

# Die Zukunft der technologischen Wissensproduktion in multinationalen Unternehmen – Eine Szenarioanalyse



Prof. Dr. Guido Reger und Dana Mietzner

Centrum für Entrepreneurship und Innovation an der Universität Potsdam (BIEM-CEIP)  
Am Park Babelsberg 14  
D-14482 Potsdam

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## Core question – Key Actor Multinational Enterprises (MNE)

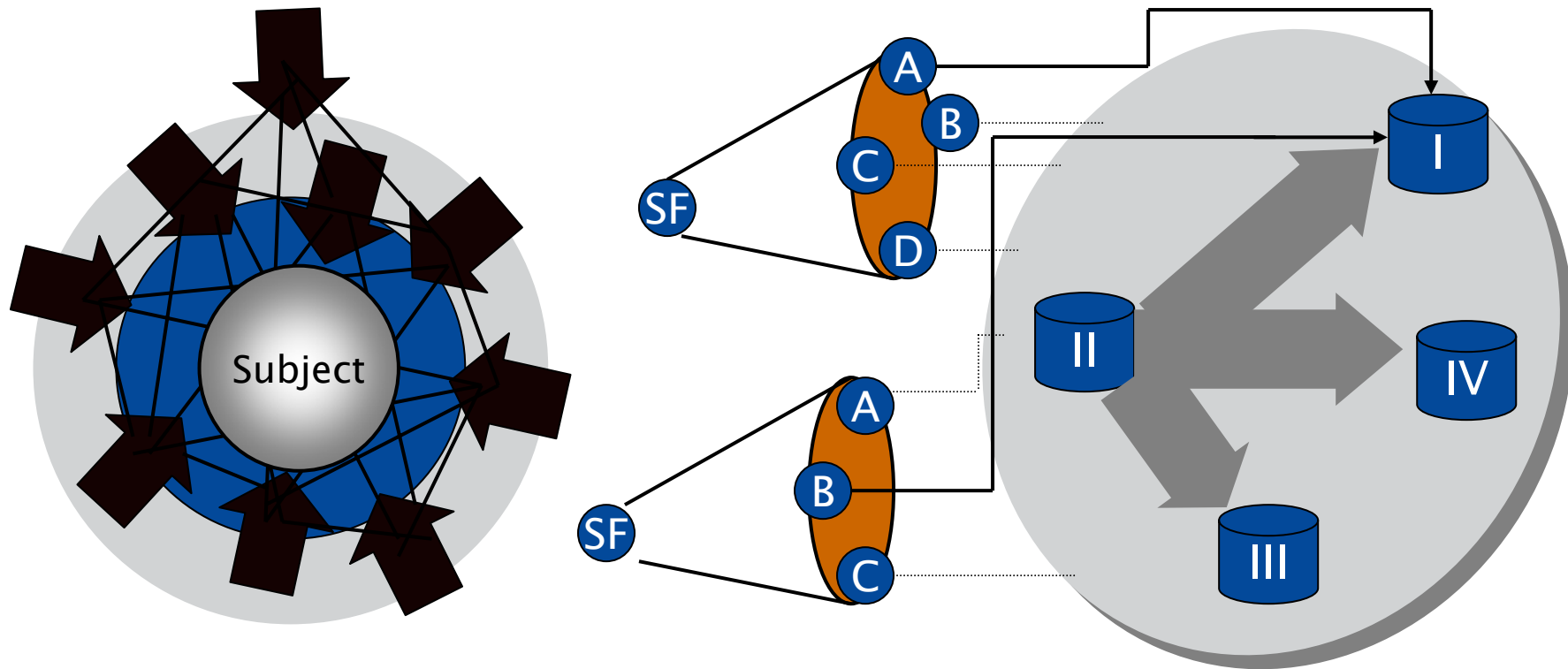
**How will knowledge production by multinational enterprises and their relative role for knowledge production in the European Research Area change until 2020?**



- Identifying important trends and changes of knowledge generation by MNE
- Assessing the relative importance of MNE in the knowledge generation
- Developing scenarios on the future of knowledge generation by MNE until 2020 and analyzing the impact of the scenario on the actors of the European Research Area

- **Scenario analysis as a method** to discover or invent, examine or evaluate, propose and promote possible, probable and preferable futures.
- Dealing with the complexity and uncertainty of the environment should by itself create or at least strengthen the basic conditions **to improve the learning** as well as the **decision making process** as well as make executives aware of so far unknown **opportunities and threats**.
- Aim of our scenario analysis is to **explore multiple futures** not to predict one future
- Development of **explorative scenarios**; starting from present trends and defining the possible future outcomes

# Developing Scenarios



## Key Factors

What is the present situation? What are the driving forces?

