University of Natural Resources
and Applied Life Sciences, Vienna
Department of Economic and Social
Sciences

INNOFORCE
EFI Project Centre

Approaches to Innovation Research

IP INNO-FOREST, 4 September 2006, Zvolen

Anja Bauer

Overview

- Schumpeter's contribution
- Linear Approach
- Innovation System Research
  - National Innovation System
  - Regional Innovation System
  - Sectoral Innovation System
- Cluster
- Networks
- Innovative Milieu
- Industrial District
- Diffusion Research

BOKU

INNOFORCE
EFI Project Centre

Schumpeter (1883-1950)

- Father of economic innovation research
- Great influence on current innovation research and policy

- Three main aspects of innovation:
  - Uncertainty is inherent in all innovation projects
  - Need to move quickly before somebody else did
  - Prevelance of resistence to new ways or inertia at all levels of society

BOKU

INNOFORCE
EFI Project Centre

Schumpeter ś hypotheses

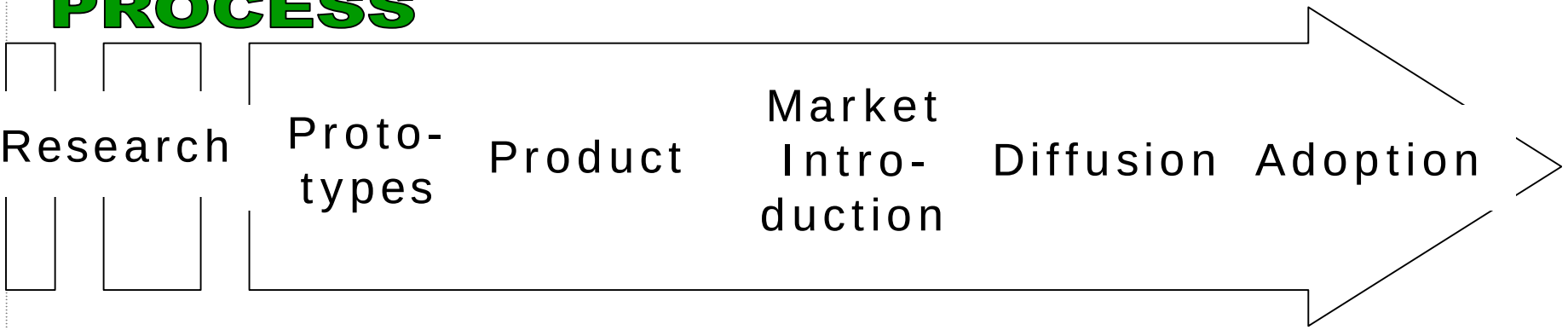
- Innovation as source of economic growth and technological change
- Capitalism is characterized by „creative destruction“ in which old ways of doing things are endogenously destroyed and replaced by the new
- The possibility to reach a (quasi) monopolisitic position increases the disposition to take the risk of innovating
- Big enterprises are more innovative than smaller ones

