IDENTIFYING RUPTURES IN BUSINESS-IT COMMUNICATION THROUGH BUSINESS MODELS

Juliana Jansen Ferreira, Renata Mendes de Araujo and Fernanda Araujo Baião

Research and Practice Group in Information Technology (NP2Tec), Graduate Program in Informatics (PPGI)
Federal University of the State of Rio de Janeiro (UNIRIO), Av. Pasteur 458, Urca, Rio de Janeiro, RJ, Brazil

Abstract: In scenarios where Information Technology (IT) becomes a critical factor for business success, Business-IT communication problems raise difficulties for reaching strategic business goals. Business models are considered as an instrument through which this communication may be held. This work argues that the business model communicability (i.e., the capability of a business model to facilitate Business-IT communication) influences on how Business and IT areas understand each other and on how IT teams identify and negotiate appropriated solutions for business demands. Based on the semiotic theory, this article proposes business model communicability as an important aspect to be evaluated for making Business-IT communication cycle possible, and describes an exploratory study to identify communication ruptures in the evaluation of business models communicability.

1 INTRODUCTION

The fast evolution of current organizations demands Information Technology (IT) and Business areas to be aligned, so that changes and information systems (IS) evolution may occur in a more efficient way, without great impacts for the organization business outcomes. The combination of unplanned IT development and the dynamic changes of business strategies are turning the IT support to business inefficient and chaotic, damaging the alignment between them (Barjis, 2008) (Plazaola et al, 2006) (Ekstedt et al, 2005) (Marques and Sousa, 2003).

In order to transform a business need into an IS specification, the organizational context where that need was identified must be known both by IT and business areas. This organizational context comprises, among others: its activities, the information handled during activities execution, the business rules applied, IS already supporting the business activities. Great part of this information may be understood and represented through the use of business models (Ericsson and Penker, 2000) (Sharp and Mcdermott, 2008).

Business and IT alignment depends on a number of components, one of them being communication (Luftman and Kempaiah, 2007). The Business-IT alignment can be achieved when both areas have the same understanding about the business context. Business models are considered as an instrument through which IT area can share the same understanding of the business area of their working contexts (Barjis, 2008). Research indicates the use of business modeling as a facilitator of communication for IS specification, helping the interaction between the stakeholders, both from business and IT parts, business analyst and IT analyst (Barjis, 2008) (Barjis et al, 2006) (Yu, 2005) (MacKnight et al, 2005) (Bittencourt and Araujo, 2008) (Cruz, 2004) (Van der Aalst and Dehnert, 2004). The IT analyst needs to understand the business reality so he can specify a IS capable to support that business needs.

Considering the business model as a means through which this the communication between business analyst and IT analyst takes place, the capability of a business model to facilitate the communication (which we will call *communicability*) may be considered as an important feature for Business-IT alignment to be effective. The main issue here is how to improve the understanding of the business context by the IT analyst so that he/she can specify ISs aligned with business contexts represented in business models. IS specification, in this work, concerns the

identification of main IS functional requirements and data conceptual models.

This research proposes the use of Semiotics as an approach to the evaluation of business models communicability. Semiotics, which is applied and discussed in many areas of research as psychology, anthropology, and philosophy, is the study of signs, the relation among those signs and what they mean all together (Pierce, 1958) (Chandler, 2002). With this purpose in mind, semiotics concepts are applied.

This research proposes the application of semiotics concepts to business models, considering those models as a set of signs and its relations that have meaning for those who model, who analyze or use the models as a communication instrument. In this research case, the focus is the business model as the message being communicated by the business analyst to the IT analyst to specify IS, helping on the interaction between the stakeholders from IT and business parts. This work also proposes the definition of communication ruptures, as defined by the HCI (Human-Computer Interaction) area semiotic theory - Semiotic Engineering- to evaluate the communicability features in systems interfaces (De Souza, 2005) applied to business models communicability evaluation.

