Micro Dynamics of Knowledge - The role of KIBS in Cumulative and Combinatorial Knowledge Dynamics

Simone Strambach

Exploring Knowledge Intensive Business Services
University of Padua
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Content

1  KIBS – a knowledge producing and processing industry
2  Knowledge dynamics and innovation
3  Empirical findings - the Eurodite Project
4  KIBS - regional development and policy challenges

simone.strambach@staff.uni-marburg.de
KIBS patterns of spatial organization in Europe

- Large interregional disparities
- Strong concentration in metropolitan areas
- Country specific specialization patterns of KIBS subsectors

Source: Eurostat 2010: 112
KIBS patterns of spatial organization in Germany

- Strong concentration in metropolitan areas
- Region specific shape and development path of KIBS

Source: Strambach 2004: 51
Enterprises, employees and turnover in KIBS sub-sectors of selected European countries, 2004

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<th>Country</th>
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</table>

Source: Strambach 2010: 178-179

simone.strambach@staff.uni-marburg.de
1. KIBS - a knowledge producing and knowledge processing industry

**Common industry-specific characteristics of organisation:**

- Clients are directly involved in the value added activities
- Project organisation is the dominant form of work organisation
- High coordination costs due to the integration of myriad knowledge sources in the product and service development
- The key function of formal/informal network relations, references/reputation as coordinating mechanism for transactions
2. Knowledge dynamics and innovation

Knowledge Dynamics

Knowledge dynamics are unfolding from processes of the creation, using, transforming, and diffusing of knowledge

⇒ Innovations are their visible results

Firm level knowledge dynamics (FKDs) emerge through the interactions of individuals/groups within a firm/organisation or between a networks of firms and or organisations
2. Knowledge dynamics and innovation

What do we know already about Knowledge dynamics?

Knowledge creation and firms’ modes of innovation are strongly shaped by their specific knowledge base(s)

SAS – Typology of knowledge bases (Asheim 2007)

Types of knowledge bases:
- analytical (science based)
- synthetic (combination of science based & applied knowledge)
- symbolic (cultural based)

Different sensitivity to geographical distance/proximity
Different mixes of tacit and codified knowledge
2. Knowledge dynamics and innovation

SAS Typology of knowledge bases (Asheim 2007)

Defined by the learning processes through which knowledge is develop
Defined by the criteria applied for evaluating its usefulness

- **Synthetic**: e.g. engineering, novel combinations of existing knowledge to solve human problems; learning-by-doing, learning-by-interaction, evaluation by functionality

- **Analytical**: e.g. scientific; understanding and explanation of natural/social world, formal, scientific rationales

- **Symbolic**: e.g. cultural meanings, symbols, ethics, aesthetics; open-end creative thinking and interaction, (re)-interpretation of symbols
Knowledge bases of KIBS - Subsectors

Source: Strambach 2008: 159;161
2. Combinatorial and cumulative knowledge dynamics

Shift in knowledge dynamics

• Vertical disintegration of manufacturing, and increasingly of service industries and the emergence of global value chains are ongoing processes.

• Outsourcing and relocation processes in intangible business service processes lead to further fragmentation of value chains.

• Dynamic restructuring leads to:
  - More complex and extended value chains
  - New roles of business units, suppliers and business services
  - Creation of new distance-proximity relationships in organisational/spatial terms
2. Combinatorial and cumulative knowledge dynamics

Shift in knowledge dynamics

- **Cumulative knowledge dynamics**
  - new knowledge builds on already existing knowledge or is directly dependent on existing knowledge

- **Combinatorial knowledge dynamics**
  – new knowledge is created by the integration and connection of heterogeneous knowledge bases often located in different technological, sectoral and regional contexts
2. Combinatorial and cumulative knowledge dynamics
2. Combinatorial and cumulative knowledge dynamics

Implications of restructuring for knowledge production

• Leading to more complex labour division in knowledge production

• Creation of *combinatorial knowledge* gains importance

→ KIBS drive knowledge dynamics through the content of their products and the ways they are produced
2. Combinatorial and cumulative knowledge dynamics

Fields of tension related to horizontal/ knowledge domains

Specialization

Comprehensive Solutions

Standardization

Client-Specific Solutions

KIBS

Source: Strambach 2010:198
3. Empirical findings – Eurodite Project

**Method: Innovation Biography**

- Innovation Biography: A ‘biography‘ of an innovation event
- Knowledge Dynamics unfolding in time and space

⇒ Insights into the labour division in knowledge production
  – Actor constellations
  – Interactions
  – Types of knowledge exchanged/created
3. Empirical findings – Eurodite Project

• ≥ 60 case studies of different service & manufacturing industries: food, automotive, biotechnology, ICT, KIBS, new media and tourism
• located in 24 European regions
• Over ⅔ of the 759 analysed knowledge interaction processes involve actors who are external to the innovating firm

⇒ importance of labour division in knowledge production in knowledge production
3. Empirical findings

Knowledge types and their combination in knowledge interactions

<table>
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<th>Sector</th>
<th>Knowledge types</th>
<th>Combinations of knowledge types</th>
<th>Total</th>
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<td>Bio technology</td>
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<td>ICT</td>
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## 3. Empirical findings

### Knowledge types

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### Combinations of Knowledge type

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Source: Strambach 2010b:52
Location of knowledge interactions of all sectors in different horizontal knowledge domains

![Bar chart showing the location of knowledge interactions across different horizontal domains.]

