

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

*Simone Strambach*



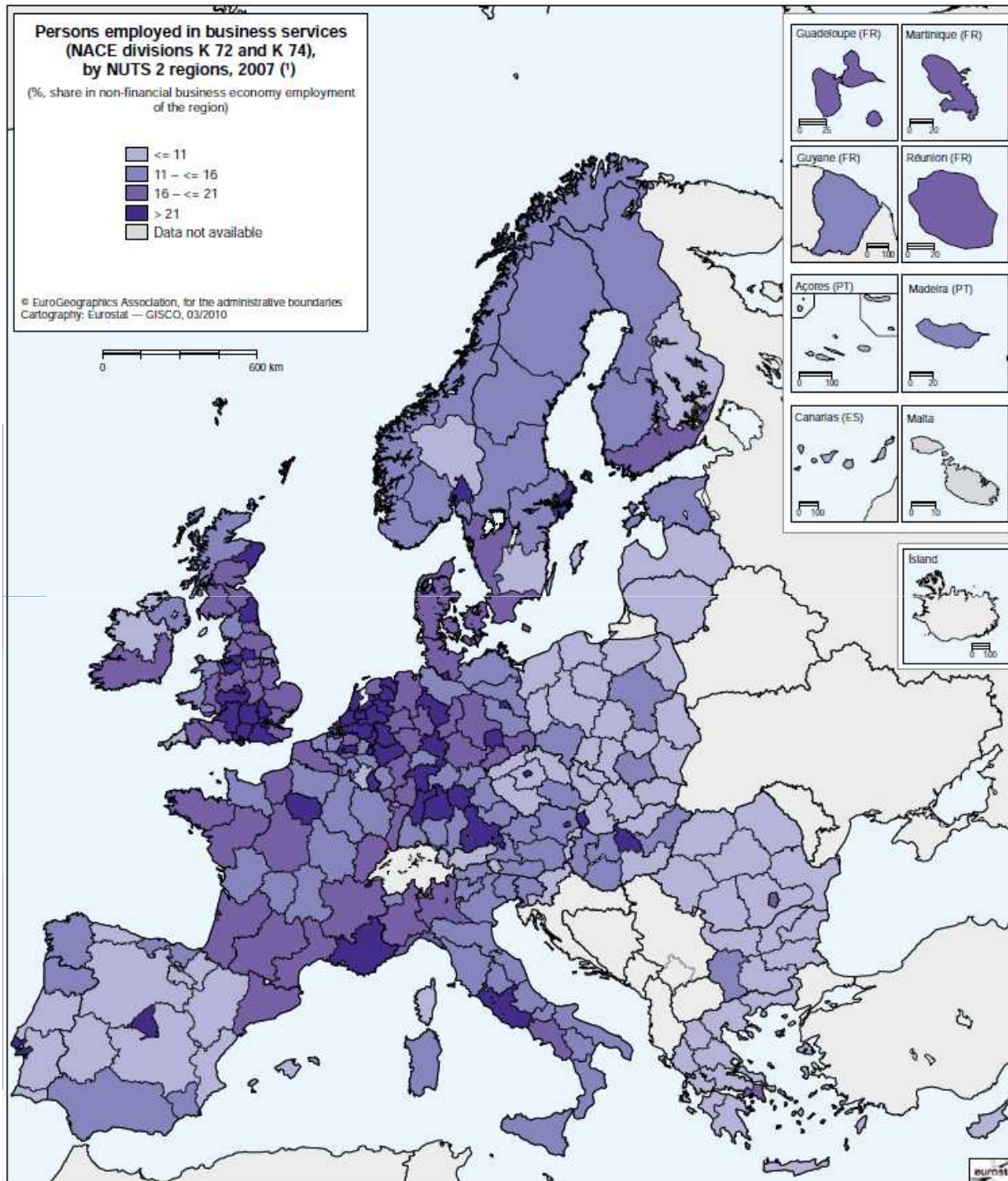
**Exploring Knowledge Intensive Business Services  
University of Padua**

