National Systems of Innovation and Creative Destruction: A small-country perspective

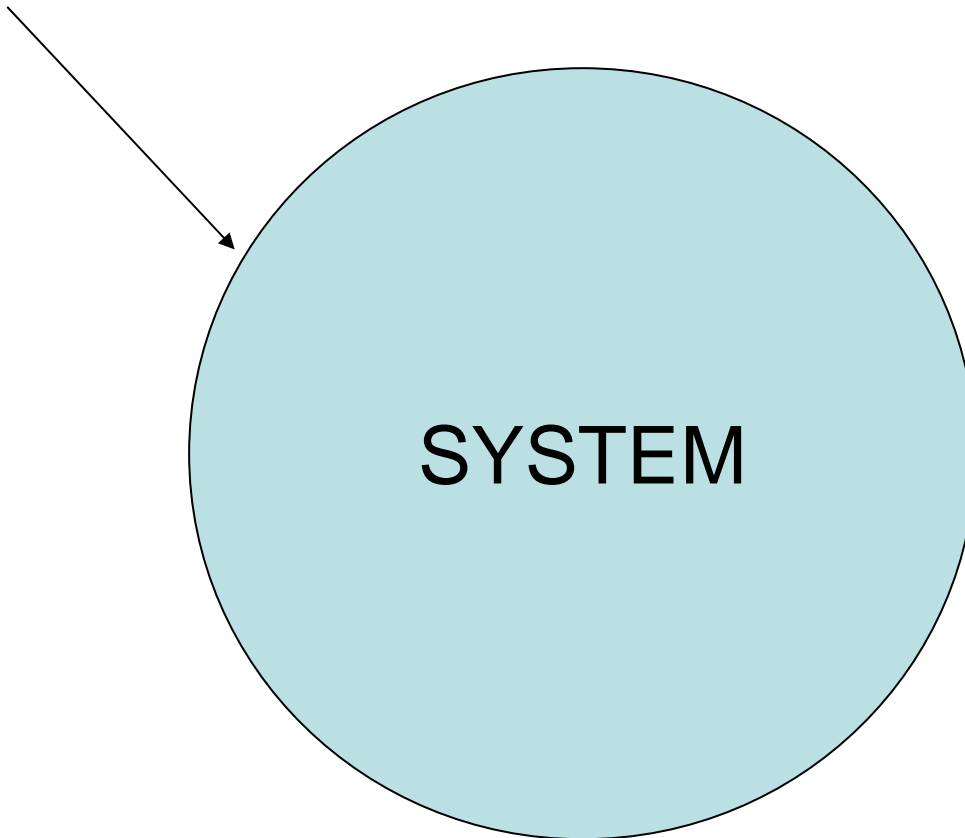## PER HÖGSELIUS

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Fundamentals of a system

System boundary

ENVIRONMENT

