Understanding Modeling Requirements of Unstructured Business Processes

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Abstract: Management of structured business processes is of interest to both academia and industry, where academia focuses on the development of methods and techniques while industry focuses on the development of supporting tools. With the shift from routine to knowledge work, the relevance of management of Unstructured Business Processes (UBP) is increasing. However, currently available modeling notations are not optimally suited for modeling UBP. By means of a representative example, we investigate the limitations of Business Process Model and Notation (BPMN) and Case Management Model and Notation (CMMN) in this respect. We derive a set of requirements for representations that are needed for modeling UBP. These requirements allow to express end-to-end business processes while providing flexibility for run-time changes. We demonstrate these requirements by a possible extension to BPMN.

1 INTRODUCTION

Business process modeling has been a very useful notion for process management. A business process model maps the end-to-end business operations, thus provide the business process awareness, filter out complexities, and enable estimation of resource utilization (Bandara et al., 2005). Depending on the nature of business process, the task of process modeling can be very straightforward or very complex. A business process is characterized by its involved participants, resources and its interactions with computer systems (Dumas et al., 2005). Various studies (Mccready, 1992; Kemsley, 2011; W.M.P and Van Hee, 2004) have defined the classification of business processes based on their level of structuredness. A business process having an ordered set of planned activities, which are defined at design-time, is said to be a *Structured Business Process (SBP)*. While, a business process which depends on real-time events, available data and knowledge of knowledge workers is referred as an *Unstructured Business Process (UBP)*.

In last few years, we observed an increased focus on UBP management by industry. According to report by AIIM (Miles, 2014), for 51% of the companies polled, more than half of their business processes are unstructured and unpredictable in nature. Companies adopt various methodologies (e.g. in-house collaborative systems, process management suites, etc.,) to deal with the shift in focus from structured to unstructured business processes. Traditionally, UBP are dealt in a structured way (Dumas et al., 2010). For example, a business process is modeled on design-time using Business Process Model and Notation (BPMN) while Business Process Management Suite (BPMS) implements the designed business process. Such process automation provides efficiency, however, it limits the process engineer to predefined activities and conditional flows.

Considering these limitations, some new and/or modified process management paradigms and modeling languages have been suggested that are specifically targeted to provide the flexibility for management of UBP. Van der Aalst et al. (2005), proposed case handling as a new paradigm to deal with UBP. To support the dynamic nature of business processes, a number of new modeling constructs were added in the BPMN v2.0 release (OMG, 2011). Moreover, OMG recently proposed a new modeling language called Case Management Model and Notation (CMMN) for modeling processes where the process activities depend on real-time evolving circumstances (OMG, 2014). The availability of a number of process modeling paradigms, with their advertised

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vendor solutions, pushes companies to rethink their tools that are used for process modeling. On one hand, BPMN is usually preferred since it is widely adopted and understood as an industry standard. On the other hand, the new proposed modeling language (i.e. CMMN) is attractive since it promises an increased level of expressibility for modeling of evolving business processes. The current scientific literature on process modeling languages lacks a comparison and capability assessment of BPMN and CMMN for UBP. However, a number of online discussions[1,2] and a recently published study by Hinkelmann (2016) suggest the integration of BPMN and CMMN for improved process modeling benefits.

This study intends to fill the gap in the scientific literature by assessing the modeling capabilities of BPMN and CMMN with respect to UBP. Moreover, this study also assists companies, and specifically their process engineers and process consultants, in making a careful selection of the most suitable modeling language for the process at hand by considering its modeling requirements. Therefore, number of representational requirements has been derived from literature. We believe, a process modeling language that is able to fulfill these representational requirements can model the SBP and UBP, while keeping their run-time flexibility. The work presented in this paper is a result of research efforts undertaken as Master thesis at University of Twente (Allah Bukhsh, 2015).

The rest of the paper is structured as follows: characteristics of UBP are provided in Section 2. To assess the capabilities of modeling languages proposed by OMG, a sample business process is modeled with BPMN and CMMN in Section 3. Based on the results of a capability assessment, a number of representational requirements for UBP are derived in Section 4. The representational requirements are demonstrated by means of an application scenario in Section 5. The validation of representational requirements with three experts from BiZZdesign is presented in Section 6. Finally, Section 7 provides our conclusion.