BOKU

INNOFORCE
EFI Project Centre

Linear Model

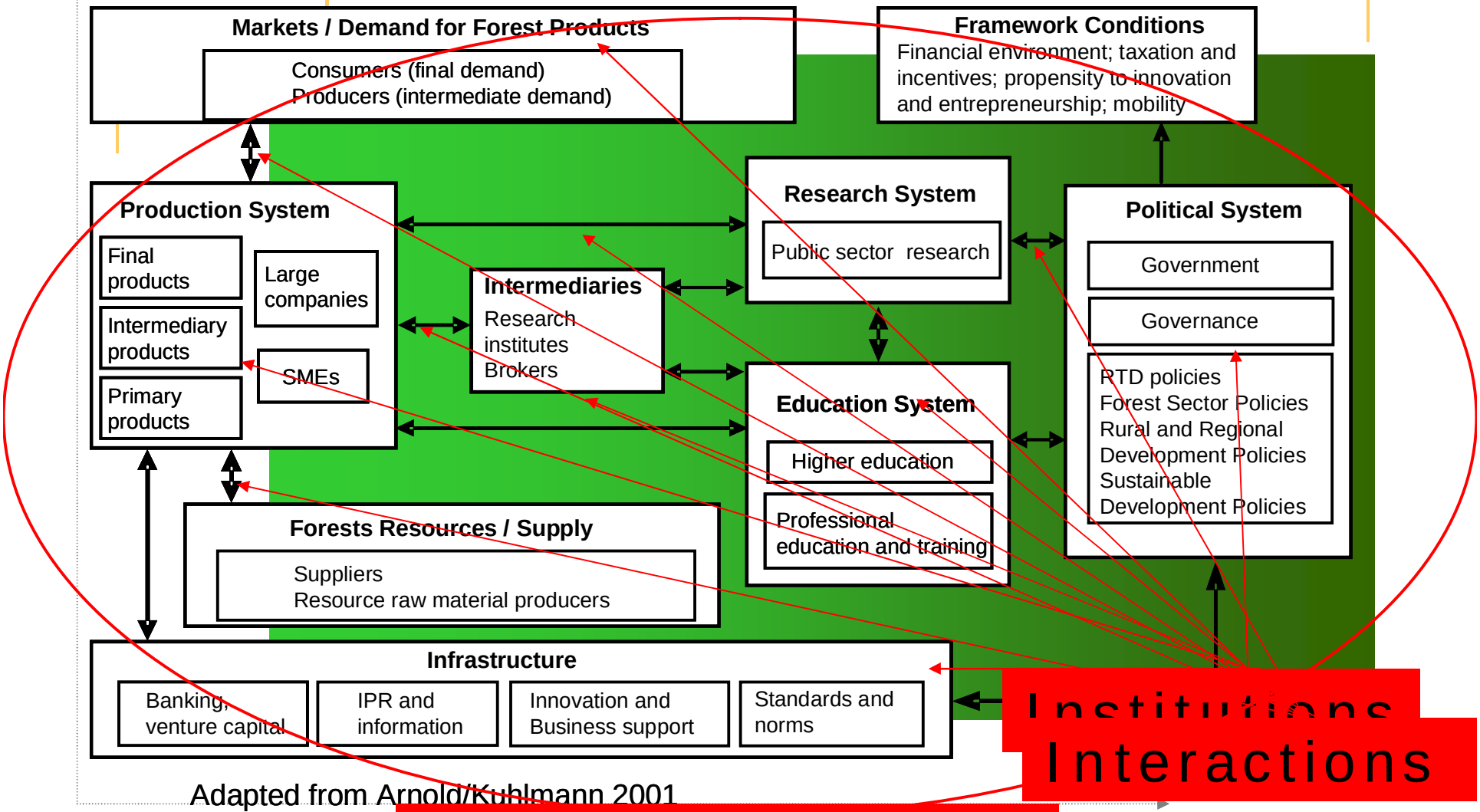
INNOVATION PROCESS



BOKU

INNOFORCE
EFI Project Centre

Systemic Model



Adapted from Arnold/Kuhlmann 2001

Systemic Approaches Base on

- New Institutional Economics
  - Role of institutions in furthering or preventing economic growth
  - Transaction costs, political economy, property rights, hierarchy and organization, and public choice
- Evolutionary Economics
  - Microfoundation for growth theory and industrial dynamics
  - Complex interdependencies, competition, growth and resource constraints
- Social Systems
  - System as a set of interrelated components working toward a common objective. Systems are made up of components, relationships and attributes.

BOKU

INNOFORCE
EFI Project Centre

Central Elements

- Knowledge – Learning economy
- Actors
- Institutions
- Interactions
- Evolutionary perspective
- Path dependency

BOKU

INNOFORCE
EFI Project Centre

Knowledge I

- Learning economy as the frame of reference
- Knowledge is the most fundamental resource in the modern economy, making learning the most important process
- Almost all learning proceses are social and interactive rather than individual
- Firms tend to engage in cooperative interactive learning relationships with a wide range of actors, such as suppliers and users of new technologies, public research institutes and other organisations.
- Learning not only within specific knowledge producing sector but also and to a large extent as by-product of ordinary economic activities

BOKU

INNOFORCE
EFI Project Centre

Knowledge II

- Important interaction between production, distribution and utilisation of new knowledge
  - Learning by doing
  - Learning by selling
  - Learning by using
  - Learning by interacting
- Different degrees of accessability
- May be more or less cumulative
- May be explicit or tacit

Actors

- Firms as key actors – characterized by specific beliefs, expectations, goals, competencies and organization and are continously engaged in processes of learning and knowledge accumulation
- Users and suppliers
- Non-firm organizations such as universities and, financial organizations, government agencies, local authorities... support in various ways innovation and diffusion

