Business Model Design from an ANT Perspective: Contributions and Insights of an Open and Living Theory

Cristina Chuva Costa[1] and Paulo Rupino da Cunha[2]

[1] ISEC, Department of Systems and Informatics Engineering,
Polytechnic of Coimbra,
CISUC, Department of Informatics Engineering,
University of Coimbra
chuva@isec.pt
[2] CISUC, Department of Informatics Engineering, University of Coimbra
rupino@dei.uc.pt

Abstract. The way the Internet has connected millions of users at negligible costs has changed playing field for companies. Several stakeholders can now come together in virtual networks 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 ensuring the sustained interest of the involved parties and the stability of the bonds. To address this problem, we sought inspiration in the Actor-Network Theory (ANT), which is capable of providing insights into socio-technical settings where human and non-human agents interact. We describe how several of its principles, ideas, and concepts were adapted and embedded in our approach for complex business model design or analysis. A simple illustration is provided. Our iterative approach helps systematically scrutinize and tune the contributions and returns of the various actors, ensuring that all end up with an attractive value proposal, thus promoting the robustness of the network. Guidelines for the services that an underlying information system must provide are also derived from the results.

Keywords: Actor-network theory, business model design, business model stability, value networks.

1 Introduction

Information and communication technologies have been steadily transforming the way companies conduct business. The Internet, for instance, has enabled unprecedented ubiquitous connectivity at negligible costs. This, in turn, has sparked innovative business models and significant power shifts. Amazon displaced established booksellers; Priceline.com gives its users the possibility to name their own price when shopping for flights, hotels, and car rentals, by aggregating demand and then negotiating with suppliers of those services. A number of exciting new ventures continue to emerge, using the web as a platform.

In the business models described above we can find phenomena of cooperation and competition, known as co-opetition (Tapscott, Ticoll and Lowy, 2000). It is urgent to introduce new tools to address this business model complexity, which cannot be developed based on intuition and hints alone. We present a novel approach to aid in the design, analysis and tuning of these business models, ensuring that all required actors have an enticing reason to participate. An iterative and incremental process of negotiation seeks the alignment of their interests, so that each can find an attractive and sustainable value proposal. The outcome is a balanced business network that documents all the interactions between actors, their contributions, their returns, and provides clues to design the supporting information system.

Researchers advocate that system development failures can be attributed more to social and organizational factors than technical ones (Doherty and King, 1998). In the interconnected worlds we described, these factors assume a reinforced significance. They can provide valuable insights about organizational, social and political viewpoints (Rose and Scheepers, 2001), improving the knowledge about the business scenario. We used concepts and contributions from Actor-Network Theory (ANT), to complement business model theories. As a result, contextual influences were integrated in the model specification, clarifying contextual perspective.

We illustrate ANT's contributions to the approach through its application to the case of a portal-supported mediation business to manage restaurant order requests. Based on simple examples, we describe the ANT' concepts that inspired us, how they were adopted, the problems they solved, and the artifacts we created to apply them in the field. This assimilation of ANT's principles makes it possible to create innovative forms to interact with the stakeholders and understand the emerging value network. The analysis of the value proposals also affords clues about the services that must be provided by the supporting information system.

The remainder of the paper is structured as follows: section 2 explains the innovation introduced by value network concept in the business model analysis. Section 3 briefly presents ANT, while section 4 clarifies why we sought inspiration in a social theory. Section 5 illustrates how ANT's concepts were integrated into our proposal to align actors' interests and achieve a stable network, and how the approach works and what are its main results. Finally, in section 6, conclusions are provided.

2   From Value Chains to Value Networks

In 1985, Michael Porter (1985) introduced the concept of value chain – a set of interrelated generic activities common to a range of firms. Products pass through all the activities of the chain in order (Figure 1). Upstream, suppliers provide input. Then, the firm adds value to this input, before passing them downstream to the next actor in the chain, the customer.