2 CHARACTERISTICS OF UBP

It is argued that in SBP, the predefined routing rules drive the process while in UBP the characteristic of the particular process instance drive the process (van der Aalst and Berens, 2001). UBP requires tacit knowledge, collaboration and decision making skills from knowledge workers. The knowledge work of an organization cannot be straight-jacketed into an automated process and electronic forms due to its unstructured and evolving nature (Van der Aalst et al., 2005). Eshuis and Kumar (2016) suggested an approach to convert the UBP to SBP to be able to model them with imperative modeling languages.

Many literature studies have discussed the characteristic of UBP under the title of case management (Di Ciccio et al., 2014; White, 2009; Mundbrod et al., 2013; Kitson et al., 2012). Following are some of the aspects of UBP which make them different from SBP.

Goal Oriented: UBP are goal oriented, which means a process evolves through a series of sub-goals and milestones (Di Ciccio et al., 2014). The achievement of each goal depends on a number of factors, e.g. availability of required data, execution of activities, decisions of knowledge workers, and responses from customers. Every sub-goal of a process is well-integrated with one final goal. An achieved sub-goal can be modified or proven wrong as more data and knowledge emerges as the process progresses (Mundbrod et al., 2013).

Data Dependent: UBP are data dependent which means process and data are strictly integrated (Chiao et al., 2013). The modification, addition or deletion of process data defines the future activities of the process. However, the unavailability of particular data may halt the processing of the whole process.

Coordination and Collaboration: Execution of UBP highly relies on the coordination and collaboration among the knowledge workers (Mundbrod et al., 2013). Usually, a single process involves many knowledge workers (Di Ciccio et al., 2014). As the process progresses, new knowledge workers may get involved or existing knowledge workers may leave their roles.

Business Rule Driven: Conformance to business rules and standards is one the most convincing arguments to automate a business process. However, due to the uncertain and emergent nature of UBP, knowledge workers are required to maintain the business rules and standards during process execution. All the process activities are influenced by particular rules and policies of business (Di Ciccio et al., 2014).

[1] https://www.linkedin.com/groups/1175137/1175137-5868060474150502404

[2] http://brsilver.com/bpmn-cmmn-compared/

3 ASSESSMENT OF BPMN AND CMMN FOR MODELING UBP

BPMN and CMMN have been modified and introduced, respectively, to deal with UBP (Unstructured Business Process). We use an application scenario of an admission process to investigate and compare the capabilities of these notations to model an UBP.

3.1 Application Scenario

The admission process is a knowledge intensive process which involves collaboration and communication among different departments to perform the smooth intake of students. Following is the detailed description of the admission process.

> With the announcement of admission, the students can send their documents to the university through an online form. Students are required to submit their personal information with their academic certificates, motivation letter and language certificate. Once the admission application is *submitted* by the student, the **admission office** is *notified*. Based on documents received, each admission file might go through at number of assessments before the final decision can be made. Initially, the **admission administrator** *checks* the application for its correctness and completeness. The admission file is then forwarded to the corresponding department of university for *assessment*. The **admission coordinator** will *review* the admission file to check the attached academic certificates. The final *decision* can be made by the admission coordinator only or it can require the *discussion* and *decision* from the **admission panel**. During the decision process, the provided details can be *verified* and new documents can be requested from the student. At the end, a student can be admitted, rejected or conditionally admitted. The involved knowledge workers and the decision highly depend on the particular admission file. Finally, the student is *informed* about the decision based on his admission file.

In this scenario description, verbs in italic letters show the activities of the admission process while nouns in bold letters represent the involved knowledge workers.

3.2 Modeling UBP with BPMN

As discussed earlier, BPMN is one of the widely adopted process modeling notations due to its ease of use and expressibility. A BPMN process model provides a layout of the business process by modeling the set of ordered activities, events, and process flow logic (Dumas et al., 2010). BPMN is often regarded as the modeling notation of choice for SBP (Rosenfeld, 2011). Figure 1 shows the admission process modeled using BPMN modeling constructs.

