

The social dimension of business models: an Actor-Network Theory perspective

Cristina Chuva Costa
Institute Polytechnic of Coimbra, ISEC
CISUC, Department of Informatics
Engineering, University of Coimbra
chuva@isec.pt

Paulo Rupino da Cunha
CISUC, Department of Informatics
Engineering, University of Coimbra
rupino@dei.uc.pt

Full Paper

Abstract

We developed BIZ2BIS (from Business Models to the Blueprint of the Information System), an approach to help design, discuss, and evaluate inter-organizational business models, and also derive high-level requirements for their underlying IS. It consists of an iterative process that involves the various stakeholders in seeking a set of value propositions that ensure that the various elements are willing to participate in a sustained manner, thus ensuring a resilient value network. Our exhaustive literature review on business models pointed to the importance of accounting for a socio-technical nature, so we grounded our approach on Actor-Network Theory (ANT). Our proposal has been successfully used in designing the business model for a 2M€ project involving multiple independent players in the wine industry.

Keywords

Business models, Actor-Network Theory, inter-organizational systems.

Introduction

Technological advances and the generalized use of the Internet have changed the playing field for companies. Several actors can now come together in network configurations to create innovative business models that would be unfeasible in the physical world. However, the more radical the departure from the established models of value creation, the bigger the complexity in analyzing those environments. Participants in the same network can be allies in the pursuit of a set of goals, and, simultaneously, be competitors in the pursuit of others (Gulati et al. 2000). Their relationships in the network are supported by a sensitive balance of interests, which raises difficulties in ensuring the sustained involvement of the parties and the stability of the forged bonds.

The literature review on business models allowed us to identify concepts, viewpoints, and proposals from the business model domain that stand out frequently. The performed survey also strengthened our conviction that a business model is not designed in a total vacuum and stressed the importance of social issues in its conception and development. We noticed that most of the proposals in the business model domain did not focus on the study of business networks, but rather on individual organizations. There were no indications on how to introduce the specificities of the network in the business model study (e.g., collaborations, dependencies, conflicts, or joint value propositions). To overcome this shortcoming, we decided to complement business model theories with influences from the social domain. We translated

the lenses of analysis proposed by ANT to our study in order to improve our knowledge of networked business models and open new possibilities of analysis, endowing BIZ2BIS with an additional and innovative look towards the business model field.

ANT characterizes a network by its relations, fluidity, and dynamics, matching aspects that we consider relevant when analyzing inter-organizational business models. It incites us to follow the elements of the network, disclose their partners, perceive their interactions, and search for the alignment of their interests. ANT goes beyond the traditional conceptualization that views networks as a collection of nodes and connections that form a web-like structure (Barab et al., 2001). It guides us into a world of associations and relations (Latour, 1996). Its unique perception complemented our understanding on how information systems influence – and are influenced – by the contexts of their business models and helped us establish connections between these two domains. Taking into account that information systems often fail, usually more due to social and organizational factors than technical ones (Carbone, 2004, Graham, 2008, Doherty and King, 1998), ANT gave us the chance to regard the role that these systems possess and their impact on the network.

We have used three case studies to mold into BIZ2BIS the principles, ideas, and concepts from the business model field, as well as ANT's contributions. Then, we used BIZ2BIS to assess and adjust a preliminary business model for a 2M€ action research project and provided the IT team with a service-oriented specification for its IS. In this paper, we detail how ANT influenced BIZ2BIS, which led us to structure it as follows: section 2 describes the insights obtained from the performed literature review on business models. Section 3 briefly presents ANT key ideas, while section 4 discusses why and how we used ANT in the business model field. Section 5 describes BIZ2BIS, underlying ANT's influences. Finally, in section 6, we present our conclusions.