17th – 18th March 2011 Padua, Italy

# 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



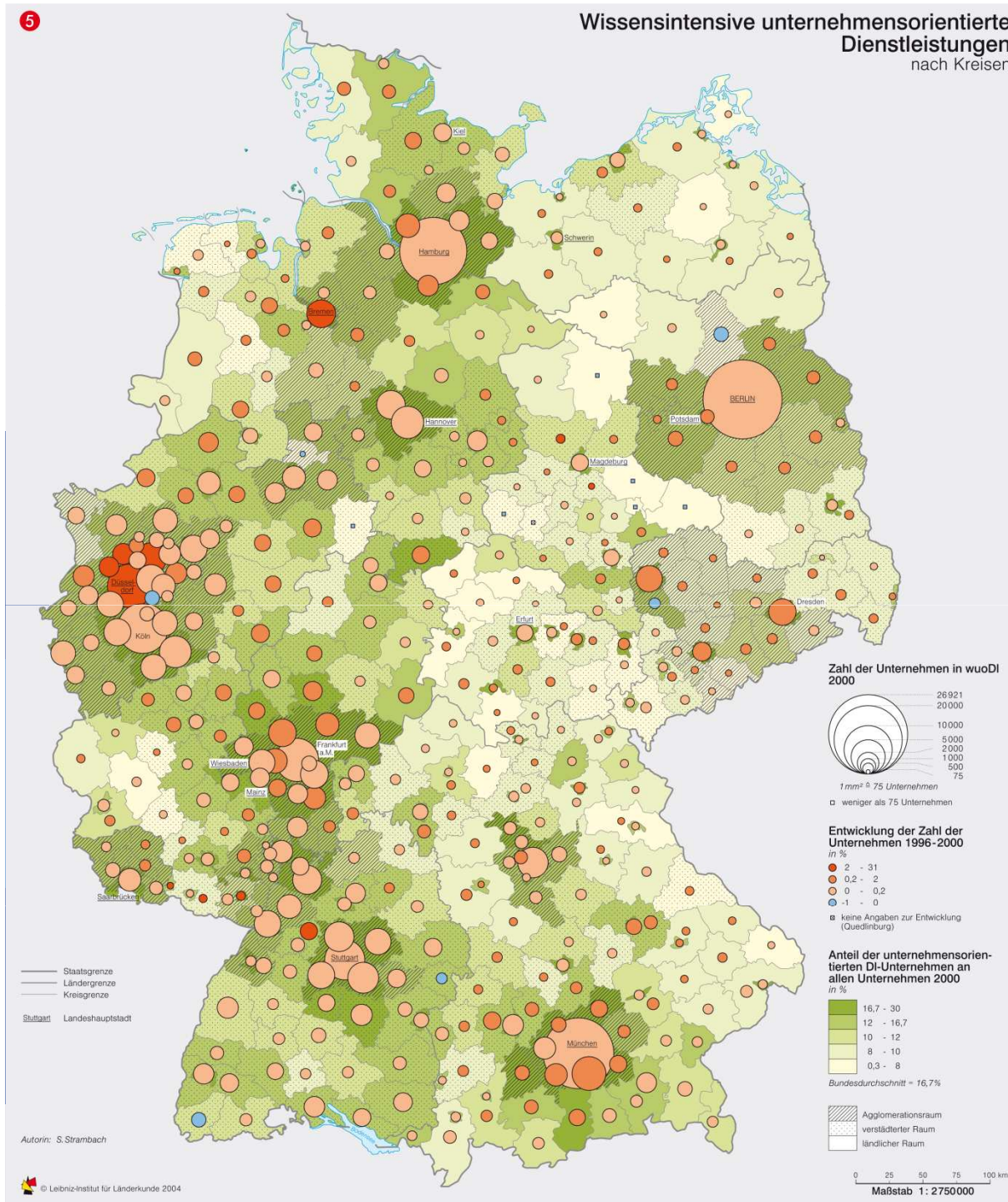
## KIBS patterns of spatial organization in Europe