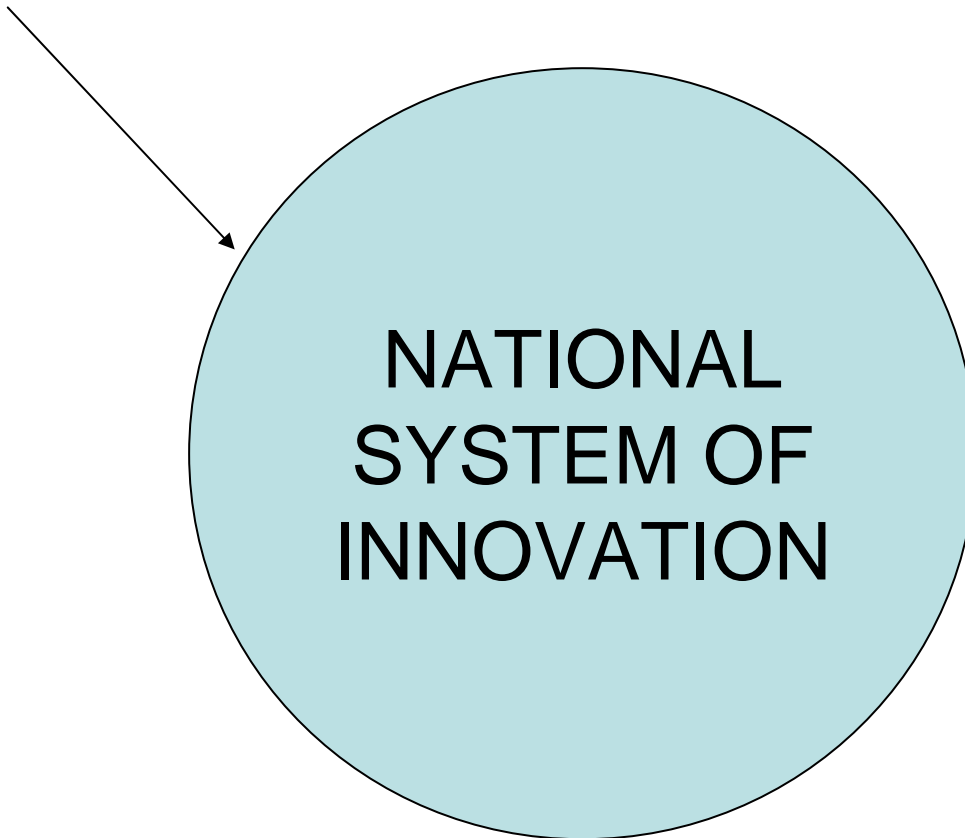SYSTEM

Fundamentals of an NSI

National boundary

FOREIGN
ENVIRONMENT

NATIONAL
SYSTEM OF
INNOVATION

Environment-system communication

System boundary

ENVIRONMENT

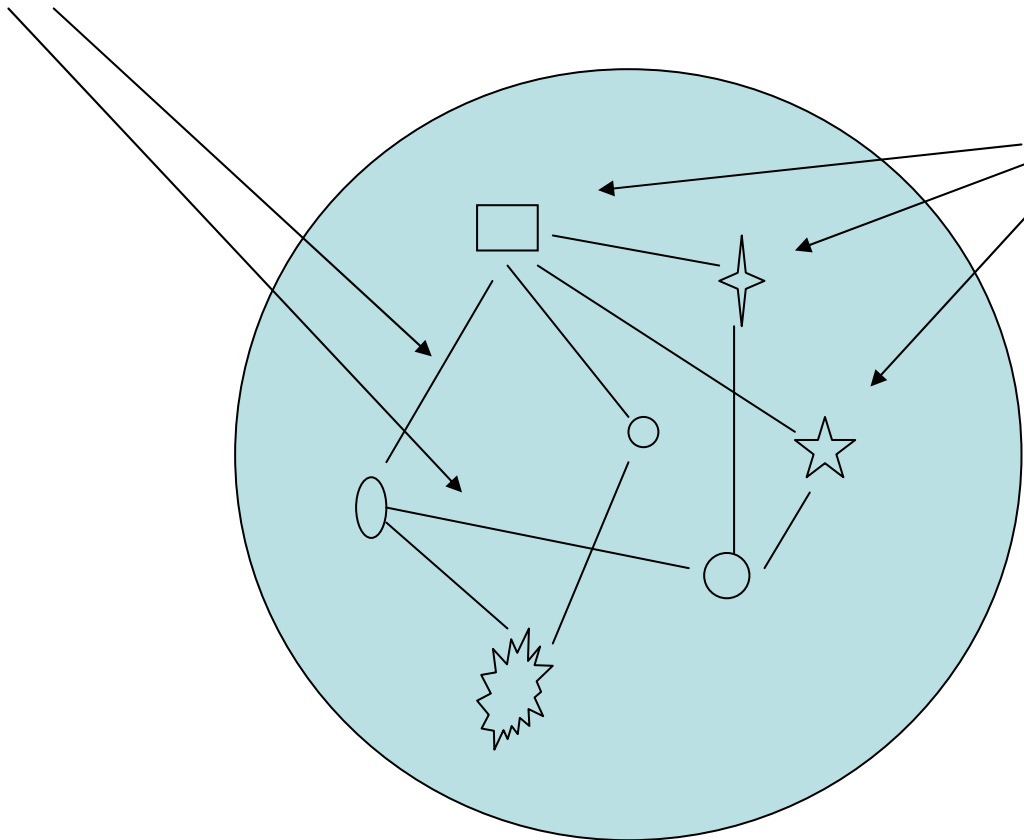Reproduction and adaptation processes within the system ('autopoiesis')
