Defining Context in a Business Process Collaborative Elicitation Approach

Douglas Machado Silva  
Renata Mendes de Araujo  
Flávia Maria Santoro  
Programa de Pós-Graduação em Informática – PPGI  
Núcleo de Pesquisa e Prática em Tecnologia – NP2Tec  
Universidade Federal do Estado do Rio de Janeiro - UNIRIO  
Rio de Janeiro, Brazil  
[douglas.machado, renata.araujo, flavia.santoro]@uniriotec.br

Abstract— Business process elicitation is usually performed through stakeholders interviews where the process analyst has the person interviewed as the main source of information. Relevant information obtained by other analysts that can help or even redirect the interview may be unknown or ignored by the analyst at this moment. This fact can lead to quality and productivity loss when building the process model, due to the occurrence of conflicts or understanding gaps among the analysts. This paper proposes a context information model to be used by a collaborative and context-based process elicitation supporting tool. It is expected that context management allows relevant information previously elicited to be shared and recommended during a new interview.

Keywords- collaborative process elicitation, context management.

I. INTRODUCTION

Business process models are considered a source for process improvement projects, redefinition of business strategies and specification of information systems requirements. Therefore, they are gaining increasing importance to organizations [1, 2, 3]. The elicitation of process is a highly collaborative activity of knowledge-building and resolution of conflict/ambiguities.

Business processes in organizations are run by different people, often in different places of the organization, including geographically distant locations. In this scenario, collaboration in the elicitation process becomes even more important. Several techniques are used to discover and elicit business processes. Among the various approaches [1,2,4,5,6,7], interviews are the most practiced [1]. During the interviews, the main source of information about the process is the interviewee. The executors of the process are interviewed at different times, possibly by different analysts.

Regardless of the technique used, the elicitation process cannot be carried out without activities for consolidation of the information. In this consolidation, the information obtained by different analysts, using different techniques, should be gathered and organized, as well as possible conflicts should be solved. The result of this consolidation is reflected in the process model built, which is common knowledge obtained in the elicitation.

The consolidation activities, depending on the complexity, importance and scope of the process in focus, can cause difficulties both in productivity and the quality of the final model. Regarding productivity, the consolidation phase may present conflicts making it necessary to return to the sources of information, consuming time and causing delays. Regarding quality, the approaches generally treat only part of the information - personal views, records, documents, application logs. Even if the analyst gathers all the information available to conduct the elicitation, he is faced with the problem of identifying the relevance of the information from these various sources, which may limit his vision and generate process models incomplete and/or inconsistent.

To partially address these problems, in [12], we proposed a collaborative process elicitation approach, where the analyst elaborates a sketch of the process model during the interview, supported by a collaborative tool on a mobile device. The application allows the access to sketches made by other analysts within the project. However, for this approach to be more effective, we observed through an exploratory case study that there is a need to filter the information to which analysts have access.

As a result, this paper discusses a context management approach in order to ensure that the analyst has access to relevant information already raised by other analysts at the time he conducts the interview. This way, he can anticipate or facilitate the consolidation phase.

For the context management to be adopted, initially there must be mechanisms to represent the context. This paper defines a model of context to be used as a basis for context management tools to support the collaborative process elicitation presented in [12]. The paper is organized as follows. Section II discusses the main scenario that motivates the use of this approach. Section III presents the concept of context management. Section IV describes the context management proposal. Section V presents the requirements of a support tool. Section VI concludes the paper.
II. Scenario

Process elicitation interviews are usually performed at process participants’ workplace. Depending on the number of participants and their geographic locations, the elicitation may be performed by a team of analysts. Each analyst collects information, registering it in paper, software, audio or video, and also having internalized some tacit knowledge.

Using interview techniques to business process elicitation is an activity that requires two types of collaboration: analyst-interviewee and analyst-analyst. The interviewee collaborates with analyst sharing the information about process enactment, and analysts collaborate among them, consolidating the information gathered.

Conducting interviews with different process participants can help a broader understanding of the business domain, especially if they perform different roles in the process. However, participants may have limited or even conflicting views of the process. Furthermore, participants with their distinct points of view can induce the analyst to have an incomplete or even wrong interpretation of the concepts and ways of process execution.

In this scenario, the group of analysts must meet after interviews in order to share the information gathered. From this meeting, doubts and information gaps can be addressed and a process model is built. Since the consolidation of information only happens after the interviews, the consequence can be delays or even quality loss in elicitation. If a high number of inconsistencies or doubts are identified, analysts may have to perform new interviews to solve them.