Following are some problems of modeling an UBP with procedural modeling language like BPMN (Rychkova and Nurcan, 2011).

Task Ordering: Procedural modeling languages like BPMN introduce the ordering and task dependency in process executions. For example, in Figure 1, the task ordering implies that the activity *'Send certificate for authentication'* will be only performed after the task *'Review admission form'* has been completed. While, in reality, the verification of certificates and review of admission form can be performed in parallel.

Unavailable Optional Tasks: In BPMN, the execution of tasks can be skipped only by employing conditions on an exclusive gateway. However, tasks that are defined with a sequential flow on the process model without any conditions cannot be skipped. Even if the tasks are not required by the particular process instance, the tasks are needed to be executed to continue the process flow. For example, the activity *'Send certificates for authentication'*, in Figure 1, should be regarded as an optional activity if the authentication is not needed.

Limited View on Data: BPMN provides a very limited view on data. Business processes like the admission process are data-intensive in nature; the provided data can define the flow of activities. With BPMN, the data input and output flow can be depicted, but the changing state of data can not be defined.

Some of the problems that are highlighted with BPMN can be mitigated by using the extended BPMN elements (OMG, 2011, p. 30). The concept of ad-hoc subprocess has been found to be most useful for modeling an UBP. An ad-hoc sub-process does not specify the ordering among activities. The activities in an ad-hoc sub-process can be executed any number of times without any pre-defined ordering. Based on process instance requirements, the activities of ad-hoc sub-processes can be done, redone or even skipped. However, according to the BPMN version 2.0 standard specification (OMG, 2011), many process engines don't provide support for ad-hoc sub-process execution. Moreover, use of extended BPMN ele-

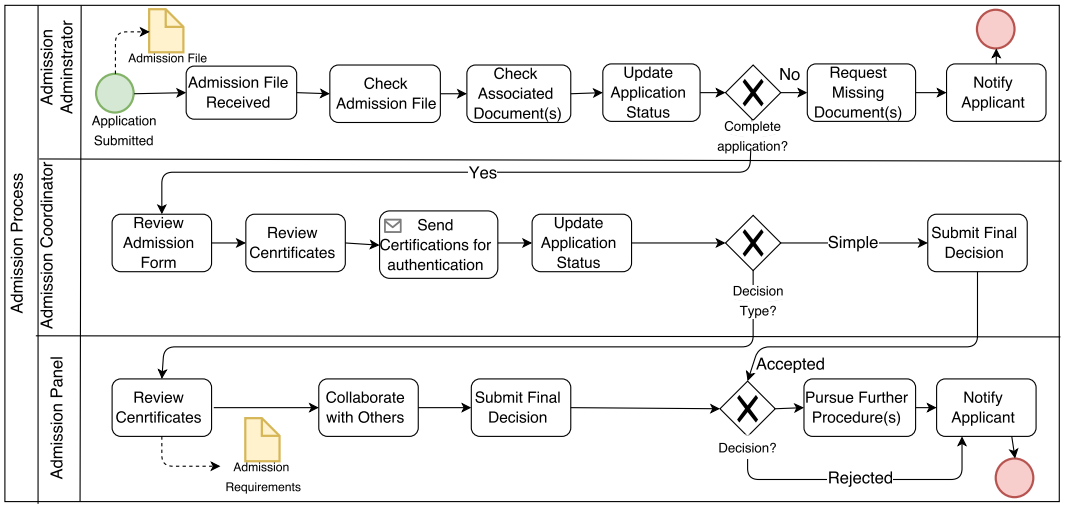


Figure 1: Process Model of Admission Process Using BPMN.

ments results into a very complex process model. The activities defined inside the ad-hoc sub-process cannot be labeled to indicate whether activities are optional, required or re-executable. The use of various events and sub-processes can negatively influence the understandability and readability of the process model.