Stabell and Fjeldstad in (1998) supervised the application of the value chain model to more than two dozen firms, from a variety of industries. They found the value chain well suited to describe and understand traditional manufacturing companies, but less appropriate to the analysis of activities in a number of service industries. With the technological advances and the use of the Internet as a business platform, this limitation is emphasized. Firms are more properly viewed as connected to each other
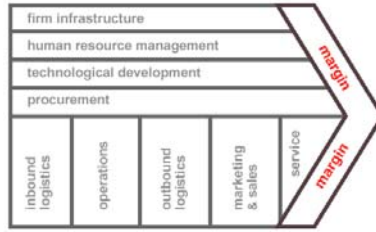
Fig. 1. Porter's Value Chain (adapted from (Porter, 1985))

in multiple networks (Gulati, Nohria and Zaheer, 2000). Amit and Zott in (2001) also stated that innovative value proposals, supported by new forms of collaboration, go beyond the value that can be realized through the sequential configuration of the value chain.

Cisco's business model is an excellent example of these value chain configurations. The company delegates physical production and other non-core functions to partners around the world. It concentrates itself in increasing the value proposal of its services. The new value proposition is service-enhanced customization (Tapscott, Ticoll and Lowy, 2000). Figure 2 illustrates the Cisco value map configuration. Those relationships would not show up in the classic "value chain" analysis.
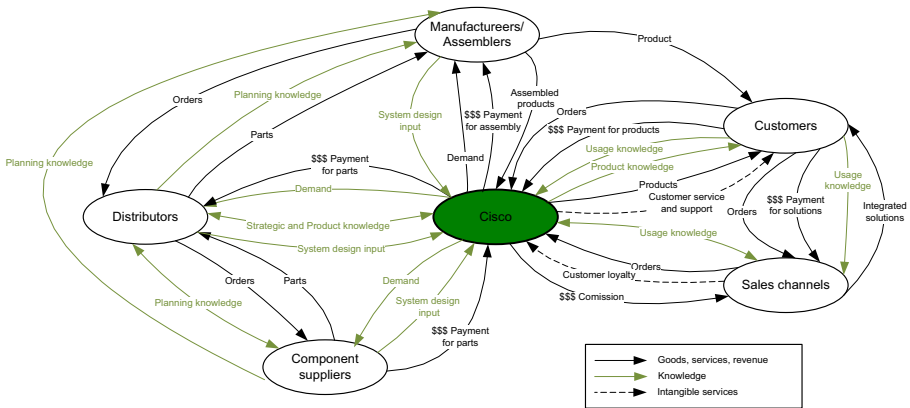

Fig. 2. Cisco Value map (adapted from (Tapscott, Ticoll and Lowy, 2000))

The highly dynamic changes in the configuration and inter-relationships of the business players provide new opportunities (Gulati et al., 2000). Factors that have always seemed peripheral turn out to be key drivers of change in a company. Invaders from previously unrelated sectors could change the rules of the game overnight (Normann and Ramírez, 1993). In such a volatile and competitive environment, the analysts need to consider not only the behavior of a given company, but its universe of interactions. This dynamic capacity of adaption provides the ability to look at the

system from the point of view of the final customers, fitting the solutions obtained with the customers' demands. Gordjin (2002) and Osterwalder (2004) works are examples of the research performed in this field.

With the Internet capacity to connect stakeholders at negligible costs, the dynamic and complexity of the networks configurations increased, as well as the importance to consider the social aspects of those configurations. To integrate this perspective in the approach, our perception and vision of the network is inspired by ANT. We present this theory in the next section and subsequently explain how it helps us in the approach conceptualization.

3 A Brief Overview of Actor-Network Theory

In 1981, Michel Callon and Bruno Latour developed ANT (Callon and Latour, 1981). Subsequently, ANT has been enriched by its original actors and others like John Law (1992) and Madeleine Akrich (Akrich and Latour, 1992).

