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Business Ecosystem Perspective to New Product Development

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ABSTRACT

The purpose of this conceptual study is to synthesise a theoretical view for describing business ecosystems based on stakeholders' business models, to aid new product development ecosystems. The research approach of this study is constructive. This study is founded on a thorough literature review clarifying how business ecosystems are covered in academic writings in conjunction with new product development. The literature findings are analysed and synthesised to obtain a theory-based view on business ecosystems.

This study indicates that a business ecosystem can be described via the business models of participating actors, and that business model elements can portray the structure of an ecosystem. Business actors are connected to each other and to ecosystem's customers via relationships characterised by offering and revenue. An ecosystem offering is the composition of the actors' offerings. The value creation structure of an ecosystem is described by linkages between actors. Based on the experiences of this study, describing semiconductor ecosystem via business model elements is a tangible way to perceive an ecosystem and the roles of different actors.

This study is purely conceptual and is based on the existing literature; hence some aspects are potentially ignored. Academics and company managers may benefit of utilising the results of this study in describing, and analysing different ecosystems, understanding which business actors are required, and what their role is in new product development.

Keywords: Business ecosystem, business models, new product development, semiconductor industry,

1) INTRODUCTION

New product development (NPD) in today's business environment is challenged by short product-life cycles, technical complexity, market uncertainties and rising cost of development (e.g. Bhaskaran and Krishnan 2009, Cooper 2001) Accelerating NPD is one way navigate in a fast changing business environment, in the world of globalisation (e.g. Chen et al., 2012; Stanko et al., 2012) These challenges can also be addressed by sharing costs, sharing risks, and sharing profits by collaborating with others, or outsourcing (Bhaskaran and Krishnan 2009; Chesbrough 2003). Consequently, NPD research has been extended from a firm-specific focus to integration of other actors (Leonard-Barton 1992; Mishra and Shah 2009).

Increasingly, successful new product development calls for collective effort by a collaborative network (Bhaskaran and Krishnan 2009). The risks involved in product development can be alleviated through collaboration, while potentially improving customer satisfaction and taking advantages of market opportunities that would be overwhelming for single companies (Littler et al., 1995). Nevertheless, in order to collaboration to truly increase the efficiency and effectiveness of product development, knowledge transfer and communication must be seamless among the participating actors (e.g. Distanont et al., 2011).

Networked businesses being the current reality for companies in the global market makes analysing business ecosystems, from different perspectives, potentially beneficial (e.g. Zarvić et al., 2012). For instance, a business ecosystem engaged to a product development project can be composed of tens of organisations globally, while the success is dependent on the whole ecosystems performance (Iansiti and Levien 2004b). Ecosystem participants can be classified in different ways, each having their own role in the cooperation (e.g. Moore 1993). It is often the case that some central companies lead the new product development in their ecosystem and plan new business around their innovation, making the central companies more dependent on the projects as they invest the most resources (e.g. Iansiti and Levien 2004a).

Business ecosystem perspective is especially interesting when, as a result of development, the product may change the nature of the business, either requiring new partners, or changing the business model of the current stakeholders (e.g. Petrie 2012). However, even though business model theory has been studied from different perspectives (e.g. Shafer et al., 2005; Afuah 2004; Osterwalder and Pigneur 2009), business model elements have not been utilised to describe an ecosystem.

This study aims to come up with a theoretical view over business ecosystems based on stakeholders' business models. This conceptual study is conducted by carefully analysing the existing literature on business ecosystems and business models. Also, new product development context is analysed from the perspective of ecosystem design. The research has been further divided into two distinct research questions:

RQ1 How do actors' business models describe a business ecosystem?
RQ2 How does the created concept reflect semiconductor business ecosystem?

The research questions are attempted to answer via conducting an extensive literature review. The theoretical background is reflected to practice with a semiconductor business ecosystem example that is also constructed based on the literature.