3.3 Modeling UBP with CMMN

CMMN is for modeling the case/process where the activities are not strictly defined, but dependent on evolving circumstances and decisions of knowledge workers (OMG, 2014). As compared to BPMN, CMMN is a relatively new process modeling language with unique constructs. Modeling construct of CMMN, which are exploited in Figure 2 for admission process model, are the following:

A rectangle shape with the title of 'Admission Process' is called *case folder*, while the title depicts the name of the case/process. A *case folder* is a container that consists of all CMMN elements to model the process. A rectangular shape with angled corners shows the episodes of a process which are called *stages*. 'Check Admission File', 'Assess Admission File' and 'Decision on Admission File' are stages of the admission process. Shapes with half-rounded corners are called *milestones*; they represent the goals to be achieved in a process. 'Completed Admission File' and 'Final Decision Submitted' are *milestones* that are required to be achieved in processing of the admission file. Finally, diamond shapes in the model are called as *sentries*; they define the entry and exit criteria for tasks and stages.

Following are problems that were encountered while modeling an UBP with CMMN.

Predefine Users: CMMN doesn't have any notation to represent the assigned user roles. According to CMMN specification OMG (2014), the user roles are defined semantically when the case/process is initiated.

Limited View on Data: CMMN is meant to model those processes that evolve with time and where the execution of a process is mainly based on data and knowledge workers' decisions. CMMN has a concept of case file along with file versioning. However, the versioning of a case file is defined semantically. From a visualization perspective, CMMN provides a very limited view on data.

Task Dependency: Connectors and sentries represent the concept of task dependency in CMMN. The tasks will be executed only if the entry/exit condition, associated with it, is fulfilled. However, as compared to BPMN, the combination of connector and sentries provides poor readability. For example, in Figure 2, the stage of *Assess Admission File* will only be executed if the milestone *Application Check Completed* has been achieved.

Unlike BPMN, CMMN is a declarative language. It is used to specify what should be done in the process instead of how it should be done. The purpose of a CMMN model is to provide a guidance map which instructs the process engineers on what can be done for successful process execution. Instead of design-time defined conditional flows, the evolving data and knowledge of knowledge workers drive the process execution. Consequently, BPMN is more expressive in its process flows as compared to CMMN. On the other hand, the discretionary tasks and stages of CMMN provide a better understanding of which tasks can be skipped during process execution as compared to ad-hoc sub-processes of BPMN. A detailed

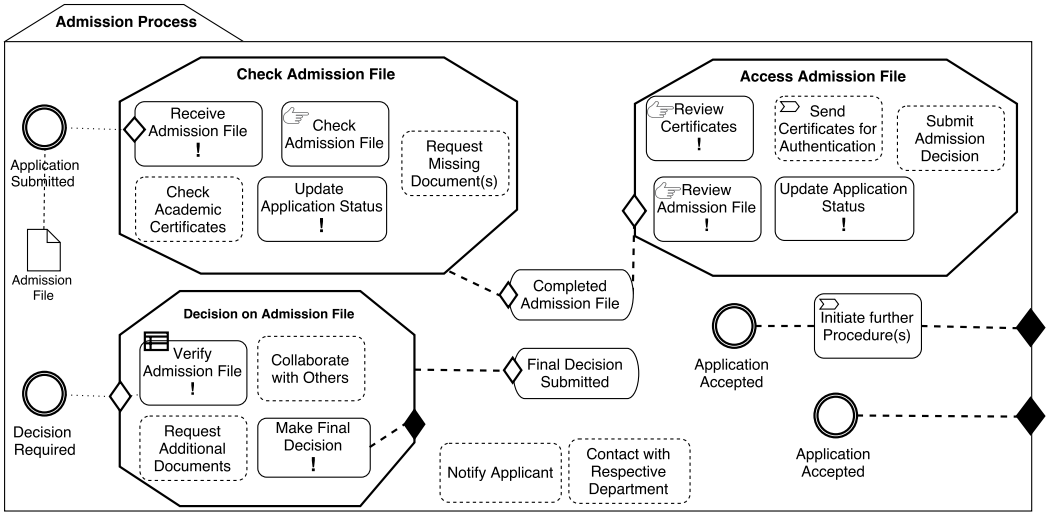


Figure 2: Case Model of Admission Process Using CMMN.

comparison of BPMN and CMMN notations is provided in (Allah Bukhsh, 2015, section 4.4).