## Future Projections

How may the key factors develop in the future?

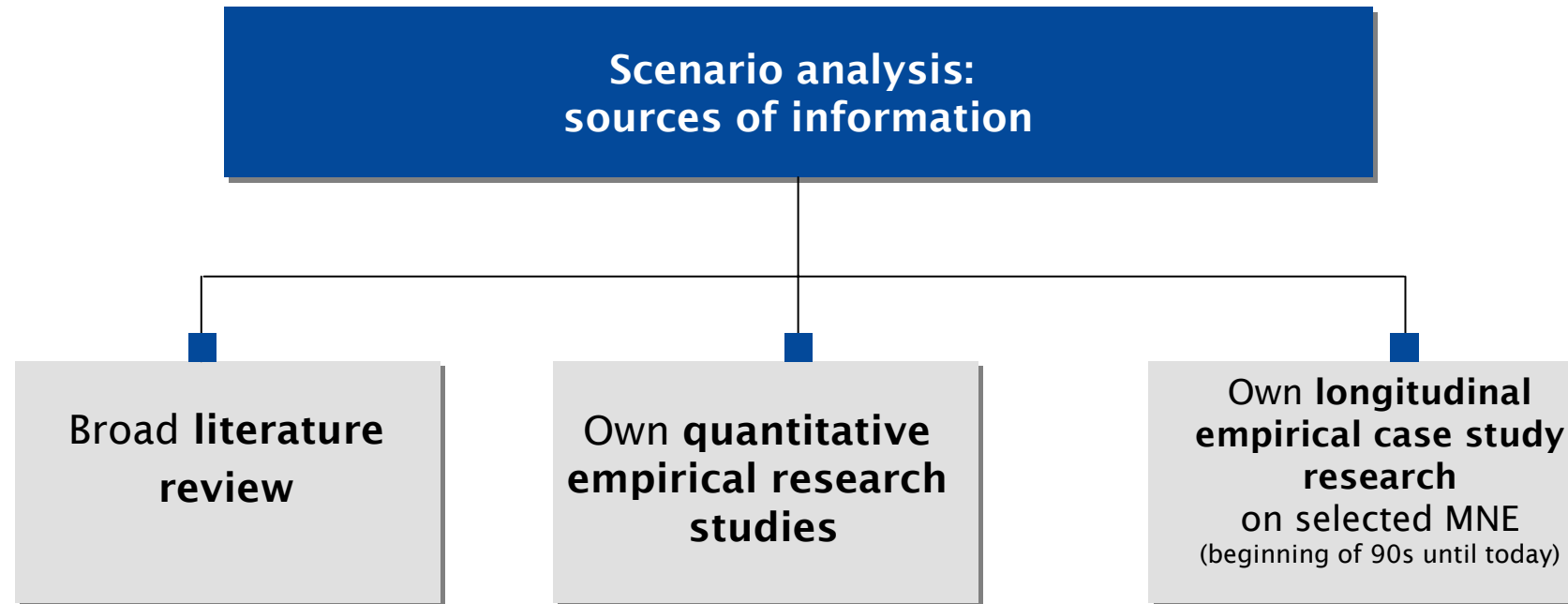
## Scenarios

Which possible future scenarios are imaginable?

## Future Spaces

How are the different scenarios inter-linked? Conclusions?