The business model domain

To develop BIZ2BIS, we started by reviewing the literature on business models. It allowed us to identify the topics usually addressed by this domain. We noticed that the concept of value proposition acquired a prominent role in the available business model definitions, and that others like business architecture, revenue sources, network partnerships, business actors, roles, and resources were also common. In the topic of business components, the organization value propositions, financial aspects, target customers, distribution channels, customers' relationships, and network agreements were common denominators. The available business representations confirmed the relevance of the mentioned elements. Most of the contributions we analyzed address the business model of a company. They may consider the partnerships established by a given company, but the organization remains the most important reference point, not the networked business model as an entity that co-creates value. In turn, available taxonomies showed us a tendency in perceiving different categories of business models (e.g., freemium, razor/blades, or reverse auction) as building blocks that can be combined in multiple ways, as jump-starts of a creative business model process of discussion (Johnson 2010; Osterwalder and Pigneur 2010).

When researchers like Osterwalder and Pigneur (2002), Shafer et al. (2005) and Morris et al. (2005) started to synthesize the research mentioned above, they created a base of knowledge that promoted the development of conceptual tools. The Business Model Canvas (Osterwalder and Pigneur 2010), the e3-value ontology (Gordijn 2002), and the STOF framework (Bouwman et al., 2005) are unavoidable references. They showed us the importance in defining an outlined plan for the application of BIZ2BIS to offer guarantees that its users do not overlook critical issues. The former two inspired us to use our approach as an effective communication tool to discuss business models and promote collaborations with all the participants. The latter two underlined the importance of examining the network of relationships in which firms are implanted and the role of the IS. The e3-value ontology establishes a link between value propositions and their underlying business processes, while the STOF framework details how the service offering can be carried out from a technical perspective. However, despite the previous efforts, there is still a gap between business model design and the specification of the supporting IS.

The literature review also underlined the importance of accounting for the influence of the social context in which a business model is developed and implemented in its study (Hoegg et al. 2006; Monteiro 2000; Pateli and Giaglis 2004). We also became aware that there were no indications on how to address social factors in the development, adoption, or modification of real-world business models. In addition, we observed that many of the available proposals did not focus on the study of networked business models,

which led us to move our analysis beyond a company's boundaries and focus our attention on inter-organizational business models, on their innovative possibilities to co-create value, and on the challenges that these configurations pose. When the complexity of network configurations is taken into account it becomes even more relevant to integrate the social dimension of the business model in their study. A comprehensive view can promote their understanding, discussion, and definition, creating favorable conditions to a more reliable translation of the business models' requirements to their underlying information systems. This research direction was supported by the literature on business models in network configurations that the need to address issues such as the dependencies among network actors, negotiation mechanisms able to align distinct interests involved, joint efforts to create value, or transaction of intangible items (Allee 2008).

Table 1 summarizes the contributions from the literature that had a role in shaping BIZ2BIS.

Number	Author	Influence in the development of BIZ2BIS
Guideline 1	Timmers (1998), Al-Debei and Avison (2010)	Address dimensions of the business model concept such as value proposition, value architecture, value network, and value finance
Guideline 2	Osterwalder and Pigneur (2002), Shafer et al. (2005)	Take into account business model components like value proposition, technology, revenue model, customers, distribution channel, and partners
Guideline 3	Gordijn (2002), Osterwalder (2004), Bouwman et al. (2008)	Define an outlined plan for using the approach in the field, in order to ensure that critical issues are not overlooked
Guideline 4	Gordijn (2002), Osterwalder (2004)	Use the approach as a communication tool to reflect on, discuss, innovate, and articulate a business model
Guideline 5	Shafer et al. (2005), Gordijn et al. (2009)	Address the potential offered by the network concept in the business model domain
Guideline 6	Allee (2008)	Detail the kind of ties established among the network participants to elicit clues on how these could strengthen the business model or obstruct undesirable movements
Guideline 7	Osterwalder and Pigneur (2010)	Develop easy-to-use field tools that promote collaboration among all the stakeholders
Guideline 8	Gulati et al. (2000)	<i>Identify vital dependencies in a the networked business model (e.g., important resources, indispensable actors, and critical value propositions)</i>
Guideline 9	Normann and Ramírez (1993), Iansiti and Levin (2004)	<i>Develop negotiation mechanisms to promote eventual adjustments to new circumstances and balance the network pursuit for joint value creation</i>
Guideline 10	Gordijn (2002), Bouwman et al. (2012)	<i>Acknowledge the need to change, to reconsider adopted options, revisit past assumptions, and rebuild taking into account new contexts</i>
Guideline 11	Gordijn and Akkermans (2003), Bouwman et al. (2012)	<i>Make use of alternative business model scenarios to encourage discussion and explore new opportunities</i>
Guideline 12	Pateli and Giaglis (2004),	<i>Address social factors in the discussion, design, adoption, and change of business models</i>
Guideline 13	Tapscott et al. (2000), Allee (2008)	<i>Consider other influences beyond financial flows in the business model evaluation (e.g., prestige and brand recognition)</i>
Guideline 14	Gordijn (2002), Bouwman et al. (2012)	<i>Explore connections points between business models and their technological support</i>

