Innovation Systems
Structure, typology and design

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Postgraduate Programme “Advanced Design: Innovation and Transdisciplinarity in Architectural Design”
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Contents

1. Innovation as system
2. Typology of innovation systems
3. Design for systems of innovation
What is a system

Definition
- A system is a set of interacting or interdependent component parts forming a complex/intricate whole.
- A system is a collection of elements or components that are organized for a common purpose.

Components
- Elements / members
- Relationships among elements
- Input
- Output
- Processes
- Control / decision making
- Feedback
- Boundary
Towards innovation systems setting: External know-how
### Figure 4: Innovation Networks Consist Of Four Types Of Organizational Models

<table>
<thead>
<tr>
<th>Business model</th>
<th>Specialization</th>
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<tbody>
<tr>
<td><strong>Inventor</strong></td>
<td>Intellectual powerhouses that conduct basic science research and/or design products and services that result in patentable inventions. <strong>Example:</strong> MIT, IDEO, SRI, GE Global Research, KAIST, Celera, Oxford, Microsoft Research, HP Labs, CNRS, Persistent, IIT</td>
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<td><strong>Transformer</strong></td>
<td>Multifunction production and marketing services that convert inputs from Inventors and other Transformers into valuable business innovations for either internal or external customers. <strong>Example:</strong> Dell, Pfizer, BP, Merrill Lynch, SAIC, IBM, Infosys</td>
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<td><strong>Financier</strong></td>
<td>Funding source for Innovation Network service providers — especially Inventors and startup Transformers. Financiers will seek to own intellectual property rights for inventions. <strong>Example:</strong> Cargill Ventures, Silicon Valley Bank, Garnett &amp; Helfrich Capital, InterActiveCorp, ICICI Bank, Vulcan, IP2IPO</td>
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<td><strong>Broker</strong></td>
<td>Market makers that find and connect Innovation Network service providers — buying and selling or enabling service delivery both within and among companies. <strong>Example:</strong> Knowledge Campus, yet2.com, PLX Systems, Big Idea Group, InnoCentive, EvaluateServe, ISTC, Intellectual Ventures, P&amp;G’s Technology Entrepreneurs, DCMA, METI, TiE</td>
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Source: Forrester Research, Inc.
Example: Interaction patterns among partners within Procter & Gamble’s Innovation Network

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<tr>
<th>Scenario</th>
<th>Description of P&amp;G’s roles in the scenario</th>
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<td>1</td>
<td>P&amp;G employs 7,500 inventors in 20 global R&amp;D centers; it’s the second-largest patent filer in the US. But P&amp;G’s InnovationNet organization brokers ideas generated by 18,000 innovators hailing from across the firm, including non-R&amp;D groups like purchasing.</td>
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<td>2</td>
<td>P&amp;G’s Equity Ventures group finances internal skunk projects or external startups. For instance, the group took equity position in a medical device startup to transform a microneedle technology — invented by P&amp;G — into a drug delivery system.</td>
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<td>3</td>
<td>P&amp;G's scientists co-invented, with university researchers in the US and Denmark, proprietary protease and cellulase enzymes with robust stain removal capabilities. Plant engineers at P&amp;G and its suppliers transformed them into manufacturable goods.</td>
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<td>4</td>
<td>As part of its Connect &amp; Develop program, P&amp;G has 55 globally spread Technology Entrepreneurs who broker internal innovation requirements with external inventions (“external” nodes include other P&amp;G business units).</td>
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## Operation logic of IS components

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<th>Working principles</th>
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<td>Funding institutions</td>
<td>Risk management of novelty</td>
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<td>Equity funding</td>
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<td>Portfolio of solutions</td>
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<td>Academic research organisations</td>
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<td>Producers</td>
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<td>R&amp;D departments - Patents</td>
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<td>New product development</td>
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<td>Process innovation</td>
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<td>Marketers</td>
<td>Technology brokering / market</td>
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<td>Open marketplaces</td>
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2. Typology of innovation systems
I. Low level: Supply chain

Type A: Innovation chain

Type B: Tech transfer chain
II. Innovation cluster

"A cluster is a geographical proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and externalities". (Michael E. Porter, On Competition)

**Innovation cluster: agglomeration of innovating organisations**

**Typology and innovation generating mechanisms**
Ila. Industrial district (Marshallian)

Basic elements
- Specialised firms / skilled workers
- Buyers / catalysers

Structuring elements
- Flexible combinations
- Nontraded inputs
- Technological spillovers
Lawson and Lorenz (1999) argue that the technological dynamism of districts is dependent on the firms within them, sharing two forms of cooperation: (1) the provision of collective goods and services such as training, education, R&D, and (2) sharing of certain norms of reciprocity such as information, subcontracting, refraining from wage competition.