1.1) Research Process

Figure 1 illustrates the research process utilised in this study. The literature was reviewed carefully to clarify how business ecosystems are covered in academic writings in conjunction with a new product. The literature review was specifically focused to cover the topics of business ecosystem, new product development, and business model elements. The literature review concentrated particularly on the early phases of new product development. The literature findings were analysed and synthesised in order to obtain a theory-based view on business ecosystem, one that acknowledges business models of relevant actors. Hence, the research approach utilised in this article can be considered to be constructive (e.g. Oyegoke 2011). The conceptual theory-based view over a business ecosystem was used to provide a theory-based example by describing the semiconductor ecosystem via the relevant actor groups and business model elements. The findings of this study were carefully analysed in order to answer the research questions set for this study, together with considering relevant implications.

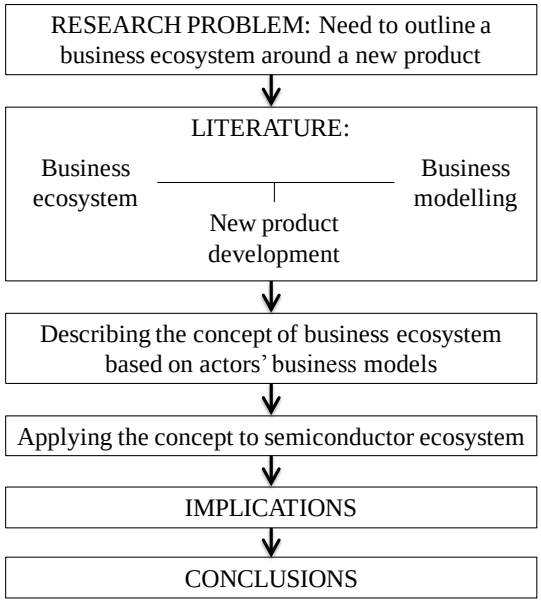

Figure 1: Research process

2) LITERATURE REVIEW

The business ecosystem concept has been derived from biology and is commonly used to describe business networks (Moore 1993). The concept provides an analogy and a vivid view on the nature of business networks, regardless of the fact that biology and business do not share congruent scientific basis (Corallo 2007). Both, business and biological ecosystems are characterised by a large number of loosely interconnected participants who depend on each other for their mutual effectiveness and survival (Iansiti and Levien 2004a).

Business ecosystem is partially an overlapping concept with value network and value chain (Hearn and Pace 2006). In a value chain, organisations are horizontally linked to each other and each providing products or services to the next operator (Porter 1985). A value chain can be considered as a group of sequential activities that are connected through information and resource flows. The goal of a value chain is to provide value to the end customer. A value network, on the other hand, has the goal of providing value also for firms and societies participating in the network, not only for customers (Parolini 1999; Bovet and Martha 2000). In value networks, resource and information flows can be simultaneous and multidirectional. Therefore, a value network can be described as a web rather than a funnel-like value chain. In a network structure, actors are linked, vertically and/or horizontally, through value exchange activities. The ecosystem perspective emphasises network members' symbiotic, co-evolving relationships and dynamic nature of business networks (Hearn and Pace 2006). In a business ecosystem, companies' capabilities co-evolve around new innovations while cooperation and competition advance coming up with new offerings, satisfying customer needs and eventually discovering innovations (Moore 1993).

Ecosystems are characterised by the structure, relationships and connections among members, and the differing roles played by their members (Iansiti and Levien 2004a). According Moore (1993) business ecosystem members can be classified as leaders, followers or business partners. The leader plays a role of central ecological contributor, and the role is valued by the rest. Followers appreciate the leader because of its grip on customers (Moore 1993). Iansiti and Levien (2004a) identify four fundamentally distinct roles in a business ecosystem, including keystone, classic dominator, value dominator and niche player.

According Corallo (2007) actors in a co-evolutionary relationship activate selective pressure on others, consequently influencing each other's evolution. Economic and social aspects are emphasised in a business ecosystem; its evolution is due to competitive and cooperative interactions among its members. The members take part in an ecosystem for their own benefit and share the total value that the ecosystem creates. Each organisation adds its distinct aspects of offering to the value generated by the ecosystem (Camarinha-Matos et al., 2009).