Number	Author	Influence in the development of BIZ2BIS
Guideline 15	Gordijn (2002)	<i>Translate business models into high-level requirements for the specification of its underlying IS</i>

Table 1: Guidelines for the development of BIZ2BIS

A brief overview of Actor-Network Theory

ANT considers that both technical and social determinism can be flawed and proposes a socio-technical account (Latour 1986; Law and Callon 1988) that denies that purely technical or purely social relations are possible and neither the social nor the technical positions are privileged. It stands that networks are a shifting system of relationships, alliances and exchanges among their elements (Underwood 1998). These networks are heterogeneous – link together human and non-human actors (e.g., person, group, idea, plant, or animal) (Latour 2005, p. 71). Both should be treated using the same conceptual apparatus: described through the same language and analyzed according to the same procedures. The symmetric treatment of human and non-human actors has been criticized in the literature (Collins and Yearley 1992). However, we do not interpret that assumption literally. To regard them as equal signifies considering the roles, activities and importance assigned to both as they are engaged in the network.

Each actor has its own view of the network and its individual agenda and goals. These gain relevance when they are shared by different actors, creating a common set of interests. The negotiations among the actors involves two concepts: translation and inscription. The former is the process of engaging the different actors and it approaches two aspects: on the one hand, translation is assumed as an interpretation which can lead to representations of common interests (Callon and Latour 1981). On the other hand, translation is a set of methods by which actors within a network will try to enroll the other actors into positions that can serve their own purposes. Callon (1986), identified four distinct phases in the process of translation:

- **Problematization:** a focal actor (the one driving the creation of the new network or changes to the existing one) frames the problem and defines the identities and interests of other actors that are consistent with his/her/their own (Bloomfield et al. 1994; McMaster et al. 1997). This process, according to Callon (1986), is designated as an obligatory passage point. The actions performed by the focal actor can be viewed as part of a strategy to align the other interests with his/her/their own (Tilson and Lyytinen 2005), and can involve methods so diverse as seduction, violence, and transactions.
- **Interessement:** encompasses the strategies by which the focal actor attempts to enroll others according to the entities and roles defined for them in problematization (includes searching for new allies, isolating actors not yet enrolled, and encouraging others to overcome obstacles in the way of passing through the obligatory passage point). It is necessary to implement an actors' recruitment process – creating an interest and negotiating the terms of their involvement.
- **Enrolment:** requires more than one set of actors imposing their will on others for enrolment to be successful (Uden and Francis 2009). It is only achieved when actors take on the network's problematization as their own and accept the roles defined for them during interessement. This phase is characterized by the group of multilateral negotiations that can lead to the establishment of a stable network of alliances.
- **Mobilization:** occurs when translation is complete, actor interests are stabilized and controversy is removed. With mobilization, enrolment is transformed into active support, it assumes a definitive physical reality which can be materialized through a series of displacements (Callon 1986; Law 1986). This phase includes the use of a set of methods to ensure that allied actors act according to the established and do not betray the network interests (Mähring et al. 2004).