BOKU

INNOFORCE
EFI Project Centre

Institutions I

- Shape actors 'cognition and actions
- Regulate the relations and interactions between individuals, groups, and organisations
- Include norms, routine, established practices, rules, laws, standards
- May range from ones that bind or impose enforcements on agents to ones that are created by the interaction among agents
- Binding to less binding, formal and informal

BOKU

INNOFORCE
EFI Project Centre

Institutions II

- Form selection environments for innovation and store and transmit knowledge from one period to another (routines)
- Evolutionary processes are embedded in institutions
- Continuous mutual interaction between knowledge, innovation and institutions

BOKU

INNOFORCE
EFI Project Centre

Interactions

- Interactive character of innovation process
- Innovation not only depend on properties of organisations and institutions but also on how they interact
- Interactions include market and non-market relations, inter-firm alliances and formal networks of firms
- Interactions may be
  - Vertical
  - Horizontal

BOKU

INNOFORCE
EFI Project Centre

Evolutionary Perspective

- Technological change as evolutionary process (similar to biology):
  - Selection mechanisms
  - Trial and error processes
  - Open-ended process
  - Uncertain future
  - Diversity creation
- Inovation keep the evolutionary process going by introducing new variety

BOKU

INNOFORCE
EFI Project Centre

Path dependency

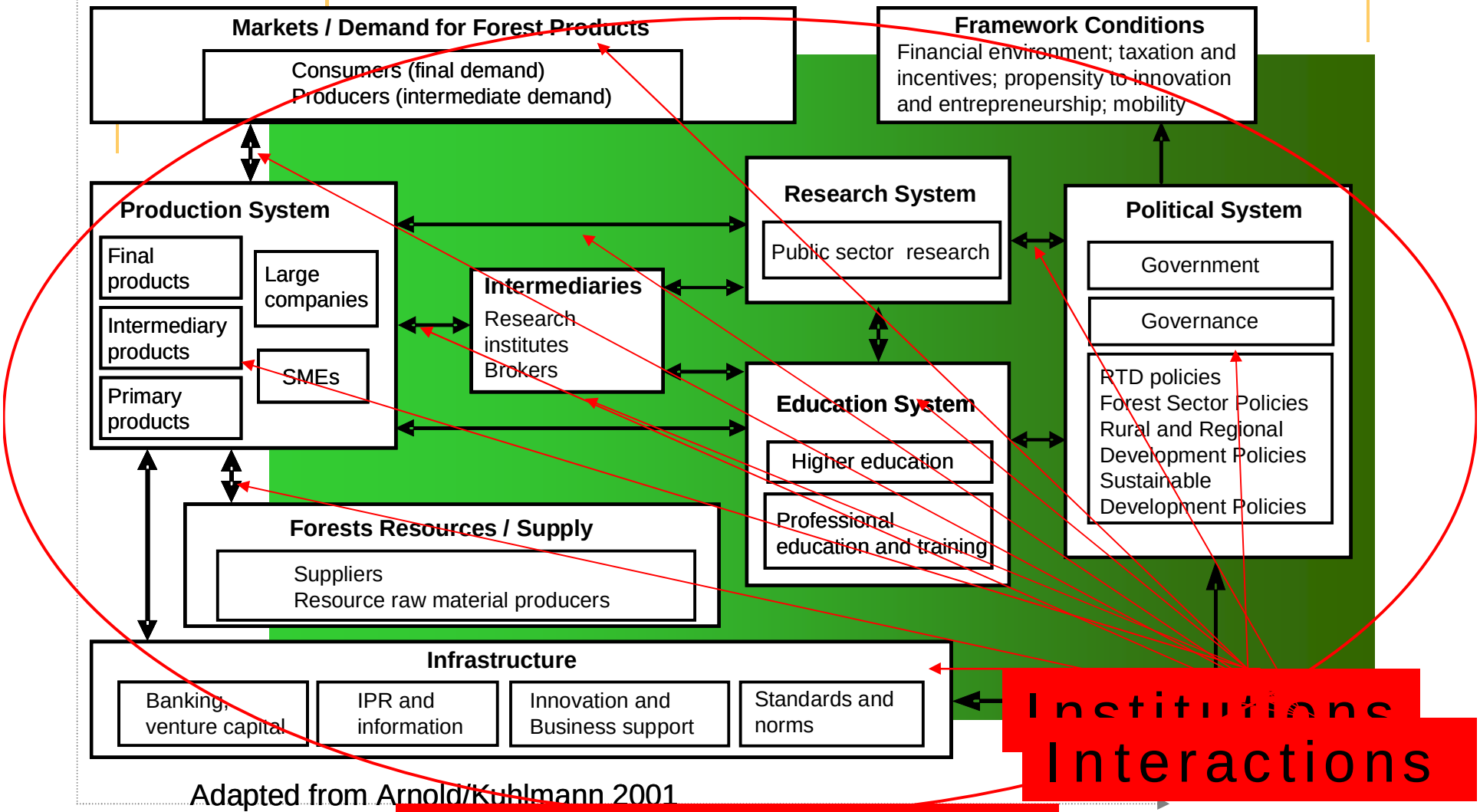
- Growth process – historically specific
- Institutions are self-reinforcing