This paper discusses the how to conceptualize business models communicability, taking the semiotics concepts as foundation. This paper also presents an exploratory study from which a set of communication ruptures could be identified when a business model is used as a reference to specify IS. The search for communication ruptures aims at evaluating the communicability features of business models. The specific points of the business model where communicability needs to be improved are identified. Also by knowing the kind of communication problems that a business models might present, some actions can be taken even at modeling time, when the business models are being designed. This way, the business model has a higher probability to be a powerful communication instrument for Business-IT alignment.

This paper presents at section 2 the concepts of business modeling as its relation to IS specification. Section 3 presents the concepts of semiotics and its application. Section 4 defines communicability for business models. Section 5 presents an exploratory study on evaluating business model communicability, analysis and considerations. Section 6 presents a list of preliminary communication ruptures identified during the exploratory study. Section 7 concludes the paper and outlines the following steps of the research.

2 BUSINESS MODELS FOR INFORMATION SYSTEMS SPECIFICATION

Business modeling may have different objectives. Some approaches focus on business process improvement (Yu, 1995), others consider the need to identify requirements to develop IS that support the business models (MacKnight et al, 2005) (Bittencourt and Araujo, 2008) (Cruz, 2004) and others consider business model automation. (Van der Aalst and Dehnert, 2004) (Iendrike and Araujo, 2001). At the present research, the business model is understood as an instrument to support the communication between the stakeholders of an IS implementation, business analyst and IT analyst (Figure 1), when there exists a business context and need which demands IT solutions and support.
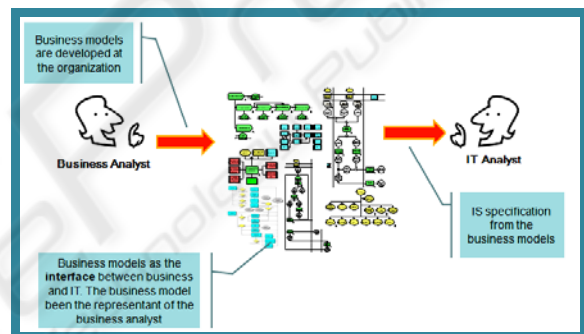

Figure 1: Business models as instrument of communication between business and IT.

The communication we focus is the one taking place when an IT analyst specifies an IS using the business model as the representation of how business occurs. In this situation, the business analyst, who modeled the business, is trying to communicate the business context where the IS should be inserted to the IT analyst. In this way, we can consider that the IT analyst interacts with the business analyst through the business model.

There are several methods for specifying IS from business models (Barjis, 2008) (Yu, 2005) (MacKnight et al, 2005) (Bittencourt and Araujo, 2008) (Cruz, 2004) (Van der Aalst and Dehnert, 2004). All of them present the following premise to be successfully executed: the business models must communicate to IT analyst what is necessary to the IS specification that will support that business model. The business models must communicate the business context, presenting what the business analyst would inform to the IT analyst so the IS

specification could be aligned with the business needs.

Therefore, it is important to evaluate if the business models that are being produced can be an effective communication instrument for specifying IS. The subject of evaluation would be the business model communicability, not the model itself. Its communicability can be identified and evaluated when the IT analyst is using the business model in order to specify the IS.

This communicability evaluation should be able to identify **communication ruptures** - the moments when the business model was not able to communicate, or some miscommunication occurred. The number and type of the communication ruptures resulting from this evaluation could be used as input for improving the business model regarding its communicability feature towards being a better communication tool between business and IT (Figure 2). This work attempts to identify a set of communication ruptures which can be further used both as reference for communication evaluation methods as well as guidelines for the definition of business modeling heuristics for communicability .
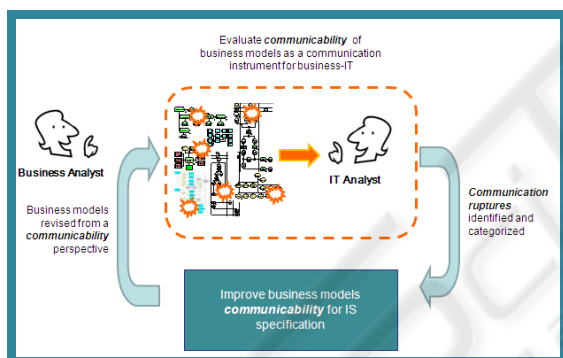

Figure 2: Business model communicability evaluation providing improvement business-IT alignment for IS specification.

