BUSINESS MODEL AS RELATIONAL AGGREGATOR

EXPLORING BUSINESS RELATIONSHIPS

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ABSTRACT—Bringing up services based on Information and Communication Technologies (ICT) shows to be a complex process for everyone involved in it. Networks of businesses participating in creation of the value proposition of the services require a collaborative way of reasoning and simplified guidance to implementation. We discuss how industrial relationships evolve in terms of value dimensions, through a lens of a business model. This discussion has been done through three streams of literature starting from Activities, Resources and Actors Model and continues through value networks, to round up in discussion on different approaches to business models. We build on the emerging notion of business model on a network-level perspective. Out of this discussion, we present basis for the division of the analysis of services based on ICT into two different views and finally offer a table of separation of concerns, into an internal view (that covers the establishment of the value network), and an external view (that focuses on the customer and user aspects).

KEYWORDS—Business Model, Value Networks, ICT services, Value dimensions, Business Relationships

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INTRODUCTION

The service industry is growing with every new entrant that comes into the market, but also with a vast array of companies that have shifted their orientation from products towards service industry. In order to stay competitive and survive in the market, companies need to innovate and one recurrent strategy is to create services based on Information and Communication Technologies (ICT) (Bygstad & Lanestedt 2009).

Development of services based on ICT usually involves aspects from various industries and it develops at intersection of various activities executed by different actors driven by the current digitalization trend. In such complex and dynamic environments, collaboration with key partners from the very start is crucial in order to ensure that the service is successful (Bygstad & Lanestedt 2009).

ICT technologies can be an efficient way to support the implementation of new services; this can be reflected in the appearance of services targeting mobile solutions, motivated to make our daily activities more efficient and help us manage our lives in a better way in areas such are, payment, retailing, travel, etc. It can also be reflected in the recent emergence of connected products to monitor, control or automate processes creating efficient resource utilization (Porter & Heppelmann 2014), this notion is usually embedded in the concept of Internet of Things; industries exploring this type of services range from automotive and transportation to healthcare and wellbeing.

Creation of services based on ICT represents a case where setting up and orchestrating relationships in a dynamic value network is a central strategic issue. The evolution of Business Model (BM) relationships alongside the new ICT service development lacks a detailed investigation and narrative.

Service system theories provide a simple definition of service as "the application of competences (knowledge and skills) by one entity for the benefit of another", implying that value can be created on the interactivity between entities (Vargo & Lusch 2004; Lusch & Vargo 2006); denoting that all parties are simultaneously creators and beneficiaries of values. According to the research manifesto for services science (Chesbrough & Spohrer 2006), services share essential elements, and service based on ICT share common elements such as that: *(i)* they cause a close interaction of supplier and customer *(ii)* they result from a combination of knowledge into useful systems *(iii)* they are characterized by the simultaneity of production and consumption of value.

It is worth noting that most of the current solutions in the areas of connected devices and mobile payments have a low reach and have been designed for a niche markets. There are many commercial applications and services in these areas, but the consolidation of numerous solutions in the market remain scarce, we consider that the main reasons behind it are in the business domain. Adopting services that rely strongly on new technologies usually require major changes in the traditional business thinking (Markendahl & Laya 2013).

Established theories seem to provide answers for isolated firms, but attention is emerging towards a need to build a business from a perspective that involves all the firms that participate in the service creation and provisioning (Westerlund et al. 2014). This view is of particular interest for services that are heavily based on ICT, in which a set of actors is

actively involved in different stages of the service. These types of services are seldom provided by a single actor because they require multidisciplinary expertise. It is important to acknowledge that:

- The nature of such services is dynamic in the sense that they evolve over time, either to improve technical aspects or due to changes in partnerships or user requirements.
- They involve the usage of devices with communication capabilities, which receive input or create useful information for users and other entities in the ecosystem.