- **1 horizontal domain**: 80% Distant knowledge interactions, 20% Proximity knowledge interactions
- **2 horizontal domains**: 10% Distant knowledge interactions, 90% Proximity knowledge interactions
- **3 horizontal domains**: 5% Distant knowledge interactions, 95% Proximity knowledge interactions
- **>3 horizontal domains**: 3% Distant knowledge interactions, 97% Proximity knowledge interactions

Contact: simone.strambach@staff.uni-marburg.de
3. Empirical findings – Eurodite Project

• The mobilization of regional knowledge is a major feature of firm knowledge dynamics

• Knowledge interactions include a mix of proximal and distant actors – they have a multi-scalar nature

• The ways to combine distant and proximal knowledge depends on the sector

• A common organizational framework is a prerequisite for an intensified knowledge exchange

➤ KIBS were involved in innovative change in every analyzed sector
Interior Development of a new Car Type:

1998-2001

OEM (production department)
OEM (design department)
Supplier I
KIBS Engineering
System Supplier
Region of Stuttgart
Czech Republic
Austria
Germany

OEM II Development Department
Customer
Integrated HR

simone.strambach@staff.uni-marburg.de
Interior development of a new car type – engineering KIBS

**External knowledge Resources from**

- **... abroad**
  - System Supplier (Austria)
  - Developm. Engineer (Czech Rep.)
  - System Supplier (Austria)
  - Production department OEM (Ludwigsfelde)

- **... Germany**
  - Supplier (Osnabrück)
  - Design department OEM (Stuttgart)
  - Design department OEM (Stuttgart)
  - Design department OEM (Stuttgart)

- **... Region**
  - Design department OEM (Stuttgart)
  - Design department OEM (Stuttgart)
  - Design department OEM (Stuttgart)
  - Design department OEM (Stuttgart)

**Composite Knowledge product**

- Matching of design and functionality
- Building of prototype components
- Testing of serial car
- Optimization of product

**KIBS internal knowledge resources**

**Phase** | **Design finding** | **Prototyping** | **Serial phase** | **Start of production**
---|---|---|---|---
**Time** | 1998 | 1999 | 2000 | 2001

**Type of knowledge input**
- synthetic
- symbolic
- cumulative
- composite

**Mode of knowledge interaction**
- regular meetings
- work on site of customer
- irregular meetings
- human resource integration

Source: Strambach/Dieterich 2011

simone.strambach@staff.uni-marburg.de
3. Empirical findings

KIBS as drivers of knowledge dynamics at the firm and sectoral level

• By delivering composite knowledge products from contexts in which their clients are usually not embedded in

• By interconnecting heterogeneous knowledge domains, complementing or changing the knowledge base of their clients

• By operating in all knowledge phases along the generic knowledge value chain

• By contributing to problem identification, problem solving and thus subsequently to knowledge articulation, sharing and reconfiguration
3. Empirical findings

Summary

The innovation biographies provide much empirical evidence that firm-level knowledge dynamics themselves reshape the territorial configuration of economies in creating new forms of organisation as part of the innovation process.

Micro-dynamics of knowledge are reflecting an intersection between cumulative and combinatorial knowledge dynamics.
4. KIBS – Regional development & policy challenges

*Cumulative knowledge dynamics:*
- Co-evolution processes with client sectors leading to cumulativeness of knowledge and specialisation of KIBS sub-sectors in horizontal and vertical knowledge domains

*Combinatorial knowledge dynamics:*
- By acceleration of implicit knowledge transfer and the diffusion among sectoral contexts
- By extracting knowledge from different vertical and horizontal knowledge domains and recombining it in different sectoral contexts, they contribute at the same time to specialization and diversification
4. KIBS – Regional development & policy challenges

- A principal role is to facilitate the self organisation of local interactive learning systems

- Promoting interaction and networks between KIBS and between KIBS and clients in complementary knowledge domains

- Policy support to foster combinatorial knowledge dynamics even if this does not immediately lead to economic value added

- Despite the fact that much time is needed in order to build up a common knowledge base, the outcome of these interactions might set further knowledge dynamics in motion
4. KIBS – Regional development & policy challenges

• Intersection of multiple value chains at the regional level provides a rich repertoire for variation that can be used by firms to recombine, adapt pre-existing knowledge bases for new requirements

• The importance of place-based institutional regimes for the exploration and exploitation of combinatorial knowledge

• Combinatorial knowledge dynamics have the potential to open up established regional knowledge trajectories

• Focus on the integration of international and non-technological symbolic knowledge


Strambach, S. & Dieterich, I. 2011: The territorial shaping of knowledge dynamics in Baden-Württemberg. Inter-organizational relations in the sectoral knowledge domain of the automotive industry (forthcoming)


——— 2004: Wissensintensive unternehmensorientierte Dienstleistungen in Deutschland. Leibniz Institut für Länderkunde (eds.): Nationalatlas Bundesrepublik Deutschland, Unternehmen und Märkte, Bd. 12., pp. 50-53.