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

## Wissensintensive unternehmerorientierte Dienstleistungen nach Kreisen

## 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

Country	Size classes (in number of persons employed)	IT-Services			Economic Services			Technical Services			Marketing/Advertising		
		Share (in %) in ...			Share (in %) in ...			Share (in %) in ...			Share (in %) in ...		
		Enterprises	Employees	Turnover	Enterprises	Employees	Turnover	Enterprises	Employees	Turnover	Enterprises	Employees	Turnover
Denmark	1 to 9	93,2	18,3	23,7	95,7	29,9	40,9	93,1	16,6	22,5	91,5	24,5	31,9
	10 to 49	5,5	21,9	17,5	3,7	28,7	21,0	5,7	21,3	18,2	7,2	33,7	30,0
	50 to 249	1,0	22,6	21,1	0,4	19,2	16,3	0,9	17,2	15,6	1,2	28,5	32,3
	250 or more	0,3	37,2	37,6	0,1	22,2	21,8	0,4	44,9	43,7	0,1	13,3	5,8
Finland	1 to 9	84,5	13,6	13,9	95,8	46,3	49,7	90,2	26,4	31,7	91,8	43,6	30,3
	10 to 49	11,5	18,6	18,0	3,6	25,9	23,5	8,1	27,5	24,9	7,3	36,6	42,7
	50 to 249	3,4	31,5	32,3	0,5	N/A	N/A	1,4	N/A	N/A	1,0	N/A	N/A
	250 or more	0,5	36,3	35,7	0,1	N/A	N/A	0,2	N/A	N/A	0,0	N/A	N/A
Germany	1 to 9	<b>88,7</b>	16,1	12,8	<b>87,1</b>	35,9	35,5	<b>91,8</b>	32,0	36,9	<b>90,3</b>	16,4	34,3
	10 to 49	9,4	24,3	16,4	12,2	40,6	33,3	7,5	35,4	30,4	8,4	20,6	36,1
	50 to 249	1,6	21,3	17,3	0,5	10,2	11,9	0,6	15,3	15,8	1,0	13,9	20,9
	250 or more	<b>0,3</b>	38,3	53,5	<b>0,1</b>	13,3	19,3	<b>0,1</b>	17,3	16,9	<b>0,3</b>	49,1	8,6
Norway	1 to 9	94,6	21,3	22,7	96,4	49,9	50,1	94,4	32,0	34,6	94,4	43,6	31,4
	10 to 49	4,5	26,1	20,6	3,4	24,9	21,2	4,9	28,3	N/A	5,2	39,6	N/A
	50 to 249	0,7	21,1	20,2	0,2	10,1	N/A	0,5	15,1	17,9	0,4	12,1	17,0
	250 or more	0,2	31,6	36,5	0,1	15,1	N/A	0,1	24,6	N/A	0,0	4,7	N/A
Spain	1 to 9	91,6	14,0	13,8	96,9	51,5	55,2	97,4	33,1	47,0	93,3	25,1	24,7
	10 to 49	6,7	20,7	13,5	2,9	28,4	26,5	2,2	24,9	17,6	5,7	24,0	21,9
	50 to 249	1,3	21,3	15,5	0,2	10,1	10,1	0,3	19,3	16,5	0,9	23,0	45,3
	250 or more	0,3	44,0	57,3	0,0	10,0	8,2	0,1	22,8	18,8	0,1	27,9	8,0
Sweden	1 to 9	96,3	20,5	21,2	98,7	51,6	55,2	97,4	35,5	43,1	96,9	44,7	38,0
	10 to 49	2,9	21,0	19,8	1,1	N/A	N/A	2,2	21,3	20,9	2,8	33,8	34,1
	50 to 249	0,6	21,9	18,6	0,1	13,0	13,1	0,3	17,1	15,0	0,3	14,0	24,7
	250 or more	0,2	36,6	40,5	0,0	N/A	N/A	0,1	26,1	20,9	0,0	7,6	3,2
United Kingdom	1 to 9	94,4	28,4	0,3	91,8	28,3	1,2	90,8	28,8	0,3	88,8	22,8	1,2
	10 to 49	0,1	37,8	5,6	0,2	29,6	0,7	0,2	31,7	1,6	0,3	31,0	10,0
	50 to 249	4,6	17,6	8,0	7,1	24,0	1,5	8,0	23,7	4,3	9,3	24,6	12,8
	250 or more	0,8	16,2	86,0	1,0	18,1	96,6	1,0	15,8	93,9	1,6	21,7	76,1