2.1) New product development ecosystem perspective

Ability to commercialise product innovations has long been an essential way for companies to grow in terms of market share, revenue and profit. Many firms have adopted a formal NPD process, such as the idea-to-launch process, for developing and bringing new products to the market (Cooper 2001). NPD success is challenged by shortening product lifecycles, increasing technical complexity, market uncertainty and rising cost of development (Bhaskaran and Krishnan 2009, Cooper 2001). A common way to respond to this challenge is to accelerate NPD as well as to share costs, risks and profits by collaboration and outsourcing (Chesbrough 2003, Bhaskaran and Krishnan 2009). NPD research has been extended from a firm-specific process to integration of different actors, such as suppliers, partners and lead users, to the process (Bhaskaran and Krishnan 2009). Still, NPD addresses market opportunity by products which best combine customer satisfaction, available technologies and firm profitability (Krishnan and Ulrich 2001).

In an ecosystem, NPD addresses business opportunities that require a diverse set of capabilities to meet customer needs that are beyond the capability of any single company (Carbone 2009). Ideally, business ecosystem members share resources, knowledge and technologies across the ecosystem providing basis for holistic value creation via the ecosystem (Hearn and Pace 2006). Compared against an individual firm, an ecosystem has several potential advantages in new product development: it can invest more resources and tolerate higher risk through cost sharing; it may integrate broader set of diversified capabilities; and it may develop broader set of products. Productivity, i.e. networks ability to consistently lower costs and launch new products, is seen as one of the main indicators for ecosystems health (Iansiti and Levien 2004b). In emerging ecosystems, central companies focus on working together with essential stakeholders, such as lead customers, key suppliers and important channels, to (Moore 1993):

- Define new customer value propositions based on innovation,
- Determine how to deliver and implement the customer value propositions,
- Design business that serves the potential market

2.2) Business model elements and components

Business models have actively been discussed in the literature during last fifteen years. As a consequence, dozens of various business model concepts and frameworks exists, including up to fifty different business model components (Morris et al., 2005; Mäkinen and Seppänen 2007; Shafer et al., 2005).

Generally, a business model describes how a firm creates and captures value (Haaker et al., 2006). Afuah (2004) defines a business model as a framework for money-making and explains business models as a strategic management approach. According to Osterwalder and Pigneur (2009) a business model describes the rationale of how an organisation creates, delivers and captures value. Furthermore, Osterwalder and Pigneur (2009) view business models as a blueprint for strategy to be implemented through organisational structures, processes, and systems. Shafer et al. (2005) define business model as a representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network. Their study is an example of many attempts to define business models by integrating and synthesising earlier literature. According Suikki et al. (2006) business model describes the offering, the value chain/ network, and revenue model of a firm. The framework by Suikki et al., (2006) provides an example of using business models for research purpose in an industry setting.

Table 1 summarises the content and structure of the above discussed frameworks by dividing them into main elements and components.

Table 1: Business model elements and components in the literature

Author	Main elements	Components
Afuah (2004)	Positions	Customer value; market segments; revenue sources; price; relative position (vis-à-vis competitive forces)
	Industry factors	Competitive and macro forces; co-operative forces; industry value drivers
	Activities	Decisions of: Which activities to perform and which not; how to perform activities; when to perform activities?

	Resources	Resources (or assets: tangible, intangible and human); competences (or capabilities)
	Costs	Cost drivers of: industry; resource; activity; position
Osterwalder and Pigneur (2009); *Osterwalder* (2004)	Offer	Value proposition
	Customers	Customer segments; channels; customer relationships
	Infrastructure	Key resources; key activities; key partnerships
	Financial viability	Cost structure; revenue streams
Shafer et al., (2005)	Strategic choices	Customer; value proposition; capabilities/competences, revenue/pricing, competitors; output (offering); strategy; branding; differentiation; mission
	Create value	Resources/assets; processes/activities
	Value network	Suppliers; customer information; customer relationship; information flows; product/service flows
	Capture value	Cost; financial aspects; profit
Suikki et al., (2006)	Offering	Composition; customer; sales approach
	Value creation system	Structure; players; size
	Revenue model	Basic logic; cost and pricing structure; market; share of value