Business model, as a tool to support strategy execution (Casadesus-Masanell & Ricart 2010; Ghezzi et al. 2015), could be seen as the service provider's strategic relational aggregator, based on the assumption that the relationship between two firms is based on a relation between the firms' business models (Ghezzi 2013). It is in the business model that different value creating building blocks are related and interact (Osterwalder & Pigneur 2010). Similarly, through the business model the company relates with its external environment and a network of other actors' business models, in an activity systems perspective (Zott & Amit 2010).

Regarding business strategies for services based on ICT, Iansiti & Levien (2004a) argue that "stand-alone strategies don't work when your company's success depends on the collective health of the organizations that influence the creation and delivery of your product". Emerging notions even suggests that services based on ICT that require active interaction of partners may benefit from the design of business models beyond the perspective of a single firm (Westerlund et al. 2014; Leminen et al. 2015).

A perspective that considers the actors involved in the value creation and the relationships among them is value network perspective (Normann & Ramírez 1993) In broad terms, a value network corresponds to a set of actors and the relationships between them (Brass et al. 2004; Provan et al. 2007).

We consider business ecosystems and value networks as the same object of study (Anggraeni et al. 2007) and we assume that business ecosystems and value networks are indeed a system of interrelated business models (Ghezzi 2013; Zott & Amit 2010).

Furthermore, based on previous analysis and interdisciplinary research projects on services based on ICT[1], it has been observed that the study of services can be separated into two distinct views, which can be described following the related value dimensions presented by Ghezzi et al. (2015). One view is related to the external aspects of the service and the other is related to internal aspects. This separation serves the purpose of easing their description and analysis. The two views represent different points, in which different actors and relationships have relevance:

- In the internal view, the important aspects are the establishment of solid partnerships and the design of business model components (e.g. resource usage and activity execution) that benefit the different parties involved.

[1]The project COIN-SWEAT (https://wireless.kth.se/sweat/) follows the Digital Agenda for Europe and targets innovative solutions for self-management of health. The focus is on ICT solutions developed for well-being and physical training. During the project, the value networks and relationships were studied.

- In the external view, the focus can be given to the relationship with customers and users, and the active role that connected device can have.

The purpose is to explain these complex environments, with the future intent to analyse empirical data on services related to mobile payment and Internet-of-Things services, in which more than one actor is actively involved and participate in the service.

The contribution of this paper is twofold. On one side, we develop a discussion on how industrial relationships evolve in terms of value dimensions that constitute dynamics of Business Model. On the other side, we identify and present the basis for the division of the analysis of services based on ICT into different views, in order to provide clearer descriptions and identification of patterns in the business ecosystems of services based on ICT.

The study's contribution may be beneficial for both the new service development and the business model literatures. We propose an extension of the ARA interaction model to integrate the value element and business models element as well. The goal is to expand on this model and make it feasible for test in empirical studies for services based on ICT, considering the acknowledge difficulties of ARA to test empirical studies due to the static nature of the model (Raskovic 2015).

The remainder of this paper is organized as follows: in the next section, a literature review is provided for the research streams of business relationships, value networks and business models. This is followed by a summary, where the link between the research streams is presented and then a discussion regarding the separation into the external and internal view of services based on ICT is further explained. Finally, the conclusion section closes the paper with relevant remarks and future research implications.

LITERATURE REVIEW

In this section, we present an overview of research streams that are key in order to study new services based on ICT:

1) Business relationships (Hakansson & Snehota 1993): We depart from the Activity, Resources and Actors (ARA) model. This model is taken and the basis to describe the industrial relationships that can be found within services based on ICT.
2) Value networks (Normann & Ramírez 1993): we review relevant literature supporting the argument to suggest that in services based on ICT is no longer possible to define fixed positions for firms based on a set of activities along a value chain; therefore the focus should be on the overall system.
3) Business models (Zott & Amit 2010; Chesbrough 2007; Osterwalder et al. 2005): business models have different definitions in the literature. However, all the relevant approaches include relevant aspects such as the networks of actors and how the value is created and delivered.