Source: Strambach 2010: 178-179

# 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

---

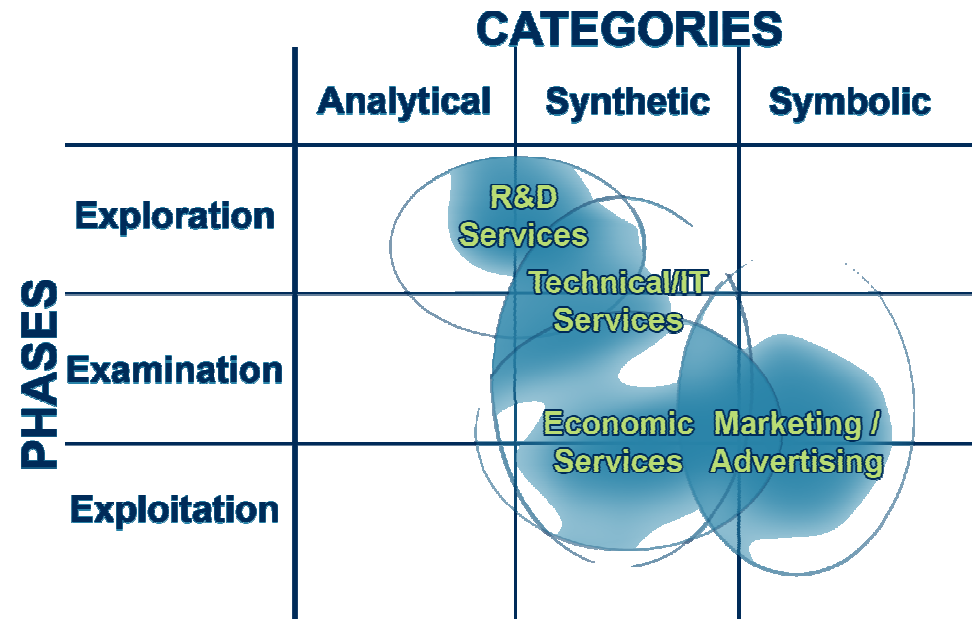
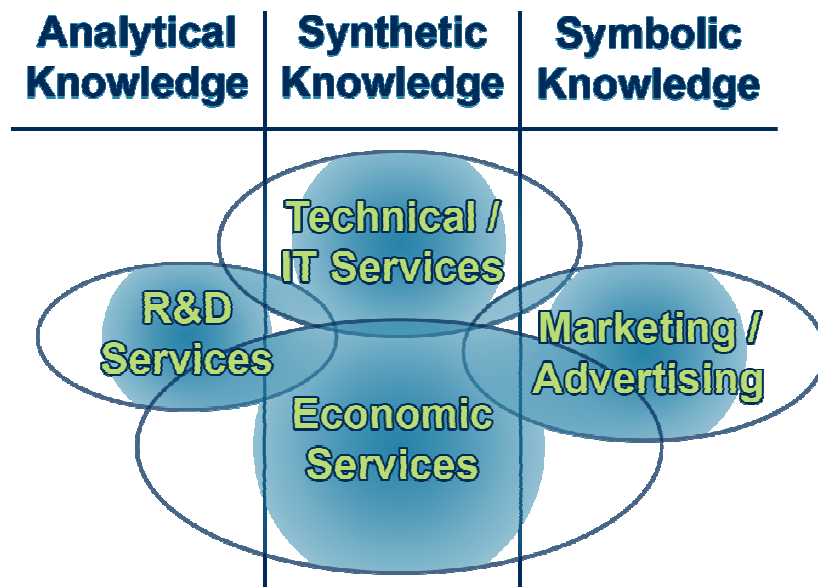
### **SAS Typology of knowledge bases** (Asheim 2007)

Defined by the learning processes through which knowledge is developed

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-ended 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

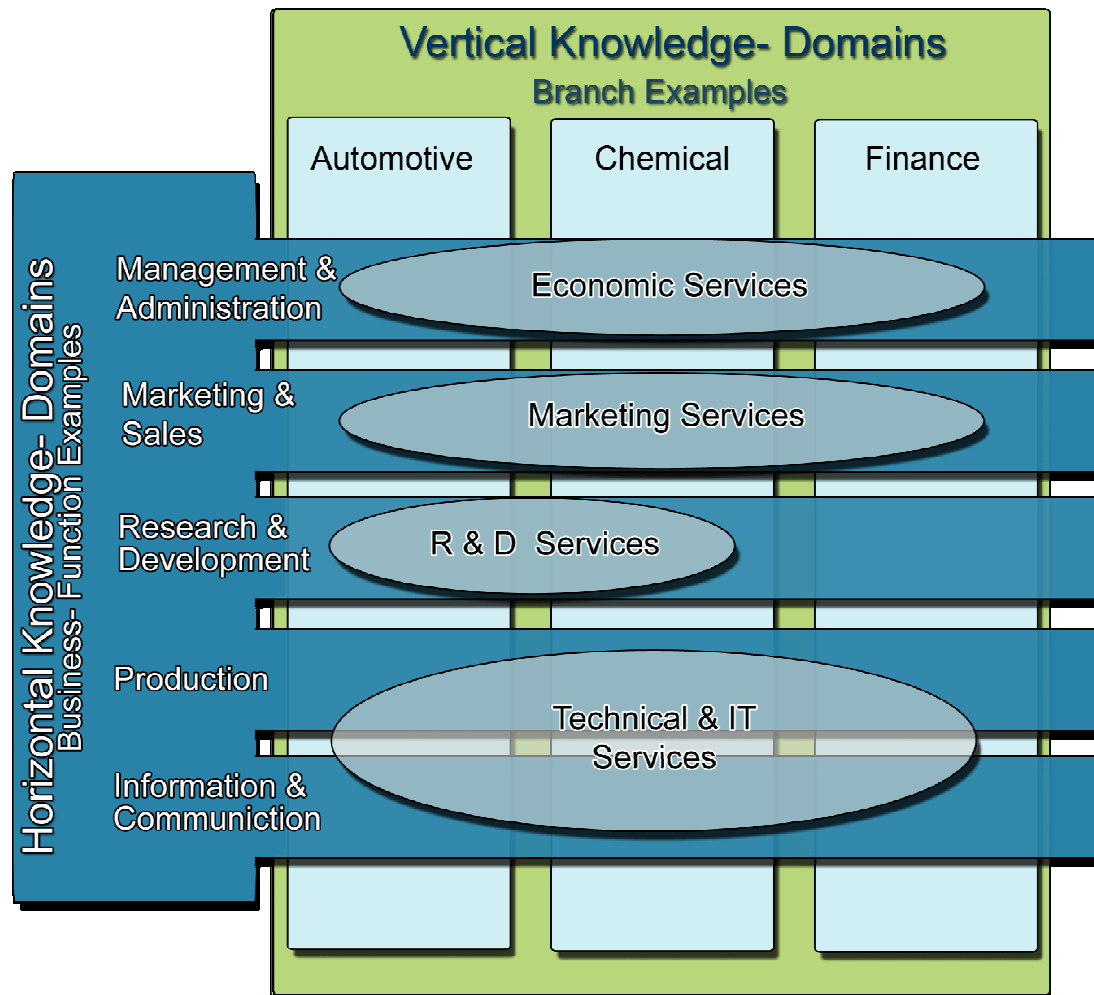
## 2. Combinatorial and cumulative knowledge dynamics