4 REPRESENTATIONAL REQUIREMENTS OF UBP

In this section, representational requirements of UBP are presented. These requirements will facilitate us into modeling the UBP in a flexible manner. The proposed requirements are based on the limitations of BPMN and CMMN discussed in Section 3. Cardoso et al. (2016) also comparatively evaluated the BPMN with another modeling language and concluded that, despite its popularity, BPMN is limited in its ability to model UBS. Therefore, representational requirements for modeling UBS are suggested in this study. Some literature studies (Hauder et al., 2014; Di Ciccio et al., 2014; Chiao et al., 2013) have proposed the requirements for the development of an adaptive process management system, which support flexibility in management of a knowledge-intensive process. While, the representational requirements presented in this section are mainly focused on process modeling.

To define requirements concretely, we adopted the convention from (Chiao et al., 2013), where each requirement is explained with the help of an application example.

4.1 Process Specification Requirements

Each process has some general requirements that need to be fulfilled to represent the real-world scenarios.

Support to Capture Real-time Events: It should be possible for UBP to capture and respond to real-time events. These real-time events can be related to process start or end, arrival of data, modification of existing data, or they can be triggered by user activity.

> When an applicant submits his admission application, the admission office is notified. The *notify event* can be a start event to initiate the admission process.

Support to Quantify and/or Qualify the Conditions: On certain steps in processing of an UBP, the decision to execute next process activities is taken. It should be possible to represent the conditional flow on process model.

> A complete check in admission process is an example of quantifying condition.

4.2 Activities Specification Requirements

Activities define the work that is expected to be performed for successful execution of a process. The requirements of activities specification from the perspective of an UBP are discussed below.

Support for Ordered and Unordered Activities: A business process consists of structured and unstructured parts of the process. It should be possible to define and follow the control flow among the activities as well as skip the activities' execution, if needed.

Ordered Activities: The steps like *submission* of admission file by student and *notifying* it to admission office are ordered set of activities. These process activities are required to be executed one after another.

Unordered Activities: An *assessment* activity which consist of check on academic certificates, analysis of their authenticity and review of other related documents are example of unordered process activities.

Support for Required and Optional Activities: Due to non-deterministic and emergent nature of UBP, it should be possible to define the process activities as optional or required.

Required Activities: Irrespective of type of admission file, it is required to inform the student about the status of his application.

Optional Activities: During the *assessment* activity, the activity of certificates authentication can be treated as an optional activity based on admission application.

Support for Re-execution and Undo Activities: An UBP mainly relies on decisions made by knowledge workers. Such decisions may lead to undo or re-execute the previously performed activities.

Re-execution of Activities: An admission application from the recognized national university might require single review while the international admission application might go through a number of reviews.

Undo Activities: For example, a request to defer the admission for a specific time can lead to undo certain activities that had marked the student as an upcoming admitted student.

Support for Collaboration among Activities: In addition to parallel execution of activities, it should be possible to define and depict the collaboration among the individual process activities. BPMN depicts the collaboration between the external and internal process through message passing but not with-in a process.

The activities of *discussion* and *decision* require collaboration and can further leads to *verification* of the admission application. Therefore, the collaboration activities should be explicit.

Support for Varying Levels of Granularity: A process model with low level of granularity provides the flexibility for knowledge workers in process execution while a process with high level of granularity limits the knowledge workers' freedom.

Assessment and *verification* are examples of those activities that be modeled with varying level of granularity.

Support for Process and Data Alignment: Unlike traditional business process, where data are limited to defining control flows, UBP have an abundance of data with changing states. With process and data alignment, it should be possible to trace back data through a process and vice versa.

Almost each activity of admission process have associated data e.g. admission documents, remarks, decisions, etc.

Support for Process/Activity Call: It should be possible to model the already available process or activity. The callable aspect will reduce the burden of re-modeling/re-doing the same activity.

In case the applicant, who had applied for admission, also submitted his application for a scholarship. With activity/process call, the results of the authentication activities can be reused from admission process.