Mäkinen and Seppänen (2007) conclude that business model literature is diverse and lacks unified taxonomy and conceptual groundings. Besides differences in naming and hierarchical classification, there is deviation in the actual content of business model descriptions. Within firms, the business model concept is linked to, and positioned between, strategy level and operations in which activities and processes are carried out (e.g. Osterwalder 2004). It is also argued whether a business model includes competitive strategy, value capture aspects of strategy, or whether it is a blueprint of strategy (Afuah 2004, Chesbrough and Rosenbloom 2002, Osterwalder and Pigneur 2009). Furthermore, authors, such as Osterwalder and Pigneur (2009) and Suikki et al., (2006) exclude strategy completely from a business model. Relations to external environment, and actors outside a firm, are diversely described and included in business models. Besides customers, perceptions on which actors should be included in a business model vary by default. Relation to external environment is overextended in Afuah's (2004) business model framework compared to others. Especially, the main element of industry factors and its components are not included in other business model frameworks.

2.3) Business model elements describing an ecosystem

In simple terms, a business model describes how a firm creates and captures value (Shafer et al., 2005, Osterwalder and Pigneur 2009). Although business model frameworks vary, there are some commonalities. Table 2 describes the business model elements and components synthesised from the literature.

Table 2: Business model elements and components for describing a business ecosystem

Elements	Components
Business actors	A firm, customer, co-operator
Value creation structure	Chain or network
Offering	Offering
Capabilities	Capabilities, activities, processes
Resources	Resources
Revenue	Revenue logic, share of value
Cost	Cost of: resources, capabilities, upstream (co-operators)

Typically, business model frameworks include direct connections from the focal firm to its customers and to the *actors* with whom it creates value, namely co-operators. The connections between all the actors define whether the *value creation structure* is a chain or a network. Value creation is built into all business models, but the emphasis is typically on different aspects, such as resources, activities, value network, and those participating in a value network. All the studied frameworks identify customer and a firm's *offering* that proposes value to a customer. An offering is understood as a source of *revenue* that includes everything a firm offers to its customers, from raw materials and components to products, services, tools and technologies. *Costs* are a very basic element of all business models, and they are seen to result from other business model elements. For example, different activities, such as using and maintaining *capabilities* and *resources*, making acquisitions from the value network, and delivering an offering, create costs for a firm.

The main actors in business model frameworks are a firm and customers. In addition, different co-operators, i.e. suppliers, partners and value network players are mentioned in the literature (Figure 2).

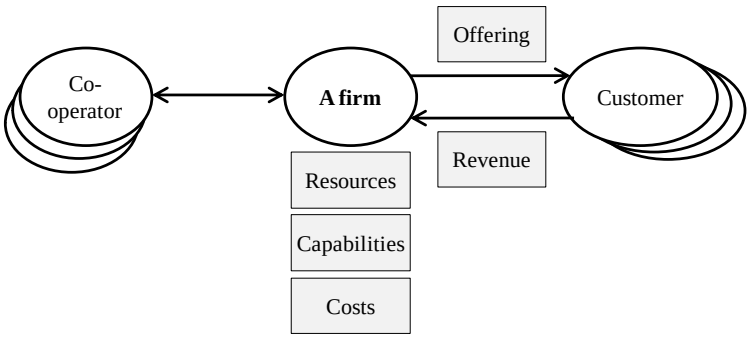

Figure 2: Business model elements and the main actors

A business model framework provides means to describe a firm and the relationships between the firm and its customers. Describing the business models of all actors in an ecosystem would provide an interlinking view on an ecosystem. The actors would be more or less interconnected

to each other through customerships. Figure 3 introduces a theoretical view on a business ecosystem.