In the following subsections, each stream of research will be covered, followed by a summary section that includes a table comparing the literature streams and further related work in the area of business models from a network perspective.

BUSINESS RELATIONSHIPS

As compiled by Basole (2009), interfirm relationships include alliances, partnerships, joint ventures, consortia, collaborations and supply and marketing agreements. Basole also highlights the fact that there are three main theoretical perspectives to explain the reasons to establish interfirm relationships; reduce transaction costs, organizational learning and resource dependency. In the latter case, it is considered that firms are constrained in terms of technology, politics or knowledge. Therefore, the reason for interfirm relationships is to exchange resources or capacities. "This is particularly the case for firms that provide complex products and services; in many instances they are often dependent on numerous complementary resources" (Basole 2009).

Business relationships or industrial relationships are a phenomenon that didn't find a convincing explanation in the traditional framework of economics and management. Therefore, (Hakansson & Snehota 1993) conceptualized it through two dimensions that evolve over time, in other words, called it a mutually oriented interaction over a time period between two businesses. Those two traits (dimensions) of business relationship are:

- Contents of relationship exchange: Activity layer, Resource layer and Actor layer.
- Functions that a relationship can take: Individual (single actor), Dyadic and Network.

This conceptualization of a business, i.e., industrial, relationship is complex in terms of its dimensions that affect the outcome of the exchange. Next, we present a revision of the original idea behind each building element explicated by (Hakansson & Snehota 1993):

ACTIVITY LAYER

It is assumed that a firm takes a form of complex coordinated activity structure. Therefore, an activity layer is actually representing a *link* between firm's activities. As the activity structures of the two companies change due to the interaction of companies via relationship, the relationship itself needs to be modified, adjusted and mutually adapted. In that case, interdependencies between activities of two differing companies can be used for innovation.

RESOURCE LAYER

Resources, such as man power, equipment, or knowledge, are the ones that support firm's activities, and without which there would be no activities, nor firm. Often they are combined into complex units, and when integrated, they embody new qualities. When it comes to a relationship, it is a resource which *ties* together other resource units in collaborating firms.

ACTOR LAYER

Two firms in an exchange are two actors *bonded* through a relationship they have. It's the relationship to some extent that influences actors' capabilities and possibilities to act. Trust and commitment are important in uncertain moments of the relationship. Moreover, these bonds among the actors makes us aware of the aggregate—an organized—structure of actors.

SINGLE ACTOR FUNCTION

Each actor is individually important and any performed business activity has economic purpose. Established relationship affects the performance potential of a company by the

effects it has on the activity structure of the company. These effects are *innovativeness, productivity* and firm's *identity*. A relationship from this functional perspective can be seen as "a broad learning and attribute development process".

DYADIC FUNCTION

Functional dimension of a relationship called dyadic function is explained as a mutual orientation of two companies toward each other in an industrial market. These companies have interlocking of activities, and this "team" accomplish activities that they would not be able to do on their own. The possibility of mutual learning through relationships has effects on *activity links, resource ties and actor bonds*.

NETWORK FUNCTION

Companies (different actors) have no common goals, but do share common believes about activity pattern. These patterns are part of the network of relationships among companies intertwined in a network of actors. Thus every relationship has the organizing function as it shapes the overall structure (of the network of actors). That is, it is an element of an aggregated structure that embodies: *activity pattern, resource constellation and organization structure.*

All these building elements are summarized in Table 1; this table is called the model of analysis and also referred to by authors as "framework to identify the variables intervening in the relationship development".

		Functional perspectives		
		Single Actor Function	Dyadic Function	Network Function
Content	Activity Layer	Innovativeness	Activity Links	Activity Pattern
	Resource Layer	Productivity	Resource Ties	Resource Constellation
	Actor Layer	Identity	Actor Bonds	Actors Network

Table 1: Building elements of ARA model (Håkansson & Shenota 1995)

It is important to bear in mind that on different layers of content, as well as different functions, a principle of interrelatedness applies. Finally, the function is very important when looking into development of the relationship, because even though all three functions coexist, the view on the development might be seen differently from a specific functional perspective.