According to ANT the 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., people, machines, software, and ideas) – but ANT describes them using the same language, and analyses them in the same way. ANT considers that social and technical perspectives are entangled and, for that motive, they must be analyzed together and with the same degree of importance (Akrich and Latour, 1992). The symmetric treatment has been criticized in the literature (Collins and Yearley, 1992). However, we do not interpret that assumption literally. In our approach, to regard them as equal means considering the roles, activities and importance assigned to both types as they are engaged in the network.

Each actor has its own view of the network and its individual goals. These goals gain relevance when, through negotiation processes, they are shared by different actors, creating a common set of interests. Actors' heterogeneous interests become aligned and embedded into technologies that stabilize the network, at least temporarily (Callon, 1991).

The process of negotiation between the actors involves two concepts: translation and inscription. The former is responsible for the interpretation and conciliation of positions/commitments, which can lead to representations of common interests (Callon and Latour, 1981). The latter describes how patterns of behavior are "wired" into the network, using artifacts, to create action programs (for instance, the rules for processing a customer complaint) which the actors must fulfill (Latour, 1991). These concepts influence themselves mutually, enabling a relative stability or the exposition of new issues that will contribute to new network configurations. Translation includes four distinct phases (Callon, 1986):

- Problematization: a focal actor (the ones 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 own. The focal actor renders her/himself indispensable by defining a process under her/hir control that must occur for all actors to achieve their interests. This process according to (Callon, 1986) is defined 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 her/his own (Tilson and Lyytinen, 2005).

- Interessement: encompasses the strategies by which the focal actor attempts to enroll others (includes searching for new allies, isolating actors and encouraging others to overcome obstacles in the way of passing through the obligatory passage point). This is the process of recruitment of actors – creating an interest and negotiating the terms of their involvement. Groups of actors with the same goals can be represented by a single actor (spokesperson).

- Enrolment: requires more than one set of actors imposing their will on others for enrolment to be successful (Uden and Francis, 2009). Actors achieve that when they take on the network's problematization as their own and accept the roles defined for them in the newly defined network during interessement. This leads to the establishment of a stable network of alliances.

- Mobilization: occurs when translation is complete, actor interests are stabilized and controversy is removed. Mobilized actors are committed to a common course of action (Holmström and Robey, 2005). These actors are given the tools to create for themselves an interest in the network or to develop sub-networks. Due to the wide acceptance of the solution adopted, the number of absent entities represented by spokespersons increases (Uden and Francis, 2009). In order that the spokesperson will not betray the interests of their group a set of methods are developed.

Inscription is the act in which actors perform on other actors, shaping their attitudes and properties (Akrich and Latour, 1992). This process consists in the definition of a program of actions that specify the requirements of the network, embedding the social agendas of the actors into technical artifacts, such as information systems. Human actors are able to inscribe onto non-human actors, and vice-versa (Lindahl, 2005). As inscriptions become stable and routine, they reduce the possibility of being challenged or questioned at a later date (Callon, 1991; Holmström and Robey, 2005).

4   Why Seeking Inspiration in Actor-Network Theory

New solutions are required to systematically integrate the nature and behavior of the business models into design. Our approach proposes a radical departure from the dominant conceptions in the literature and adopts a social-technical approach inspired by ANT. One of its main contributions is the revolutionary and freshness towards the concept of network. ANT views a network as a series of transformations (translations), in which each actor is influenced by its relationships.

ANT's rich vocabulary describes how the actors come together to create a network, their relationships, the diversity of flow between them, and the agreements they establish. It offers complementary perspectives of the network. ANT's capacity to disclose the value that each actor provides to the network, as well as its ability to analyze actors' relationships reveal tactical insights. This information is used by the negotiation artifacts created in our approach to develop a business model that ensures sustainable value proposals for all the actors (as suggested by ANT). To provide

feasible scenarios in the negotiation process, we take into account information such as: the actors' gains, efforts, and relationships.