To address this problem, one possibility is that the analyst could bring to each interview session all the information already obtained by the team. However, accessing all the information at the moment of the interview can harm the interview flow, since not all of it will be useful. Anyway, the problem relies on how to identify the relevance of the information available, as depicted in Figure 1. The information about the elicitation is available without enough understanding of its relevance, bringing obstacles to the analyst to access valuable information in the moment of the interview.

The problem of having difficulty to access relevant information has been investigated through an exploratory study performed with four undergraduate students in our university. In this study, students played the role of process analysts and interviewed process participants in the university context. Each pair of students interviewed a different person in different places using a mobile device and an application as described in [12].

The exploratory study showed that, although allowing participants mobility and share of information about the interviews, conflicts and limited viewpoints about the process arose. They reported that they had extra effort to identify what would be relevant information among those shared by the tool as well the need to communicate in real time with their partners to check for inconsistencies or solve doubts.

This work argues that if this collaboration can be associated to a context management approach, it is possible to analysts to have access to relevant information among those shared by the team.

III. Context Management

Context is described by [13] as “everything that is relevant for a tool or its users about a given situation” or “any information that can be used to characterize the situation of an entity”. The entity in this case can be a person, a place or an object that is considered relevant for the interaction between the user and the application, including the user and the application. Context cannot be separated from its use [18]. In [14] it is highlighted that the information about the context of past activities performed by a group can help its members to understand the current situation.

Context only exists in a given focus, for instance, when a person performs a task or any problem solving activity is under execution. At this moment, three types of knowledge related to context [18] emerge: the proceduralized context, the context knowledge and the external knowledge. The proceduralized context is the one that is directly related to the focus and is used in the execution of the task. Contextual knowledge is not directly used but is available to be retrieved while the focus changes. The external knowledge is all the other knowledge that is not relevant to the current focus.

Since context is directly related to focus, it changes dynamically through time and that is where context management activities are needed. The basis for context management is to define explicit what is context in a given situation. In [17] it is proposed the use of contextual graphs to model the different types of context information.

Contextual graphs represent the actions to be performed (by a person or an application) according to context. Figure 2 shows an example of a contextual graph [17] and its notation. Circles in the graph represent contextual elements. Conditions (C 1.1, C 1.2...) indicate possible values for these elements. Each branch or path in the graph will lead to the execution of a given action, represented by rectangles. In order to illustrate this notation, let’s take the Sales domain for instance. A sales clerk that is selling an electronic product may change his
sells a product according to the technical background of the customer, as talking about technical specifications with the customer who has a high level of technical knowledge about the product and talking about pricing and customer support with the one who doesn’t know the technical terms. In this case, the contextual element could be “technical background” and the conditions could be “high level of technical knowledge” or “low level of technical knowledge”. The action for the former condition could be “show the technical specification” and “talk about pricing and customer care” for the last condition. In contextual graphs, the reasoning involved in the proceduralized context is represented by the path followed in the graph according to the flow of actions (changing focus).

Figure 2. Example of a contextual graph [17]

IV. CONTEXT MANAGEMENT IN A BUSINESS PROCESS COLLABORATIVE ELICITATION APPROACH

The elicitation approach adopted is based on interviews, when analysts collect information about the process with business people, while they build sketches of the process model using an application on a mobile device. The sketches of process made by the analysts during the interview are very simple; just three elements of the BPMN metamodel [19] are used: start and end events, activities and gateways. The central idea is that analysts can share sketches that contain relevant information for the interview that is being conducted at the moment.

Context management can help the identification of relevant information already obtained about a process, reducing the need of second interviews and improving meeting productivity. The main idea is that it is possible to capture the context that surrounds information about the process when it had been obtained during an interview. While conducting a new interview, other analysts could retrieve relevant information based on his current context and the context from previous interviews in order to have a broader understanding of the process, avoiding incompleteness; solve doubts; or anticipate possible conflicts of understanding about the process being elicited.

A. Contextual elements

To be captured, stored and used, what is context in a given situation must be defined and modeled [15]. Considering a business process elicitation approach described, this work argues that the elements that characterize a specific context are the ones shown in Table 1. Although context cannot be completed described [18], this work argues that this set of information would be a first attempt to provide business process elicitation with contextual elements. It focuses on the possibility to effectively make recommendations of previous made sketches during process elicitation interviews to avoid conflicts, to clarify concepts and to avoid information inconsistency.