- A standard which is first-to-market can become entrenched
- Feedback mechanisms like bandwagon and network effects lead to reinforcing patterns
- By this inferior standards can persist simply because of the legacy they have built up = lock in
- Leaving the path would require high switching costs

BOKU

INNOFORCE
EFI Project Centre

Systemic Model



Adapted from Arnold/Kuhlmann 2001

Different Approaches

- National Innovation System
- Sectoral Innovation System
- Regional Innovation System

BOKU

INNOFORCE
EFI Project Centre

National Innovation System

- *„...the elements and relationships which interact in the production, diffusion and use of new, and economically useful knowledge (...) and are either located within or routed inside the borders of a nation state "* (Lundvall 1992)
- *„...the set of institutions whose interactions determine the innovative performance (...) of national firms " (Nelson and Rosenberg 1993)*
- *„The national systems of innovation is constituted by the institutions and economic structures affecting the rate and technological change in the society (Edquist and Lundvall 1993)*

BOKU

INNOFORCE
EFI Project Centre

National Innovation System

- Guiding concept for empirical research on how institutional and production structures affect economic performances in firms and industries in different national contexts
- Special emphasis on historical evolution of national institutions
  - National institutions represent a medium through which the current options that firms and policy makers are confronted with are affected by previous economic agents 'choices and actions
- Cultural characteristics of a nation

BOKU

INNOFORCE
EFI Project Centre

Sectoral Innovation System

„System of firms active in developing and making a sector ś products and in generating and utilizing a sector ś technologies“ (Breschi and Malerba 1997)

Sectoral Innovation System

Three key dimensions:

- Set of sector-specific characteristics defining its technological regime (knowledge base, appropriability and cumultativeness conditions and technological opportunities)
- Actors and their networking relationships that define how cooperation is realized by different organisations such as firms and universities, users and suppliers, individual entrepreneurs and finance, R&D institutes and government agencies...
- Institutional framework and the impact of specific common habits of thought, norms, standards and laws

BOKU

INNOFORCE
EFI Project Centre

Sectoral Innovation System Traditional Sectors

- Knowledge base for innovation: relatively simple, generic, and embodied in equipment and materials, easy imitation
- Opportunities to innovate are mainly related to the search for lower production costs, through the introduction of new capital goods, inputs, and materials coming from suppliers
- Appropriation of competitive advantages rests upon the use of less conventional means, like trade marks, aesthetic design...
- Competition on the basis of price as well as other non-price variables, like advertisement and post-sale assistance (Breschi and Malerba 1997)