Our approach also provides clues for the development of the information system that will support the network. We, much like others (Mumford, 1983; Holmström and Robey, 2005), believe that information systems development is a socio-technical process. Under this perspective no project is purely technical or purely social. The social aspects' importance and impact is also emphasized by (Schmidt, Lyytinen, Keil and Cule, 2001), who defend that many of the success/failure factors are organizational rather than technical. Integrating ANT principles in our approach allow us to increase the chances of developing an information system that is able to respond to the business model demands.

The integration of the concepts provided by ANT in the design of business models demands a new analytic perspective. "Artists, writers, and scientists do not hesitate in their creative efforts and researches to borrow ideas outside their special fields", begins Philip Wiener, in his preface to the Dictionary of the History of Ideas (1974). How to adopt ANT to design business models and their supporting information system remains open to research's imagination and is not prescribed by ANT's proponents. 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 very crude method (Latour, 1999).

ANT's ideology is embraced in our approach through the development of an iterative and active negotiation processes that intend to achieve the alignment between the stakeholders' interests. In this process, stakeholders are identified and characterized, their relationships are understood, and the overall scenario is described. However, our approach does not intend to produce just a detailed description of a story. We developed a set of artifacts to assist the negotiation process and enhance visibility over the interplay of aims of each actor. The insights obtained enable the tuning of the alignment of interests, in order to balance them and ensure sustainable value proposals for all the actors. Our aim is to ensure that each stakeholder gets what is expected and, thus, becomes committed to the enduring success of the emerging value network.

5 A Business Model Design and Analysis Approach Based on Actor-Network Theory

In this section we will clarify how ANT's ideas and concepts influenced our approach. For each contribution borrowed from ANT, we will explain the problem it helps to solve, as well as the artifacts developed to apply its principles in the field. ANT's contribution is illustrated through simple examples, obtained by applying the approach to an illustrative business idea. This idea was chosen because of its simplicity, which allows the reader to concentrate on the adaptation of ANT and not on the case specifics. It must be stressed, however, that the proposal itself emerged and was validated by combining case studies Yin (2003) and action-research (Baskerville and Wood-Harper, 1996), both applied to complex real world systems. This multi-methodology tactic was used to minimize the limitations of individual research approaches (Bouwman, Hooff, Wijngaert and Dijk, 2005).

5.1   FoodAtYourDisposal Business Idea

FoodAtYourDisposal is a company that intends to create a business to manage take-away orders for several restaurants. The mediation between the customers and the restaurants should be supported by a portal. When an order is received, the request is sent to the selected restaurant that confirms the availability to satisfy the request. When this happens, a cooking time is presented and the portal sends the information back to the customers, to reconfirm. If they agree with the presented conditions, a staff from FoodAtYourDisposal will pick up the order at the restaurant and deliver it to the customer, from which payment will be collected.

FoodAtYourDisposal revenues are obtained through a small activation rate to access the portal and a fee of 5% over each request. Paying extra fees, the restaurants can strengthen their presence in the portal (e.g., put their menus at the top of the search results list or have special sections to advertise promotions).

5.2   Assessing the Business Model

Our proposed approach is organized in three phases. First, we identify the network actors and study the structural aspects that influence their behavior. Then, we analyze the network and suggest eventual adjustments to better align their interests. Finally, in the third phase, we evaluate the business model stability.

Phase I – Identification of actors and of structural aspects

We need to identify and characterize the actors, as well as to analyze the scenario in which the network will operate. As a source of inspiration we use ANT's Problematization concept, which guides us on our study of understanding actor interests, behaviors and relationships. The items that we use to describe those aspects are introduced in Figure 3 through the application of our approach to the FoodAtYourDisposal's business idea. In this scenario, we identified four actors: FoodAtYourDisposal's board, the portal, the restaurants, and the customers. The first two are characterized and used as an example of a human and non-human actor (top row), respectively.