Inscription is an act that actors imprint on other actors to shape their attitudes and properties (Akrich and Latour 1992). It also refers to the way interests, values, rhetoric, social and economic relationships,

patterns of use, and designer's beliefs are converted into devices or materials, such as reports and scientific papers, or incorporated in technological solutions (Akrich and Latour 1992; Bowker and Star 1994; Monteiro 2000). Inscriptions also prescribe a program of action, which specifies the properties of a setting, sustaining and embedding the social discourses of the actors into technical artifacts. For instance, information systems developers can formulate and shape the services of a business model's underlying information system in order to lead and control its users. Inscription and translation are interrelated and to a large extent take place simultaneously, as soon as technology starts to be considered and developed (Latour 1991). As inscriptions become stable and routine, they reduce the possibility of being challenged or questioned at a later date (Holmström and Robey 2005).

Why seek inspiration in Actor-Network Theory

ANT offers an enlightening vocabulary that describes how the actors come together to create a network, explores how its relationships are composed, how these emerge and are maintained, the existing diversity of flows, how the actors compete among themselves, the established agreements, and how networks are made durable over time. Its aptitude to analyze actors' associations reveals tactical insights (such as anti-programs) and clarifies the value provided by the actors. The obtained data is a wealth of information on networks. Business model theories already point to the importance of covering business model interactions, but ANT's inspiring outlook led us to go beyond that.

The concept of translation was also a major contribution to the development of BIZ2BIS. We used it as the starting point to the specification of a set of steps to trace and assist the social process of negotiation among the network actors. Our aim was to discover what could compromise the network and identify what could promote its actors' interests - how they could be involved, what could strengthen their presence in the network, how business model alignment could be achieved, and how it could be maintained. ANT's ability to view a network as a collective of human and non-human actors in a continual evolving entanglement (Grabher 2006) gave us the background to take into account in BIZ2BIS the role that non-human actors possess in networked business models. It allowed us to consider actors like standards, governmental laws, or underlying information systems, the latter being of particular interest for our research. According to Doherty and King (1998) and Graham (2008), social factors are, in many cases, more responsible for information systems failure than technical ones. The interplay between the social and the technical can stimulate new forms of thinking information systems.

When the arrangements established in a network result in the alignment of its actors, their interests are translated in accepted programs of action that can be inscribed in information systems. The concept of inscription inspired us to include in BIZ2BIS the ability to transfer knowledge acquired on human actors to the non-humans, revealing how human interests are materialized in non-humans. These non-human actors can be used as delegates for specific goals, concealing the way that social interests are represented (Holmström and Robey 2005) in business models. ANT's principles offered us the potential to reveal technical complexities and contingencies often overlooked. The obtained knowledge can be used to provide additional clues on the information systems suitability, increasing its chances of acceptance and success.

In what concerns ANT's practical implications, the available literature is somewhat disappointing, since most texts do not explain how to go about doing ANT. It does not provide a narrative that can help identify the network's problems, nor does it produce an exact rendering of the state of affairs that can guide analysts throughout future actions to promote the network or avoid possible drawbacks (Gad and Jensen 2010).

The integration of ANT's concepts in an approach whose outcomes may be used to intervene in a scenario under study demands to look at it in a new analytic perspective. Note that ANT's adoption under the described scope remains open to researcher's imagination and is not prescribed by ANT's proponents. However, according to Law, "Only dead theories and dead practices celebrate their self-identity. Only dead theories and dead practices hang on their names, insist upon their perfect reproduction" (Law 1999). Also Latour describes ANT as a very crude method (Latour 1999). This sustains the idea that ANT cannot be reduced to a standard approach that can be universally applied (Cressman 2009). In our research, we borrowed ANT's ideas and developed efforts to integrate them in our approach, by molding them to our needs. ANT provided us with an inspiring background that we used in BIZ2BIS to:

- Identify the network goals;
- Define the network borders;
- Describe the actors in their practice and their relationships;
- Understand how actors can be involved in the network;
- Perceive actors' common purposes;
- Specify an outline of a negotiation mechanism to align the interests of the actors;
- Take into account human and non-human actors.
- Include in the business model the social context of the network, as well as of its elements;
- Specify the high-level requirements of the underlying information systems.