---

### 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 heterogenous knowledge bases often located in different technological, sectoral and regional contexts

## 2. Combinatorial and cumulative knowledge dynamics



## 2. Combinatorial and cumulative knowledge dynamics

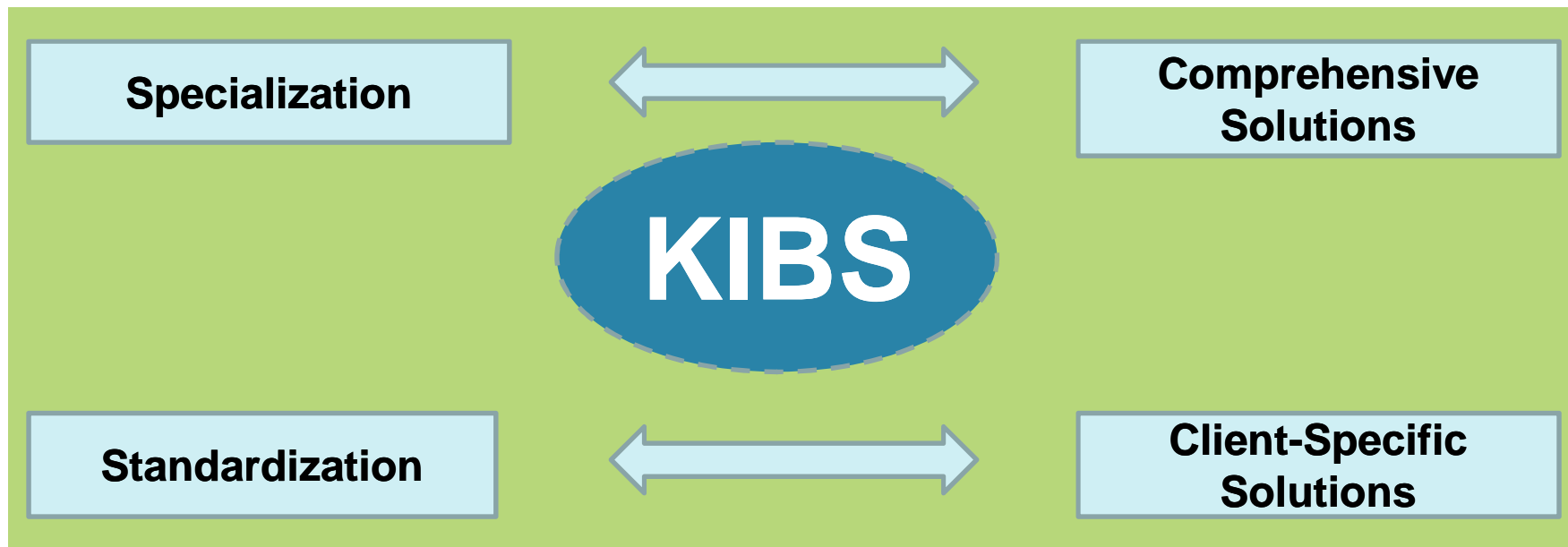
---

### 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



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

---

- $\geq 60$  case studies of different service & manufacturing industries: food, automotive, biotechnology, ICT, KIBS, new media and tourism
  - located in 24 European regions
  - Over  $\frac{2}{3}$  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