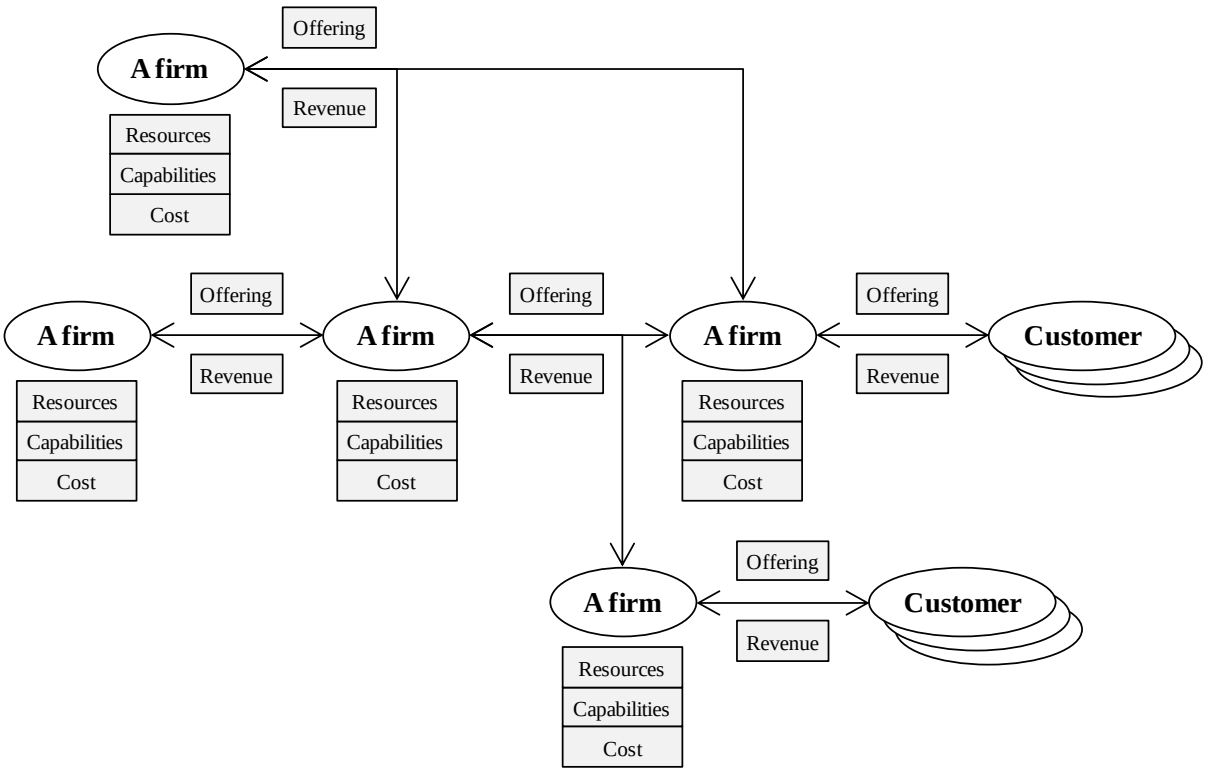

Figure 3: A theory-based view on business ecosystem based on business models of actors

In simple terms, a business ecosystem is a loose network of interdependent business actors (e.g. Iansiti and Levien 2004a). From a theoretical perspective, actors' business models describe business ecosystem in several ways: Business actors are connected to each other and the customers of the ecosystem, through relationships which are characterised by *offering* and *revenue*. An actor's offering describes the value that the actor creates and proposes together with its co-operators, while revenue is the value that the actor captures from the customers. An *ecosystem offering* is the composition of the actors' offerings. Connections between actors describe the *value creation structure* of an ecosystem. An ecosystem can be a chain, a network, or more likely a mix of these two. The position and the necessity of each actor for an ecosystem can change over time. The position and the necessity are determined by the actor's resources, capabilities, offering and financial performance. The revenue gained by an actor must cover the costs of actor's resources, capabilities and upstream actors' revenue, in order to survive in a long run. Every business model element has its role in describing a business ecosystem.

2.4) Semiconductor ecosystem

Semiconductor industry has grown since inventing a transistor and an integrated circuit, in some 60 years, into a 300 billion USD annual business (SIA 2012). The industry serves other major industries such as consumer electronics, information and telecommunications, transportation, medical, automation, and energy, by providing fundamental enabling technologies (e.g. Albright 2002; Sturgeon and Kawakami, 2011).