4.3 Data Specification Requirements

UBP are fundamentally data-centric, which means that the process and data are strictly bounded (Marin et al., 2013; Van der Aalst et al., 2005). The execution of process highly relies on available and evolving process data.

Support for Data Representation: UBP produce and consume data during execution. It should be possible to clearly define the inflow and outflow of data files for a particular process activity.

In the *assessment* activity, the admission application can be represented as an input data file while remarks as an output data file.

Support for Data Authorization: With the involvement of number of knowledge workers in UBP, it is should be possible to define the access level of data.

The admission application should not be accessible to the admission coordinator and admission panel before it is verified by admission administrator.

Support for Version Control of Data: Due to evolving nature of data, the version control of data is important. The concept of versioning for UBP is introduced by OMG in CMMN version 1.0 OMG (2014). Data versioning can be modelled as data states on a process model.

The remarks and the decision on the admission file have evolving nature which can be revised, added or deleted.

4.4 Business Rules Specification Requirements

To conform to standards and business policies, business rules need to be employed during process execution. These rules provide information on how certain business processes should be performed and how the resources can be used Penker and Eriksson (2000). The alignment of process with business rules will answer the questions about 'how and why certain activities were performed and specific decisions were made'.

The admission deadline defined by an institute is one example of business rule, which is related to admission process.

4.5 Process Goals Specification Requirements

Goal-orientedness is one of the most distinguishing characteristics of UBP. Based on the main goal, a process evolves into a number of sub-goals and milestones as process progresses. To provide an overview of process, it should be possible to model goals and sub-goals.

The main goal of admission process is final verdict of acceptance or rejection of admission application, while the other goals can be 'application received', 'application reviewed', and 'application verified'.

4.6 Knowledge Workers' Specification Requirements

Knowledge workers play a critical role in managing and solving UBP. Knowledge workers, primary job is to create, distribute and apply their tacit and explicit knowledge to comprehend process, analyze related information and make decisions Grudzińska-Kuna (2013).

Support for Knowledge Workers' Roles Assignment: Due to involvement of many knowledge workers in process management, it should be possible to define the roles of each knowledge workers along with their assigned tasks.

Admission administrator, admission coordinator, and admission decision panel are knowledge workers of the admission process with their assigned set of tasks.

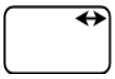
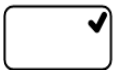
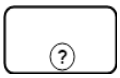
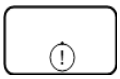
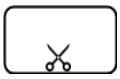
Support to Capture Knowledge Workers Decisions: One of the most important tasks of knowledge workers is to utilize their tacit knowledge, available data and process context to take the certain decisions. The decisions made by knowledge workers affect the process running time, its control flow, final outcome and many other process related aspects. It should be possible to capture every decision of knowledge workers.

The admission administrator needs to make a decision about the completeness of the admission application before forwarding it to admission coordinator.

5 DEMONSTRATION OF REPRESENTATIONAL REQUIREMENTS

To demonstrate the proposed representational requirements, a few extended modeling constructs based on BPMN are suggested in Table 1. The reason to demonstrate representational requirements with

Table 1: Extended Modeling Constructs of BPMN (Demonstration).

No	Name	Notations	Semantics
1	Collaborative Sub-process		Collaborative sub-process represents collaboration among different activities of the process
2	Decision Activity		Decision activity shows a decision taken during the course of process execution
3	Optional Activity		Optional activity defines an activity that can be skipped during the process execution considering the process context
4	Required Activity		Required activity defines a process activity that must be executed
5	Undo Activity		Undo activity represents an activity that can be undone considering the particular process context
6	Goal		Goal represents the purpose of the process.
7	User Role		User role represents a person or a class of people who are assigned to perform the process execution
8	Business Rule		Business rule represents a related business rule on the process model

BPMN is two fold: First, as compared to CMMN, BPMN is widely known and adopted by process engineers. Second, many available modeling constructs provided by BPMN are able to fulfill a number of representational requirements.