BIZ2BIS: business model and IS design

BIZ2BIS provides a shared and common understanding of the business model that promotes communication, discussion, and collaboration among participants. It consists of four phases. In *Phase I* – “Business model characterization”, we characterize the network, by identifying its actors and detailing their relationships. Then, in *Phase II* – “Business model refinement”, we analyze the network and suggest eventual adjustments to better align the interests of the actors. In *Phase III* – “Stability assessment”, we assess the business model stability by systematically verifying if the value propositions in the business model bring benefits to all the actors. In *Phase IV* – “Information system specification”, we use the gathered information about the network and its actors, as well as the arrangements established to align their interests, to detail the high-level requirements of the IS underlying the business model in a service-oriented fashion.

By default, the analyst performs iterations of the sequential phases, but breaking out of any one of them is allowed if relevant information thus dictates. This flexibility enables BIZ2BIS to account for the dynamic nature of the networks, as suggested in the literature, Guideline 9 (Table 1). The importance of defining an outlined plan for using the approach was inspired by the Guideline 3 and 9 (Table 1). The four phases of BIZ2BIS are detailed above, as well as the contributions gathered from the business model domain and from ANT.

Phase I – Business model characterization

Phase I analyzes the business model by looking at its network. It consists in three steps:

- *Step 1.a* – “Exploration of the business model”: allows analysts to broadly specify the main aims of the networked business model, who contributes to its success, and how, as well as contextual influences that guide the performed activities. This step was inspired by the business model literature, namely guidelines 1, 2, 4, 5, 8, and 12 (detailed in Table 1). ANT’s concepts of problematization and intersement also led us to introduce in BIZ2BIS the ability to detail new networked business model ideas, or changing existing ones.
- *Step 1.b* – “Description of the participating actors”: identifies actors and describes their roles, relationships, as well as expectations. Guidelines 6 and 8 (Table 1) supported this step. We were also inspired by ANT and its lens of heterogeneous networks that led us to follow human and non-human actors and describe their roles in BIZ2BIS. The obtained description corresponds to ANT’s program of action that inscribes the behavior of the actors in the network, materializing the ANT concept of inscription.
- *Step 1.c* – “Representation of the business model”: represents the business model using a graph notation, in which the nodes represent the actors and the arrows the direction of the business model flows. They are categorized in four types: material or service, finance, information, and intangible connection (e.g., reputation, influence, and cooperation). *Step 1.c* was inspired by business model guidelines 6 and 8 (Table 1) and by ANT’s recommendations of following the actors, describing their relationships, defining a program of action for the network, and considering its context.

Phase II – Business model refinement

Having detailed what was planned for the networked business model in *Phase I*, *Phase II* addresses the need to perform refinements by providing a negotiation mechanism that looks for alignments among actors. This phase takes an optimistic view of the negotiation process, searching for win-win value propositions based on the assumption that the actors are engaged in a positive-sum activity in which they jointly create value. Five steps support *Phase II*:

- *Step II.a* – “Detection of dependencies among goals”: - highlights how the goals of each actor contribute to reaching the aims of the overarching value network. It also exposes the dependencies among those goals and discloses how individual expectations interlock in a network of interactions that directly influences the ultimate business model objective. This step was mainly inspired by ANT’s concepts of problematization and intersement, since it encompasses attempts to define how actors can contribute with their own goals for the ultimate purpose of networked business models.
- *Step II.b* – “Identification of actor affinities”: supports the identification of goals common to various actors participating in the business model, which provides clues in order to strengthen the collaborations or minimize conflicts/problems identified in *Step II.a*. This step was inspired by business model guideline 6 (Table 1) and ANT’s recommendation of following the actors, which aids to understand if the roles defined for them in problematization are exploring all the potential of the network.
- *Step II.c* – “Negotiation of actor contributions”: balances gains and efforts of the actors to clarify their interests towards the network. When a positive balance is not reached, analysts should initiate a negotiation process and consider adjustments in order to encourage actors’ participation. Analysts should base their attempts on the data gathered in the previous steps of BIZ2BIS. *Step II.c* was inspired by business model guidelines 9, 10, and 11 (Table 1). In turn, ANT’s concept of translation influenced us to address the dynamics in networked business models. It showed us the importance of continuously considering the needs of each actor in the network, searching for their alignment, and establishing a program of action. Through the conceived negotiation mechanism, BIZ2BIS iteratively searches for a business model capable of meeting the expectations of its actors.
- *Step II.d* – “Description of critical dependencies”: discloses domino effects caused by the extinction of a particular business flow. When indications of events that may jeopardize the business model no longer exist, analysts should advance to *Step II.e*. *Step II.d* was inspired by business model guideline 8 (Table 1) and influenced by ANT’s recommendation of following the actors, which led us to create mechanisms to point out critical dependencies for the business model.
- *Step II.e* – “Stabilization of value propositions”: uses the data gathered in the previous steps of BIZ2BIS to list the existing business flows. Then, based on the contribution of the flows to the activities performed by the actors, analysts should refine and stabilize the list of value propositions provided by the business model. This step integrates ANT’s concepts of program of action and inscription, since it establishes the actors’ behavior in the network to make the defined value propositions available.