# Background and Sources for Information



# Main Changes in the Management of Technology and R&D in MNE

## 1. R&D as a strategic element in competition

- MNEs have developed more and more overall strategies for their management of technology
- Need for strategies to enable firms to build knowledge in existing core technologies but also to assess newly emerging technologies to sustain long-term competitiveness

## 2. Time-based strategies to decrease time-to-market

- Shorter time-horizons for market introduction in many sectors
- Time-to market = significant factor of the innovation and company strategy

## 3. Integrating the various elements of the value chain

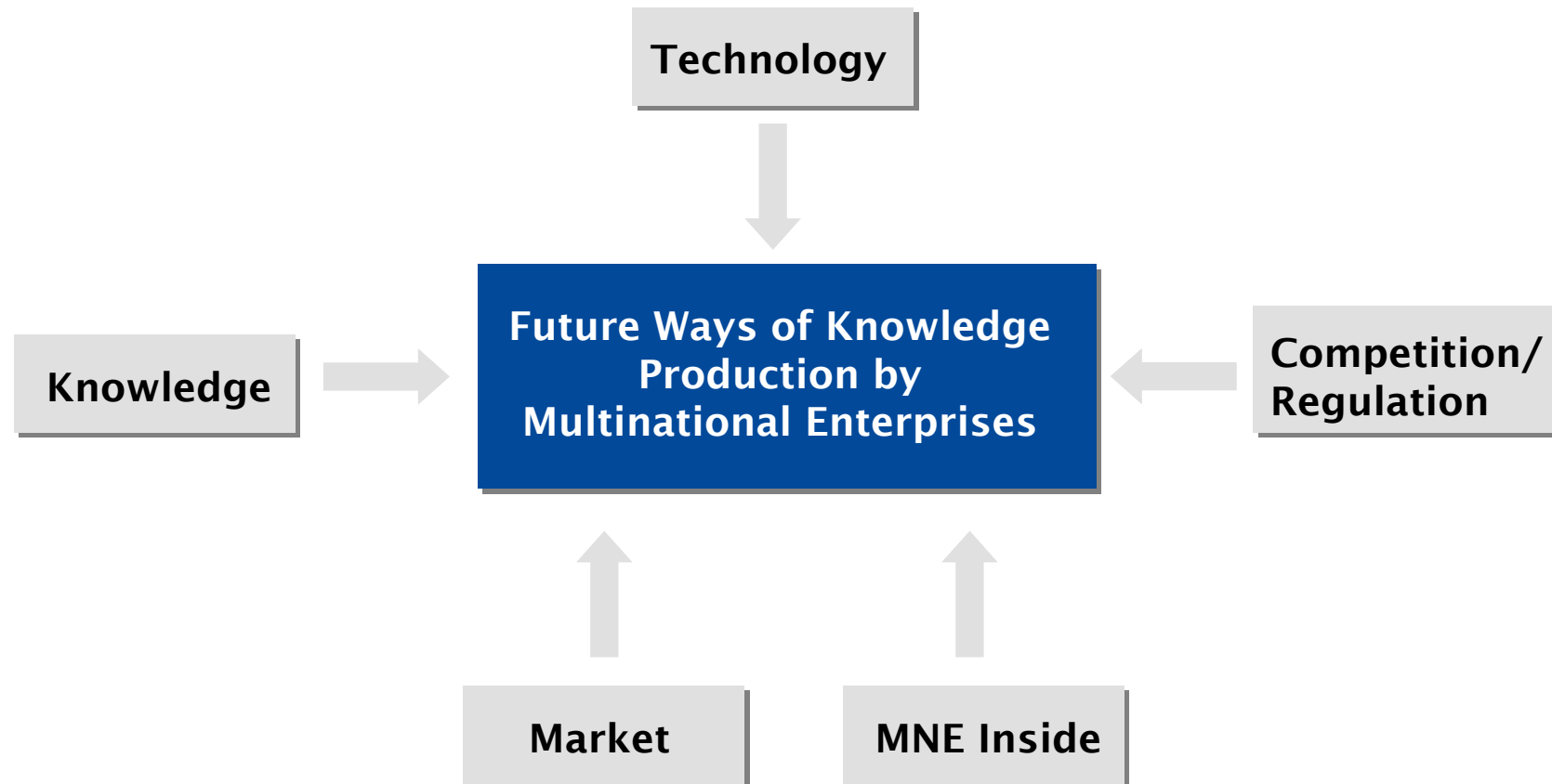
- The traditional institutional separation of basic research, applied research, development, production and application may be overcome
- Integrated product development processes, simultaneous engineering, and closer links between R&D, marketing, product/process development

