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# Firm Strategies in Open Internet of Things Business Ecosystems: Framework and Case Study

*Anssi Smedlund, Aalto University School of Business, [anssi.smedlund@aalto.fi](mailto:anssi.smedlund@aalto.fi)*

*Heini Ikävalko, Aalto University School of Business, [heini.ikavalko@aalto.fi](mailto:heini.ikavalko@aalto.fi)*

*Petra Turkama, Aalto University School of Business, [petra.turkama@aalto.fi](mailto:petra.turkama@aalto.fi)*

# Motivation

- **Internet of Things (IoT) increases the connectivity around us**
    - Devices are connected to each other in distributed “mesh” with open standards, organizations are connected through devices
  - **Data will not be intermediated by the platform owners, also other organizations can utilize the data**
    - Data is detached from the service
  - **Owning the whole service system (i.e. technology platform + sensors + data) will no longer be the only best strategy**
    - What other strategies there may be?
  - **The need for new frameworks to make sense of strategies in open IoT ecosystems (Yoo et al., 2010)**
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# IoT increases connectivity in business ecosystems

- **Business ecosystems** are essential for market creation and growth (Moore, 1993)
  - Firms are connected and interdependent through shared standards
  - Central firms are technology platform owners specifying the standards (Teece, 2014)
  - Complementors attach their offering to the platforms with technological enablers and interfaces (Gawer & Cusumano, 2008)
- Business ecosystems consist of overlapping **Service Systems** (Maglio & Spohrer, 2008) that are interconnected to **System of Systems** that resembles complex adaptive system (Karcnias & Hessami, 2010)
- **IoT System of Systems** may reach a higher level of synergy and efficiency through the connectivity of several service systems

# Firms may orientate differently towards IoT ecosystem

- **Strategic orientation reflects what set of actions a firm believes will lead to superior performance (Gatignon & Xuereb, 1997)**
- **Strategic orientations are the guiding principles on firms' interactions with the marketplace (both customers and competitors) (Noble et al, 2002)**
- **Firms' strategic orientations effects their business model adaptation (Saebi et al, 2016)**

# Strategic orientation in the ecosystem

**Two key decisions that firms can make to differentiate their orientation in the ecosystem:**

**1. Level of integration with the ecosystem**

1. To benefit from controlling the value chain
2. To benefit from participating in ecosystem

**2. Firm's knowledge processing in relation to the ecosystem: Offering type**

1. To benefit from either outside-in or inside-out processes, that is, internalization of external knowledge or externalization of internal knowledge (stand-alone offering)
2. To benefit from co-creation of knowledge with the network actors (systemic offering)

# IoT Strategy Framework

		Level of integration	
		Value chain	Open ecosystem
Offering focus	Systemic	<p>SERVICE SYSTEM OWNER</p> <p>Controlling value chain</p> <p>Coupled knowledge processes</p>	<p>SYSTEM OF SYSTEM FACILITATOR</p> <p>Driving ecosystem</p> <p>Coupled knowledge processes</p>
	Stand-alone	<p>COMPLEMENTOR</p> <p>Participating in value chain</p> <p>Inbound or outbound knowledge processes</p>	<p>MODULE PRODUCER</p> <p>Participating in ecosystem</p> <p>Inbound or outbound knowledge processes</p>

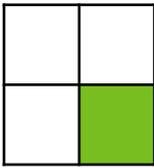
# Data and methods

# Data & analysis

- **Qualitative case study with two large European projects, in the context of the European initiative of building an IoT Open Innovation Ecosystem**
- **23 companies, representing a variety of value chain partners in IoT**
- **Narrative approach to capture the firms' characterization of strategic orientations.**
- **Websites as primary data**
- **How do the texts and language describe firms' goals and actions with IoT ecosystem?**
  - > **micronarratives with taking a stand on the framework dimensions**
  - > **cross-case analysis and descriptions of the strategic orientation types**