The characterization of the actors enhances the visibility over the interplay of interests. For instance: "Relevance" exposes the actors' importance in the network, which provides clues on how to respond to their demands; "Relationships" (respecting ANT's recommendation of following the actors) depicts each actor's interactions, which allows to spot future alliances or possible conflicts. When focal actors characterize the network scenario (Figure 3, row below) they can use the privileged information about the other actors to define the "Present goals" and "Organizational Interactions". The former gather all the information obtained for each actor, balance it, and propose a first draft of the network goal. It corresponds to ANT's obligatory passage point. The latter, based on the actors' individual relationships, allows the focal actors to perceive the existing relationships and to disclose the entire network configuration. The remaining items of the network scenario are introduced to provide clues about structural restrictions that may influence the actors' relationships, complementing ANT's perspective.

FoodAtYourDisposal's board	FoodAtYourDisposal Platform
• **Relevance:** high (fundamental to deploy and maintain the business) • **Relationships:** restaurants, customers • **Roles:** defines Company's strategy; manages financial viability; supervises operational aspects; manages the interaction between restaurants and customers; develops and maintains the portal • **Goals:** obtain revenues; deliver the food on time; offer a good set of order and reservation choices; allure a high number of portal users	• **Relevance:** high (critical to support the business) • **Relationships:** customers, restaurants • **Roles:** provides features that stimulate the use of the platform; manages portal database; analyses profiles; supplies data to enhance advertising mechanisms; mediates orders request

Network Scenario
• **Present goals:** encourage restaurant participation in the project; offer qualified services; advertise the business; assure customers satisfaction • **Organizational interaction:** the portal acts as a mediator between the restaurants and the customers that intend to request a service; FoodAtYourDisposal establishes agreements with the restaurants • **Existing power relationships:** FoodAtYourDisposal enables the restaurants to advertise their products on-line; FoodAtYourDisposal depends economically on fees it charges to the restaurants; FoodAtYourDisposal established agreements with the restaurants to offer differentiated proposals; FoodAtYourDisposal depends on the number of active customers • **Institutionalized sanctions:** restaurants that do not provide quality services, or do not pay the established fees can be removed from the database; customers that don't pay their bills are not allowed to request more services • **Existing rules:** restaurants should answer the requests as quickly as possible; restaurants must pay the fees on time; users must pay the order to the delivery staff • **Available resources:** computers, network infrastructures, technical knowledge, motorcycles • **Direct rivals:** Not known

Fig. 3. Topics that describe actors and the network scenario

Phase II – Negotiation towards alignment

This phase aligns the interests of the various participating actors (in terms of their contributions and returns), so that the resulting network is balanced and resilient in pursuing the goal set by the focal actors. To help us in this endeavor, we conceived four artifacts illustrated in Figure 4:

- Common Goal Diagram (Cell 1). Inspired by the concept of interessement, it aims to understand how actors can be engaged. With this purpose, it describes how each activity contributes to the overarching purpose of the business model and how individual goals interlock in a solid network of interactions that supports the ultimate objective. For instance, the activity "Order request" receives contributions from other activities, and contributes itself to the network goal.

- Negotiation Diagram (Cell 2). Influenced by the concept of enrolment, it describes the adjustments carried out by the actors to establish a stable network of alliances. This diagram is enhanced progressively as the negotiations to align the various actors' interests demand adjustments. This process is completed, similarly to enrolment, when the actors perceive the proposed business model as their own.