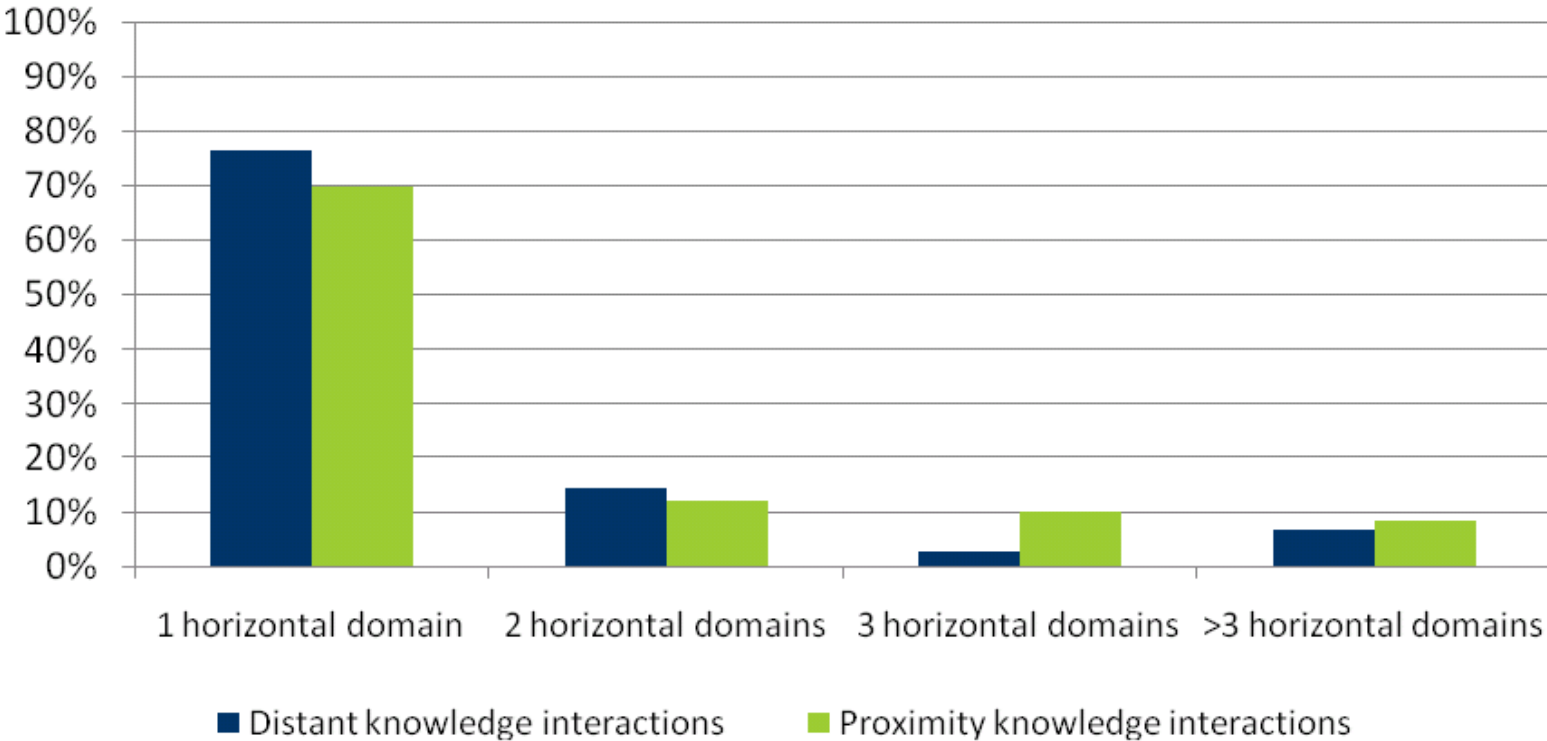
Sector	Knowledge types			Combinations of knowledge types			Total	
	Analytic (1) %	Synthetic (2) %	Symbolic (3) %	Analytic / Synthetic (1,2) %	Synthetic / Symbolic (2,3) %	A / S / S (1,2,3) %	%	
Automotive	13%	<b>64%</b>	13%	4%	4%	0%	100%	89
Bio technology	<b>24%</b>	18%	18%	14%	26%	0%	100%	145
Food & drink	13%	41%	37%	4%	5%	0%	100%	78
ICT	10%	<b>54%</b>	5%	31%	0%	0%	100%	87
KIBS	0%	<b>88%</b>	3%	0%	9%	0%	100%	66
New media	14%	14%	<b>53%</b>	0%	16%	4%	100%	57
Tourism	0%	10%	<b>76%</b>	0%	14%	0%	100%	171
All	11%	<b>35%</b>	34%	8%	12%	0%	100%	693

### 3. Empirical findings

	<i>Knowledge types</i>			<i>Combinations of Knowledge type</i>		
	Analytical	Synthetic	Symbolic	Analytical/ synthetic	Synthetic /symbolic	All three types
Auto	●	● ● ●	●	●	●	
Bio	● ●	●	●	●	● ●	
Food	●	● ● ●	● ●	●	●	
ICT	●	● ● ●	●	● ●		
KIBS		● ● ●	●		●	
New media	●	●	● ● ●		●	●
Tourism		●	● ● ●		●	
All cases	●	● ●	● ●	●	●	