# Results

# Service system owners



- operates in a closed or semi-closed proprietary system or controlled set of standards and with a bounded set of actors
- control over the partners and the growth of their service system
- the profit comes from the end-users
- increase the connectivity and the service offering of the ecosystem
- **DrivCo**,
  - a global manufacturer of automobiles and motorcycles
  - offers mobility services, makes the decisions of the collaborating partners in providing them
  - involvement of users of the services is crucial

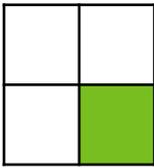
# Complementors



- **sell tailored services or products through service systems owned by other companies or channels specific to a certain use case area, standard or a value chain**
- **profit from the sales of professional services, tailoring and maintaining their solution in the service system**
- **represent either hardware or software providers**
- **offer higher level of specialization and niche offering**
- **provide tailored services or products and aim of profiting from connecting their products in the service system**

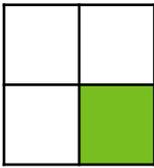
e.g. EnerCo offers stand-alone products for ventilation, but also seeks profits from the services related to the product

# Module producers



- **produce solutions that are interoperable and can be integrated into all kinds of technology platforms and service systems through standardized interface**
- **little control over the service system orchestration, and usually pay rent to different platform owners.**
- **Profit from collecting royalties or licensing fees**
- **Benefit from flexibility and mass customization**
- **Their stand-alone solutions can be integrated to any service system**
  - For example, CyclCo offers solutions for product life cycle knowledge management

# System of systems facilitators



- **control and define interface standards that connect different independent technology platforms, typically on the API level**
- **enable others' connectivity in the business ecosystem**
- **Maintain standards, act as repositories for open source code**
- **Non-profit business model; collect membership fees, provide education in the use of standards**

**For example, StandCo, a consortium of hundreds of member organizations, enables others' connectivity in the ecosystem They provide a platform for others to perform on and try to make their performance easier by co-creation of shared rules and boundaries for performance.**

	Service System Owner	Complementor	Module Producer	System of Systems Facilitator
Key actors	A bounded set of actors, contractual connections with platform owner	Hardware and software providers, consultants and integrators with domain specific expertise	Product and service providers tapping into APIs and open standards	A set of actors operating with loose terms and open standards in an emergent manner
Role	To control the growth of the ecosystem	To react to requirements and changes	To screen new opportunities in agile manner	To set and maintain standards
Aims	Grow scale and service offering for end customers	Provide and upgrade limited set of products and services to platform	Enjoy scale economics in several ecosystems with modular products	To promote open standards and scalability, grow network and offering
Offering	Offers total solution and tangibles	Offers service system specific solutions	Offers modular solutions to several systems	Offers venues and blueprints for new value creation
Activities	Orchestrates bounded sub-system	Tailored interfaces	Able to adapt to any service system	Educates for use of standards
Characteristics	Closed system, controlled by owner	Products & solutions. Tailored Partner	Open interfaces, API's, apps, plug-and-play products and services	Certifications, consortium, members, standards

# Discussion & conclusions

# Contribution

- **The paper explains the changes that IoT causes in the fundamentals of the business ecosystems, and coins the future business ecosystems as systems of systems, complex adaptive systems (c.f. Karcantias & Hessami, 2010)**
- **The paper provides a framework to classify strategic orientations in the IoT context and contributes to the ongoing discussion about IoT business models (c.f. Dijkman et al, 2015)**
- **The paper contributes to open innovation research by illustrating not only the standalone knowledge processes but also the need for coupled knowledge processes (c.f. Gassman et al., 2010; Dahlander & Gann, 2010)**

# Managerial implications

- **IoT changes the nature of competition inside and between business ecosystems**
- **Managing complexity for the benefit of the end customer, not intermediating data flows will become increasingly important**
- **Firms must be able to establish and sustain their presence as Service System Owners, Complementors, Module Producers or System of Systems Facilitators**
- **The framework implies that all roles are needed, and firms can change their roles over time and take several roles**



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# Thank you!

*Heini Ikävalko, Aalto University School of Business, [heini.ikavalko@aalto.fi](mailto:heini.ikavalko@aalto.fi)*

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