The value chain of semiconductor industry is constantly evolving and the roles of the business actors in the ecosystem are changing (e.g. Li et al., 2011). Originally, so called integrated device manufacturers (IDM) dominated the industry due their strengths in technology development for manufacturing processes, devices and applications. Over the years specialisation took place as the size of required investments, capacity needs and diversity in applications and technological complexity increased (Ernst 2005). Today, semiconductor industry is relatively capital intensive, in which capacity utilisation significantly influences the effectiveness and profitability (Chien and Lin 2012).

Semiconductor ecosystem can be fundamentally characterised as a design and manufacturing ecosystem. (e.g. Li et al., 2011; Ernst 2005). Figure 4 illustrates the main ecosystem actors that can be identified based on the literature.

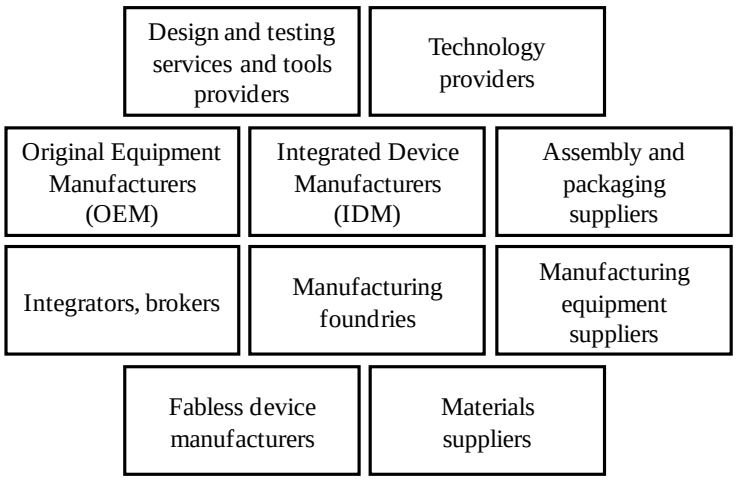

Figure 4: Main actors of semiconductor industry

In the ecosystem the original equipment manufacturers (OEM) are closest to end users and applications served by retailers, service providers and public sector (Liu et al., 2007; Luo, 2007; Mathews, 2002; Brandt and Thun, 2011; Sun et al., 2010; Sturgeon and Kawakami 2011). Integrated device manufacturers (IDM) are companies that design, manufacture, and sell semiconductor devices (Yu and Po, 2012; Chen and Xue, 2010; Wen and Yang, 2010; Vind and Fold, 2007). Fabless device manufacturers (FDM) specialise in the design and sale of semiconductor devices while outsourcing the fabrication (Ku et al., 2007; Kumar, 2011; Sturgeon and Kawakami, 2011; Yeung, 2007). Manufacturing foundries (FAB) purely concentrate on fabricating semiconductors by providing manufacturing capacity to other actors (Ku et al., 2007; Chien and Kuo, 2011; Li et al., 2011). Intellectual property (IP) providers

purely provide IP and IP libraries to make money from patents and related fees (Rong et al., 2010; Chu and Chen 2011; Brown and Linden 2009). Design services and tools providers either concentrate on providing tools or design support services (Ku et al., 2007; Chu and Cheng, 2005; Yu and Po, 2012; Li, 2009; Chou et al., 2011). IP integrators and brokers purely act as intermediaries between actors by mapping and commercialising intellectual property (Li, 2009; Yuncui and Gang, 2011). Material suppliers, manufacturing equipment suppliers and assembly & packaging suppliers have a limited role in serving the ecosystem members running manufacturing foundries (Brown and Linden 2009). Nevertheless the business actor roles, in the semiconductor industry, are widely discussed in the literature, and they are not always pure, but different combinations exist (e.g. Sturgeon and Kawakami 2011; Kumar 2011).

2.5) Semiconductor ecosystem and business models

The semiconductor industry is discussed broadly in the literature as is the case with business models. However, the previous literature has not comprehensively viewed the roles of semiconductor industry actors through different business model elements.