# Main Changes in the Management of Technology and R&D in MNE

4. Increasing relevance of innovation-related networking
  - There is a growing tendency of MNEs to acquire technology from external resources
5. Internationalisation of innovation
  - International exploitation of technology produced on a national basis
  - Collaboration with partners in more than one country for the development of know-how and innovation
  - Internal R&D networks as innovation activities which are carried out simultaneously in the home and the host country
6. Organising R&D activities in MNE (decentral/central)
  - Changes in the overall organisation have a strong impact on the organisation of R&D
  - In general, there seems to be a shift from the centralization of R&D toward the decentralisation of R&D since the 1980s

Main changes and challenges of R&D management in MNE are summarized in different “Generations of R&D Management” (see e.g. Roussel, Saad, Tiby (1991), Coombs, Richards (1993), Edler, Meyer-Krahmer, Reger (2002), Rothwell (1993))

# Influence Areas



# Influence Areas and Influence Factors

## Knowledge

1. Speed of knowledge production
2. Novelty of knowledge production
3. Costs of knowledge production
4. Property of knowledge production (IPR)
5. Globalisation of knowledge production
6. Efficiency of knowledge production
7. Complexity of knowledge production
8. Investment in knowledge production

## Market

9. Attractiveness of foreign markets
10. Change of the population
11. Change of the age pyramid
12. Economic development
13. Change of values

## Technology

14. Technological competencies of public R&D system
15. Technological competencies of high-tech SME
16. Technological competencies of MNE

## Competition/Regulation

17. Industrial structure
18. Competition
19. Regulations and policy interventions at EU level

## MNE Inside

20. Corporate Governance
21. Organisation of R&D activities
22. Customer orientation
23. Innovation in company strategy



## Selected Key Factors

1. Competition (18)\*
2. Economic development (12)
3. Globalisation of knowledge production (5)
4. Innovation in company strategy (23)
5. Investment in knowledge production (8)
6. Novelty of knowledge production (2)
7. Technological competencies of MNE (16)
8. Change of the age pyramid (11)
9. Change of values (13)
10. Regulations and policy interventions at EU level (19)