3 SEMIOTIC THEORY AND ITS APPLICATION

Semiotic is a multidisciplinary theory related to various areas of knowledge such as psychology, anthropology, philosophy, linguistics and others; where questions about signs, its relations and its communicability are the focus. A sign is "something that stands for something, to someone in some capacity" (Peirce, 1931). It may be understood as a discrete unit of meaning, and includes words, images, gestures, scents, tastes, textures, sounds – essentially all of the ways in which information can

be communicated as a message by any sentient, reasoning mind to another). Semiotics is related to the human impressions of the meaning of things in the world, but also has the concern with the communication (intent) held with the use of those signs and its relations (Eco, 1976) (Chandler, 2002).

Pierce (1958) defines signs as a triad: representation, reference and meaning. The representation is how the sign is presented, the reference is related to the existence of the sign at the real world and the meaning is the interpretation (semantic comprehension) that people built in their minds when they are exposed to a representation of a reference. From a semiotic perspective, it does not make sense to mention representation without mentioning reference and meaning do not make sense.

One example of the application of semiotics is the Semiotic Engineering, a research field of the HCI (Human-Computer Interaction) area. The Semiotic Engineering emphasizes the ability of designers to communicate their intent through interactive interface discourse (De Souza, 2005). In Semiotic Engineering, a method to evaluate and enhance interaction in software applications (the communicability evaluation method) was developed. Using heuristics identified at the HCI area, those methods are used for identifying communication ruptures so that the interface communicability can be improved. The communication ruptures identify the points where the interface can be improved towards a more communicative interface (De Souza, 2005).

Applying the semiotic theory and its concern about the communication held with the use of signs and its relations to business models, the signs and relations that composes those models have a communicability feature that can be investigated and evaluated so that the business models may be effectively used for communication. Communication ruptures, as defined by HCI Semiotic engineering, may be applied to business models, those work as the interface between the business analyst and the IT analyst where the communication for an IS specification can be held.

4 COMMUNICABILITY OF BUSINESS MODELS

Applying the concept of communicability to business models for IS specification, we define **the Communicability of a Business Model** *as the capability of a business model to facilitate the*

communication between business analyst and IT analyst during an IS specification.

We argue that business model communicability directly influences the ability of an IT analyst to understand the business model as it was designed by the business analyst. If the IT analyst understands the business context represented by the business model, the probability that he/she elaborates an IS specification aligned to the business needs increases.

The need to evaluate the communicability is also identified for business models. As the business analyst is the designer of the communication of business models, the messages to the IT analyst must be evaluated, looking for communication ruptures which can be inputs for the business model communicability improvement.

A communication rupture of a business model is the identification of a point in the business model, where it was not able to communicate, or otherwise the communication was incomplete or incorrect of any information or understanding necessary for the specification of the IS. Ruptures are identified during the interaction of the IT analyst and the business analyst through the business models. Ruptures can be categorized into temporary and permanent. Temporary ruptures are those solved by the end of the interaction, either by finding some additional information or by understanding something that was not clear at first. Permanent ruptures are those that remain unsolved by the end of the interaction.

Being aware of communication ruptures, a communicability diagnosis of business models for IS specification can be formulated and used as the input for improving business model communicability.

During this research, no communicability ruptures for this context were found in literature. Therefore, our research strategy was to perform exploratory studies to identify an initial set of communication ruptures, as described in the next sections.

