓ Prof. Dirk Helbing (FuturICT)	
10:30 ~ 12:00	Invited Talks ✓ Prof. Takao Terano (PAAA President) ✓ Prof. Aoyama Hideaki (FuturICT Japan, Kyoto Univ., Japan) ✓ Prof. Seiichi Inagaki (Hitotsubashi Univ., Professor, Japan) ✓ ...	
12:00 ~ 13:00	Lunch	
13:00 ~ 14:50	Korea-Japan Social Simulation Joint Workshop Session ✓ Prof. Shingo Takahashi (Waseda Univ., Professor, Japan) ✓ Prof. Hiroshi Takahashi (Keio Univ., Professor, Japan) ✓ Prof. Manabu Ichikawa (Tokyo Institute of Technology, Professor, Japan) ✓ Prof. Setsuya Kurahashi (University of Tsukuba, Professor, Japan)	
14:50 ~ 15:10	Coffee Break	
15:10 ~ 17:00	Korea-Japan Social Simulation Joint Workshop Session (To Be Organized) ✓ 3 ~ 4 papers	
17:00 ~ 18:00	Panel Discussion ✓ How to build up Asia-Pacific Social Simulation Community? ✓ How to create an International Collaboration Project? ✓ What would be the scope and contents of the project	
18:00 ~ 20:00	Networking Dinner	

Asia-Pacific Social Simulation Workshop

- **Host**

- ✓ ETRI (Electronics & Telecommunications Research Institute)
- ✓ UNIST (Ulsan National Institute of Science & Technology)
- ✓ KORMS (Korean Operations Research and Management Science Society)
- ✓ PAAA (Pan-Asian Association for Agent-based Approach in Social Systems Science)
- ✓ NST (National Research Council of Science & Technology)

- **Important Dates**

- ✓ Tutorial Proposal : **Feb. 20, 2015**
- ✓ Abstract Submission: **Feb. 20, 2015**
- ✓ Acceptance Notification: **Feb. 27, 2015**
- ✓ Full Paper/Presentation/Poster Submission: **Mar. 20, 2015**

- ❖ EU FuturICT Project
- ❖ Korean “Simulated Reality” Project Planning
- ❖ How to create it?

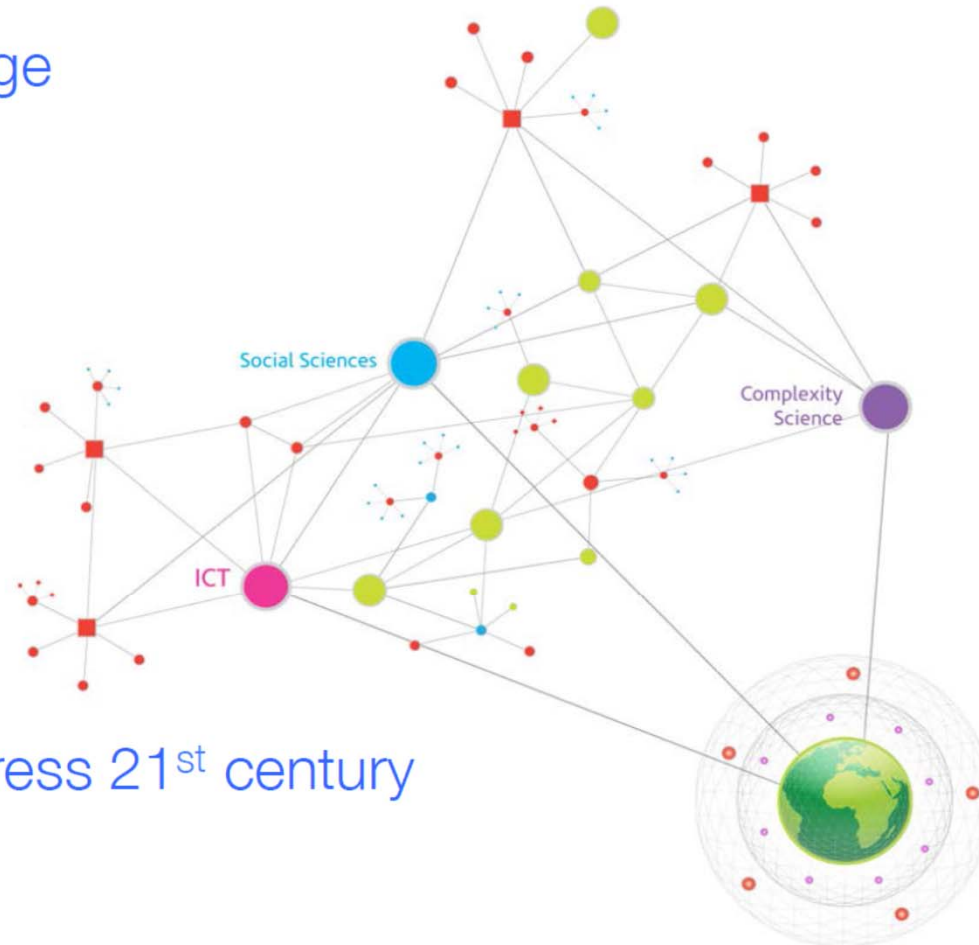
CREATING “SIMULATED REALITY” R&D PROJECT