VALUE NETWORKS

Value is a terminology with many interpretations in research and discussion environments. Groenewegen & Dobb (1974) described value, in economics, as worth of a commodity in terms of other commodities, or in terms of money. Michael Porter (1985) defined value as what buyers are willing to pay for products or services. Taking a general definition of value as the benefit provided by services to consumers of the service and actors creating it, we review relevant literature on the value as a unit to analyse the relationships between firms.

We are based on the assumption that every business relationship exists on the preconditions that there is a positive value exchange between the involved parties.

In order to discuss in terms of networks, it is worth starting from the concept of Value Chains, which refers to interrelated operating activities performed during the process of converting raw materials into finished products (Porter 1985). Normann & Ramírez (1993) provide a different perception to the value chain, suggesting that it is not always possible to define fixed positions for firms based on a set of activities along a chain. Instead, they refer to a new logic of value, the value constellations, or value networks, as a model to focus on the overall system, with focus on the value creation. The conceptualization of value networks has been applied in academic work to study several contexts, including product, service, innovation, and knowledge flow (Basole 2009). In generic terms, a network corresponds to a set of nodes representing firms and the set of ties representing relationships between the nodes (Brass et al. 2004; Provan et al. 2007).

A similar terminology for constellations of actors is *business ecosystem:* it finds a definition in J. Moore's work (1996) as "the network of buyers, suppliers and makers of related products or services" within a socio-economic environment that includes institutional and regulatory framework. As synthetized by Anggraeni et al. (2007), business ecosystem mainly stresses the interconnectedness and interdependence of economic agents; it corresponds to a research perspective to study the relationships between firms and the business network around them. Furthermore, it is argued that a business ecosystem revolves around a specific core, which corresponds to shared and common assets (Mazhelis et al. 2012; Iansiti & Levien 2004b; Iansiti & Levien 2004a). Common assets could be presented in the form of platforms, technologies, processes, and standards that are fundamental in their businesses. Defining clear boundaries for business ecosystems has also been a discussion aspect, suggesting that every potentially important network relationship should be considered (Basole 2009). Some definitions of business ecosystems consider actors that do not have direct interaction as part of the same ecosystem; however, other streams suggest that they can be indeed the same object of study as value networks (Anggraeni et al. 2007). In this regard, Provan et al. (2007) state that, in broad terms, networks are bounded by including only those organizations that interact in order to achieve a common purpose. Regarding the specifics of the mobile industry, Basole (2009) suggests that the system boundaries are fuzzy when firms belong to different categories. A more recent description of business ecosystems by Muegge and Reilly (2011) proposes that business ecosystems are institutions where organizations self-identify as an ecosystem of players; also adhering to the notion that organizations are anchored around a platform (Westerlund et al. 2014).

Whether talking about value networks or business ecosystem, it is clear that not all critical challenges can be appreciated at a firm level, but rather on the ecosystem or network level (Leminen et al. 2012; Leminen et al. 2015).

We bring the discussion on ecosystems to highlight recent work regarding ecosystem business models for Internet of Things (Leminen et al. 2012; Westerlund et al. 2014); this perspective suggests that businesses cannot be anymore understood from a single actor perspective and the value creation and exchange requires active involvement from all the relevant actors and needs to be understood across the network of companies. In the case of services based on ICT, enabling actors play a fundamental part; their involvement in the

service provisioning is dynamic, therefore, these firms need to understand and develop the business and offerings conjunctively.

BUSINESS MODEL

There is no clear definition of what business model (BM) is, but in the literature review by Zott et al. (2011) there are four identified views on BM and they are:

- BM as a unit of analysis.
- BM as a holistic approach on how firms "do business".
- BM conceptualized through firm's activities.
- BM as an explanation of *value creation* (as well as value capture)

Moreover, business model has been called many things: a *statement, a representation, an architecture, a conceptual tool or model, a structural template, a framework,* etc. but always cantered on a focal firm, where sometimes its boundaries or reach are wider than those of a firm like Zott et al. (2011) stipulate.