BOKU

INNOFORCE
EFI Project Centre

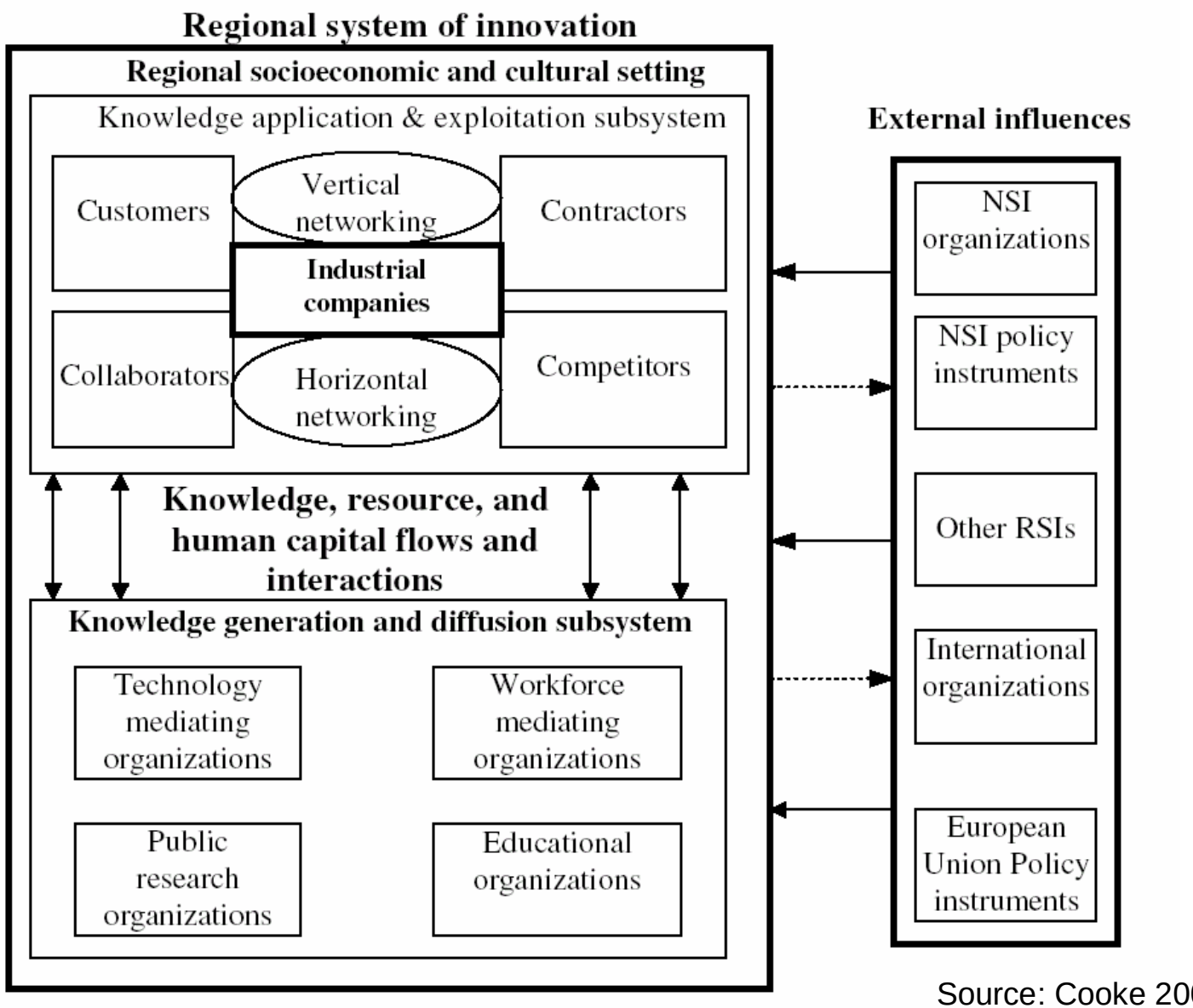
Regional Innovation System

„geographical distinctive, interlinked [institutions and] organizations supporting innovation and those conducting it, mainly firms“ (Cooke et al. 1996)

- Spatial and social proximity are important conditions for the realisation of innovation
- Facilitate exchange of knowledge, create learning processes

BOKU

INNOFORCE
EFI Project Centre



Source: Cooke 2002, S. 137

Innovation System

- Common characteristics of IS approaches
  - Innovations, learning and institutions at centre
  - Holistic and interdisciplinary
  - Evolutionary perspective
  - Non-optimality
  - Emphasis on interdependece and non-linearity
  - Product and process innovations
  - Conceptual framework rather than formal theories

BOKU

INNOFORCE
EFI Project Centre

Related concepts

- Clusters
- Networks
- Innovative Milieus
- Industrial Districts
- Comparison

BOKU

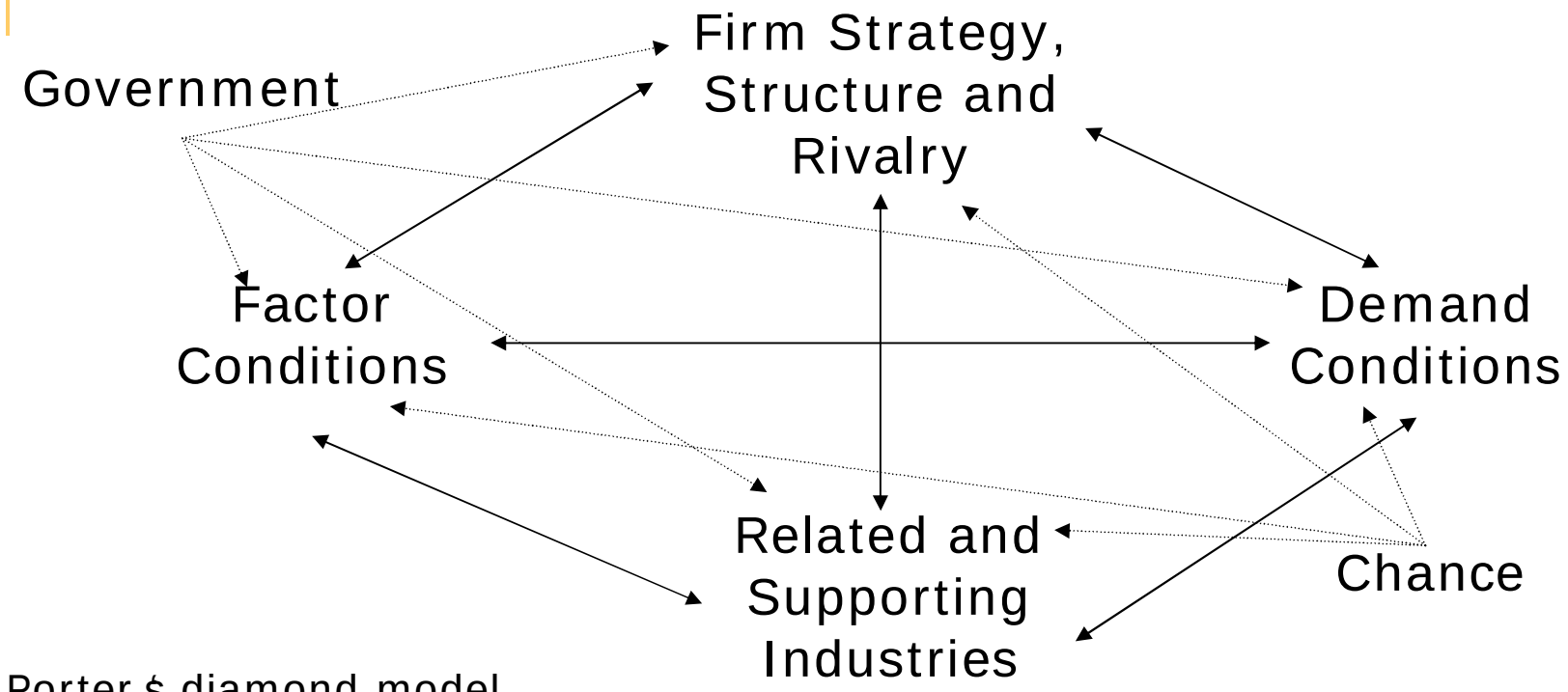
INNOFORCE
EFI Project Centre

Clusters

"Clusters are geographic concentrations of interconnected companies, specialized suppliers, service and specialized infrastructure providers, firms in related industries, channels and customers and associated institutions in particular fields that compete but also cooperate"

(Porter, 1998)

Clusters



Porter ś diamond model

(Porter 1990)

Types of clusters

- Generally two types of business clusters, based on different kinds of knowledge:
- Techno clusters- high-technology oriented, well adapted to the knowledge economy , often involve renowned universities and research centers, examples Silicon Valey, Bangalore
- Historic know - how-based clusters - based on more traditional activities that maintain their advantage in know-how over the years; often industry specific, examples: Paris for Haute Couture, Antwerp for diamonds

BOKU

INNOFORCE
EFI Project Centre

Networks

- Networks as intermediate organisational forms between markets and firms, when these fail in efficiency and efficacy
- Constituted by a set of actors and by the links connecting them, non-hierarchical
- Exchange characterised by:
  - Reciprocity
  - Interdependence
  - Loose coupling
  - Power

BOKU

INNOFORCE
EFI Project Centre

Cluster vs. Networks

Rosenfeld 2001

CLUSTERS:

- Attract specialized services to a region
- Have open membership
- Are based on social values that foster trust
- Generate demand for more firms with similar capabilities
- Require both cooperatin and competition
- Have collective visions

NETWORKS:

- Allow firms access to services at lower costs
- restricted membership
- Are based on contractual agreements
- Make it easier for firms to engage in complex production
- Are based on cooperation
- Have common business goals

BOKU

INNOFORCE
EFI Project Centre

Innovative Milieu

„Set of relationships that occur within a given geographical area that bring unity to a production system, economic actors, and an industrial culture that generate a localised dynamic process of collective learning and that act as an uncertainty-reducing mechanism in the innovation process “
(Camagni 1995)

- Socio-cultural approach
- Informal, social and cultural factors
- Networking
- Historical structures

BOKU

INNOFORCE
EFI Project Centre

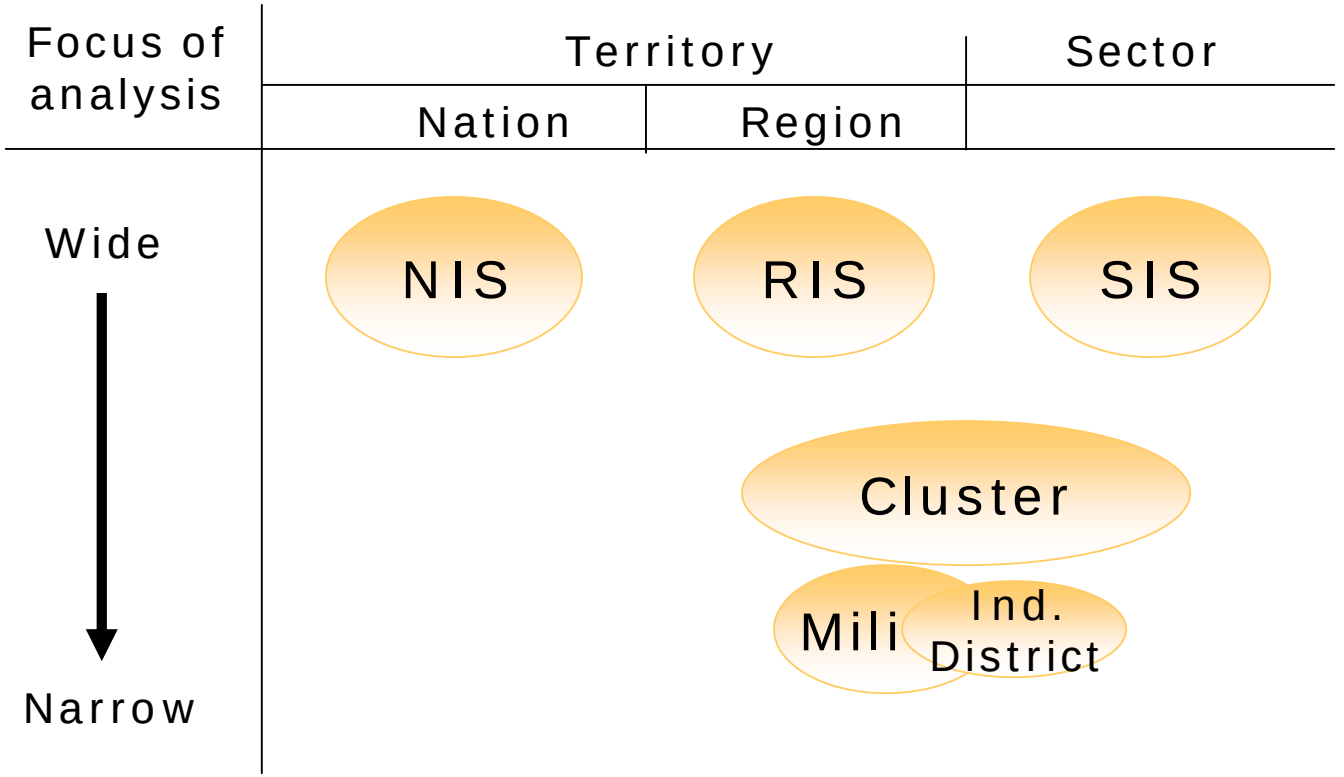
Industrial district

- Model of network of firms: characterised by a low level of hierarchy, by horizontal linkages among small firms, by inter-organizational networks
- Strongly rooted in local context
- Productive structure bases on highly specialized division of labour among SME s
- Most of firms are specialized in a single stage of production

BOKU

INNOFORCE
EFI Project Centre

Comparison


Focus of analysis
Territory
Sector
Nation
Region
Wide
Narrow
NIS
RIS
SIS
Cluster
Mili
Ind. District

