Lecture 08.1 - Information Infrastructures - Emergence and Evolution

Information Infrastructures - Emergence and Evolution

Ole Hanseth – E-Health in Norway

🔍 Trends in Digital Infrastructure

- **Rapid increase in solutions**:
  - Aker BP: 700
  - Nordea: 2000
  - Equinor: 3000
  - Helse Sør-Øst: 5000+
- **Installed Base Evolution**:
  - IS development resembles **geology**: digital "sand" becomes "rock" or "concrete" over time.
  - Layers upon layers of technologies and solutions.

🧱 From Systems to Ecosystems to Infrastructures

- **Infrastructure**:
  - A **shared resource** for a community/organization.
  - Not a tool, but a platform: e.g., electricity, telecom, railroads, Internet.
  - Built upon an **installed base**: evolves incrementally and is path-dependent.
- **Ecosystems**:
  - Exist **between hierarchy and markets**.
  - Mix of governance structures, forms and functions.

🏭 Digital Transformation of Industries

- **Airline Industry**: Booking systems (1950 s)
- **Banking**: SWIFT (1960 s), Vipps, shopping/payment platforms
- **Media, Advertising, Shipping**: All undergoing digital transition
- **Shift**: From organization-level change to industry-level transformation

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📊 Example: Programmatic Advertising

- Explosive growth of AdTech companies since early 2000 s.

⚙️ Socio-Technical Regime

> A regime is a rule-set embedded in technology, practices, institutions, and infrastructures.

- Involves:
  - Engineering practices
  - Product standards and processes
  - Institutional and social structures
- Used in **transition studies** (e.g., sailing → steam, carbon → renewables)

Key Levels:

1. **Niche**
2. **Regime**
3. **Landscape**

🧠 Core Concepts

- **Architecture**
- **Governance structures**
- **Process models**: Agile, waterfall
- **Conway's Law / Mirroring Hypothesis**:
  - System design mirrors organizational structure

🧭 Regime Strategy

- Strategies can be **deliberate or emergent**
- Especially relevant in complex infrastructures with many actors

Example: Norwegian Health Sector

- Who sets strategy? How does it evolve? Who's in control?

🛠 What is an Information Infrastructure?

> "A shared, evolving, open, standardized, and heterogeneous installed base." – Hanseth
>
> "Fractionally coherent object" – Grisot & Law

- Characterized by **multiplicities**:
  - Connected, layered, overlapping, criss-crossing infrastructures
  - Each regime adds to complexity

🧬 E-Health in Norway: Geology of Infrastructures

Timeline of Dominant Regimes:

Period	Regime Characteristics
1970–1990	Developer/user constellations, in-house innovation
1990–2002	Standardization committees, formal standards
2002–2008	Regional IT management, application standards
2008–2012	IT architects, service-oriented architecture (SOA), RBCWS
2012–2019	Top-down control, consolidation, "One citizen – one record"
2019–Now	Ecosystem approach, post-Akson failures

🧪 Evolution = Interaction of Regimes + Landscape

Contributing Factors:

- Technological innovation: Mainframes → Cloud, IoT, Blockchain
- Medical innovation: Genetic tech, mRNA, etc.
- Organizational change
- Destabilization leads to **new regime emergence** and eventual (re) stabilization

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🧾 Key Regime Transitions

🧩 Pre-1990:

- **Stand-alone apps**

- Developer/user-driven innovation
- Loosely coupled systems

🔁 1990–2002:

- **Destabilization**: Redundancy, inconsistency, rise of comm tech
- **Emergence**: Telenor, Fürst Lab, ISO standards
- **Stabilization**: Health Ministry + KITH-led standardization

📦 2002–2008:

- **Destabilization**: Hospital system nationalized
- **Emergence**: Regional IT management
- **Stabilization**: Governance (Y-model), framework contracts

🧱 2008–2012:

- **Destabilization**: National ICT coordination
- **Emergence**: IT architects propose SOA & RBCWS
- **Stabilization**: Projects launched in multiple regions

🏛️ 2012–2019:

- **Destabilization**: KA project failure
- **Emergence**: Centralized control via Parliament
- **Stabilization**: Digital Renewal program; Epic introduced

🌐 2019–Present:

- **Destabilization**: Epic fails, Akson scandal, outsourcing backlash
- **Emergence**: Move toward ecosystem model
- **Stabilization**: Ongoing, ecosystem logic replacing "big projects"

🔄 Regime Dynamics

- Destabilization introduces **new actors**.
- New actors bring **new perspectives**, reshaping the regime.
- **Events** act as triggers:
  - 1990: Telenor + ComTech → standardization
  - 2002: Govt takeover → regionalization
  - 2008: SOA/RBCWS proposal
  - 2012: Merge failure → centralization
  - 2019: Akson, outsourcing → ecosystems

⚒️ Installed Base Challenges

- **Each regime embeds future problems**:

  - | 1990: Fragmentation

  - 1990–2002: Bureaucratic slowness
  - 2012–2019: Unmanageable complexity
- **Not deterministic**: Human agency and pragmatism still matter

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📚 Key Concepts Summary

Concept	Definition
Infrastructure	Shared, evolving technical base
Regime	Stable configuration of tech, practices, and actors
Destabilization	Disruption due to new tech, actors, events
Installed Base	Accumulated historical systems shaping present/future

Concept	Definition
Ecosystem	Decentralized, multi-actor collaboration model

🧠 Final Thoughts

- Information infrastructures evolve **organically**—not just by design.
- Transitions happen through **interaction** between technologies, actors, and external events.
- A **socio-technical lens** is essential to understanding digital transformations.
- Today's e-health infrastructures are shaped by a **long history of regimes**, and now lean toward **ecosystem-based models**.