Extracting Essential Business Entities from BPMN Models

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Abstract

Essential Business Entities (EBE)s are part of the subject matter of any organization, and are important part of many software system models representations. In this paper, we present a method to extract the set of EBEs from business models represented using the business process modeling notation (BPMN). The presented method is demonstrated using a case study from the healthcare domain.

Keywords: *Essential Business Entities, Business Process Models, BPMN.*

1. Introduction

Essential Business Entities (EBE)s are the drivers for obtaining many software system models as well as obtaining organization's business process architectures, such as the Riva method for identifying business process architecture [1].

Many research papers have emphasized the significance of EBEs and their role in identifying components and/or services in the service oriented architecture such as in [2]. Business entities were also used to perform measurements such as measuring the degree of service cohesion in service oriented designs[3].

EBE are usually identified through brainstorming which is conducted with members from different departments and domain experts to improve thinking by helping to answer specific questions. One problem with this method is that the identified set of entities could not be complete, where there could be a possibility to miss one or more of these entities.

In this paper, we provide a method to extract a set of EBEs from models represented using business process modeling notations (BPMN). So, if an organization already has it business processes represented using a modeling notation such as BPMN, this can help identify the set of EBEs from which other important system models could be derived. An example from the Cancer Care and Registration (CCR) process [4, 5] has been utilized to demonstrate this method.

Section 2 describes the current approach for identifying essential business entities in an organization, section 3

presents our method for identifying essential business entities from BPMN models, section 4 demonstrates the method of extracting EBEs from BPMN using a case study, section 5 concludes the paper.

2. Identifying Essential Business Entities: Current Approach by Ould [1]

An Essential Business Entity (EBE) is part of the subject matter of the organization [1]. So, EBEs are there because of the business the organization is in.

EBE can be identified using a brainstorming exercise with the key person in an organization to answer questions concerned with what the organization makes and what product lines and/or service lines it has, what things the organization can be differentiated from other organizations in the same industry, what events in the outside world it needs to respond to, what business entities are listed in the organization's data model and what things do the organization's information systems keep information on. Recognizing who the organization's external and internal customers, can also help in identifying EBEs.

EBEs can be filtered by putting the word 'a' or 'the' in front of each suggestion. If it is not familiar, it should be excluded. Designed entities, which are there because of the way the organization chooses to do its business rather than because these entities characterize its business fundamentally, should also be excluded. For example, an "invoice" is not an EBE for a car manufacturer organization because it is not in the business of invoices. However, for the invoice handling department, which is in the business of handling invoices, an "invoice" is an EBE.

3. Identifying Essential Business Entities from BPMN Models

BPMN is a rich process modeling notation that can be effectively used to model business processes understandable at all levels, from business users, business analysts, and process owners, to the technical architects and developers [6, 7]. BPMN has been developed under the auspices of the OMG (Object Management Group) and

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defines four categories of elements [7]: flow objects, connecting objects, swim lanes and artifacts.

Flow objects in BPMN are comprised of activities (tasks or sub processes), events (triggers or results) and gateways (to control sequential flows). Connecting objects are used to connect flow objects. The three types of connectors are: sequence flows, message flows and associations. Swim lanes are used to organize activities and pools. Finally, artifacts are used to include additional information annotations and data objects.

As we have explained in section 2, obtaining an organization's essential business entities is done through a brainstorming exercise which is conducted with members from different departments and domain experts to improve thinking by helping to answer specific questions. So, having the previously mentioned questions available, we have analyzed business process models represented using BPMN to extract essential business entities. Figure 1 describes the algorithm used to extract EBE.