Table 1. Contextual elements for a sketch made during an interview

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td>Any term from the domain</td>
</tr>
<tr>
<td>Interviewee</td>
<td>Process participant/stakeholder being interviewed</td>
</tr>
<tr>
<td>Position</td>
<td>Interviewee position in the organization structure</td>
</tr>
<tr>
<td>Role</td>
<td>Interviewee role in the process</td>
</tr>
<tr>
<td>Place</td>
<td>Physical place where the interview takes place</td>
</tr>
<tr>
<td>Term was viewed before</td>
<td>Indicates if the term definition was ever seen by the analyst</td>
</tr>
<tr>
<td>Sketch was viewed before</td>
<td>Indicates if the sketch was ever seen by the analyst</td>
</tr>
</tbody>
</table>

Besides the general interview context, a term used in a sketch defined by an analyst also has its own contextual elements associated, according to Table 2.

Table 2. Elementos de contexto dos termos

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Description of a term or activity</td>
</tr>
<tr>
<td>Counter-definition</td>
<td>List of terms that do not be Express the same concept, but could be misinterpreted</td>
</tr>
<tr>
<td>Example</td>
<td>Examples that illustrate the term</td>
</tr>
<tr>
<td>Authorship</td>
<td>Author of the term definition</td>
</tr>
<tr>
<td>Occasion Definition</td>
<td>This is the occasion when the term definition was obtained</td>
</tr>
</tbody>
</table>

B. Reasoning

This section shows how the context elements described above can be used to reason about context using contextual graphs [17]. There are two main reasoning objectives in this scenario: 1) to manage the context in order to help the analyst to complete his understanding about something he is registering about the process; 2) to manage the context in order to anticipate possible conflicts of understanding. Considering these two objectives, the actions in the contextual graph would be recommendations about previous information captured in similar contexts.
For a given situation (context) a set of recommendations can be done. Moreover, their relevance can change according to the context. Therefore, recommendations are ordered by priority or importance, receiving a different weight value (referred as ‘ranking’ in the graph), depending on the path followed in the graph. Additionally, each recommendation is classified according to its objective: to complement the analyst understanding or to avoid conflicts.

The contextual graph for this proposal is depicted in Figure 3 and is detailed in Figure 4. Each term registered by an analyst starts a new instance of the graph (1). If this term had been used in a previous interview, and it has an associated definition, this means that this term/definition has the potential to be relevant to the analyst. In this case, the proceduralized context of this situation is instantiated to “Exists” (there is a previous definition to this term).

The first element of the contextual graph refers to the term informed by the analyst. During the interview, while the analyst elaborates the sketch of the process, if he/she uses a term that has been registered before in other interviews (ie, present in other sketches) and also, it has a definition associated to it, then this information may be relevant. In this case, the instance to the contextual element (1) is “Exists”. In other words, no definition for the term registered.

If the term had been already retrieved by the analyst (3) “Term ever viewed by analyst?”, no recommendation is made. Otherwise, if the answer is “No”, a recommendation to read the term definition is noticed. This recommendation can be classified depending on who had been the author who defined the term (2). If the author had been the same interviewee, this means that this definition is important to make the analyst aware of it to better communicate with his interviewee. Actions (4) and (5) comprise the assignment of high priority (ranking 1) to this recommendation to clarify the analyst understanding.

Even if the authorship of the definition is a different person, this information is still useful to complete the process understanding if the author has the same position in the organization than the person being interviewed, if he performs the same role in the process, or if he works in the same place (context elements 7, 6 and 9, respectively). If these conditions are different, there is a potential for conflicts in the term definition. In this case, there is the space to recommend this complementation in a higher value (context elements 22 and 23), anticipating conflicts, ambiguity and inconsistency.

During the interview, the context can change, if any analyst in the field is working during a different meeting elsewhere. Therefore, the information registered by this analyst can also be recommended. Additionally, any information registered by the analyst also makes the context to change.

On the other hand, if the analyst has consulted the information, but did not see the definition of the term (or term did not have a definition associated), then the sketch must be recommended. However, the priority of this recommendation is no longer the same, since the information has already been seen by the analyst. In this case, the recommendation is still made, but with a lower priority.
To illustrate the approach, Table 3 presents a scenario in the field of beer brewing. This scenario represents the moment when the analyst was building the sketch during the interview and typed the term bottling and the context information produced at the time. At this point, the analyst might ask: "Is there a definition for the term "bottling" in a similar context of the interview being conducted?"

By writing the term “bottling” the context of the interview shown in Table 3 is compared with the context of all the sketches already registered. Table 4 presents an example of a sketch that could have been stored, answering the question of the analyst.