5 THE EXPLORATORY STUDY

An exploratory study was performed to observe and investigate communication ruptures between IT analyst and business analyst through the business model, while the IT analyst tries to specify an IS. This study domain is related to a process of real estate management. The business context is of a large organization that needs to manage its real state assets, regarding tax payment; ownership regularization, real estate documentation (like real estate writ, environment taxes, and ownership

transfers), real estate documentation and taxes pendency. The exploratory study scenario was defined as follows:

- IT analyst profile – the IT analyst selected for the study is skilled in IS specification but has little experience on business modeling.
- The observer – the observer was an IT analyst with business modeling experience. The observer also had experience on communicability evaluation related to HCI. The observer objective was to identify and register the communication ruptures during the study.
- Tasks to perform – the IT analyst was asked to elaborate a class diagram and a use case specification (both in UML notation) from the business model. The final artifacts presentation was chosen by the IT analyst, so it would not be a difficulty factor that could cause false communication ruptures.
- Business model presentation – the business model was represented in a document called "business process book", or simply the "book". The book is a document composed by process flows, processes and activities descriptions, elements descriptions as documents, business rules, input/output informations; and business terms. This representation format was well known by the IT analyst, so this was not a difficulty factor that could cause false communication ruptures.
- Business models domain – the business models domain chosen for the study was known by the IT analyst. The domain is related to management of real estate assets of an organization, treating properties documentation, history and regularization.
- Business models types – the main models used on the study were the eEPC (Extended Event-Driven Process Chain), that represents the business process workflows, and the FAD (Function Allocation diagram) that details one activity considering its input/output information or artifacts, its ator and any other relevation information (IDS Scheer, 2003).

The idea while defining the exploratory study scenario was to prevent other factors to cause communication ruptures during the study and influence on the results.

5.1 Execution

The first task performed by the IT analyst was the class diagram elaboration. The researcher asked the

IT analyst to narrate what she was thinking while elaborating the class diagram, so the rationale evolved through the task execution could be also a subject to consider on the investigation. The IT analyst decided to draw the diagram using paper, pencil and eraser.

The IT analyst started the task searching for the classes that would compose the diagram. The IT analyst narrated that she searched for domain concepts on the business model used for the study. She explored the business process book (the book) looking into the process and activities names and descriptions, trying to identify the domain concepts. During this task, at some moments, the IT analyst had doubts related to the domain concept's candidate: *"Is this a domain concept for sure?* **What does it mean?"** This kind of questioning happened more than once; sometimes the answer was discovered right away by another description or model presented in the book (*"Yes, this is a domain concept!"*), but in other times the question remained and the IT analyst decided to consider the concept as a domain concept or not, but without confirmation of the business model (*"I'm not sure, but I think this is it!"*).

The IT analyst reported that she preferred the textual description to the graphical one (Table 1), due to her little experience on business modeling. The IT analyst knew that there was a graphical presentation of the business model, but she choose to use the textual: *"I prefer the textual description to the graphical one because I still do not easily understand the notation and since I know that the textual description reflects the graphical one, I feel more comfortable using it."*. But when she needed to know the actors of the processes, she used the graphical models: "*It is easier to visualize!*". The actors of the process are described by text but also represented at the graphical model. The textual description was an alternative way to identify the actors. She said **"No, thanks."** and used the graphical model to get the understanding that she needed about the process.

The IT analyst looked for relationships and candidate methods on the process and activities description. Some doubts related to relationships were narrated: "*What composes a real estate history? Which are its attributes? Where is this information?* **Where is it?**" Looking further into the book, she found an activity related to *real estate history analysis*. By this activity description, she found the answer for her questions about *real estate history*.

While going through the descriptions, the IT analyst noticed that there were some *documents*

Table 1: Textual and graphical description examples of a business process activity (FAD – Function Allocation Diagram).