FuturIST or FuturICT



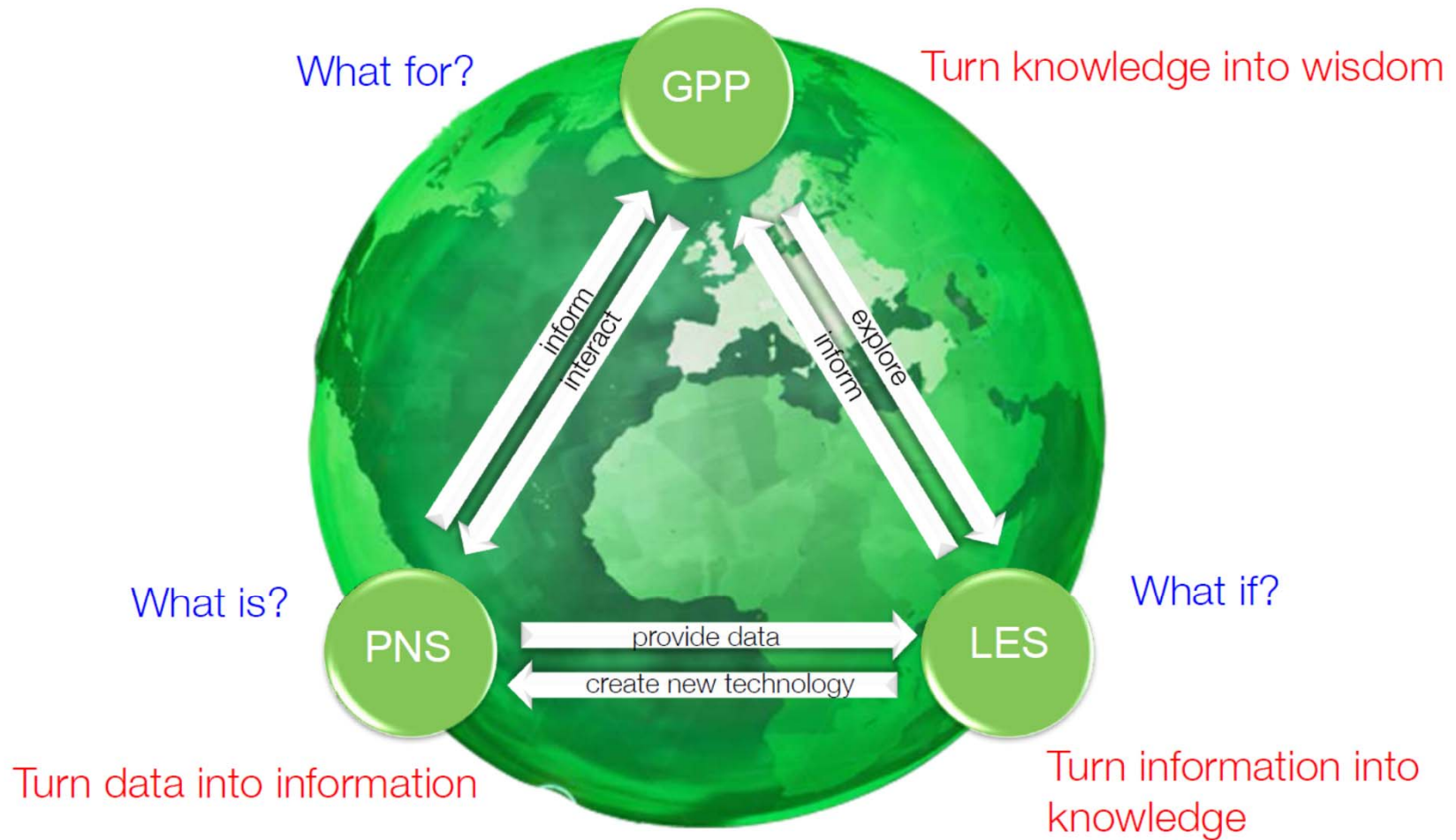
FuturICT Vision: Integrating Different Fields of Science to:

- Create new knowledge
- Create new ICT
- Leverage this to address 21st century challenges



FuturICT

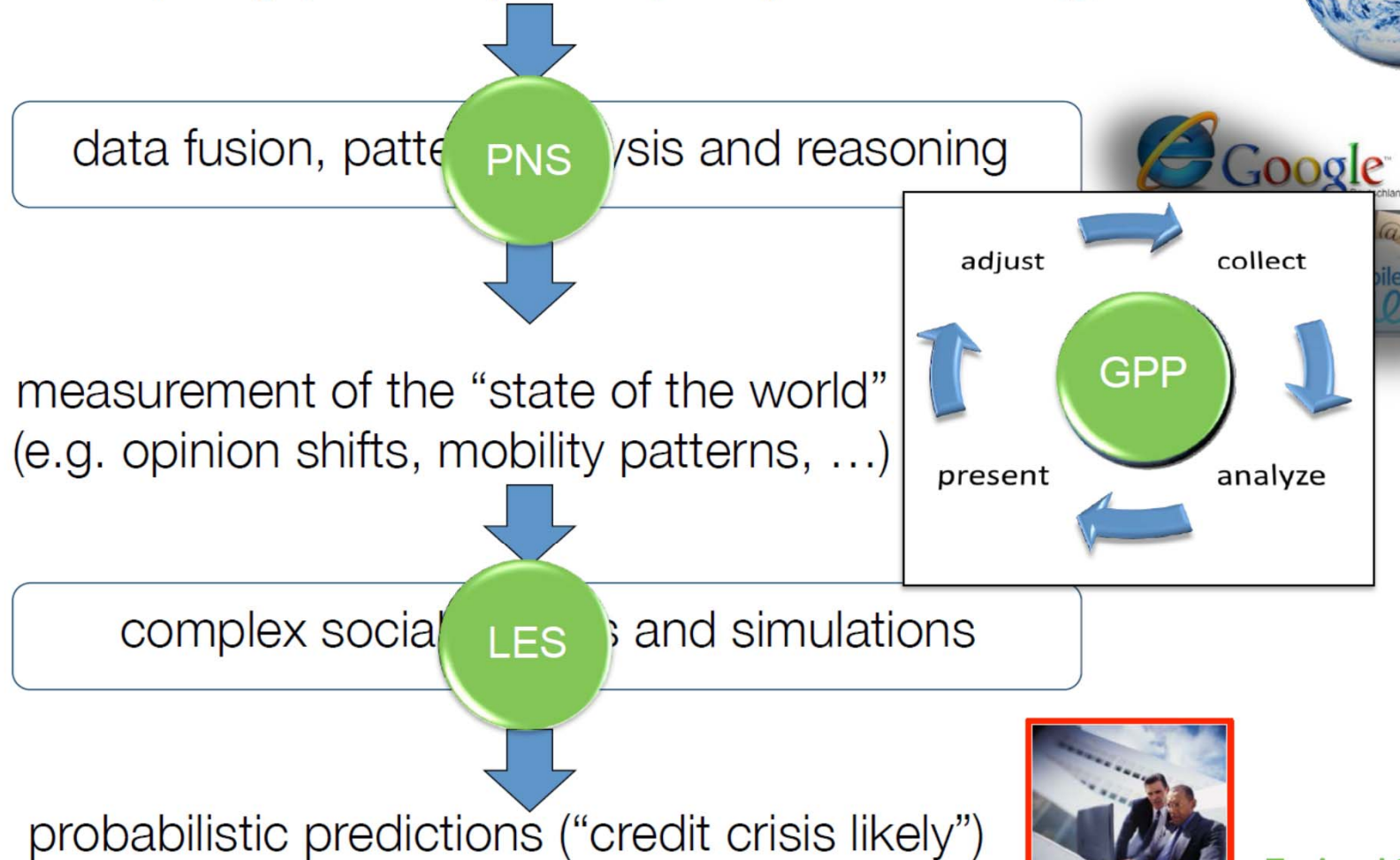
How It Will Work



Shedding Light on the Data Shadow