Using BPMN and the extended modeling construct, an admission process is modeled in Figure 3. The description of each construct is provided as added comments in Figure 3 and with Table 1. All the activities without incoming and outgoing sequential flow are unordered, while the sequential flow define the order between activities. Moreover, a sub-process can be attached to the conditional flow to reach to the goal. For instance, the goal *Application verified* can be only be reach if the condition *verification completed* is met. Data objects with their changing states are also represented in the process model. The position of data objects in the process model shows the data access levels for the involved performers. For example, the data object applicant file with created and verifying state is only accessible by admission administrator while the applicant file with verified state can be accessed by all the involved performers.

As compared to the admission process model presented in Figure 1 and 2, the admission model that fulfills the representational requirements offers a number of advantages.

Expressive Process Model: As compared to CMMN, the process model provided in Figure 3 has a well-defined process start and end event. Moreover, the modeling constructs to show the required, optional, decision and collaborative tasks makes the process model easy to read and communicate.

Ability to Model (un) Structured Process: The process model shown in Figure 3 represents the structured and unstructured process parts. Sequential flow represents the task ordering and task dependency between tasks which is a must requirement to model structured process. CMMN doesn't have the concept of sequential flow while in BPMN the use of the sequential flow inside the ad-hoc sub-process yields a semantically incorrect process model.

Ability to Model User Roles: With the user role notation, a person or group or department can be set as responsible to perform certain activities. CMMN and BPMN don't have any notation to define the user roles on the process model. However, in BPMN lanes are used for this purpose.

Ability to Model Data Access Level: The data access level is defined based on data object position on the process model. A data object that is defined inside the sub-process belongs to the assigned user only, while, the data object outside any sub-process is accessible by all the involved users of a process.

Ability to Model related Business Rules: With BPMN and CMMN, it is feasible to represent busi-