- Reciprocity was identified as the key element of technological dynamism, reducing the risks associated with new product development and discouraging wage competition.
The complexity of networks within the district makes technology district planning extremely difficult.

The nearest simulation of the tech district concept in planning: science and technology parks

Four constituting elements: (a) land & infrastructure, (b) R&D, (c) technology intermediaries, (d) innovative companies

Different types of innovation generation: R&D-driven, tech transfer, spin-offs, attraction,
Incubators

Θερμοκοιτίδα Επιχειρήσεων - Λειτουργία

Αξιολόγηση
Αποδοχή
Υποβοήθηση
Υπηρεσίες
III. City districts

Port cluster

Commercial district / mall

Technology campus

Tourism / recreation cluster

Transport
The region is conceptualised as living organisation with technology learning, management, selection, and knowledge development capabilities

- Innovation is based on a system of clusters, R&D, tech transfer, and finance
- The system includes (1) demand and supply institutions, (2) knowledge networks, (3) funding mechanisms
- Networks allocate ‘formal’ and ‘tacit’ knowledge and enable collaborative innovation
- Institutions work as switches selecting (on) and rejecting (off) innovations
- Priorities are on intangible infrastructure, skills, human capital, finance, cooperation and social capital
The model denotes the “university-industry-government” relationship as a complex of interdependent institutional spheres, which overlap and complement each other along the process of innovation.
TYPE 2 includes most of Sweden (6 small, export-oriented regions, with a highly educated workforce), and effectively represents what we could call “the Swedish model: innovation is for academics”.

TYPE 5 ("private R&D, public support, poor transfer and exchange mechanisms") includes 19 regions: the Netherlands (except Flevoland), the Italian regions of Basilicata and Trentino-Alto Adige, three eastern German regions (Brandenburg, Magdeburg and Halle) and three north-eastern British regions (Cumbria and around Glasgow).

TYPE 9 ("private and public R&D, good information flows") includes two German regions (Hamburg and Koblenz) plus eight British regions, on north-south axes.

TYPE 10 ("private R&D, good transfer and exchange mechanisms") includes Austria, most of Germany (except Brandenburg and Sachsen-Anhalt in Eastern Germany, Oberpfalz in Bayern, Koblenz, Koln and Hamburg, plus Braunschweig) and Ireland.
Regional system of innovation: cluster-based
Regional precarious systems
V. National system of innovation

Chris Freeman: ‘The rate of technological change in any country and the effectiveness of companies in world competition in international trade in goods and services, does not depend simply on the scale of their R&D... The national system of innovation may enable a country with limited resources... to make progress through appropriate combination of imported technology and local adaptation and improvement.’
VI. Intelligent – global systems: for all
General configuration

Business sectors

Government

Regional policy; Strategic planning; Business associations; Regional stakeholders

Suppliers

Technology and Information Intermediaries
- Technology transfer agencies;
- Consultancy; Tech Networks;
- Patents; Standards; Market watch

Private R&D

Public R&D

University R&D

Financial

Banks, Business Angels, Venture capital, Regional Incentives, Crowdfunding

Company(ies) & Organisations

Digital

Physical

Customers

Users

Business clusters

Technology transfer agencies; Consultancy; Tech Networks; Patents; Standards; Market watch

University R&D

Private R&D

Public R&D
<table>
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<th>Advantages and weaknesses</th>
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<td><strong>Clusters/ Technology districts</strong></td>
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<td><strong>Learning regions / Regional systems of innovation</strong></td>
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<td><strong>Digital innovation environments Intelligent / Global</strong></td>
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3. Design for systems of innovation
Strategic planning is an organizational management activity that is used to set priorities, focus energy and resources, strengthen operations, ensure that stakeholders are working toward common goals, establish agreement around intended outcomes/results, and assess and adjust the direction of actions in response to a changing environment.
Strategic planning: ABC

- **Assessment**
  - Environmental Scan
  - Background Information
  - Situational Analysis
  - SWOT – Strength’s, Weaknesses, Opportunities, Threats