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



„Google-like“ high-level queries



FuturiG

Crowd Sourcing 3D Environments



contributed
photos



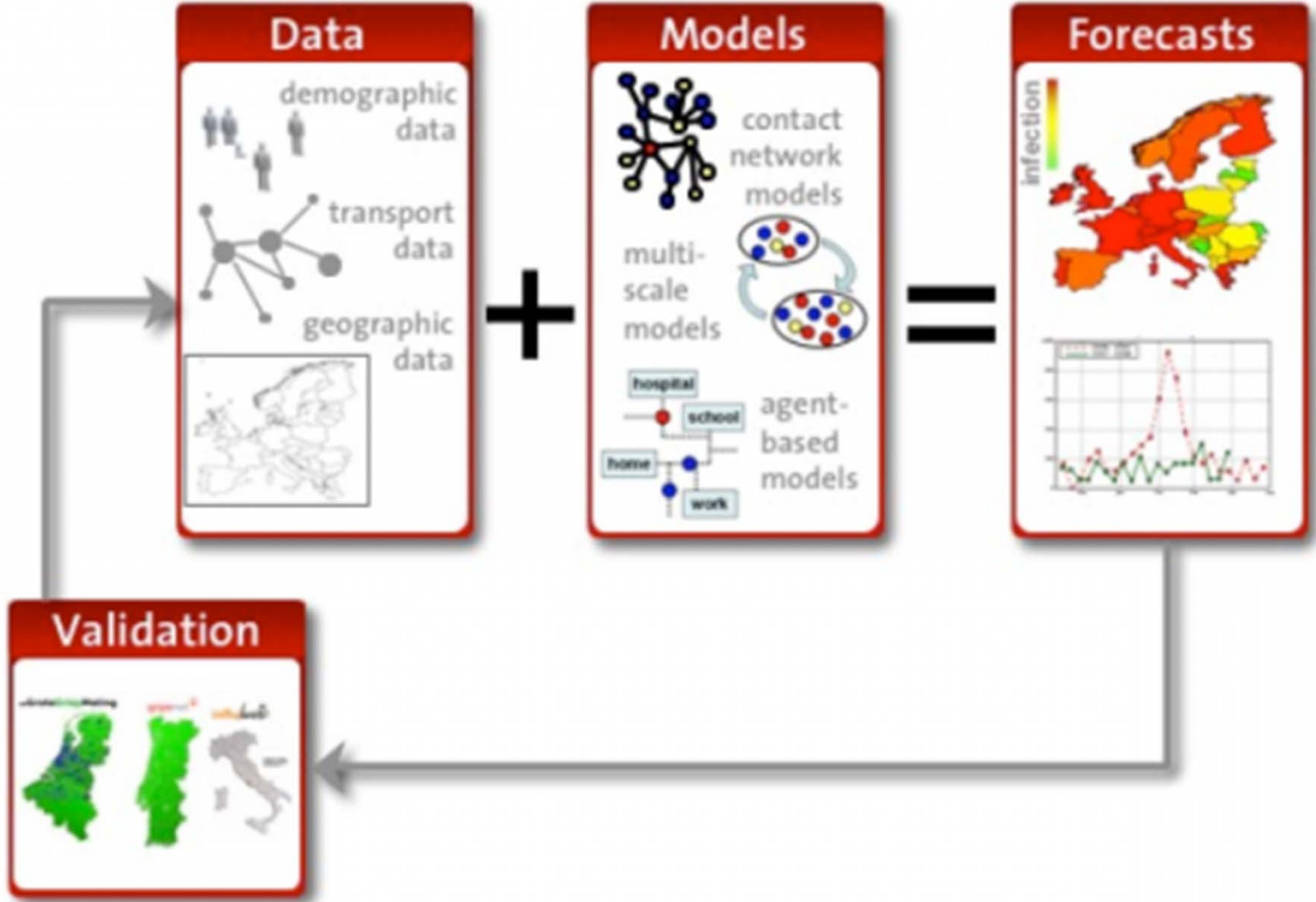