Diffusion of innovation

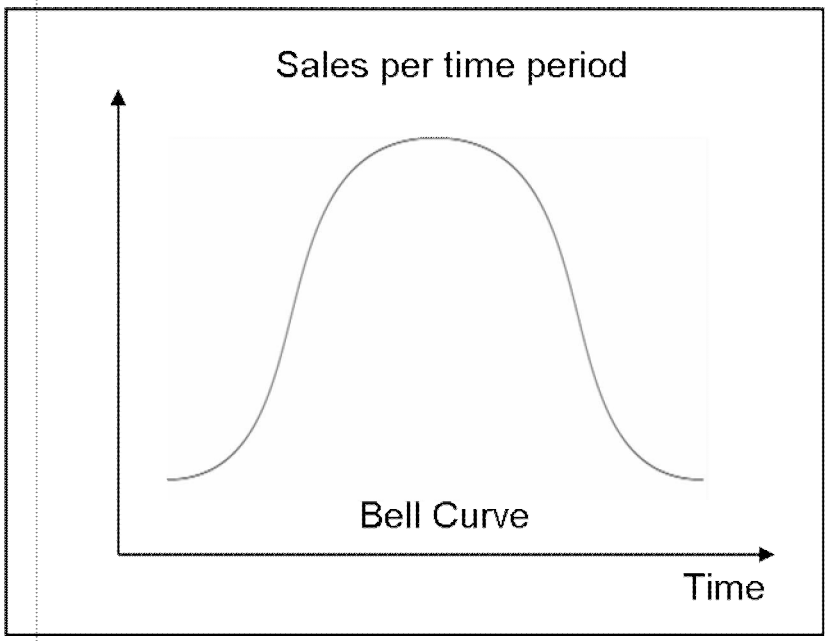
- Everett Rogers: Diffusion of Innovations (1962)
- „*An innovation is an idea perceived as new by the individual.*
  Diffusion is the process by which an innovation spreads...
  Adoption is the decision to continue full use of an innovation. ”

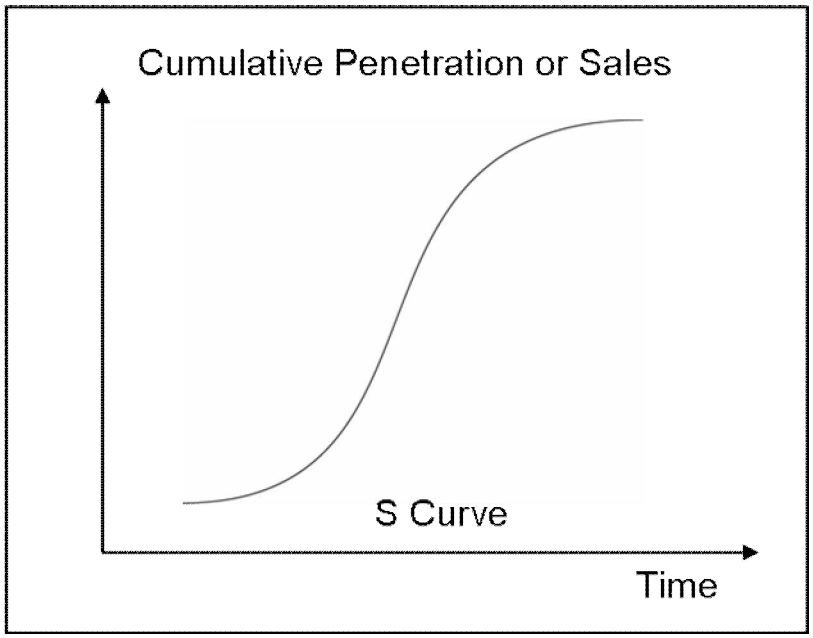
- 5 Adopters ‘categories:
  - Innovators (2,5%)
  - Early adopters (13,5%)
  - Early majority (34%)
  - Late majority (34%)
  - Laggards (16%)

BOKU

INNOFORCE
EFI Project Centre

Diffusion of Innovations





BOKU

INNOFORCE
EFI Project Centre

Rogers: Diffusion of Innovations

Five stage model for the diffusion of innovation:

- *Knowledge* - learning about the existence and function of the innovation
- *Persuasion* - becoming convinced of the value of the innovation
- *Decision* - committing to the adoption of the innovation
- *Implementation* - putting it to use
- *Confirmation* - the ultimate acceptance (or rejection) of the innovation

BOKU

INNOFORCE
EFI Project Centre

Your Questions

INNOFORCE
EFI Project Centre

Thank you

www.efi-innoforce.org