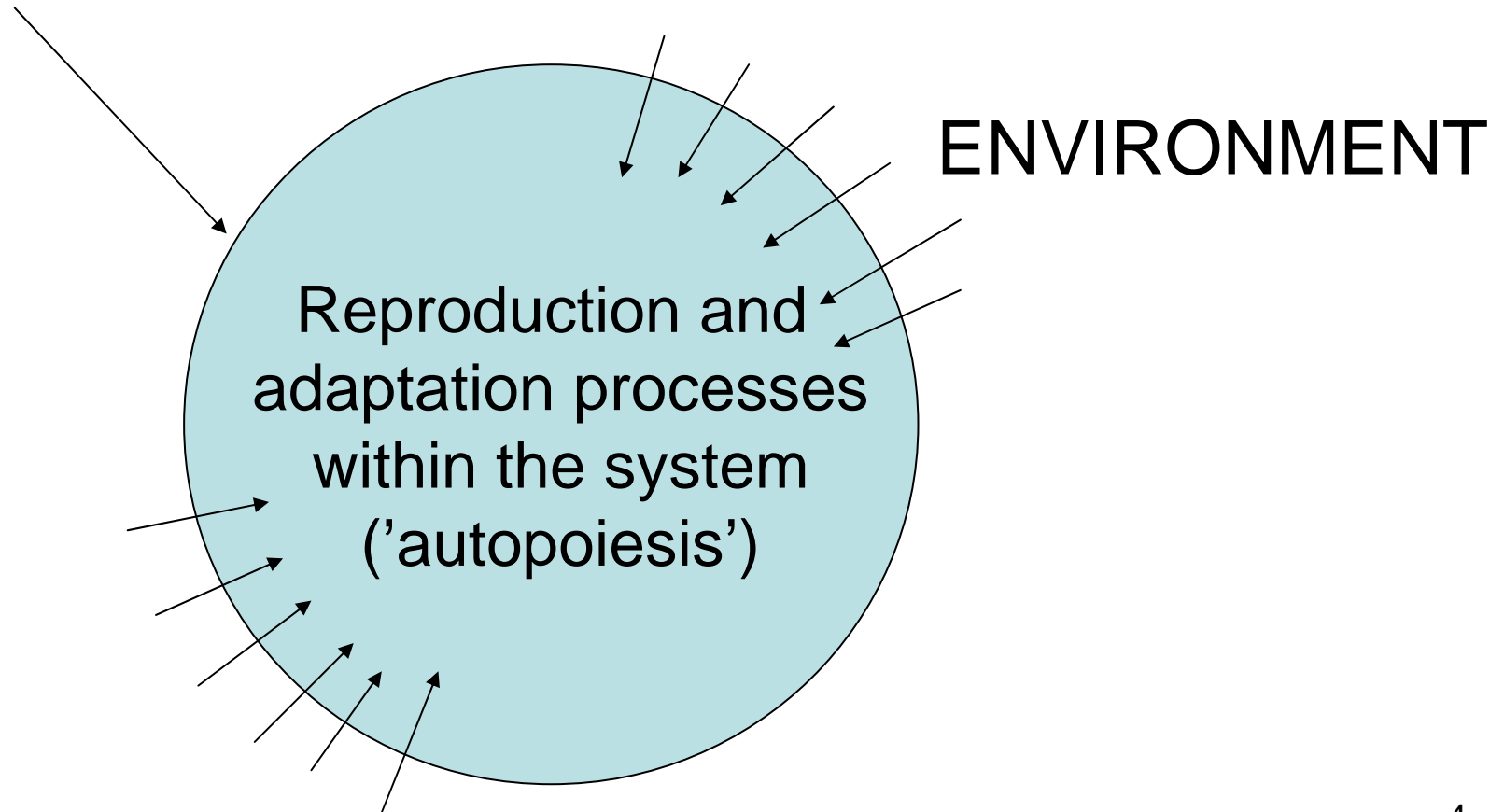
The structure of a system

Relations

Components

5

Typical components in NSI

- **ORGANIZATIONS**
- Firms
- Universities
- Research institutes
- Government agencies
- Financiers
- Users
- Inventors
- Etc.