Furthermore, Zott & Amit (2010) discuss BM as an activity system of different design elements; the *content* refers to activities that are performed, the *structure* describes how activities are linked, and the *governance* describes who performs the activities. The approach by Zott & Amit also includes analysis of business model dynamics in terms of activity design themes; indicating that the main drivers for change are: novelty, lock-in, complementarities, and efficiency.

On the other hand, we have business model by Chesbrough & Rosenbloom (2002) which contains following elements: i) the value proposition, ii) the market segment, iii) the cost structure and profit potential, iv) the firm organization & value chain, v) the competitive strategy and vi) the position of the firm in the value network. Moreover, the BM revolves around customer-focused value creation. This approach is furthermore discussed for innovation of business models in (Chesbrough 2007).

The Business Model proposed by Osterwalder et al. (2005) argues that a business model should express the business logic of a specific firm describing: "the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams".

All the three presented approaches have similarities since they include aspects like networks of actors and how the activities are distributed among actors. In our context of services based on ICT in networked market, new value mechanisms are enabled. Redefinition of value or value mechanism has attracted research in this domain since business models have previously been designed for incumbents, and are not well suited for the interdependent nature of new ventures that are evolving in the value networks. Finally, as stated by Ghezzi et al. (2015), in these works and works of other authors (Shafer et al. 2005; Lumpkin & Dess 2004) many interpretations on the dynamics of a business model have been presented. In connection to the value literature Ghezzi et al. have highlighted following four dimensions:

- *Value proposition* dimension which relates to "the effective offering in the form of products and/or services that create value for the customer but also includes target customer selection and segmentation as well as customer acquisition strategies".
- *Value creation* dimension which reflects "the internal organizational characteristics that determine a unique approach to the market and includes the key resources, assets, processes, activities and competences necessary to create the value proposition".
- *Value delivery* dimension refers to "how the business is articulated in order to reach its consumers and partners and relates to elements of value network positioning, key partnerships and relationships, delivery and distribution channels and customer relationship strategies".
- *Value appropriation* dimension "explains how a business *captures value* and generates profit. It includes the revenue generation and sharing mechanisms among value network partners as well as investment, financing and cost structures".

LINKING: BUSINESS RELATIONSHIPS, VALUE NETWORKS AND BUSINESS MODELS

LITERATURE REVIEW SUMMARY

As stated previously, in the Table 2 it can be seen that many concepts in the previously mentioned literature overlap and create an interesting perspective to explore the mentioned change in business relationship from an internal or external view. Columns represent different streams of literature, and when Table 2 is observed horizontally, previously mentioned overlap among different concepts is visible. Different authors and different levels of analysis (though mostly on a network level) use concepts from value literature, describing activity patterns, resource constellations, and actor networks from a value perspective.

<table>
<tr><th></th><th>(Håkansson & Shenota 1995)</th><th>Normann & Ramírez 1993</th><th>Leminen et al. 2015</th><th>Zott & Amit 2010</th><th>Ghezzi et al. 2015</th></tr>
<tr><td>Level of analysis</td><td>Any</td><td>Network Level</td><td>Network Level</td><td>Firm Level</td><td>Network Level</td></tr>
<tr><td rowspan="5">Discussed Concepts</td><td></td><td></td><td>Value Drivers*</td><td>Value Drivers*</td><td>Value Proposition</td></tr>
<tr><td rowspan="2">Activities, Resources & Actors</td><td>Value-creating system</td><td rowspan="2">Value Node</td><td rowspan="2">Business Model Design</td><td>Value Delivery</td></tr>
<tr><td>Business Alliances</td><td rowspan="2">Value Creation</td></tr>
<tr><td></td><td>Co-production of value</td><td>Value Exchange**</td><td></td></tr>
<tr><td></td><td></td><td>Value Extract***</td><td></td><td>Value Appropriation</td></tr>
<tr><td colspan="6">* Serve as a value node's motivational factor, source of value creation (Efficiency, Complementarity, Lock-In, Novelty)
** Describes the action that takes place in the business ecosystem in order to create and capture value
*** Shows the meaningful value that can be monetized and the relevant nodes and exchanges that are required for value creation and capture.</td></tr>
</table>