Algorithm I: Extract_EBEs_from_BPMNs

Input: A BPMN business process model, bpm_i, where it is a collection of roles, $R = \{r_0, ..., r_m\}$ consisting of a number of tasks $T = \{t_0, ..., t_l\}$
Output: A set of essential business entities present in the bpm_i, $EBE=\{ebe_0, ..., ebe_{x1}\}$

Begin
Add the bpm_i process name to EBE;
Identity the set of rolls in the business process model, bpm_i; $R=\{ r_0, r_1, ..., r_j, ...,r_n\}$, $0 \leq j \leq n$;
For each role r_j in R do the following
   Add r_j role name to EBE
   Identity the set of tasks in r_j, $T=\{ t_0, t_1, ..., t_k, ...,t_m\}$, $0 \leq k \leq m$;
   For each task t_k in T do the following
      If not already in EBE
         Add the subject name of the task t_k to EBE
         Add the object name of the task t_k to EBE
      End if
   End for each task
Exclude designed business entities
End for each role
End

Figure 1: Algorithm I: Extract EBEs from a Business Process Model

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Algorithm I, finds the essential business entities available in each business process model. The process used to find EBEs is by extracting the role names of each BPM as well as the subject names and object names of each task performed within each BPM. These are actually the subject matter of the organization. In addition, the business process model name is also one important EBE as it describes what the process does in the organization, one of the questions provided in Section 2 used to find EBE while brainstorming the organization's subject matter.

4. Demonstrating the Method of Extracting EBE from BPMN Models

In this section we demonstrate the method of extracting EBE from BPMN models using the cancer care and registration process case study [4, 5]. Figure 2 represents one of the CCR processes; the patient treatment process. This process is modeled in BPMN using e-Clarus Business process modeler.

The goal of the patient treatment process is to provide the proper treatment for cancer patients. It involves: receptionist (outpatient clinic), combined clinic (specialists), admission clerk (admission department), laboratory, imaging department, inpatient care, radiotherapy department, chemotherapy department and patient.
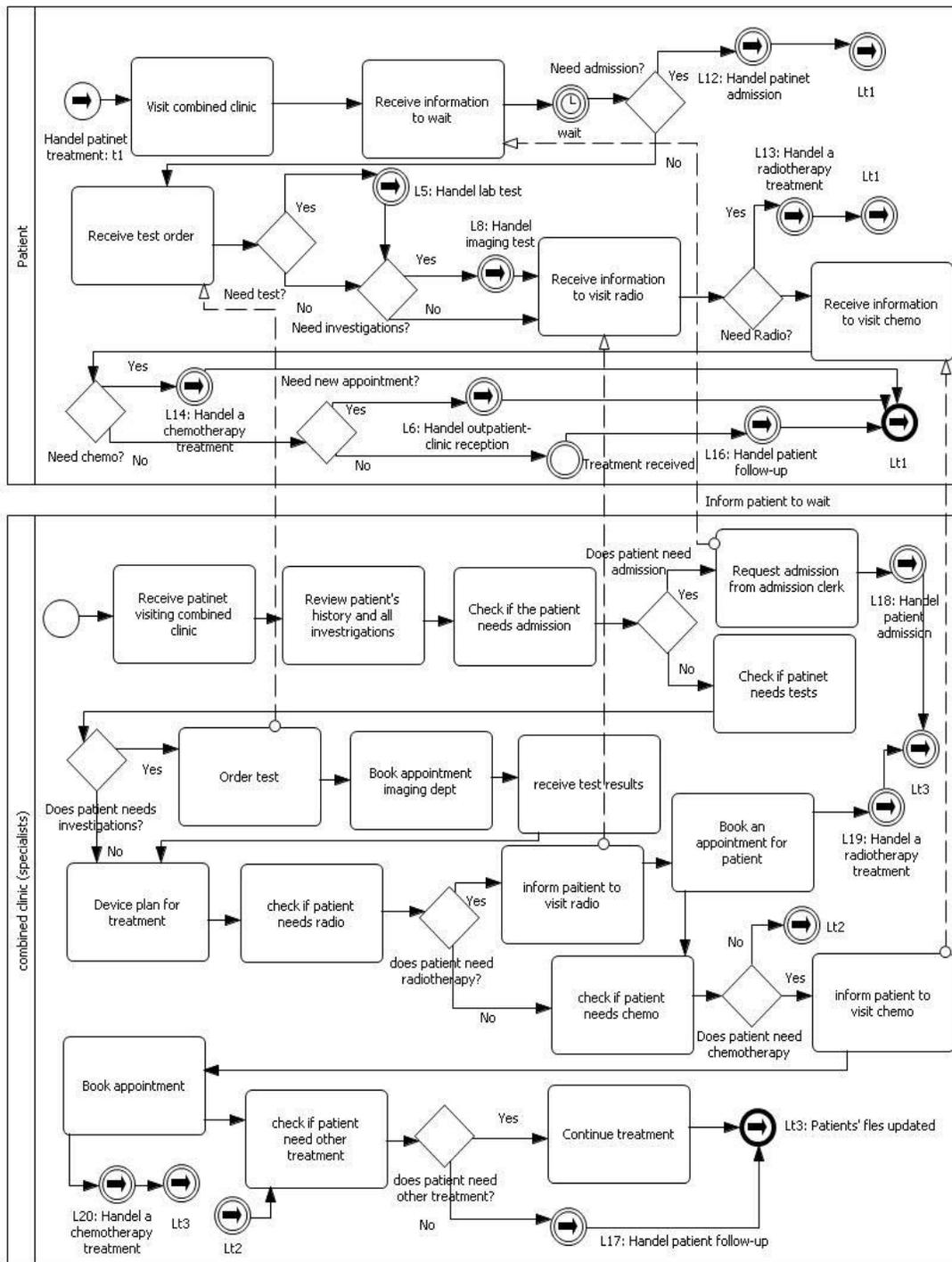
Figure 1: patient treatment process (adapted from [5] and translated into BPMN [8])