Table 3 illustrates a semiconductor industry ecosystem through business model elements of offering, capabilities and resources. Revenue and cost elements are not covered as they do not specifically describe the ecosystem structure or functions.

Table 3: Semiconductor ecosystem description by actor's business models

Actor	**Business model element**			**Example companies**
	Offering	**Capabilities**	**Resources**	
Original equipment manufacturer (OEM)	Products to consumers and industrial customers (Sturgeon and Kawakami 2011)	Understanding customer and end-user needs, market knowledge, solution development, product design and development expertise (Brandt and Thun 2011)	R&D for product development, brand, marketing and market development, distribution and sales networks (Brown and Linden 2009, Brandt and Thun 2011)	Apple, HP, Dell, Sony (Brandt and Thun 2011, Sturgeon and Kawakami 2011)
Integrated device manufacturer (IDM)	Semiconductor devices to OEMs (Chu and Chen 2011, Tuomi 2009)	Vertically broad set of capabilities: Device technology, manufacturing process technology, engineering and design expertise (Chu and Chen 2011, Kumar 2011)	R&D for device and manufacturing process technologies, manufacturing equipment and facilities (Chu and Chen 2011, Kumar 2011)	Intel, Samsung, IBM (Li et al., 2011, Tuomi 2009, Kumar 2011)
Fabless device manufacturer (FDM)	Semiconductor devices to OEMs (Kumar 2011, Li et al., 2011)	Engineering and design expertise, device and device technology development (Kumar 2011)	R&D for device and device technology development (Kumar 2011)	Qualcomm, NVIDIA, Broadcom (Li et al., 2011)

Manufacturing foundry (FAB)	Manufacturing capacity to FDM and IDM (Li et al., 2011)	Manufacturing process technology, technology development (Li et al., 2011, Brown and Linden 2009)	R&D for process development, manufacturing equipment and facilities, enormous amount of capital resources (Li et al., 2011, Chu and Chen 2011)	TSMC, UMC, GlobalFoundries (Li et al., 2011)
IP (technology) provider	License IP, designs elements and technology to IDM and FDM devices, and OEM products (Chu and Chen 2011, Brown and Linden 2009)	Design expertise and specialist knowledge technology development for devices and OEM products (Tuomi 2009)	Portfolio of IP and patents, R&D for product and device technology development (Tuomi 2009)	ARM, Rambus, MIPS (Brown and Linden 2009, Chu and Chen 2011)
Design and testing services and tools providers	Design support services and engineering tools for all the above actors (Brown and Linden 2009, Chu and Chen 2011, Kumar 2011)	Engineering and design methods for products, devices and manufacturing process development (Kumar 2011)	R&D for engineering tools and methods; engineering services capacity	Cadense Design Systems, Synopsys, Faraday Technology (Brown and Linden 2009)
IP integrator and broker	IP integration, brokering and commercialisation services to FDM, IDM, OEM, FAB, IP providers (Tuomi 2009)	Engineering and IP acquisition for devices and OEM products	Engineering services capacity, IP market platform	Design & Reuse, IPextreme (Tuomi 2009)

In semiconductor ecosystem OEMs can be seen as the top of the food chain. The entire ecosystems contact interface to end-users and access to markets is managed via OEMs. On the other hand, OEMs are dependent on the ecosystem actors' capability to innovate and supply cost effective technology solutions. In practice, the semiconductor industry serves several types of OEMs which act in different end-user market segments and industries that utilise semiconductors. Therefore, the industry is not dependent on only one OEM group.

Integrated device manufactures (IDMs) can dominate and occupy most of the value network, yet only few of them truly have this capability with leading-edge technologies. Should an IDM dominate, meaningful ecosystem may not emerge around it as the majority of value capture and creation would be based on its own business model. In practice, increasing complexity of technologies has forced IDMs to act more as keystones, thus enabling emergence of niche players.