Phase III – Stability assessment

Phase III, Step III.a – “Evaluation of actors perspective” assesses the idealized business model based on the value propositions obtained in *Phase II*. The performed evaluation integrates two perspectives (inspired by Guideline 13, Table 1). One shows the actors’ perception of the effort spent to support the value propositions, as well as the gain obtained. It compares the gain and the effort of each actor, which provides clues on the benefits that they will obtain with their participation. The other discloses how the actors perceive influences among value propositions and may expose dependencies not yet detected. The concept of translation, particularly enrolment, showed us the importance of understanding the

commitment of the actors towards the designed business model in this step. If they do not accept the roles defined for them, their enrolment is compromised. Therefore, we decided to encourage their collaboration and involve them in the business model appraisal.

Phase IV- Information system specification

When an agreement is achieved, analysts should advance to *Phase IV, Step IV.a* – “- Consolidation and description of requirements”, and specify the high-level requirements of the IS underlying the business model (it was inspired by Guidelines 14 and 15, Table 1). *Step IV.a* establishes a bridge between business models and their supporting IS by using the data obtained in the first three phases of BIZ2BIS to identify and detail the features to be provided. To enable this translation of knowledge, we used the concept of service (Marks and Bell 2006), which establishes a point of contact between what organizations provide to their customers or partners, and the functionalities delivered via the interface of an IS. As a result, we developed the “Service specification chart” to detail the services to be provided. Table 2 exemplifies this artifact.

Business model	Service Specification	
Name/Identifier	Presents the service name and its identification number	Id: 1
Version	Identifies version, data, and author	
Goal	Presents the aim of the service (data obtained from <i>Phase II, Step II.e</i>)	
Description	Describes the activities performed when using it (based on <i>Phase II, Step II.e</i>)	
Actor that provides the service	Identifies the actor(s) that provide(s) it (data obtained from <i>Phase I, Step I.b</i> and <i>Step I.c</i>)	
Actor that uses the service	Identifies the actor(s) that use(s) it (based on <i>Phase I, Step I.b</i> and <i>Step I.c</i>)	
Input data and their source	Depicts input information flows and their source (data obtained from <i>Phase I, Step I.b</i> and <i>Step I.c</i>)	
Output data and its target	Describes output information flows and their target (data obtained from <i>Phase I, Step I.b</i> and <i>Step I.c</i>)	
Service dependencies	Identifies supporting services (data obtained from <i>Phase III, Step I.a</i>)	
Access control mechanisms	Details permissions and access rights (data obtained from <i>Phase I, Step I.a</i>)	
Business flows leading to the service	Identifies the business flow(s) that contributed to the service detection (data obtained from <i>Phase II, Step II.e</i> and <i>Phase I, Step I.c</i>)	
Reasons for its existence	Explains the motives behind the service creation (data obtained from <i>Phase I, Step I.a</i> and <i>Step I.b</i>)	
Service restrictions	Presents the rules employed by the service in its activities (data obtained from <i>Phase I, Step I.a</i> and <i>Step I.b</i>)	
Information system support	Describes how the IS supports the service (based on <i>Phase I, Step I.a</i> and <i>Step I.b</i>)	
Remarks	Additional data	

Table 2: “Service specification chart”

Analysts and IT teams can easily perceive the actors that interact with the service, how they do it, the reasons for the service existence, the involved business flows, the activities related to the service, rules that govern its operation, and how the IS should make it available. At the end of *Step IV.a*, a service-oriented high-level specification of the supporting IS is available.