Table 2: Summary of the literature review

Moreover, the implication of the observation by Håkansson (1982) that the interaction through relationship between individually significant actors is a primary characteristic of a business landscape, is that it is not what's going on within a company, but between companies that constitutes doing of business. We would like to extend this notion in a sense that we believe that these two aspects within and between, represented by the two service development views are connected (through BM dynamics and four dimensions) and very much influence the way business is done and relationships evolve.

Furthermore, even though the core of a business model is the relationship between the value creation and appropriation (Chesbrough & Rosenbloom 2002; Amit & Zott 2001) scholars have shifted interest from value capture to value creation. However, all four dimensions (proposition, creation, delivery and caption) are equally important.

Finally, we will build on top of this connectedness of ARA model elements and value dimensions and explain consequences on business relationships and their development.

BUSINESS MODELS AS RELATIONAL AGGREGATORS IN VALUE NETWORKS

Looking into business models and relationships in value networks, there are emerging proposals that consider the creation and study of business models in networks, suggesting that the value creation in services based on ICT needs active involvement from all the relevant actors, coordinating the diversity in resources and activities from a value network (Leminen et al. 2015). This idea explicitly targets the development of business models that leverage the cooperation among firms in services based on ICT.

The objective of business models in networks is then to exploit common resources and coordinate the process of value creation in explicit cooperation, facilitating a profitable outcome for every party involved (Bankvall et al. 2016). On Table 3, we compare the different perspectives, based on Bankvall et al. (2016). Business models created following a network perspective have direct consequences on business relationships and their development, since we consider that these networks are based on actors and their relationship and one cannot exist without the other.

	Firm level analysis	Network level analysis
Firm-centric business model	How individual firms create a value proposition and exploits a business opportunity	Relationships with suppliers, customers and other external actors which have an impact on the business model of firm
Network-centric business model	Position and roles taken by a specific firm within a network	Explicit value network configuration to create and deliver a value proposition

Table 3: Different focuses on business model: firm-centric and network-centric business models, considering firm level and network level analyses. Based on Bankvall et al. (2016)

The framework also includes a time dimension. It starts in a development phase that moves into a pilot phase and finally reaches a market phase. In the pilot phase, a critical aspect is the need for entrepreneurial activities; it relates to the expectation to have one actor that is capable to lead the service development. This entrepreneurial actor should take care of "identifying the business opportunities to be exploited, and facilitating the development of the networked business model" (Palo & Tähtinen 2013). In the following section, we discuss on

the same topic of business models developed on top on relationships, considering a value network perspective. We make another emphasis on the possible distinction that can be made in the business relationships that take part on a service, considering different views; one view on the internal relationships that enable a service and another on the external relationships that deliver the value and are "evident" for external actors.

DISCUSSION

Firms in complex value networks should orchestrate interfirm relationships while developing business models. Each firm should consider its position in the network and the complete structure of the network of value creation and delivery (Basole 2009). This is supported by Chesbrough (2006) by suggesting that one the functions of a business model is to describe the firm's position in the overall network (Basole 2009).

In the context of services based on ICT, similarities can be seen with the analysis of the mobile industry (Basole 2009). In the mobile industry analysis, a network-centric mind-set is necessary; and understanding the business ecosystem is fundamental for the development of effective business models (Basole 2009).

This brings back the discussion from Leminen et al. (2015) suggesting that the value can be *designed* departing from a network perspective. The focus can be given to individual firm's methods to create and capture value or to parts of a network devoted to explicitly create and capture value in conjunction (Westerlund et al. 2014).