- **Baseline**
  - Situation – Past, Present and Future
  - Significant Issues
  - Align / Fit with Capabilities
  - Gaps

- **Components**
  - Mission & Vision
  - Values / Guiding Principles
  - Major Goals
  - Specific Objectives

- **Down to Specifics**
  - Performance Measurement
  - Targets / Standards of Performance
  - Initiatives and Projects
  - Action Plans

- **Evaluate**
  - Performance Management
  - Review Progress – Balanced Scorecard
  - Take Corrective Actions
  - Feedback upstream – revise plans

Matt H. Evans, matt@exinfm.com
Strategic planning roadmap

**DIAGNOSIS**
- Begin
- Overview Data
- Define the Problem

**STRATEGY**
- Formulate Goal
- Examine, Evaluate, and Choose Alternatives

**IMPLEMENTATION**
- Implement alternatives
- Evaluate Outcome

**ASSESSMENT**

**SWOT**

**DELPHI**

**SCENARIO BUILDING**

**STRATEGIES**
- Vision
- Mission
- Goals and Tactics

**BALANCED SCORECARD**
- Vision leads to a Mission
- Balanced Scorecard

**BENCHMARKING**
- Balanced Scorecard
A current case: RIS3 in the EU

- Research and Innovation Council
- RIS3 design # RIS3 implementation (IMA)
- ENTREPRENEURIAL DISCOVERY (EDP)
- Pilot actions - Experimentation
- Measurement / assessment
- Flexible action plan
The RIS3 Guide requires each RIS3 partnership to:

1. **Analyse** the regional context and potential for innovation
2. **Set up a governance** structure ensuring participation and ownership
3. **Elaborate an overall vision** for the future of the region
4. **Identify priorities / objectives**
5. Define a coherent policy mix and **action plan**
6. **Set up a monitoring and evaluation** mechanism
Concentration of ERDF investment resources to maximise the impact

- Research and Innovation
- SMEs competitiveness
- Energy efficiency and renewable energy

Flexibility (different regions present different needs)
Special arrangements for the previously convergence regions
(2) Specialisation

National specialisation

- Agrofood
- Life Sciences & Health / Medications
- Information & Communication Technologies
- Energy
- Environment & Sustainable development; Climate change
- Transport & Logistics
- Materials – Construction
- Culture - Tourism - Creative Industry
(3) KETs & Internet-driven innovations

**KETs: Supply-driven innovations**
(R&D based)

**User-driven innovations**
(Internet based)

**PRODUCTION**
- On demand manufacturing (actual demand, no storage costs, cutting middlemen, less waste, custom products)
- Crowdsourced production
- Platform logic (other companies building on the top of products)
- Multiple business models simultaneously

**OPEN MARKETPLACE**
- Collaborative marketplace
- Unlimited suppliers access vs. e-shops
- User-centrism
- Digital identities; mobile first (increasing share of access)
- Content-driven marketing (gaining traction to multiple channels, viral)

**ORGANISATIONAL CORE**
- From project to product organisations - continuous / quick lunch of products
- Semi-autonomous products teams / Product owners / Chief Product Officer
- Limited team size (two pizza rule)
- Open development
- Continuous iteration
- Markets insights
- User experience

**DIGITAL CORE COMPETENCES**
- Difficult to competitors to imitate
- Adaptable to a wide range of products and markets
- Understanding the Internet logic
- Understanding datafication
- Understanding new technologies on the horizon: 3D printing; wearable technology; augmented reality; cognitive computing

Source: ERICSSON, Digital Disruptors
(4) Discovery process

Energy in Scotland

Health in Epirus
## (5) Bottom-up action plan

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<th>SECTOR 2</th>
<th>SECTOR 3</th>
<th>SECTOR 4</th>
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<td><strong>Investment priority 1b</strong>&lt;br&gt;Business innovation projects</td>
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<td><strong>Investment priority 2a</strong>&lt;br&gt;Broadband and Next Generation Networks</td>
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<td><strong>Investment priority 2b</strong>&lt;br&gt;IT products and services for production modernisation</td>
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<td><strong>Investment priority 2c</strong>&lt;br&gt;E-government services</td>
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<td><strong>Investment priority 3a</strong>&lt;br&gt;Innovative business development</td>
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<td><strong>Investment priority 3b</strong>&lt;br&gt;Creation of competences for innovation and NPD</td>
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I asked:
“Which is your innovation system?
I got blank stare”