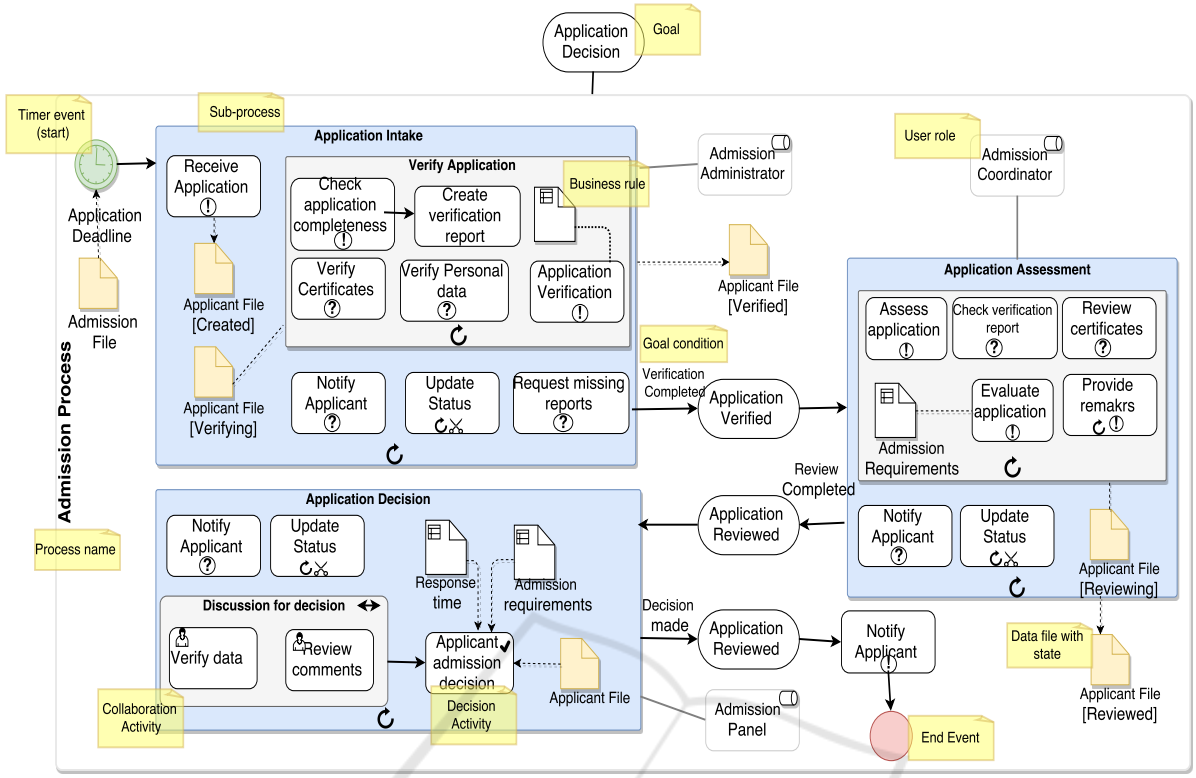


Figure 3: Process Model of Admission Process.

ness rule related activities either by a business rule task or planning table. However, in order to show the effect of business rules on process control flow, an extended modeling construct is used in Figure 3.

Ability to Model Collaborative Activities: The process model provided in Figure 3 shows the collaboration among the activities. The collaboration among activities presents that the activities are dependent on each other for their execution.

6 VALIDATION

The validation of proposed representational requirements and their demonstration with extended BPMN constructs were performed with three experienced practitioners of BiZZdesign. Each of these practitioners has considerable working experience with BPMN process modeling language. Semi-structured qualitative interviews were conducted with each participants in separate sessions that lasted from 60 to 90 minutes.

The suggested representational requirements and their demonstration with BPMN extended constructs were mainly validated for their usefulness, ease of understanding and correctness. The result of validations is provided as follows:

Usefulness: The concepts of required, optional, collaborative sub-process, goal and decision activity are regarded as very useful for modeling unstructured business processes. However, the concept business rule is termed as unnecessary because business rules are often extensive and are difficult to be included in process model. Apart from business rules, the respondents found the concepts of data specification very powerful. According to one of the responded, the demonstration of data specification in Figure 3 is very intuitive as compared to technical specification of BPMN.

Ease of Understanding: The suggested representational requirements are easy to understand and yields flexibility for modeling UBS. However, the demonstration of representational requirements in Figure 3 is indicated difficult to read when compared to BPMN process model (see Figure 1) and easy to read when compared to CMMN process model (Figure 2).

Correctness Some of the comments regarding similarities of BPMN with suggested concepts as requirements were highlighted. According to one of the respondent, the concept of optional task can be achieved by employing BPMN gateway. While, he also acknowledges the involved com-

plexity of modeling optional task with gateway (requiring three constructs) as compared to using simple optional task. Moreover, the concept of undo and compensation event of BPMN is found to be similar. Another respondent suggested to keep one concept between required and optional as if some task is not required then it would be optional. However, other responded find the separate concepts of required and optional very useful as it will bring clarity to the process model.

On overall, it is found that representational requirements and a set of extended BPMN constructs are able to model USB without incorporating unnecessary details and complexity while representing the needed run-time flexibility.

7 CONCLUSION

UBP are goal-oriented, data dependent, emergent, and require coordination and collaboration among stakeholders. Taking the unique nature of UBP into consideration, a number of modeling limitations of BPMN and CMMN are identified, for instance, BPMN introduce task dependency in process execution whereas CMMN is unable to model user roles/task assignments in process modeling. Though, BPMN provides a number of useful constructs (e.g. ad-hoc sub-processes, re-execute task) for modeling unstructured business processes. But, use of various modeling constructs results into a very complex process model, which is difficult to communicate to business people along with its semantic content. On the other hand, the expressibility of CMMN modeling constructs is found to be insufficient for process modeling.

Our contribution in this paper is to derive explicit requirements for notions that should be represented in a modeling language for UBP. We have shown how this could be done by defining an extension to BPMN that covers these requirements. We do not claim that this extension is the only or the best notations possible, but it does show that more adequate modeling notations for UBP are feasible.

The future work of this study seeks to explore and demonstrate the suggested representational requirements with other imperative and declarative modeling languages. Considering the fact that a structured business process often consists of unstructured activities and vice versa, there is a need for a comprehensive modeling language that is able to fulfill the modeling requirements of structured and unstructured business processes without introducing unnecessary complexity in process models.

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