  For the case in analysis, it allows us to recognize the influences that the actor "Customer", who performs the activity "Order request", suffers or exerts on other actors and activities. These influences can be rated on the scale [-3..3]. A negative value means that the actor must spend effort to contribute to the activity, whereas a positive value indicates how much the actor gains. The activities analyzed are the ones directly connected with the Common Goal Diagram (Cell 1). A Negotiation Diagram should be created for each of these activities, as well as for activities that can compromise the achievement of the overarching goal of the business model.
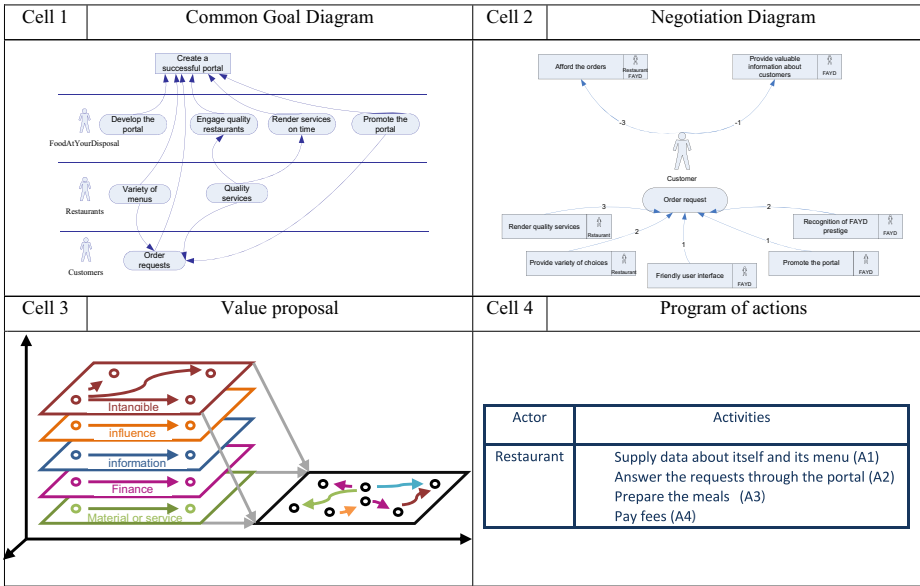
Fig. 4. Artifacts used in the negotiation process

- Value Proposal (Cell 3). It integrates in our approach ANT's principle of following actors' relationships. With this purpose, the diagram describes the value proposals ascertained among all actors in the previous negotiation process. We characterize these value proposals according to several types of flows: materials or services, finance, information, influence and intangible connections (e.g., customer loyalty, and relationships between actors). To enhance readability, the different flows can be represented in layers that can be analyzed in isolation or overlaid. The full value proposal among the actors of FoodAtYourDisposal business model is represented in Figure 5.

- Program of actions (Cell 4). After achieving an alignment of actors' interests and a description of their value proposals, it is possible to specify the activities that they should perform. These activities support the actors' individual goals, and the choreographed unfolding of their roles describes the network behavior. The program of actions materializes the ANT concept of inscription. It represents the first attempt to achieve a stable network configuration and to inscribe actors' requirements into technical artifacts, such as information systems.

Phase III – Assessment of business model stability

After understanding the network of interactions that compose the business model, it becomes necessary to assess its stability. We look for acceptable trade-offs between the effort demanded of each actor and the benefits it gets to ensure their sustained interest in participating, as suggested by ANT's mobilization phase.
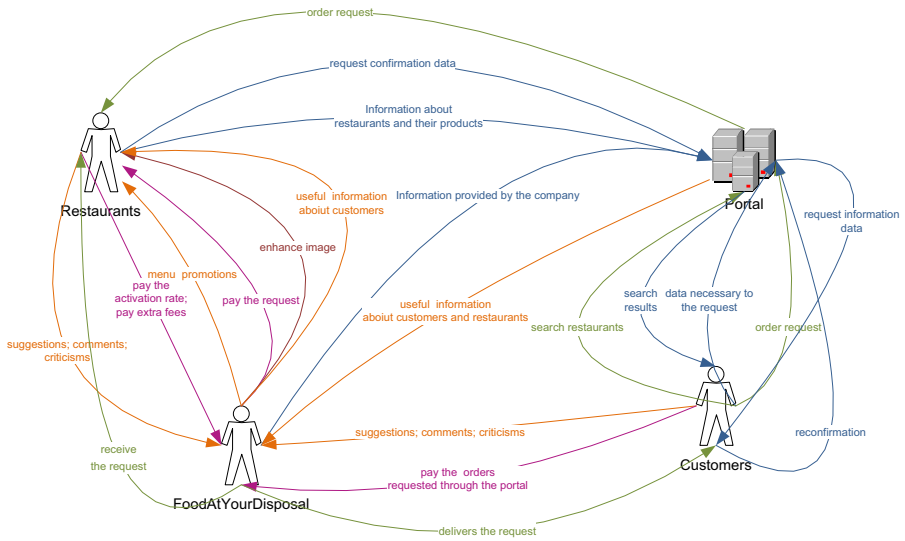
Fig. 5. FoodAtYourDisposal's value proposal