\*Numeration is equivalent to the numeration in the system grid

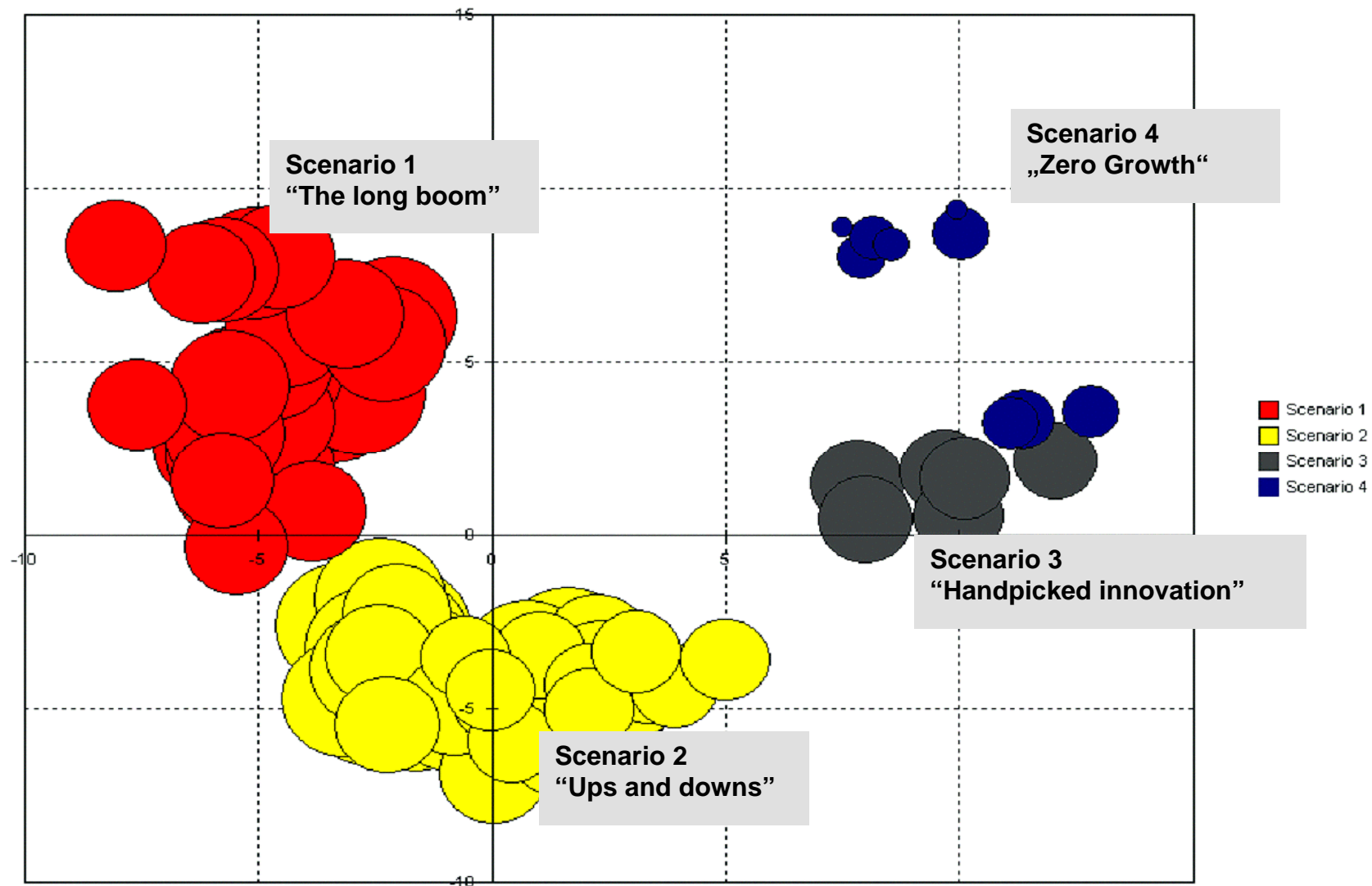
## Selected Projections of the Ten Key Factors (selection of samples)

Key influence factor (selection of samples)	Projection
<b>Competition</b>	
	<i>hyper-competition</i>
	<i>cooperation</i>
	<i>co-opetition</i>
	<i>monopolies</i>
<b>Economic development (see Becker-Boost, Fiala 2001, Dent 1998)</b>	
	<i>The long boom</i>
	<i>Zero growth</i>
	<i>Ups and downs</i>
	<i>Mega recession</i>
<b>Globalisation of knowledge production (see Gerybadze, Reger 1999)</b>	
	<i>Centres of excellent innovation abroad (CoEI)</i>
	<i>Home based innovation</i>
	<i>Export innovation</i>
	<i>Import innovation</i>

# Selected Projections of the Ten Key Factors (selection of samples)

Key influence factor (selection of samples)	Projection
<b>Innovation in company strategy</b>	
	<i>Innovation dominated strategy</i>
	<i>Innovation by chance</i>
	<i>Innovation rejection strategy</i>
<b>Investment in knowledge production</b>	
	<i>Dramatic increase</i>
	<i>Stagnation</i>
	<i>Dramatic decline</i>
	<i>Handpicked investment</i>
<b>Novelty of knowledge production (see Hauschildt 1997)</b>	
	<i>Radical innovation</i>
	<i>Incremental innovation</i>
	<i>Technology-based innovation</i>
	<i>Application-based innovation</i>
<b>Technological competencies of MNE</b>	
	<i>Completely outsourced</i>
	<i>Closed innovation</i>
	<i>Open innovation: outside-in-process</i>
	<i>Open innovation: inside-out-process</i>

# 2D Future Space Mapping of our Four Scenarios



## Scenario 1: 2020 - The Long Boom

	Impact on the European Research Area
<b>Scenario 1:</b> <b>The long boom</b>	<ul style="list-style-type: none"><li>▪ <b>MNE:</b> innovation dominates, dramatic investment in innovation, internationalisation strategy includes, firstly, export innovation and, secondly, Centres of excellent innovation abroad, open innovation model</li><li>▪ <b>Public R&amp;D system</b> is very important</li><li>▪ <b>High-tech SMEs:</b> high technological competencies, pushing technological innovation, very competitive, entrepreneurial spirit</li></ul>