Graphical description

Textual description
The real estate manager updates the real estate history according to the pendency resolved.
The required information is the real estate history (identification number of property, general plan, specific plan, space, order, design, block, lot number of the expropriation, the date of expropriation, housing code, registration, name, area, width, length, value of writing, neighborhood, owner) and the list of real estate pendency (real estate pendency descriptions).
The generated information is the real estate history (identification number of property, general plan, specific plan, space, order, design, block, lot number of the expropriation, the date of expropriation, housing code, registration, name, area, width, length, value of writing, neighborhood, and owner) updated.
The activity receives/ produces as input/ output the real estate history register (containing the real estate history).

related to the process modeled, but she was not able to define if those documents could be treated as a generic class. Since she did not found enough information at the book, she decided to treat the documents into a generic class associated to the *real estate* class: *"Since I cannot be sure, I will do this way.* **For me, this is it."**

While still looking for the *documents* related to the process, the IT analyst identified a document but did not fully understand what that *document* was: *"* **What is it?** *What is a feedback document?"* Then she located the details of a *feedback document* on the activity "*Elaborate feedback document*". The name of the activity helped her. She used the graphic model to locate the activity then looked the details on the activity description.

The IT analyst reported that some relationships of the class diagram were defined based on the analyst tacit knowledge of the business domain. This was not explicit in the book.

While looking for relationships among concepts, there were doubts about the relation among *real estate manager*, *real estate* and *real estate pendency*: *"Is the property manager also responsible for the property pendency?* **Is this it?"**

The class diagram elaborated changed during the

book exploration due to new information found while reading the book, which changed the way the IT analyst understood concept definitions: "*Oops! This is not what I thought it was. Let me change the diagram.*

While looking for possible methods for the class diagram, the IT analyst questioned about the relations between class methods and activities. She narrated that sometimes the method would have the same name as the business activity, or some very similar one (for example "*Search for real estate information*") but she was not sure about this association: *"What now?" How can I be sure about this association?* "She decided about some methods for the class diagram but the question about the association remained. At the end, to be able to finish the class diagram, the IT analyst took some decisions by herself: *"For me, this is it."*

The analyst narrated that *estate pendency* and the *solution of real estate pendency* seems to have a relationship but it was not clear for her. She looked through the book hoping to find some information that could clarify this relationship but with no success. So she decided to leave this relationship off the class diagram: *"I give up! I do not know if this relationship should exist or not so I will leave it as it is, with no relationship".*

While analyzing an activity, the IT analyst noticed that according to the activity name, the graphic model should be missing an element: *"Where is it?"* So she looked at the activity description and confirmed what she thought, that an object should be represented as a product of the activity. The graphical part of the model caused the temporary rupture.

The analyst reached the final section of the book where part of the elements used on the business models is consolidated in a table with their description. At this section are presented documents, informations, business rules, systems and business terms. The IT analyst used this section as reference to define the attributes for the classes defined in the diagram.

5.2 Discussion

The IT analyst made some inferences during the exploratory study because she had previous knowledge of the business domain to which the processes were related and also because she knew the structure of the book.

In general, the IT analyst used the textual description as reference for elaborating the class diagram, but the study gave an opportunity to observe that even though she reported that she prefer

using the textual description, many times she reported questions and rationale regarding the graphical models. The graphical models were used when an overall contextual understanding was needed.

Each IT analyst might take different steps to reach the same class diagram. Therefore, it is not possible to predict the possible steps that an IT analyst could follow during his interaction with the business model. By knowing the possible steps, the observer could question the IT analyst about other decisions or choices that were not narrated during the evaluation, remaining at the IT analyst tacit knowledge. This may hide the observation of the task execution, causing false communication ruptures or misleading the IT analyst, hiding some real ruptures. Another finding regards the "finish point". The completion of a class diagram is subjective for each IT analyst. The parameter for defining a class diagram as complete should be defined by the organization, and each IT analyst should determine what is a complete class diagram to start an IS specification.

The communicability of business models improvement is one resource to business and IT alignment. The communicability feature of business models does not eliminate other kinds of communication between business analyst and IT analyst. The business model communication could be a more robust starting point for business-IT discussions about the new IS to be specified, once the business models communicability was addressed since the modeling phase.