For the example presented in Tables 3 and 4, the corresponding path in the contextual graph would be: 1, 3 and 2. Thus, the sketch would be considered suitable for complementation of understanding with the highest priority (actions 4 and 5 of graph).

<table>
<thead>
<tr>
<th>Contextual element</th>
<th>Instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td>Bottling</td>
</tr>
<tr>
<td>Interviewee</td>
<td>John Smith</td>
</tr>
<tr>
<td>Position</td>
<td>Production supervisor</td>
</tr>
<tr>
<td>Role</td>
<td>Monitoring the bottling</td>
</tr>
<tr>
<td>Place</td>
<td>Hangar 15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sketch context example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Term</td>
</tr>
<tr>
<td>Interviewee</td>
</tr>
<tr>
<td>Position</td>
</tr>
<tr>
<td>Role</td>
</tr>
<tr>
<td>Place</td>
</tr>
<tr>
<td>Term was viewed before</td>
</tr>
<tr>
<td>Sketch was viewed</td>
</tr>
</tbody>
</table>

V. COLLABORATIVE APPLICATION SPECIFICATION

A context management approach is usually associated with some application or system, which is called context-aware application. These systems are able to adapt their operations to the current context without explicit user intervention [16]. Thus, a context-aware tool that uses the context to recommend relevant information about process elicitation was specified.

The approach proposed in this paper is based on the collaborative diagramming described before in [12]. The team of analysts share sketches of diagrams constructed during interviews making use of mobile devices, such as tablets. The software tool used, the Netsketcher, is essentially a diagram editor. We argue that that this type of tool allows a balance between textual annotation and the modeling itself.

The sketches of process diagrams are composed basically of three elements of the BPMN metamodel [19]: start and end events, activities and gateways. These sketches cannot be considered the process model itself, since it has a reduced set of elements. However, they provide a first view of the process and also permit handwriting notes free. The simplicity of the sketch allows the analyst to make his notes quickly without
harming the interview, and facilitate sharing. By performing gestures with a pointing device (stylus), Netsketcher [12] recognizes the basic elements of process diagrams, allowing the analyst issuing the sketch process easily during the interview. An example of sketch process done by the prototype of the tool can be seen in Figure 5.

![Figure 5. Process sketch sample](image)

However, the application proposed in [12] does not address the context management. Therefore, new requirements are proposed for Netsketcher. The first requirement of the new application is the record of the context information. During the elaboration of the sketch, the tool must register the context associated with the interview, according to Tables 1 and 2.

The second requirement is the recommendation of sketches. The moment that the analyst makes the interviews, the tool should keep examining continually all the sketches stored, and infer which of them has a similar context and relevant to the interview being conducted. Finding relevant sketches, the tool presents to the analyst a list of links to these sketches. Figure 6 illustrates conceptually the use of the prototype with this new requirements included.

![Figure 6. Context-oriented collaborative process elicitation approach](image)

Figure 7 presents a sketch to illustrate an example of using the tool. In that sketch, it is highlighted in bold and underlined that the analyst Michael has registered a definition for the term "bottling".

![Figure 7. Example of a sketch containing a term with a previous registered definition](image)

In Figure 8, we have other analyst, Ann, typing the word "bottling". In the upper right corner of Ann’s screen, a lamp icon indicates a link to a recommended sketch. The analyst icon represents a recommendation to chat. The red ellipse in Figure 8 highlights those icons.
VI. CONCLUSIONS AND FUTURE WORK

The approach for process elicitation proposed is based on sketches of the process model made by the analysts during an interview, being these sketches added with contextual information and shared among the analysts in charge of a business process modeling project. In this paper, we show how context management is incorporated.

The information collected about the process should be associated with its context within the interview, so that analysts could have access only to information that is relevant to the elicitation that is being conducted. We expect that the analyst has a more sophisticated understanding about the sketches already generated.

The main contribution of this work is the definition of a context model to be used as a basis for context management tools to support collaborative elicitation of process. We propose that the information being obtained in an interview (described in the sketch under construction) should be compared with previous information raised before in other interviews. The comparison is based on contextual information, and, as a result relevant sketches are recommended to the analyst during the interview.

Accessing this information allows the analyst to have a broader understanding of the process that is being raised, facilitating the identification and resolution of conflicts. The clarification of doubts and consensus building could happen at the time of interview. In addition, access to relevant information during the interview will have direct impact on the completeness and consistency of the generated model.

From the definition of the context model, future work will be done to implement the functionality of the support application, as well as case studies will be performed in real-world scenario of an organization to demonstrate the validity of the approach.

REFERENCES


[19] BPMN – Business Process Modeling Notation, available from: