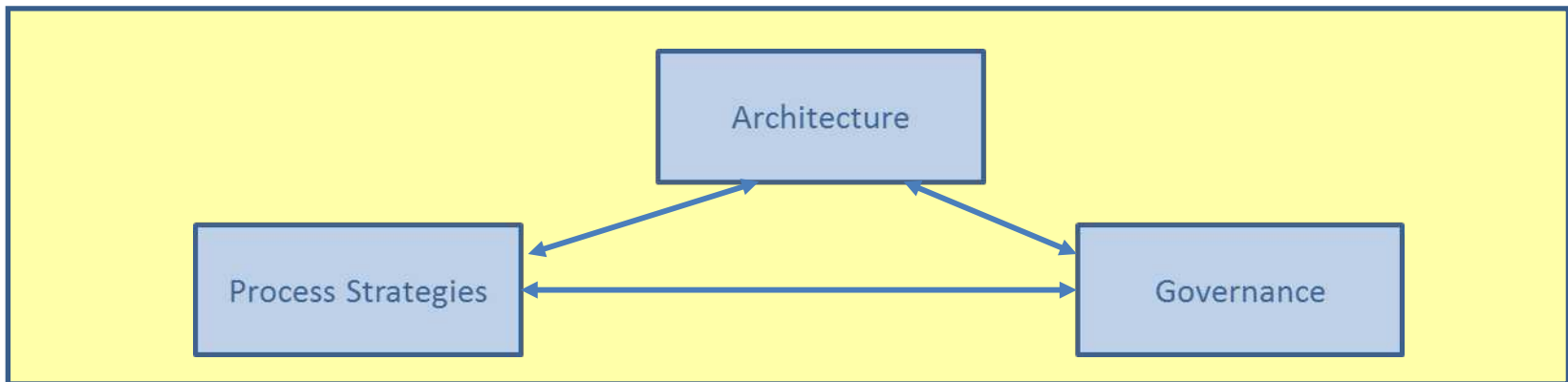


Shaping the Evolution of Information Infrastructures: Architecture, Governance Regime, Process Strategy

Towards a Theory of Information Infrastructures

A Theories of Information Infrastructures
(Evolution & Design)



Assemblage Theory

Complexity Science

Actor Network
Theory

Reflexive
Modernisation

Infrastructure evolution

- Evolution
 - Adoption
 - Scaling
 - Innovation
 - Harmonization/restructuring/consolidation
 - Crumbling/fragmentation

Innovation

- Of, in, on
- W. Brian Arthur
 - The nature of technology. What it is and how it evolves
 - Out of a material
 - (re-)combination
 - Structural deepening
 - Re-domaining

Successful information
infrastructures

=

Generative information
infrastructure

The Generative Internet

- Generativity =
 - “.. A technology’s overall capacity to produce unprompted change driven by large, varied, and uncoordinated audiences.”
 - Capacity for leverage
 - Adaptability
 - Ease of mastery
 - Accessibility
 - Computers
 - PC & Internet
 - Opposite: Appliances
 - Telecom: intelligent network + appliances

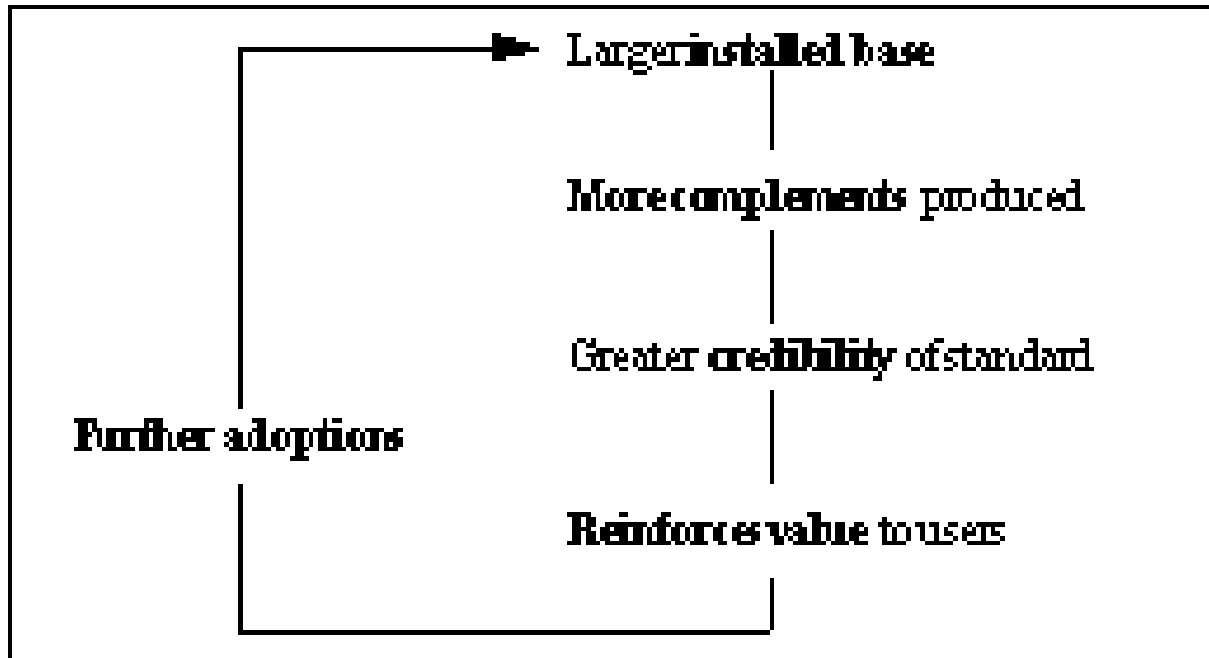
Generative relationships

- Innovation = exaptive bootstrapping
- aligned directedness
- heterogeneity
- mutual directedness.
- permissions structures
- action opportunities

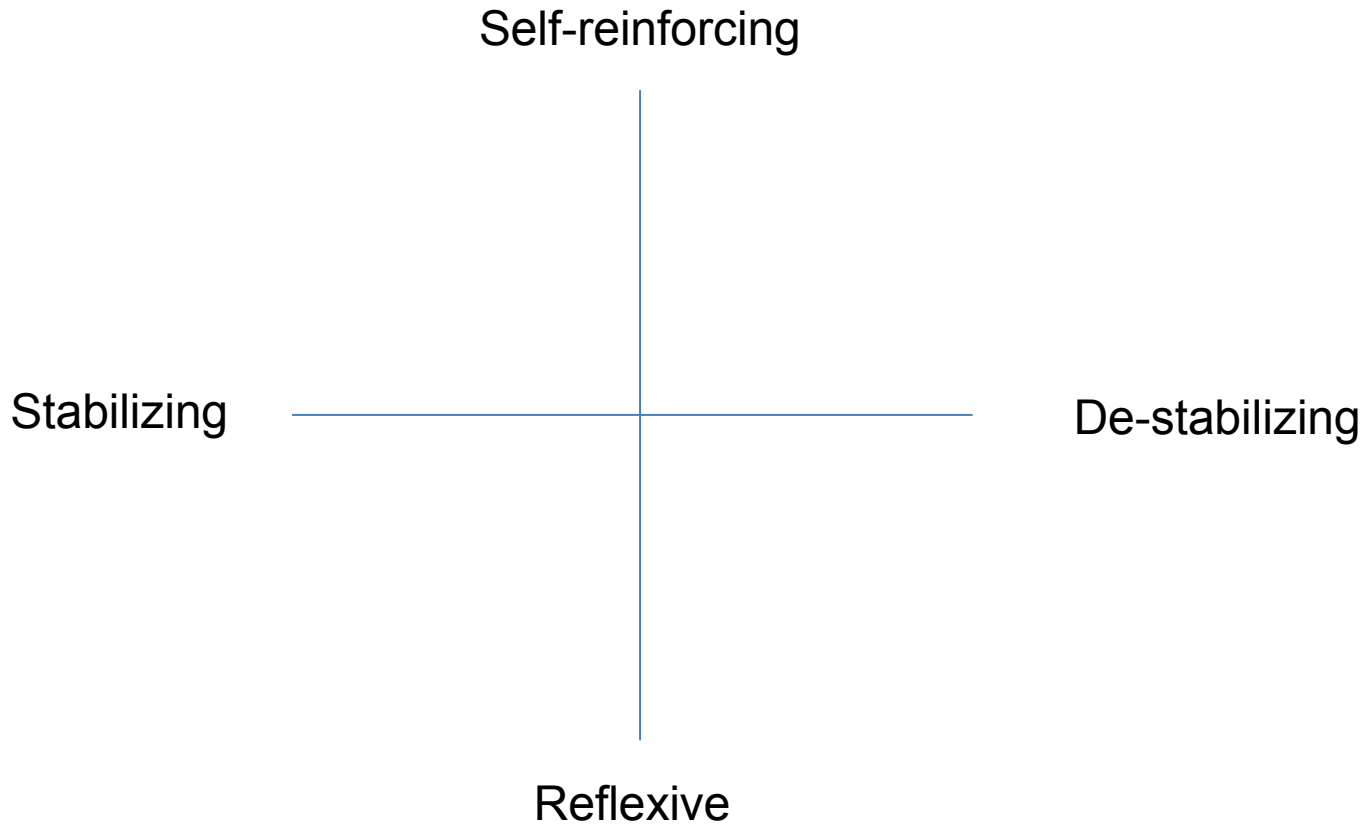
Manuel DeLanda:
A New Philosophy of Society.
Assemblage Theory and Social Complexity

- Realist ontology, Gilles Deleuze
- Relations of exteriority, capacities to interact (not properties)
- Material – expressive
- Stabilizing/territorializing – destabilizing/de-territorializing
- Thresholds, emergence, non-linearity

A self-reinforcing installed base



Processes



Platforms & apps

Apps

Platform (iOS, Android, ..)

The Medakis project (and others)

- Strategy:
 - Specification driven, big bang approach
 - Tight couplings
 - Centralized control
- Outcome? Reflexivity!!
 - Trying to stabilize (requirements, solution, use)
 - => de-stabilization

Reflexive Standardization

II development strategy

- Strategy: management, regulation, ..
- Theories of regulation
 - Julia Black:
 - From command and control to cultivation
 - Larry Lessig:
 - Regulatory modalities
 - Law
 - Technology/architecture ("code is law")
 - Market (prices)
 - Social norms
- ISO standards are law!

Examples: Internet and telecom

	Internet	Telecom
Process strategy	Experiemntal, evolutionary, bottom-up	Specification driven, top-down, "anticipatory standardization"
Architecture	Distributed "End-2-end"	Cetralized "Intelligence in the center"
Governance regime	Loosely coordinated network, open source, communication technology	Hierarchical, open standards + proprietary technology (patents)

Infrastructure Evolution & Innovation

- Shaping the evolution of infrastructures =
- Innovation
 - Of
 - In
 - On
infrastructure

MyHealthRecord

Communikasjon between patients and health
care insititutions

2002-2004

**Phase I
Conceptual design**

- 2002: Design of MyRec as component in the Clinical Portal.
- Clinical portal prioritise existing fragmentation of IS in the hospital, MyRec not further included .
- 2003: first Initial sketches as independent solution with focus on providing trusted information and access to document from hospital systems.
- 2004: first mockups with various suggested functionalities
- 2004: idea to design of secure messaging service to address the illegal use of email in patient-hospital communication

2005-2009

**Phase II
Initial experiences**

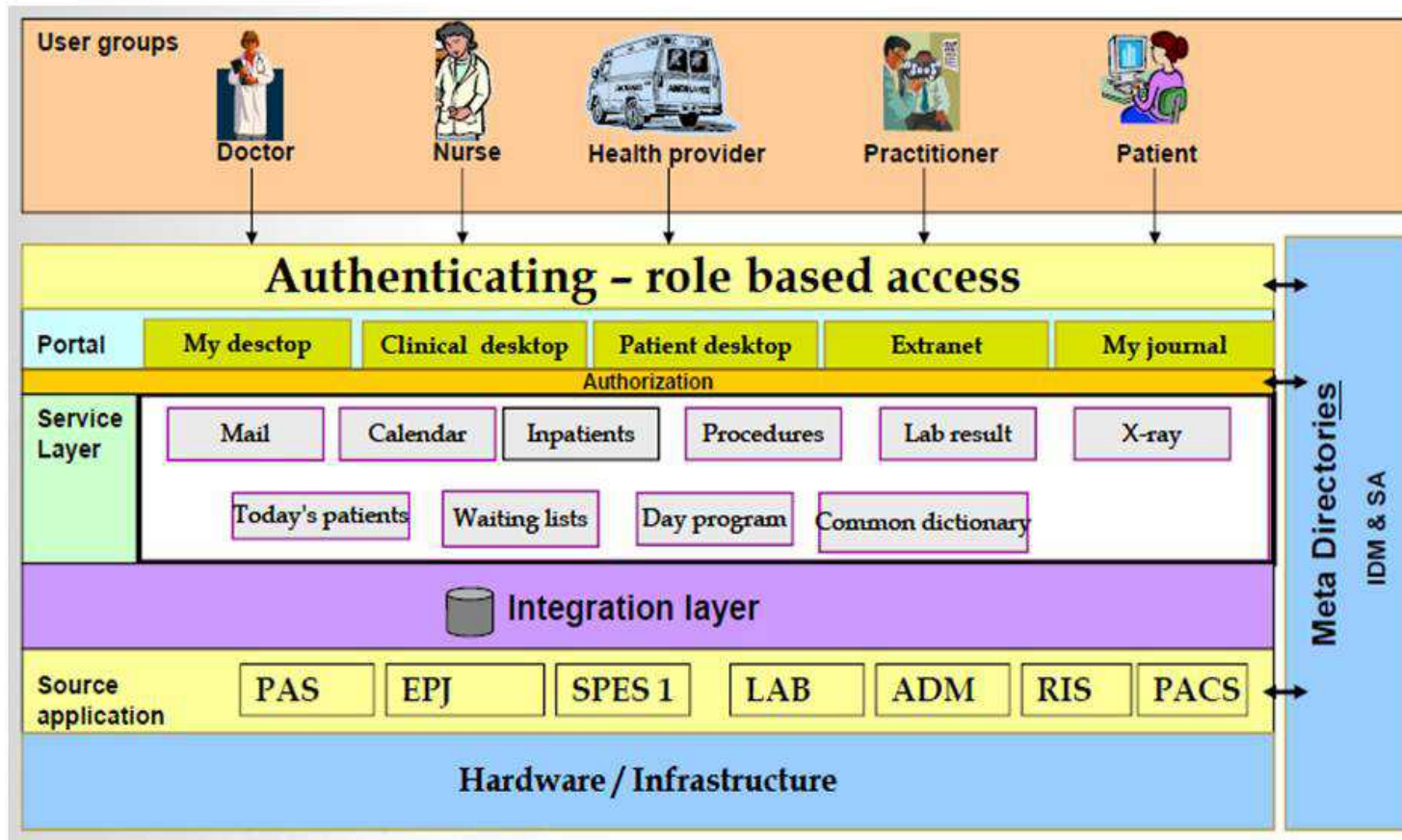
- 2005: Creation of unit for "research and patient services" (MyRec), new unit manager, new member hired
- 2005: first functional version implemented
- 2005: secure messaging designed and implemented
- Design of Request-change of appointments services and diversification in open/closed services
- Benefits
- Some functionalities dismissed
- 2008: change of security solution to a more user friendly one

2009-2012

**Phase III
Consolidation**

- MyRec is contacted by departments and patient organizations
- development of a number of modules addressing specific problems of hospital-patient communication and focus on solving concrete specific problems.
- development of a number of general modules.
- development of modules according to a generic logic for re-use.
- wider implementation of generic functionalites
- participation in EU project
- Other hospitals take MyRec into use

MyHealthRecord – 1st design



2nd version

- Stand-alone infrastructure
 - iKnowBase platform
 - A few basic services
 - Secure logon
 - Secure email
 - A few specialized services

3rd version

- Emergning
- Tools and services for diabetes patients
- "plaform for disease management"

Evolution

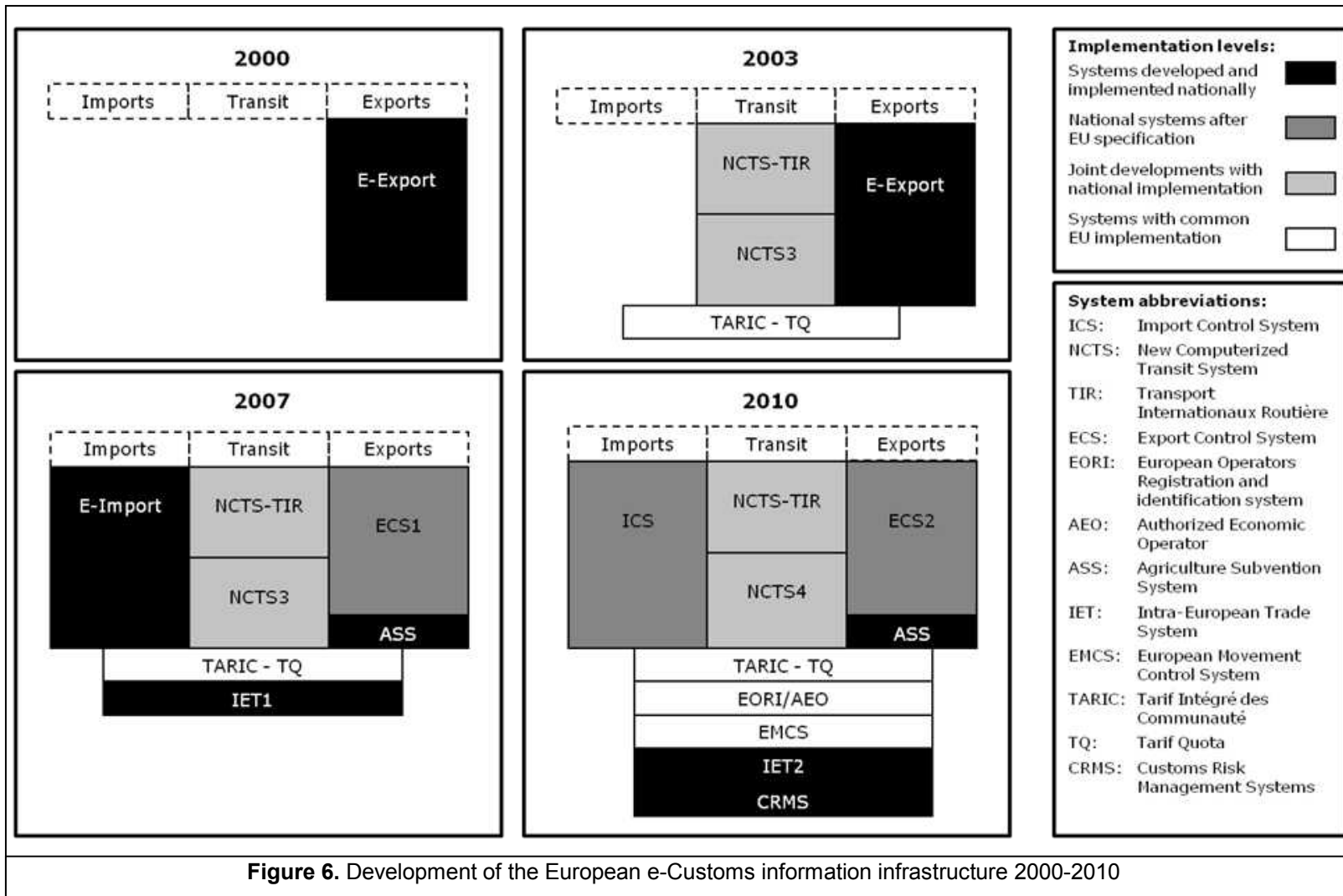
- Innovations
 - Of: 3 versions
 - In: BankID as security system
 - On: specialized services, generification, a new layer emerging
- Architecture: 3 versions, "experimental architecting"
- Process strategy: experimental development, early use (bootstrapping)
- Governance regime: small, independent team ("under the radar")

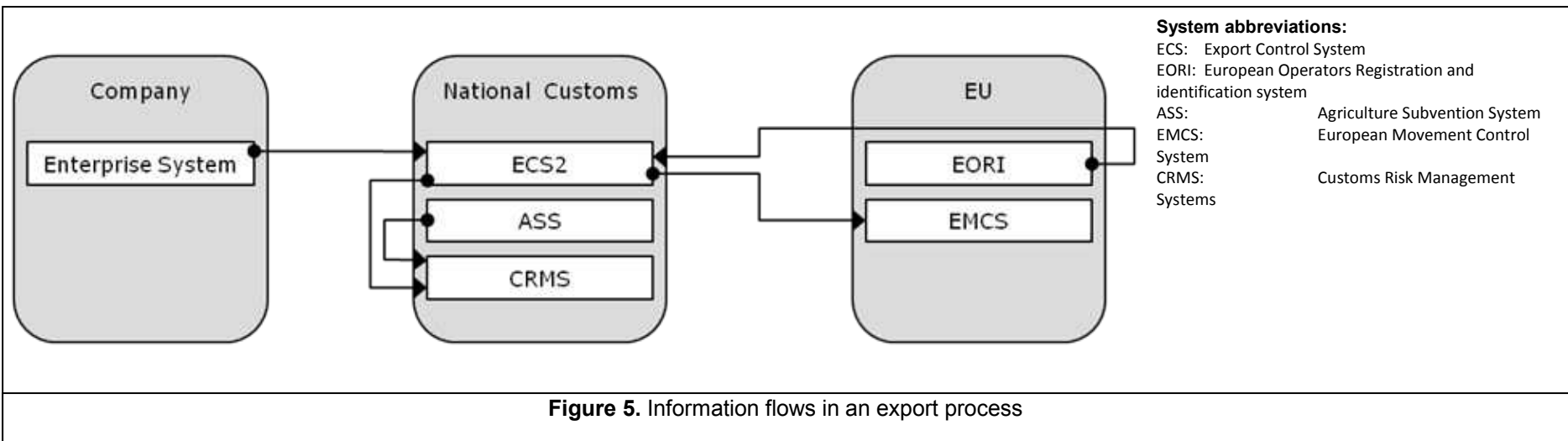
EU: Pan-European eGovernment solutions

- Domains:
 - Customs
 - Health care
 - Immigration
 - Judiciary
 -
- European Interoperability Strategy
- Interoperability solutions for European Public Administrations
- European Interoperability Architecture

eCustoms

- Harmonizing, streamlining customs declarations in EU
- Aim:
 - 25% cost reductions for traders: "Single window"
- Increased trade/globalization
 - New risks: Mad cow, terror, counterfeit, ..
 - Containers, big hubs
 - New customs control procedures
- From transaction to system based control





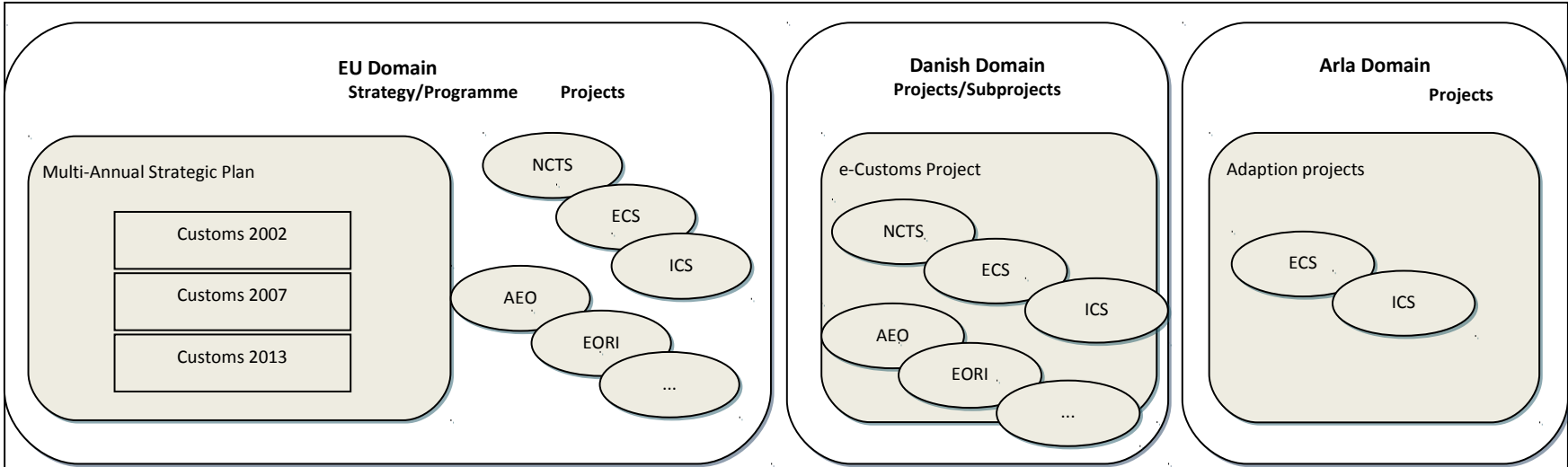


Figure 4. Organization of e-Customs projects at EU, national, and trader level.