## Scenario 4: 2020 – Zero Growth

	Impact on the European Research Area
Scenario 4: Zero Growth	<ul style="list-style-type: none"><li>▪ <b>MNE:</b> MNE dominate the economy and restrain competition. Innovation becomes less and less important to differentiate in competition, MNE dominate EU policy, lack of linkage between innovation and company strategy, accidental innovation, handpicked investment in knowledge production, and only incremental innovation.</li><li>▪ <b>Public R&amp;D system:</b> limited demand for the technological competencies of the public R&amp;D system, joint R&amp;D projects and contract research have become less and less, investment in the public R&amp;D system dramatically dropped, the technological competencies of the European public R&amp;D system are no longer competitive</li><li>▪ <b>High-tech SMEs:</b> SMEs have nearly completely disappeared, it is no longer attractive to found a technology based start-up firm</li></ul>

## Conclusions

- Scenario approach = suitable approach to learn more about the future of knowledge generation in MNEs
- Comprehensive overview about the object of investigation with help of a structured and transparent process
- No theory about driving forces of knowledge generation in MNEs, that's why we had to choose the heuristic approach
- Work in progress:
  - Scenario analysis is based on interviews and literature: further expert interviews to improve quality and value of the scenarios are needed and will be conducted in the near future
  - Implications for R&D management have to be specified

# Contact

## **Prof. Dr. Guido Reger**

*Chair for Innovation and  
Entrepreneurship*

Phone: +49-331-977-3326

Email: [Guido.Reger@uni-potsdam.de](mailto:Guido.Reger@uni-potsdam.de)

## **Dana Mietzner**

*Leader Research Group „New Market  
Intelligence and Technology Foresight*

Phone: +49-331-977-4500

Email: [Dana.Mietzner@uni-potsdam.de](mailto:Dana.Mietzner@uni-potsdam.de)

Centre for Entrepreneurship and Innovation at the University of Potsdam  
(BIEM-CEIP)

Am Park Babelsberg 14, D-14482 Potsdam



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# References

- Becker-Boost, E., Fiala, E. (2001): Globaler Wohlstand durch nachhaltiges Wirtschaften. Springer, Berlin.
- Coombs, R., Richards, A. (1993): Strategic Control of Technology in Diversified Companies with Decentralized R&D. In: Technology Analysis & Strategic Management, 5, 4.
- Edler, J., Meyer-Krahmer, F., Reger, G. (2002): Changes in the Strategic Management of Technology - Results of a Global Benchmarking Study. In: R&D Management, Vol. 32, No.2, March 2002, 149-164.
- Gerybadze, A., Reger, G. (1999): Globalization of R&D: Recent Changes in the Management of Innovation in Transnational Corporations. In: Research Policy, 28,2-3, March 1999, 251-274.
- Hauschildt, J. (1997): Innovationsmanagement, 2nd edition. Gabler, München.
- Ilseemann von, W. (1980): Die geteilte Zukunft. Szenarioplanung bei Shell, in: ManagerMagazin 5/80, 115-123.
- Rothwell, R. (1991): Successful Industrial Innovation: Critical Factors for the 1990s. Extended version of a paper presented to the Science Policy Research Unit's 25th Anniversary Conference. Brighton: University of Sussex, 3-4 July 1991.
- Rothwell, R. (1993): The Fifth Generation Innovation Process. In: Oppenländer, K.-H., pp, W. Privates und staatliches Innovationsmanagement. München.
- Roussel, P.A.; Saad, K.N.; Erickson, T.J. (1991): Third Generation R&D. Managing the Link to Corporate Strategy. Boston: Harvard Business School Press.
- United Kingdom, DTI (2004). The 2004 R&D Scoreboard: The Top 700 UK and 700 International Companies by R&D Investment (London: DTI).([www.innovation.gov.uk/projects/rd\\_scoreboard/home.asp](http://www.innovation.gov.uk/projects/rd_scoreboard/home.asp)).