aggregation



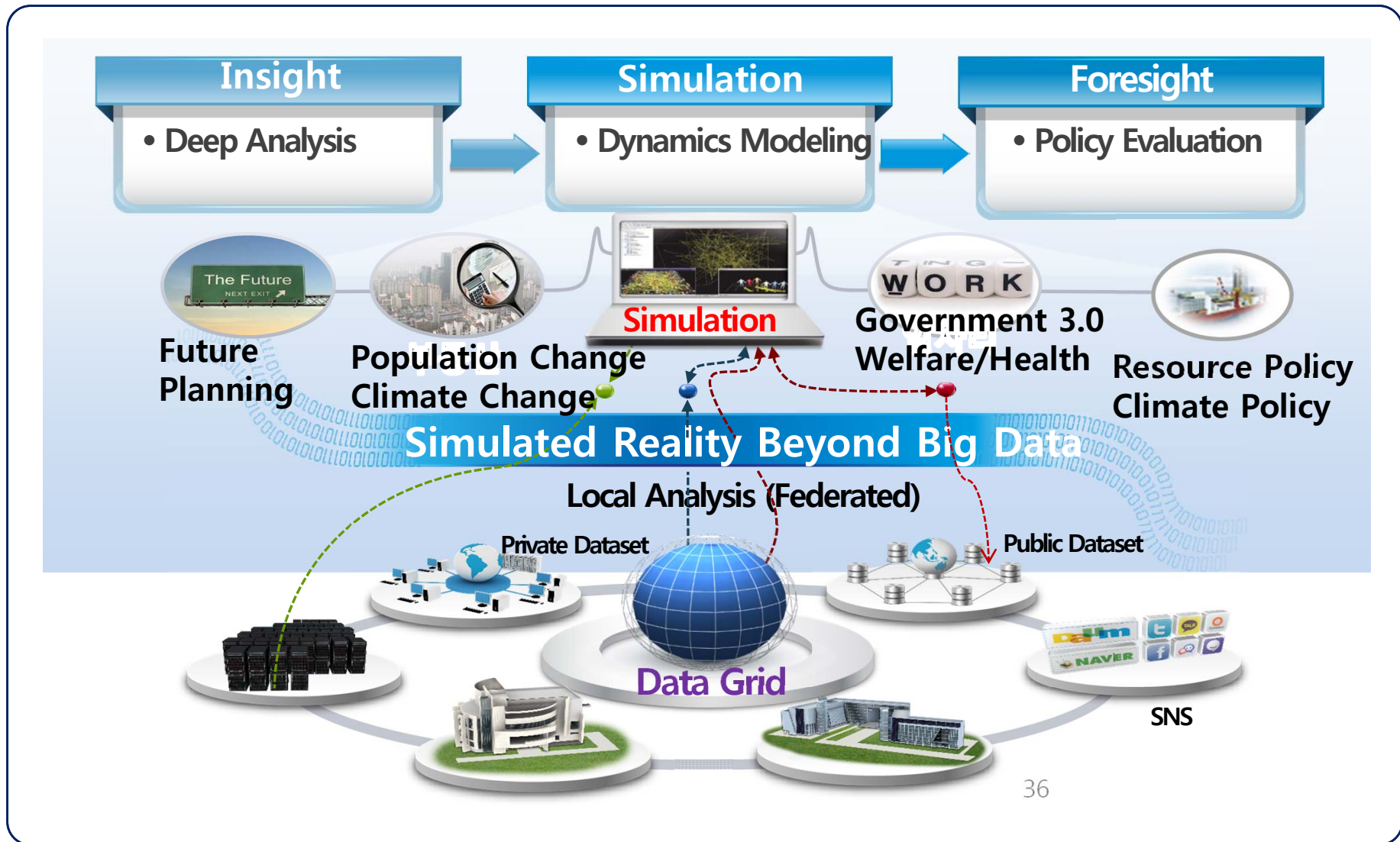
full 3-D model

Thanks
to Marc
Pollefeys
et al.

Living Earth Simulation



Simulated Reality – Concepts



Simulated Reality – Layers