Using *Algorithm I* we can identify a set of EBEs for the CCR processes case study. These EBEs are listed in Table 1, and are the result of extracting the BPM names, role names, objects and subjects of each task within the set of CCR BPMs.

Table 1: List of EBEs for the CCR Case Study

Patient General reception	Imaging test
Receptionist (general)	Imaging department
Patient	Imaging test results

Medical records	Combined clinic
Appointment	Patient treatment
Patient file	Receptionist (outpatient clinic)
Emergency unit	Outpatient clinic reception
Cancer detection unit	Admission clerk
Database	Room availability
Patient details	Emergency case
Specialist	Waiting list
Patient treatment	Paper work
Cancer detection	Radiotherapy department
Receptionist (cancer detection unit)	Radiotherapy treatment
Doctor (diagnostician)	Chemotherapy department
Clinic	Chemotherapy treatment
Medical insurance	Surgery
Payment	Patient follow-up
Clinical appraisal	Inpatient care
Notes	Nurses
History	Inpatient follow-up
Patient admission	Account clerk
Investigations	Patients fail to attend appointment
Lab test	Bed
Lab	Resident doctor
Lab test results	Hospital
Receptionist (inpatient care)	Patient financial state
Receptionist (admission department)	Hospital registration
Receptionist (Imaging department)	End of day data
Receptionist (cancer detection)	Primary tumor
Receptionist (laboratory)	JCR form
Receptionist (chemo)	Pathology reports
Receptionist (radio)	Death certificates
Medical records clerk	managers

4. Conclusions

In this paper we presented an algorithm to extract an organization's set of essential business entities given the set of business process models represented using BPMN. Business Process Modeling Notation (BPMN) is the emerging standard for modeling business processes [6]. It's becoming very common to use this notation in representing business processes in organization, where its underlying mapping to executable process languages such as BPEL makes it suitable for aligning business needs and IT capabilities. Accordingly, in this paper we have reused the valuable business logic that resides within BPMN models to extract essential business entities. EBE are as important for organizations where they are required to derive process architectures as well as to represent software system models.

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