# Lecture 09 - Generative Architectures & National E-Health Infrastructures

## Generative Architectures & National E-Health Infrastructures

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## 🔧 Platforms vs. Infrastructure

| Infrastructure | Platform |
|---|---|
| Shared by all, equal access | Business model, organizing principle |
| Community resource | Often commercial |
| Internet, EDI | Google, Facebook |
| Evolves into infrastructure when adopted widely | Can start as business innovation |

> **Ecosystems** emerge when platforms are interconnected and scaled, eventually forming **information infrastructures**.

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## 🌱 Generative Technology (Zittrain)

**Definition**:

> *A technology's capacity to produce unprompted change by large, varied, and uncoordinated users.*

### Characteristics:

- **Leverage**
- **Adaptability**
- **Ease of mastery**
- **Accessibility**

### Examples:

- PCs, Internet
- **Opposite**: Appliances
- Telecom: appliances + "intelligent" networks

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## 🏗️ Architecture and Governance

**Morris & Ferguson**: "Architectures win technology wars."

### Key Elements:

- **Architectural control points**
- **Platform-centered ecologies**
- **Mirroring hypothesis** (Conway's Law)

| Stability | Change |
|---|---|
| Integration, standardization, centralized | Modularity, variation, decentralized |
| Long-term focus, planned change | Local optimization, emergent change |
| Central control | Distributed governance |

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## 🔄 Generative Networks and Communities

**David Lane's model of innovation**:

- **Exaptive bootstrapping**
- **Generative relationships**:
  - Aligned directedness
  - Heterogeneity
  - Mutual engagement

> **User/design communities** are key for innovation "in" and "on" the platform.

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## 🧪 The Beginnings of E-Health in Norway

### 1987–1988:

- **Fürst Lab Report Transfer**
- **Telenor's Telemedicine** in Northern Norway

### Early Standardization:

- Statskonsult's EDI initiative (e.g. invoices)
- CEN TC/251, KITH
- Consensus: **EDI standard**

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## 🧬 The EDI Paradigm (1990 s–2000 s)

- Exchange of structured messages:
  - Lab reports, prescriptions, discharge letters, invoices, etc.
- Projects:
  - **ELIN**, **ePrescription**, **Meldingsløftet**
- Status: **Modest success**, many **coordination issues**

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## 🔁 EDI Ecosystem

- **Multiple vendors**: GPs, hospitals, pharmacies, NAV
- Complex **project organization**
- Evolving **ICT architecture**
- Constant issues with **implementation delays** and **disagreements**

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## 💊 ePrescription Architecture

### Architecture:

- Exchange between EPJ systems, pharmacies, and national systems
- Components: FEST (Drug info), NAV (Refunds), GP systems, etc.

### Flow:

1. Prescription generated
2. Sent to exchange
3. Handled by pharmacy system
4. Feedback to GP and NAV

### Challenges:

- Delays → generic modules introduced
- High development cost (500 MNOK)
- Still in **limited pilot use**

## 🧪 Other Notable Projects

| Project | Purpose |
|---|---|
| Fürst | Lab report + ordering (1987) |
| Edimed | Northern Norwegian health network |
| Well/DIPS | Interactive letters |
| BlueFox | Prescription registry |
| MyJournal | Patient-facing services |

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## 🏛️ Architecture Alternatives

### 1. INA Architecture (Application-Centric / Institutional Interface)

- Each app integrates with others separately

### 2. SPA Architecture (Service Provider / Communication-Centric)

- Centralized services mediate communication
- More **scalable and maintainable**

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## ⚙️ Generative Architecture

### Phases:

- **Bootstrapping**: Initial system development
- **Scaling**: Adoption across actors
- **Restructuring**: Changes in architecture & org
- **Innovation in & on**: New services and transformations emerge

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## 🩺 Summary Care Record Systems Comparison

| Country | Strategy | Cost | Outcome |
|---|---|---|---|
| **Scotland** | Centralized | £3 M | Functional |
| **Denmark** | Top-down | €10 M | Cancelled |
| | Bottom-up | – | Great success |
| **Norway** | ePrescription | 500 MNOK | One GP pilot |
| **UK** | National program | £240 M | Frozen |

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## 🔚 Summary

- **Platforms and infrastructures converge** as systems scale.
- **Generative technologies and architectures** drive innovation.
- Norway's e-health journey shows both **successes and limitations**.
- Architecture choice (INA vs. SPA) **impacts scalability** and integration.
- **Governance, coordination, and user involvement** are critical for national-scale digital health systems.