As part of the COIN-SWEAT project, we observed companies developing new services based on connected (wearable) devices in the context of health and wellbeing. Considering the discussions on the value networks, it was difficult to reach precise outcomes, since the networks tend to be complex and involving many devices, users and companies and organizations. But separating the discussions into different aspects aided in understanding and finding patterns between the developments of services. On one hand, there is a discussion on the way the service would look from the perspective of the users; on the other hand, there is a discussion on the network of enabling firms that collaborate to create value of the service. For these services based on connected devices, the business-to-business relationships tend to be dynamic and complex, involving firms from different fields, spanning from IT infrastructure companies for application and cloud solutions to organizations of potential users (including hospitals, gyms, sports associations and corporate care providers). The point of having separate discussions is to acknowledge that all aspects are relevant for this emerging services based on ICT, while recognizing the need to separate the discussion in order to reach to concrete outcomes, allowing to be immersed in rich discussions regarding different views of the services.

In order to ease the analysis of services based on ICT, we present a separation of concerns. It is a design principle in computer science where a program is separated into different sections, where each section addresses specific concerns. In the words of Edsger W. Dijkstra (1982), "This is what I mean by "focusing one's attention upon some aspect": it does not mean ignoring the other aspects, it is just doing justice to the fact that from this aspect's point of view, the other is irrelevant. It is being one- and multiple- track minded simultaneously." A

well-executed separation of concerns provides benefits in terms of complexity reduction, reusability improvements and simpler evolution (Tarr et al. 1999).

The concerns can be divided using an analogy to web development, consisting on a front-end and a back-end. The front-end corresponds to the "client-side", in other words, what users can see. The back-end corresponds to the "server-side", what users cannot see. It is important to highlight that the proposed separation is intended for services based on ICT, in which more than one company are closely involved in the service. Using the web development analogy, an *external view* (front-end) for service based on ICT corresponds to aspects related to users and consumers and the *internal view* (back-end) for service based on ICT correspond to aspects associated with the configuration and set-up, in other words, "how the engine works".

Considering the four value dimensions aspects (Ghezzi et al. 2015), an initial (non-empirical) separation into the internal and external views could be done as follows:

- For the internal view, value creation and value appropriation are the two most relevant dimensions, but decisions and strategic aspects for the value proposition and value delivery also have strong relevance. B2B relationships and actors involved in the supply-side of the service are the focus of analysis according to this view.
- For the external view, the value delivery can be regarded as the most relevant dimension, but aspects such as the offering (value proposition dimension) and the revenue generation (value appropriation dimension) also have strong relevance. Relationships between the final service provider, customer and users are the focus of analysis according to this view.

Additionally, the separation can take into consideration the two extreme levels following the ARA functions. These levels correspond to the single-actor level and the network level:

- The single-actor level considers aspects that can be defined individually. This level maps the value aspects represented in individual firm's business models. On the internal view, it can be considered as the individual delimitation that an actor has within the ecosystem. On the external view, it can be considered as the aspects that relate to interaction with the customers.
- The network level considers aspects that suggest the need for coordination among actors for the creation of services based on ICT. In traditional business model literature, these aspects can also be regarded as the market implications influencing individual business models. Additionally, this level is considered a system of interrelated business models (Zott & Amit 2010).

Business model has been discussed before as a system of activities internal and external to the firm, set in motion in order to create value for the end consumer by providing necessary services based on ICT. Furthermore, we stipulated that value networks are systems of interrelated business models, which dynamic can be described through internal and external views. Based on this stipulation, we discuss a future research line in the next section.

FUTURE LINE OF RESEARCH – SEPARATION OF CONCERNS APPLIED TO BUSINESS MODELS

In Table 4, we present the aspects considered in the four value dimensions (Ghezzi et al. 2015), separating their relevance into the internal and external views. In addition, we take into consideration the single-actor and network levels.