- **INSTITUTIONS**
- Laws
- Standards
- Regulations
- Recommendations
- Traditions
- Routines
- Taboos
- Etc.

Typical relations in NSI

- Competitive relations
- Collaborative relations:
  - Subcontracting
  - Licensing agreements
  - Investment, ownership
  - Strategic alliances
  - Research consortia
  - University-industry-government
  - Etc.
- (Transactional relations)

What are the activities in an NSI?

- **Formulation of visions**
- **Articulation of demand**
- **Creation of new knowledge**
- **Competence-building**
- **Formation of new firms and other organizations**
- **Adaptation of organizations**
- **Networking**
- **Provision of finance**
- **Consultancy, advice and lobbying activities**
- **Creating, changing and abolishing institutions**
- **Formulation of public policy**

The activities, taken together, define the **"style of innovation"** in the NSI

Creative destruction in NSI perspective

- Creative destruction as a multi-dimensional process that takes place not only with respect to **components** and **relations**, but also with respect to **activities**.

- Creative destruction in terms of activities:
  - new visions replacing old ones
  - old demand giving way for new demand
  - new dynamic innovation networks and relations taking the place of old ones
  - new methods of financing innovation coming in to replace obsolete sources of finance
  - etc.

Structural transformation and the emergence of new styles of innovation

- Can the NSI respond creatively to a radical (internal or external) disturbance?

- Components and activities will sense a need to respond to the radical change

- However, the extent to which they can actually do so is limited by a number of factors, such as
  - the complexity and strengths of existing components, relations and activities
  - lack of knowledge, competencies and experiences that are relevant in handling the transformation

- As components, relations and activities continuously adapt to the new situation **in circular and cumulative ways**, the system is likely to gradually take a more stable shape.

- Components, relations and activities develop **interlockings** by adapting to each other, and once a more stable new structure begins to crystallize **it becomes more and more difficult to change the structure in more far-reaching ways.**

- Therefore, the key to understanding the emergence of a new structure and style of the NSI should be searched for in **the early years** following the radical political or technological disturbance!

However, if the inertia of the earlier system is strong, strong internal or external pushes and pulls may – paradoxically – have little impact on the system. The existing structure may simply be so strong and stiff that further changes are made difficult in the whole system, which therefore remains very much as it was!

Do national boundaries really coincide with the system boundary??

Two types of system boundaries:

- **'Deutsch-type boundary':** national borders define the boundary of a system if the intensity and number of domestic relationships is much greater than the intensity and number of transnational relationships

- **'Luhmann-type boundary':** national borders define the boundary of a system if interactions with the foreign environment have a different impact on that system as compared to the impact on other national systems, in terms of structure and style

The role of the foreign environment

- The pressure to creatively destroy components and activities in a small system of innovation often comes **from outside** rather than from within
- Therefore, the success of the system is highly dependent upon its ability to effectively adapt itself to the radical changes in its environment
- This is particularly so in small countries!

What are the forces that determine the impact of the foreign environment upon an NSI?

- The environment can only have a (creative) impact upon a system if there is 'resonance' at the system boundary (importance of common 'language')
- Most important relations are with countries that
  - Have very advanced systems of innovation
  - Are culturally and geographically close

CONCLUSION

- Need to analyze both structure and style of NSI!
- Notion of activities help us see more clearly what creative destruction is about and how it can be managed
- Different types of system boundaries
- Crucial to understand the dynamics of system-environment interaction – especially in a small-country perspective