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Discovery Of Process In Business Process Outsourcing Domain

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Abstract

Process mining is an emerging research discipline that sits between computational intelligence and data mining on one hand, and process modeling and analysis on the other [1]. Large volumes of data are stored in the data base in business environment, and in this process many realities are missed to get recorded. This problem can be solved by recording the business events as process itself, and not as data. Process mining has grown like an important and an active area in research. In business environment, from the existing information system, the activities are recorded as events involved in business process. Business process mining takes these event logs to discover process, control, data, organizational, and social structures .This business processes are analyzed based on event logs. These event logs can be extracted from the normal database and coherent information systems. In this paper, the process model is constructed from the unstructured event log [5] by using a set of plug-ins in ProM and Petri Net. This process model discovers a new set of process model which is compared to manually stored logs in the real world business process used in BPO domain. This proposed discovery approaches are useful to make the business process execution settings in an improvised method.

Keywords: Business Events, Event, Event logs, Process Mining, ProM.

I. INTRODUCTION

Process mining has emerged from the field of Business Process Management (BPM) [2]. It focuses on extracting process-related knowledge from event logs1 recorded by an information system. It aims particularly at discovering or analyzing the complete (business, or in our case educational) process and is supported by powerful tools that allow getting a clear visual representation of the whole process.

The three major types of process mining applications are (Figure 1):

1) **Conformance checking** reflecting on the observed reality, i.e. checking whether the modelled behaviour matches the observed behaviour;
2) **Process model discovery** constructing complete and compact process models able to reproduce the observed behaviour, and
3) **Process model extension** projection of information extracted from the logs onto the model, to make the tacit knowledge explicit and facilitate better understanding of the process model.

Process mining is supported by the powerful open-source framework ProM. This framework includes a vast number of different techniques for process discovery, conformance analysis and model extension, as well as many other tools like convertors, visualizes, etc. The ProM tool is frequently used in process mining projects in industry [2]. Moreover, some of the ideas and algorithms have been incorporated in commercial BPM tools like BPMone (Pallas Athena), Futura Reflect (Futura Process Intelligence), ARIS PPM (IDS Scheer), etc.

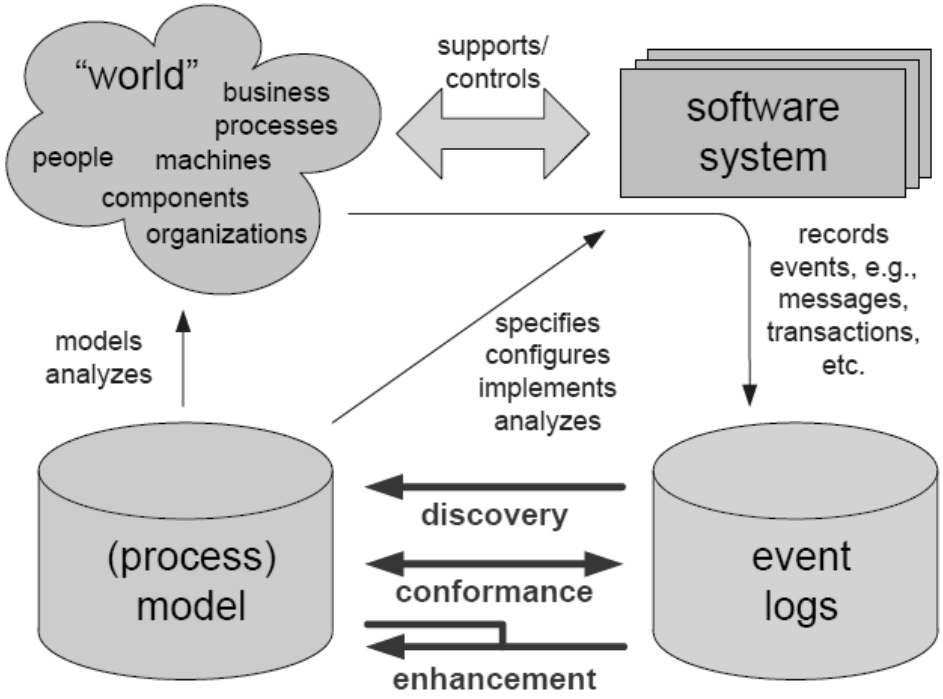

Figure1 Main three types of process mining: discovery, conformance and enhancement

II. PROCESS MINING

The first type of process mining is discovery; it takes an event log and produces a model without using any a-priori information. Process discovery is the important process mining technique. A process discovery algorithm is to construct a process

model, which reflects the behavior that has been observed in the event log [2]. Different process modeling languages can be used to capture the causal relationships of the steps, or activities, in the process.

The second type of process mining is conformance. In this technique, an existing process model is compared with an event log of the same process. Conformance checking can be used to check if reality, as recorded in the log, conforms to the model and vice versa. Typically, four quality dimensions for comparing model and log are considered: (a) fitness, (b) precision, (c) generalization and (d) Structure.

The Third type of process mining is enhancement. This technique is used to give the idea to extend or improve an existing process model using information about the actual process recorded in some event log. It aims at changing or extending the a-priori model. A non-fitting process model can be corrected using the diagnostics provided by the alignment of model and log.

Event logs

- A process consists of cases.
- A case consists of events such that each event relates to only one case.
- Events within a case are ordered.
- Events can have attributes. eg. Attributes like Activity, timestamp and resource.

III. PETRI NETS

Petri Nets were developed originally by Carl Adam Petri [Pet62], and were the subject of his dissertation in 1962 [6]. Since then, Petri Nets and their concepts have been extended and developed, and applied in a variety of areas: Office automation, work-flows, flexible manufacturing, programming languages, protocols and networks, hardware structures, real-time systems, performance evaluation, operations research, embedded systems, defence systems, telecommunications, Internet, e-commerce and trading, railway networks, biological systems.

Petri Nets are graphical and Mathematical tool for modelling notations. This model consists of places, transitions and arcs that are used to connect them. Places are represented as circles; Transitions are represented as rectangles and arcs are represented as arrows.

A Petri Net is a collection of directed arcs connecting places and transitions. Places may hold tokens. The state or marking of a net is its assignment of tokens to places. The current state of the Petri Net is given by the number of tokens on each place. Transitions are active components modelling activities that may occur and cause a change of state by a new assignment of token to places. Transitions are allowed only they are in enable state. This means that, there is at least one token on each input place. After transition in the input place the token will be moved on to the output place. The repeated occurrence of transitions and the resulting sequence of marking are called the token game.

Petri Nets are used for describing and analyzing the systems such as concurrent, asynchronous, distributed, parallel, nondeterministic and stochastic. Due to their graphical form, Petri Nets are used as a visualization technique like flow charts. Petri Nets are more powerful tool in the business process modelling and workflow management concepts.

IV. WORK FLOW MANAGEMENT

The term workflow management refers to the domain which focuses on the logistics of business processes [3]. There are also people that use the term office logistics. The ultimate goal of workflow management is to make sure that the proper activities are executed by the right person at the right time.

Workflows are always case based, that is every piece of work is executed for a specific case. Cases are usually generated by the external customer. However, the case also can be generated by another department within the same organization. The goal of workflow management is to handle cases as efficiently and effectively. Cases are handled by executing tasks in a specific order. A task which needs to be executed for a specific case is called a work item. Most work items are executed by a resource. A resource is either a machine or a person. Resources are allowed to deal with specific work items. Resources are allowed to deal with specific work items. To facilitate the allocation of work items to resources, resources are grouped into classes. A resource class is a group of resources with similar characteristics.

A work item which is being executed by a specific resource is called an activity. Work items link cases, tasks and resources [7].

V. REQUEST MANAGEMENT PROCESS ON TO PETRI NETS

In Information Technology Service Management Processes needs support in controlling and monitoring the services [4]. IT service management processes, promoting a quality approach to achieving business effectiveness and efficiency in the use of information systems. There are four types of processes in service operation. They are 1) Request Management 2) Incident Management 3) Problem Management 4) Change Management. In this paper we will focus on the Request Management service operation processes by workflow technology. The goal of Request fulfilment is to ensure that a standardized method for efficient and prompt handling of all requests to a controlled IT infrastructure is utilized. On its turn, workflow technology focuses on supporting these kind of processes. Workflow technology represents a class of software products which enable advanced modelling and execution of processes. Based on process model, Workflow management systems (WfMSs) are able to manage the flow of work in processes such that individual work items are done at the right time by the proper person. The benefit of applying this kind of technology in the IT service management domain includes a reduction in labour cost and more efficient process execution.

In Request management, the workflow model consists of service request which is given by the user request for information, advice or a standard change, then

that request will be allocated to the service desk analyst that team will analyse the response time and completion time. The use of the Request fulfilment process as one way to ensure requirements are being met or exceeded. Then the proper documentation will be recorded as a proof. Each request has associated tasks, each of which is assigned to a concerned team, which in turn will assign to an individual to the team concerned to communicate accountability and responsibility for the completion. Here, we will introduce the Business Process Management in the field of workflow management is introduced and positioned with respect to BPM.

Here, we focus on the support of the service process by workflow technology. An important characteristic in the context of service processes, and which is influential for the course of a process, is predictability. The predictability of a process determines to what extent the severity of the process and the corresponding treatment can be predicted y using the discovered process model.

In service process, process flexibility is an important requirement and therefore needs to be provided by workflow technology in order to successfully applied in the service domain. Here flexibility is very important in order to be able to deal effectively with variations in the case of severity of service. However, flexibility is not the topic of this paper. Rather, its focus will be on the issues neglected in literature and not supported by contemporary systems. The contemporary workflow systems offer work items to users via specific workflow list which is scheduled every month beginning. The scheduled services will be done by the allocated staff at assigned time. But some of the service job may have higher priority than the current scheduled job. So, the contemporary system will not be followed here and the mismatch of the calendar schedule is identified.

In Request Management System workflow, the order of the workflow model is mentioned in the diagram, but here the Inter-Workflow model is not used i.e., in some situation, the assigned person may unable to clear the job and as per the workflow model the job will be redirected to the next team. But the same team can undergo that service process by using another service engineer in their team itself. However, current workflow systems do not provide support for the inter-workflow model. Therefore, the major problems identified in this Request Management are predictability, inter-workflow model and the mismatch in the calendar schedule. And also, some the request may be cancelled due to out of scope of the service.

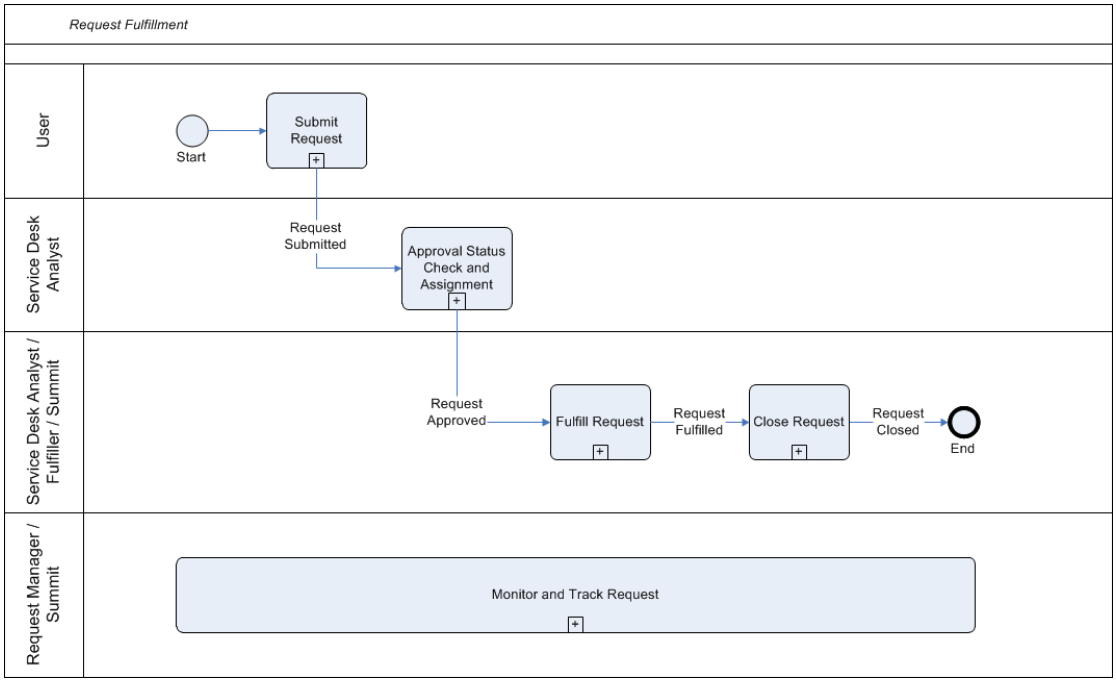

Figure2 Request Management Work flow

The above given figure2 shows the normal workflow model. In this model some mismanagement request are identified using the process discovery technique and that will be handled using the Petri Net application and the visual model for the request management process given figure2.

Table 1: Request Management Event Log (each row corresponds to an event)

case_id	event id	Timestamp	activity	resource
1	27010	12/12/2012 11:58	register request	Jabal Mohammed Rifah
1	27011	12/12/2012 15:58	approval check	Mike
1	27012	12/6/2013 16:23	final check	Mark
1	27013	2/7/2013 12:43	decide	Vinoth Balakrishnan
1	27014	2/8/2013 10:38	reject request	Vinoth Balakrishnan
2	27028	9/12/2012 8:13	register request	Ramanujam
2	27029	9/12/2012 12:13	approval check	Ravi
2	27030	4/3/2013 10:15	final check	Ravi
2	27031	4/4/2013 9:47	decide	Ravi
2	27032	4/8/2013 10:16	fulfill request	John Stephen
3	27039	9/27/2012 11:07	register request	Praveen
3	27040	4/7/2013 18:05	approval check	Mike
3	27041	4/21/2013 14:02	final check	Mark
3	27042	5/17/2013 19:11	decide	Mark
3	27043	5/17/2013 21:12	reinitiate request	Karthikrishnan
3	27044	7/2/2013 22:02	approval check	Mike
3	27045	8/4/2013 23:17	check local	Mark
3	27046	9/27/2013 11:08	decide	mike
3	27047	9/28/2013 23:08	fulfill request	Karthikrishnan
4	27052	10/15/2012 12:56	register request	Karthikrishnan
4	27053	10/17/2012 0:57	approval check	Petchi Ganesan
4	27054	10/21/2012 11:52	final check	Petchi Ganesan
4	27055	10/21/2012 0:12	decide	Petchi Ganesan
4	27056	10/21/2012 0:20	reinitiate request	Karthikrishnan
4	27057	10/21/2012 0:51	check local	Petchi Ganesan
4	27058	11/22/2012 11:45	approval check	Niral Gandhi
4	27059	11/15/2012 12:57	decide	Petchi Ganesan
4	27060	11/25/2012 22:20	fulfill request	Petchi Ganesan
5	27061	12/4/2012 13:04	register request	ValliKannu
5	27062	12/4/2012 13:06	approval check	Mike
5	27063	12/4/2012 17:04	final check	Ram Mohan
5	27064	4/8/2013 10:06	decide	Ram Mohan
6	27065	12/12/2012 11:58	reinitiate request	Jabal Mohammed Rifah
6	27066	12/12/2012 15:58	check local	mike
6	27067	2/8/2013 10:38	approval check	mike
6	27068	2/8/2013 11:10	decide	Jabal Mohammed Rifah
6	27069	4/8/2013 9:20	reject request	mike

The above table represents the information in an event log. The requirements for process mining are that an event can be related to both a case and an activity. With

the information from the above table we got the information representation of the event log as shown below.

Trace of the event log

case id	Trace
1	{a,b,c,d,h}
2	{a,b,c,d,g}
3	{a,b,c,d,e,b,f,d,g}
4	{a,b,c,d,e,f,b,d,g}
5	{a,b,c,d,e,f,b,d,h}

In the above table, the case is represented by a sequence of activities referred to as trace and the activity names are represented by single letter labels. The various labels mentioned in the table denotes as follows:

a – register request
b- approval check
c- final check
d- decide
e- reinitiate request
f- check local- fulfill request
h- reject request
i- close request

The information given in the above trace table can be transformed in to process model.

Here we examined the trace of the first case – {a,b,c,d,h} to show that the trace fits to the proposed model. With the help of token in start (Figure3), a is enabled. After firing a places c1 and c2 are marked with tokens. b is then enabled at this marking and its execution results in tokens c2 and c3. The next event c is enabled and this results in marking enabling d and further firing d results in the marking with one token in c5. This marking enables the final event h in the trace. After executing h the case ends in the final marking with just a token in the place end. All the other four traces can also be checked in the model and all these traces result in marking with just a token in the place end.

Process Work -flow Model

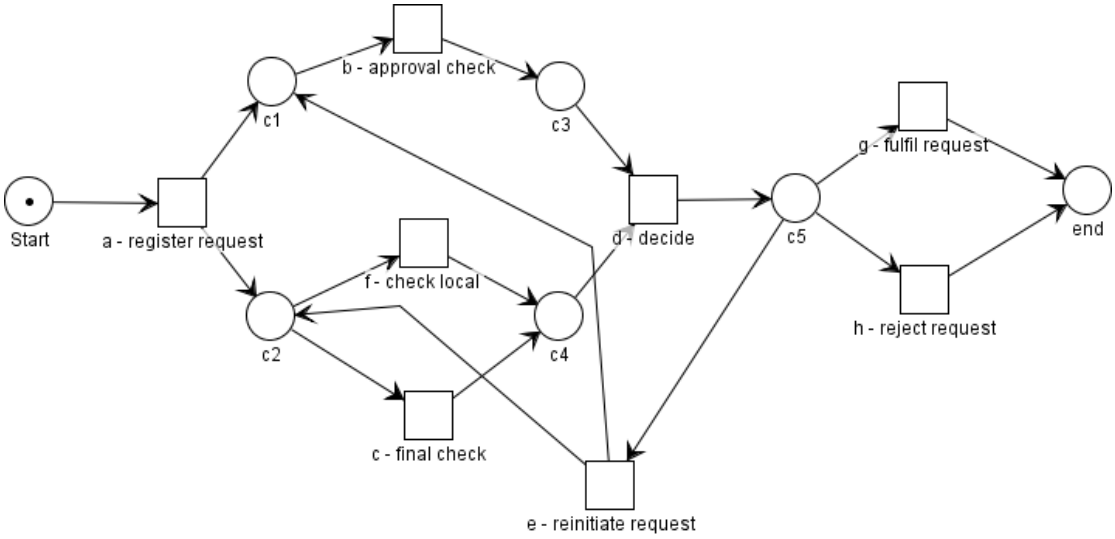

Figure3 Process Workflow Model – Petri Net

VI. CONCLUSION

This paper discovers and identifies some activities which are incomplete in the request management process workflow in the BPO domain which leads to very low service levels. By using the Petri Net a new process model is discovered, in that the missing activities are included. Workflow management is fruitful application domain for Petri Nets. In this paper, pitfall in handling the service request process of the customer in the BPO company domain will be identified lead to very low service levels. The discovered model is used to identify bottlenecks, problem forecast, record rule violations and streamlining the process.

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