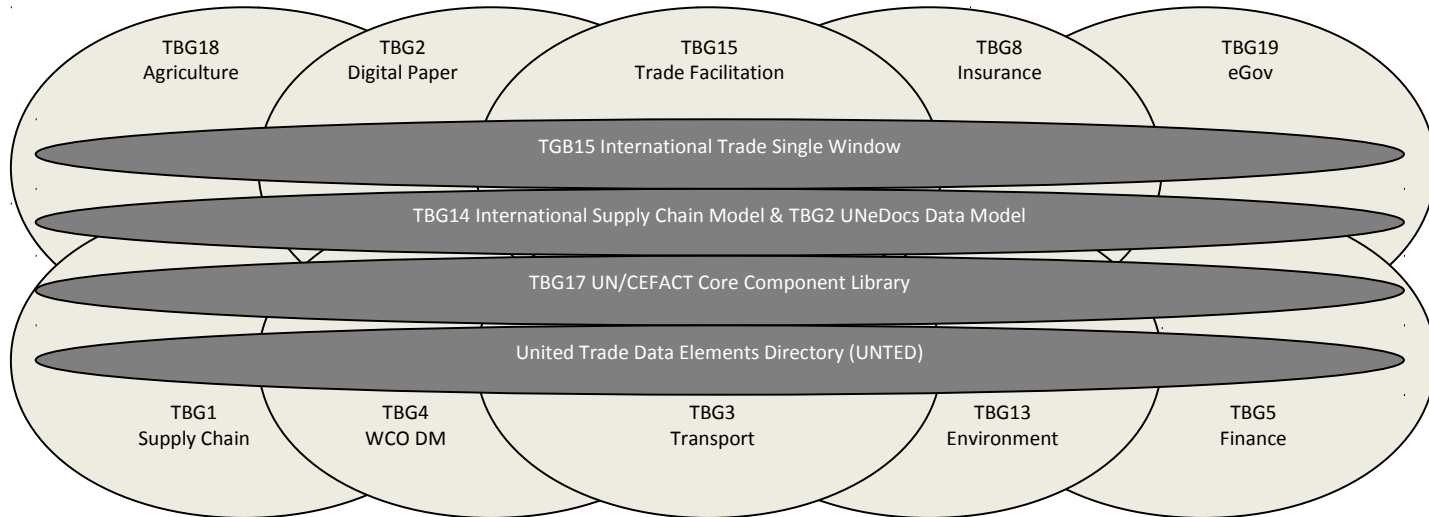


Figure 3. UN/CEFACT International Trade and Business Processes Group (TBG) and key relationships between these working groups. Redrawn from Dill (2007).

Development activities

- First step: Export system
 - Aim: One common export system
 - Extensive adaptation to national installed base
- Next: Transit system
 - Developed one system in each country (=27 independent implementation of the same spec.)
- Next ...
 - Aim: One common system ...

Plus

- For each new system:
 - Control systems build on top of customs systems
 - Additional data collected for control purposes

Dynamics

- More trade, more risk, more needs for control
- New systems for customs declaration
 - => new opportunities for building new control systems
- Adapted to (national) installed base
 - => more stability
 - => more fragmentation
- Traders need to adapt their system to 27 diff. National IIs

The shaping of the evolution of the eCustoms II

- Process strategy: Specification driven, one system at the time
- Architecture: tight coupling within national IIs, loose coupling between national IIs
- Governance: Loosely coupling between tightly coupled national projects, traders detached

Alternative?

- Process strategy: Evolutionary, learning focused
- Architecture: loose coupling within national IIs, tight coupling between national IIs, (minimum data), traders connected through one European portal/gateway
- Governance: Tight coupling between loosely coupled national projects, traders integrated