Source: Strambach 2010b:52

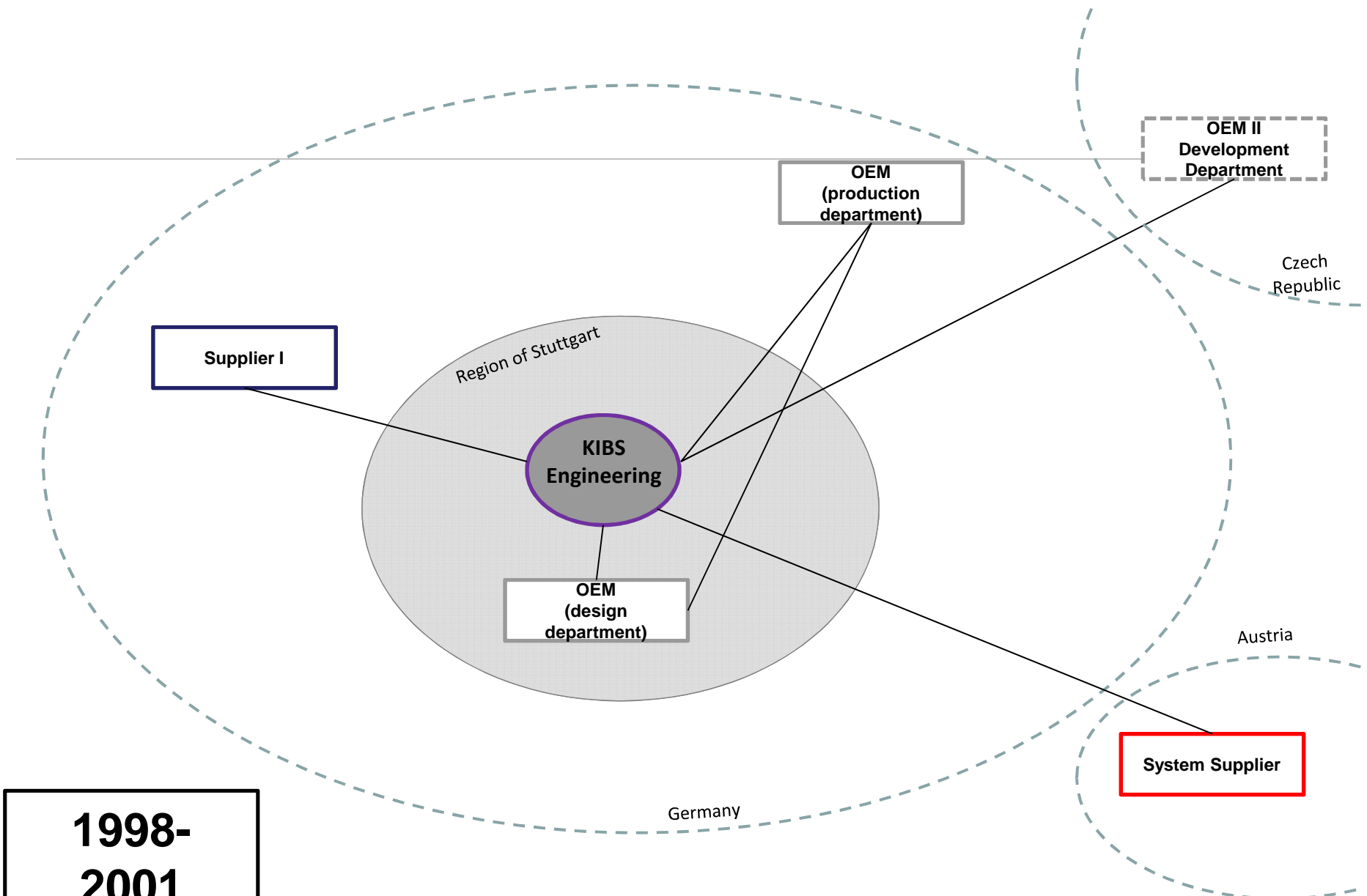
# Location of knowledge interactions of all sectors in different horizontal knowledge domains



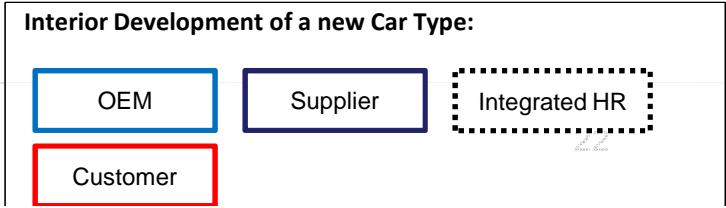
### 3. Empirical findings – Eurodite Project

---

- 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

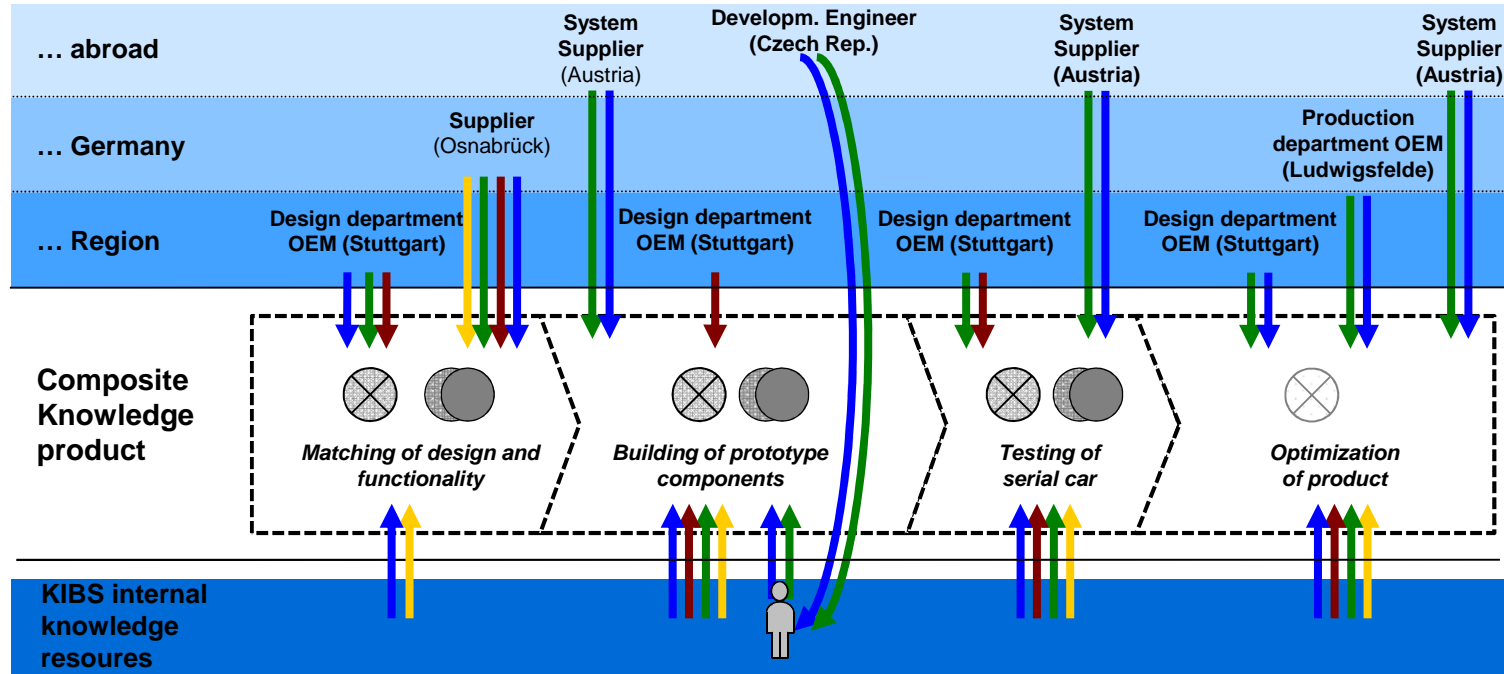


**1998-2001**



# Interior development of a new car type – engineering KIBS

External knowledge  
Resources from



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
  - irregular meetings
  - work on site of customer
  - human resource integration

Source: Strambach/Dieterich 2011

[simone.strambach@staff.uni-marburg.de](mailto: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

## References

Asheim, B. 2007: Differentiated Knowledge Bases and Varieties of Regional Innovation Systems. In: *Innovation*, 20 (3): pp.223-241.

Eurostat European Commission 2010: Eurostat regional yearbook 2010. Luxembourg.

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)

Strambach, S. 2010: Knowledge-intensive business services (KIBS). In: Cooke, P., C. de Laurentis, S. Mac Neil & C. Collinge (eds.) : *Platforms of innovation. Dynamics of new industrial knowledge flows*. Cheltenham: Edward Elgar pp. 170-204.

—2010b: Micro-dynamics of knowledge – firms, organizations and their territorial shaping. In: Halkier, H., M. Dahlström, L. James, J. Manniche & L. Olsen (eds.): *Knowledge dynamics, regional development and public policy*. Aalborg, pp.47-59.

— 2008: Knowledge-Intensive Business Services (KIBS) as drivers of multilevel knowledge dynamics. In: *Int. J. Services Technology and Management*, 10 (2/3/4): pp.152-174.

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