Also manufacturing foundries can act as keystones from the perspective of the entire ecosystem, in the same manner as IDMs. Foundries have enabled the emergence of fabless device manufacturers (FDMs), which both foster the existence of niche players while competing against IDMs in serving the OEMs.

Niche actors, such as technology and IP providers, integrators and services providers can be regarded to locate at the bottom of the ecosystem, serving the other players, even OEMs directly. Even if the role of these actors is typically minor, some specialised materials and IP suppliers may be able to gain a value dominator position, potentially endangering the healthiness of the entire ecosystem.

Actors in a semiconductor ecosystem can benefit of strong keystone players, such as IDMs and FABs, when the entire ecosystem thrives in competition and gains more profit and revenue. Such ecosystem can create and capture more value than individual actors and produce a wider variety of offering and serve a higher number of OEMs. This type of ecosystem can serve end user applications in variety of market segments and industries.

3) CONCLUSIONS

New product development in the current business environment is often beneficial to be conducted in collaboration with others in order to share risks, and to increase the efficiency and effectiveness of the required activities. In many cases, an entire business ecosystem of relevant stakeholders is required to carry out the NPD activities. This conceptual study utilises business model elements to describe such an ecosystem based on findings from the existing literature. The theoretical background is attempted to reflect to practice via a literature based example of semiconductor business ecosystem.

According to the findings of this study, the main business model elements that can describe a business ecosystem include; business actors, value creation structure, offering, capabilities, resources, revenue, and cost. Compared to other concepts, such as value network and value chain, the proposed model aims to include the entire business model, rather than single perspectives. A business model framework provides means to describe a firm and the relationships between the firm and its customers. From a theoretical perspective, *actors*' business models describe a business ecosystem in many ways: Actors are connected to each other and the customers of the ecosystem, through relationships which are characterised by *offering* and *revenue*. An actor's offering describes the *value* that the actor creates and proposes together with its co-operators, while revenue is the value that the actor captures from the customers. An *ecosystem offering* is the composition of the actors' offerings. Connections between actors describe the *value creation structure* of an ecosystem.

According to the literature, semiconductor ecosystem can be interpreted to include the following main actors; original equipment manufacturers, integrated device manufacturers, fabless device manufacturers, manufacturing foundries, intellectual property providers, design & testing service and tools providers, and intellectual property integrators and brokers. In this study the roles of these actors are described via the business model elements of offering, capabilities and resources. Some companies that belong to the identified categories are also named to provide more tangibility on the discussed issues. Based on the experiences of this study, describing the semiconductor ecosystem via business model elements is a tangible way to perceive an ecosystem and the roles of different actors.

As an implication of this conceptual study, academics interested in business ecosystems can consider utilising business model elements to describe different ecosystems when seeking

ways to provide the ease of comprehension, and analysing the roles of different actors. In addition, this study may provide new viewpoints to the new product development research. Elements typical to business model literature have been utilised in an original way to describe business ecosystems. One of the major contributions of this article include, a company being able to utilise the model when organising collaborative new product development and choosing which ecosystem/s to join. The presented conceptual model may enable focal companies in perceiving which actors are required in ecosystems relevant for new product development, and what is the role of those companies. In principle, a focal company can be located anywhere in a business ecosystem. Better understanding an ecosystem may benefit managers by enabling better preparation for risks and to understand business opportunities enabled by a product more swiftly. A business ecosystem description may also enable understanding potential success with different business models.

The limitations of this study include the research being purely conceptual and being based on the existing literature. Another limitation includes this article merely focusing on business actors, potentially ignoring any actors or bodies who do not have business models, hence not seeking for profit. This type of actors/bodies may impose important issues such as environmental standards, green-related regulations and laws. Even though the literature reviews were conducted in a very comprehensive manner to cover all relevant viewpoints, there is always the possibility that some aspects are ignored. It is noteworthy that it can be difficult to draw exact boundaries to an ecosystem and figure out all the actors who belong to it, leaving some room for interpretation. At best, any model can only be an illustration of a given moment, making the time aspect a challenge. The future research could include testing the constructed theory-based view on business ecosystem based on actors' business models by analysing real-life ecosystems in practice.

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