We study network stability and its value proposal configuration from three different perspectives:

- The activities carried out by the actors that contribute to a specific value proposal. It reveals the actors associated with a specific value proposal, clarifying their contribution to the network goals;

- The correlation between value proposals and actors' efforts or gains. Helps detect possible imbalances for each actor, leading to adjustments in the business value proposal if it does not correspond to the actors' expectations;

- The influence among the different value proposals. It anticipates any "domino effects". For instance, an actor can be involved in a particular value proposal that influences positively the value proposals of others. If that actor decides to quit the business, the gains of others could be affected, potentially leading them to reconsider their participation as well.

Besides the described guidelines, special attention should be given to important actors with major influence in the network, such as those who invest considerable time or money, those that hold key resources or capabilities, those with a high degree of influence, those that connect sub-domains (e.g., an actor who works in automobile industry and is a university lecturer), those that cannot be replaced, or those that are central (those located in the position with most connections and relationships). The centrality concept, borrowed from social network analysis, can contribute to enhance the business stability evaluation in our proposal, and we plan to include it in the future (Wasserman and Faust, 2008).

The information gathered in the approach (e.g., actors, activities, and value proposals) allows the definition of the business services and of the activities that the

information system supporting the network should provide. This perspective, based on the concept of business services, offers a high level of abstraction that will establish a connection with the internal business processes implemented by the actors. For the reasons aforementioned, we are considering a mapping to a service-oriented architecture.

6   Conclusions

We presented an approach to help design and assess the soundness of inter-organizational business models. In an iterative negotiation process inspired by ANT, we analyze the interplay of interests of all involved actors from organizational, social, and political viewpoints. As shown, ANT provides clues to develop flexible mechanisms that assist the management of uncertainty and ambiguity in business models. It helps us ensure that each actor gets an attractive value proposal and, thus, becomes committed to the enduring success of the emerging value network. Tracing the activities that the actors must perform to obtain their value proposals also provides indications about the services that must be provided by the information system supporting the network.

References

1. Akrich, M., Latour, B.: A summary of a convenient vocabulary for the semiotics of human and nonhuman assemblies. In: Bijker, W.E., Law, J. (eds.) Shaping technology/ building society, pp. 259–264. MIT Press, USA (1992)
2. Amit, R., Zott, C.: Value creation in E-business. Strategic Management Journal 22(6-7), 493–520 (2001)
3. Baskerville, R., Wood-Harper, A.: A Critical Perspective on Action Research as a Method for Information Systems Research. Journal of Information Technology 3(11), 235–246 (1996)
4. Bouwman, H., Hooff, B., Wijngaert, L., Dijk, J.: Information and Communication Technology in Organizations. Sage Publications Inc., London (2005)
5. Callon, M.: Some elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of Saint Brieuc Bay. In: Law, J. (ed.) Action and Belief: a new Sociology of Knowledge? Sociological Review Monograph, pp. 196–233. Routledge, London (1986)
6. Callon, M.: Techno-economic network and irreversibility. In: Law, J. (ed.) A sociology of monsters? Essays on power, technology and domination, pp. 132–164. Routledge, London (1991)
7. Callon, M., Latour, B.: Unscrewing the big Leviathan: how actors macro-structure reality and how sociologists help them to do so. In: Knorr-Certina, K.D., Cicourel, A. (eds.) Advances in social Theory and Methodology: Toward an Integration of Micro-and-Macro Sociologies, Boston, pp. 259–276. Routledge & Kegan-Paul (1981)
8. Collins, H.M., Yearley, S.: Journey into Space. In: Pickering, A. (ed.) Science as Practice and Culture, pp. 369–389. University of Chicago Press, Chicago (1992)
9. Doherty, N.F., King, M.: The consideration of organizational issues during the systems development process: an empirical analysis. Behaviour & Information Technology 17(1), 41–51 (1998)