Some benefits regarding business models quality were observed during the communicability evaluation. While evaluating communicability, some prospective business model quality improvements were observed related to quality issues identified at the business models. Other effects were related to the prospective of evolving business model towards an IS specification oriented model. Some IS specification needs were not presented at the models used as reference, the IT analyst needed to infer about some points. If the business models represent some IS specification needs more clearly, the business model-IS specification process could be benefited.

6 PRELIMINARY COMMUNICATION RUPTURES

Based on the exploratory study, some

communication ruptures could be identified.

What does it mean? This kind of questioning happened more than once; sometimes the question was answered by looking further into the business process book, making this communication rupture a temporary one. But sometimes the questioning remained and the IT analyst decided how to proceed, making the communication rupture permanent: ***For me, this is it.***

No, thanks. The IT analyst was aware that there was other option to get the information she needed, but she chose the way that was more familiar to her or worked better at a given situation or need.

Where is it? This communication rupture had temporary and permanent instances. Sometimes, the understanding needed was found looking further into the book, or even by analyzing the graphical model, but sometimes the IT analyst did not found what she was looking for, and left the class diagram without the complete information. There was one occurrence where the graphical model caused the rupture, but the description plus the IT analyst domain knowledge prevented the rupture to be permanent.

For me, this is it. This communication rupture was identified when the IT analyst decided how to proceed without any basement of the business process. The IT analyst made a decision by herself.

What is it? This communication rupture was only identified as a temporary rupture. The IT analyst found what she needed by looking further into the book and the question was answered.

Is this it? This communication rupture was identified a couple of times and it was a kind of rupture that did not have a solution. It was a permanent rupture because the book, where the business process was present, was not able to communicate enough to answer the question narrated by the IT analyst.

Oops! This communication rupture presented a "change of mind" of the IT analyst once she had more understanding about the business process. She defined the class diagram in a way and after getting more knowledge from the book; she changed the diagram according to what she had learned from it. It was a temporary rupture, since by the time the diagram was finished, the IT analyst had a better understanding of the business process and was able to change the class diagram to reflect it.

What now? This communication rupture remained a rupture by the end of the class diagram elaboration. The IT analyst did not know how to proceed, making the communication rupture permanent: ***For me, this is it***.

I give up! This communication rupture is a very serious one because the class diagram missed

information because of lack of communicability of the business model.

The list of ruptures identified during the exploratory study described above will be compared with the list of ruptures identified on other two exploratory studies and then the consolidate list from the exploratory studies will be verified on study cases using real business models.

7 CONCLUSIONS

Business models are considered a valuable instrument through which Business-IT alignment may be improved, and in this context the communication between these areas is a very important issue to address, and yet not solved in the literature.

We define the *communicability* of a business model as its capability of facilitating this communication. To evaluate business model communicability, this work proposes an approach, based on the Semiotics Theory; to identify communication ruptures in business models during IS specification.

We conducted an exploratory study which resulted in a preliminary list of communication ruptures that can be used as reference to define potential heuristics of business model communicability. Heuristics or recommendations for business model modeling, considering it as the communication from business to IT, could be defined to be used by the business analyst when designing business model with the intent of supporting IS specification. The communicability concern would be addressed during the business modeling phase, increasing the communicability potential of business models regarding IS specification.

Some of those ruptures were observed more the once at the same study, which strengthens its possibilities to really be a communication rupture that can be generalized and used as a criteria to evaluate business model communicability.

The issues related to the subjectivity of an IS artifact elaboration; possible ways to elaborate and the "finish point" of an IS artifact; need to be taken under consideration for the following exploratory studies to investigate if those issues can impact the business model communicability. The IS artifact elaboration has an interpretative factor that need to be investigated and treated.

As future work, two more exploratory studies are planned with different IT analysts. After those studies, the results of the three exploratory studies

will be compared to consolidate a set of generic communicability heuristics that could be used to evaluate business models for IS specification.

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