Several researchers have sustained that information systems, and technology in general, are not independent from the network where they are applied. This fact assumes an extra relevance in the

complex interconnected worlds where networked business models operate. To answer this challenge in BIZ2BIS, we used ANT's guidelines to address the role of non-human actors, such as information systems, and look at their interactions in the networked business model. ANT inspired us to integrate topics in BIZ2BIS that allow us to complement the requirements of the business model with the specificities of its context and technical considerations (based on data gathered in *Phase I* and *Phase II*). Together, these perspectives create a valuable source of knowledge that supports the specification of the high-level requirements of the information system underlying the business model.

Conclusion

We contributed to the existing literature on business models by moving beyond the usual accounts of individual scenarios and focusing our attention on networked business model configurations. When analyzing a business model, we take into account the value propositions of each organization, but we do not limit ourselves to a compartmentalized view. We look at the network and how each actor can be valuable to others, and what others possess that may be considered valuable by the former. Moreover, we consider that actors can assess value differently and that the revenue streams are not the only measure of value creation. The fertile combination of business model flows and contributions, which gives rise to multifaceted interpretations by the actors, had two main implications in BIZ2BIS: understanding how these flows could be arranged to capture and co-create value, and the importance of developing an evaluation mechanism with the capacity to integrate each actor's perception.

The complexity of network configurations strengthened the importance of integrating social aspects in the study of business model scenarios. As others, (Lyytinen and Damsgaard, 2001), we argue that social reality cannot be reduced to a small set of discrete variables (such as power, influence, technical know-how, available funds, values, beliefs, norms, or rituals), and that complex systems are historically situated and depend on context and time. To integrate this perspective in BIZ2BIS, we complemented insights from the business model domain with ANT's influences. Its guidelines to follow and identify the business actors aided us to unveil connections and helped us to clarify the network boundaries. Using the definitions, taxonomies, components and representations in the business model literature as a starting point, we integrated ANT's ability to disclose and detail relationships in the specification of the business model dimensions. Furthermore, ANT's concepts of translation and inscription showed us how actors form alliances or come into conflict, which inspired us to create a negotiation mechanism to manage the different interests that co-exist in a networked business model.

The developed negotiation mechanism supports the search for network stability. It endows BIZ2BIS with sensitizing devices that try to enroll actors in the business model, tune less satisfactory solutions, reach network alignment, and anticipate and cope with emergent problems. When this happens, we present the adopted solution to all the involved actors and ask for their assessment. Due to the impact that the actors' abandonment might cause in the network, our evaluation attributes a high importance to their own perceptions and takes into account their individual expectations. Furthermore, we consider it fundamental to involve the actors in the business model conceptualization, as well as in the specification of its supporting information systems.

The relationship between business models and information systems is underrepresented in the literature (Bouwman et al., 2012). Clear advantages can be obtained by establishing connection points and detecting influences between both (Chan and Reich, 2007). Taking into account the wealth of information collected by BIZ2BIS, we gathered promising conditions to expose the connections between these two domains and explore their combined efforts. We used the concept of service to translate the data obtained about the business model into high-level requirements that should be met by its information system. The concept of service helped us to perform this translation. It allowed us to establish a point of contact between the value propositions made available and the internal business processes supported by the information system. ANT's ability to regard non-human actors and observe how they affect and are affected by humans, as well as its concept of inscription also inspired us to detail the relationships between the two domains and investigate their dependencies.

Acknowledgements

This work has been partially funded by the ICIS project CENTRO-07-0224-FEDER-002003.

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