10. Gordjin, J.: Value-Based Requirements Engineering: Exploring Innovative e-Commerce Ideas. Free University Amsterdam, Amsterdam (2002)
11. Gulati, R., Nohria, N., Zaheer, A.: Strategic networks. Strategic Management Journal 21(3), 203–215 (2000)
12. Holmström, J., Robey, D.: Inscribing organizational change with information technology. In: Hernes, B.C.a.T. (ed.) Actor-network theory and organizing, pp. 165–187. Liber and Copenhagen Business School Press, Malmö (2005)
13. Latour, B.: Technology is society made durable. In: Law, I.J. (ed.) A sociology of monsters. Essays on power, technology and domination, pp. 103–131. Routledge, London (1991)
14. Latour, B.: On recalling ANT. In: Hassard, J.L.a.J. (ed.) Actor-Network Theory and After, pp. 15–25. Blackwell Publishers, Oxford (1999)
15. Law, J.: Notes on the Theory of the Actor-Network: Ordering, Strategy and Heterogeneity. Systems Practice 5(4), 379–393 (1992)
16. Law, J.: After ANT: complexity, naming and topology. In: Hassard, J.L.a.J. (ed.) Actor-Network Theory and After, pp. 1–14. Blackwell Publishers, Oxford (1999)
17. Lindahl, M.: The Little Engine That Could: On The Managing Qualities of Technology. In: Hernes, B.C.a.T. (ed.) Actor-network theory and organizing, pp. 50–66. Liber and Copenhagen Business School Press, Malmö (2005)
18. Normann, R., Ramírez, R.: From Value Chain to Value Constellation: Designing Interactive Strategy. Harvard Business Review 71(4), 65–77 (1993)
19. Osterwalder, A.: The business model ontology - a proposition in a design science approach. l'Ecole des Hautes Etudes Commerciales. Université de Lausanne, Lausanne (2004)
20. Porter, M.E.: Competitive Advantage: Creating and Sustaining Superior Performance. Free Press, New York (1985)
21. Rose, J., Scheepers, R.: Structuration Theory and Information System Development - Frameworks for practice. In: Smithson, S., Gricar, J., Podlogar, M., Avgerinou, S. (eds.) 9th European Conference on Information Systems Bled, Slovenia (2001)
22. Schmidt, R., Lyytinen, K., Keil, M., Cule, P.: Identifying Software Project Risks: An International Delphi Study. Journal of Management Information Systems 17(4), 5–36 (2001)
23. Stabell, C.B., Fjeldstad, Ø.D.: Configuring value for competitive advantage: on chains, shops, and networks. Strategic Management Journal 19(5), 413–437 (1998)
24. Tapscott, D., Ticoll, D., Lowy, A.: Digital Capital: Harnessing the Power of Business Webs. Harvard Business School Press, Boston (2000)
25. Tilson, D., Lyytinen, K.: Making Broadband Wireless Services: An Actor-Network Study of the US Wireless Industry Standard Adoption. Sprouts: Working Papers on Information Environments, Systems and Organizations 5(3), 137–154 (2005)
26. Uden, L., Francis, J.: Actor-Network Theory for Service Innovation. International Journal of Actor-Network Theory and Technological Innovation, IGI Global, 23–44 (2009)
27. Underwood, J.: Not another methodology: What ant tells us about systems development. In: Proc. of the 6th International Conference on Information Systems Methodologies, Salford, UK (1998)
28. Wasserman, S., Faust, K.: Social Networks Analysis: Methods and Applications. Cambridge University Press, New York (2008)
29. Wiener, P.P. (ed.): The Dictionary of the History of Ideas: Studies of Selected Pivotal Ideas. Charles Scribner's Sons, New York (1974)