The motivation of this separation is to acknowledge that all the value dimensions are simultaneously relevant, but they can be separated in different views and levels to simplify the study, analysis and even the improvement of business models for services based on ICT. Empirical evidence to support this initial separation and description is what we consider a future line of research.

			External view		Internal view	
			Single-actor level	Network level	Single-actor level	Network level
Value dimensions	Proposition	Offering in service	●	◑	○	○
		Customer segmentation	●	◑	○	○
		Customer acquisition strategy	○	○	●	○
	Creation	Internal organization	○	○	●	○
		Market approach	○	○	●	○
		Key resources, assets, processes	○	○	●	◑
		Activities and competences	○	○	●	●
	Delivery	Articulation to reach consumers	●	○	○	○
		Articulation to reach partners	○	○	●	○
		Positioning in the network	○	○	◑	●
		Key partnerships and relationships	○	○	◑	●
		Delivery and distribution channels	●	◑	○	○
		Customer relationship	●	○	○	○
	Appropriation	Value capture	○	○	●	◑
		Revenue generation	●	○	○	○
		Sharing mechanisms	○	○	○	●
		Investment and financing	○	○	●	○
		Cost structure	○	○	●	○

Relevance ○ Low ◑ Medium ● High

Table 4: Mapping of the aspects of the four value dimensions and their relevance in accordance to the separate views of services based on ICT.

Each domain (view-level combination) is described next:

External view, Single-actor level

This domain can be interpreted as all the aspects that involve interaction with customers, and can follow user-centric approaches of value design (Osterwalder et al. 2015). In general, it is related to the value proposition and distribution channels discussion on business model literature, a clear example being Osterwalder & Pigneur (2010b).

External view, Network level

These are the aspects related to consumer interaction that should consider coordination among actors in the network. Considering the split on the aspects of the value dimensions presented in **Error! Reference source not found.**, there are no aspects with a high level of relevance for the external view on the network level; we argue that aspects of the external view are dominated by the single-actor level since the customer interactions are always considered between a customer an a single firm. Nevertheless, more than one firm could be actively interested in the value proposition and value capturing aspects and could be addressed from a network level perspective.

Internal view, Single-actor level

This domain corresponds to the main aspects of individual business models, excluding the offering and distribution channels, which are already covered by the external view on the single-actor level. This domain can also be interpreted as the individual delimitation that an actor has within the business ecosystem

Internal view, Network level

These are the aspects that are relevant in the ecosystem-level discussion; they could also be interpreted as parts of business strategy not fully covered by business models. Relevant aspects are the network composition, the position of the actors, the combination of activities and competences and the distribution mechanisms for value appropriation. These aspects of the value dimensions are the ones that require high level of coordination between actors that are actively involved in services based on ICT.

The initial relevance value given in Table 4 to each value dimension is based on literature review and our judgment; therefore we understand the limitation and the need for empirical evidence to validate and refine our claim. Nevertheless, initial discussions within research projects with companies involved in the development of services based on ICT have shown the relevance in having a concrete approach to handle the growing complexity in this context, welcoming further exploration in the area.

CONCLUSIONS

The complex set of relationships that happen in services based on ICT should be approached from a holistic perspective, but current established theories seem to provide answers for isolated firms. Business models can be regarded as service provider's strategic relational aggregator, based on the assumption that the relationship between two firms is based on a relation between the firms' business models. Emerging theories suggest that business ecosystem and value networks are indeed a system of interrelated business models.

Nevertheless, business model is a subject that still creates confusion and divided approaches, therefore, providing yet another level of complexity by considering their development and study from the perspective of value networks has intrinsic challenges. For this reason, in this paper we studied relevant theory to suggest a separation of concerns in regard to service development into internal and external views, in order to ease their description and analysis. This is an initial point to explain the emerging complex environments, with the future intent to analyse empirical data on services related to mobile payment and Internet-of-Things services, in which more than one actor is actively involved and participate in the service. Moreover, future research should address a current limitation, which is related to the changes over time of the business ecosystem and the relationships of actors involved in services based on ICT.

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