Autonomous Co-operation and Control in Complex Adaptive Logistics Systems

Contributions and Limitations for the Innovation Capability of International Supply Networks

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Agenda

- Introduction

- **Heterogeneity**: A Pre-condition for the Innovation-Capability of Complex Adaptive Logistics Systems (CALS)

- **Dominant Logic**: A Driver for Homegeneity in CALS

- **Autonomous Co-operation and Control**: A Driver for Heterogeneity and Innovation Capability

- Conclusions

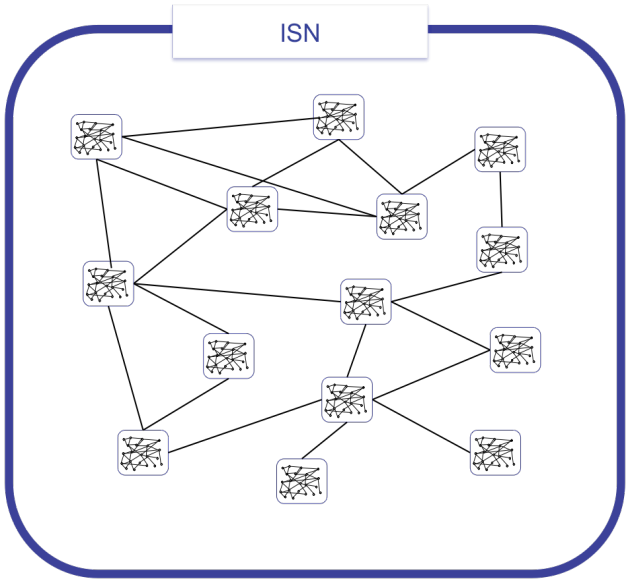
Introduction

Innovation Capability

- **ideas**, **concepts**, and **practices**
- in order to **improve characteristics** and **features**
- of **products** / **processes**,
- perceived as **new** and **valuable**
- **crucial for sustainable wealth** of the regarded system.

Source: Rogers (2003) | Westphal et al. (1997)

International Supply Networks (ISN)



What characteristics of international supply networks facilitate or reduce their innovation capabilities?

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Complex Adaptive Logistics Systems (CALS)

ISN = CALS

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Characteristics on the Individual Level

- **Interaction**
- **Heterogeneity**
- **Ability to learn**

Improvement of products and processes is only possible, when

- single elements are **able to learn**
- which is only possible if they **interact** with each other
- which is only possible if they are **heterogeneous**.

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Heterogeneity as a pre-condition for innovation capability

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What aspects determine a logistics system‘s degree of heterogeneity?

Source: Wycisk et al. (2008) | McKelvey et al. (forthcoming)

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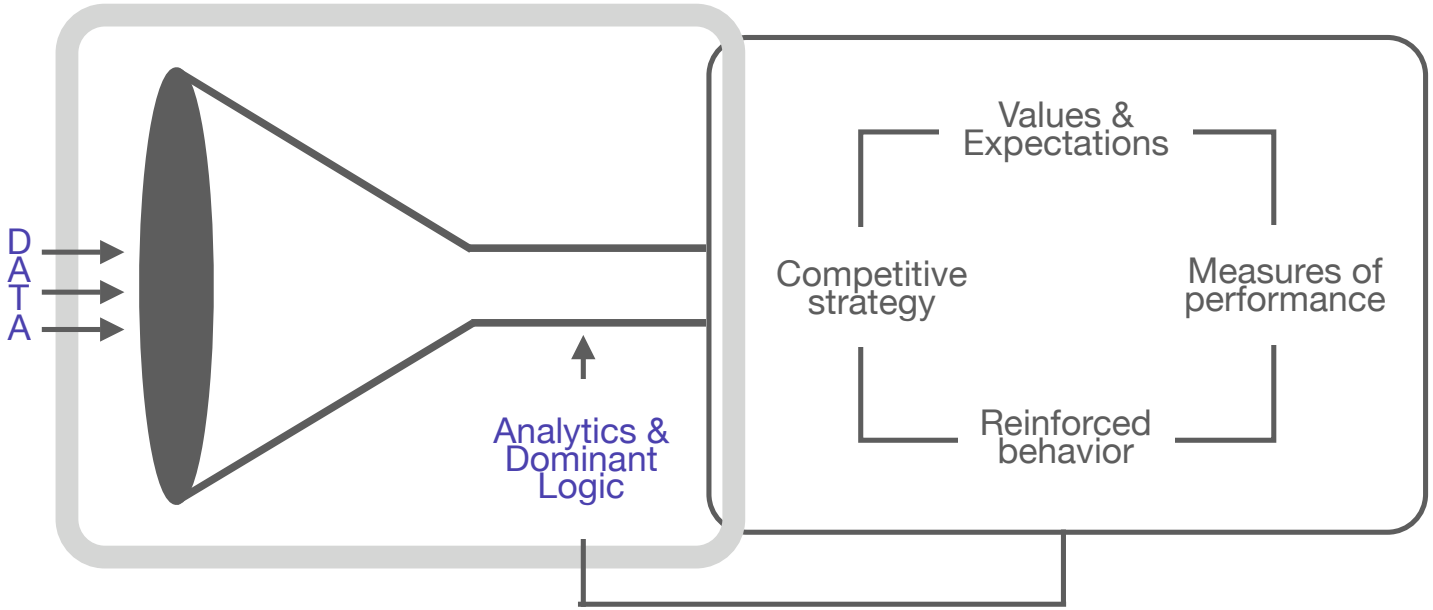
Dominant Logic



Organizational Intelligence

Organizational Learning

Source: According to Bettis and Prahalad (1995)

Dominant Logic‘s Influence on Innovation Capabilities

The Dominant Logic

- limits the **information inflow** by filtering incoming data
- therewith limits the system‘s element‘s **supply with information**
- therewith limits their **incentives to interact** with each other
- decreases their **heterogeneity**
- **decreases the system‘s innovation capability**.

Which organizational principle of a CALS is able to decrease the intensity of dominant logics?

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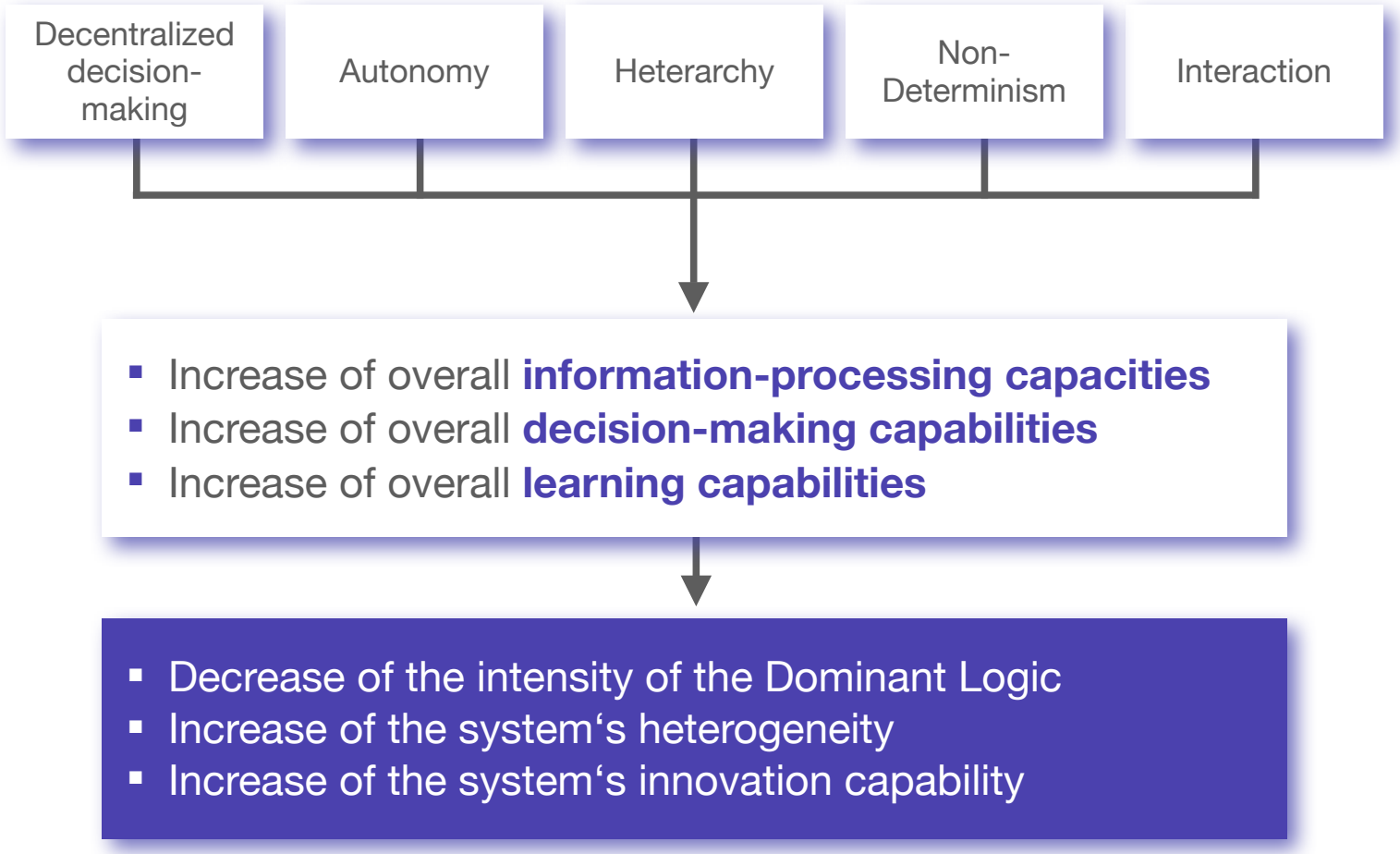
Autonomous Co-operation and Control (ACC)

- ... is based on the idea of **Self-Organization**.
- ... aims at ”(...) the achievement of **increased robustness** and **positive emergence** of the total system due to **distributed** and **flexible** coping with **dynamics** and **complexity**.
- ... can be understood as ”(...) processes of **decentralized decision-making** in **heterarchical structures**. It presumes **interacting** elements in **non-deterministic** systems, which possess the capability and possibility to render decisions **autonomously**.

Source: Windt and Hülsmann (2007)

Autonomous Co-operation and Control as a driver for innovations in CALS



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Key Findings

- Dominant logics decrease the innovation capabilities of CALS
- The higher the degree of heterogeneity in CALS, the higher are by trend their innovation capabilities (up to the »edge of chaos«)
- Autonomous controlled systems tend to have higher innovation capabilities than systems that are organized by external control

Implications for Management

- Innovation-based management
- by implementing autonomous co-operation
- increasing the degree of its characteristics

Implications for Further Research

- Need for empirical evidence
- Development of multi-agent based models
- Design Options for CALS

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