



## **Business Process Discovery From Event Logs**

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### **Abstract**

In the area of information system (IS), process mining is considered as a new paradigm focusing on the extraction of knowledge to build event logs from data which are recorded in IS. The purpose of the mining process is to extract information about business processes and process discovery is one of the most challenging process mining tasks. From the event logs, the process model can be extracted in process discovery which is very important for analyzing and optimizing processes. This paper focuses on process discovery and models the explored process that has been restored to the event log by applying the alpha algorithm. A scenario example has been applied in my-invenio to automatically represent the organization process. The result shows that the process models and the related details of executed process are very useful for optimizing processes.

**Keywords:** Process mining, Process discovery, Process model.

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### **Introduction**

In today's business environment, the uncertainties increase the business requirement changes that have encouraged companies to make use newer business processes which result in the further complexity of the business process. As a result, companies started the implementation of integrated information systems for supporting their business process [1]. Consequently, different technologies of IT system have emerged such as ERP and Workflow Management System (WfMS) [2]. ERP is an integrated computer system that manages and stores all related data and information in the company's operations in which all relevant business users can have access to these data. WfMS is the systems, which distribute, based upon a company's process model, different tasks among different actors. As a result of this development, a WfMS helps the facilitation of the changes in business processes. With the emergence of the Web Services, the possibility of integration of WfMS with other systems has become less complicated. Consequently, due to the complexity of workflow management, WfMS have become more integrated with other enterprise systems known as Business Process Management System (BPMS) [3].

In the area of information system (IS), process mining is considered as a new paradigm focusing on the extraction of knowledge to build event logs from data which are recorded in IS. From the event logs, the aim of process mining would be to discover, monitor, and enhance a specific process in various application domain. Event logs refer to activities being performed and events may be commented with further data like the timestamp of the event, the resource or person performing the activity, or data elements which are recorded with the event. Event logs can be created by Process-Aware Information Systems like CRM systems, ERP system, BPMS [4-6].

The remainder of this paper is organized as follows. Background of process mining is briefly explained in section 2. In Section 3, . A scenario example has been applied in my-invenio to automatically represent the organization process. Finally, section 4 concludes the paper.

### **Process Mining**

The purpose of the mining process is to extract information about business processes. Process Mining involves techniques, tools, and methods for discovery and actual improvement of the process by extracting knowledge from a log event. These data are generated during the implementation of business processes in the information systems and

are used to rebuild the model processes. These models are useful for analyzing and optimizing processes [6].

Figure 1 shows a process mining general outline in SCM and shows three main kinds of process mining such as process improvement, process discovery, and conformance checking. From the event logs,

the process model can be extracted in process discovery; by comparing the event logs with the first process model, the aim of conformance checking is to find deviations; and in process improvement, an existing process model and log would be aligned by applying data from the event logs to enhance the model [6-7].

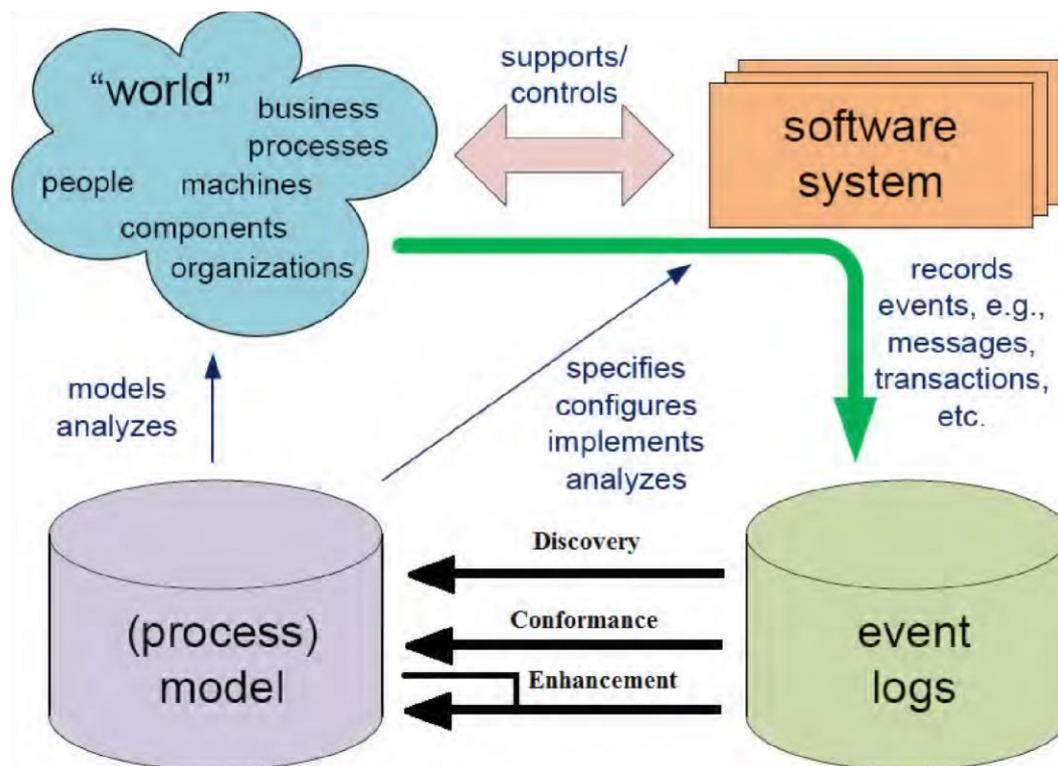


Figure 1: process mining general outline [6]

The goal of the process is to model process processes based on "log data". In the concepts of information systems, it is a single representative model of the real world instance of which it is used for a given purpose. The model can be used to reduce complexity so that desired and desirable features are displayed in the model and other features are eliminated. A process model is a graphical representation of a business process that outlines interdependencies between activities that are integrated and implemented to fulfill a given business goal.

### Event logs and process model

Process discovery is one of the most challenging process mining tasks. Based on an event log, a process model is constructed thus capturing the behavior seen in the log [6-8]. Event logs are stored in the standard format for process mining XES (eXtensible Event Stream).

Process models can be described in the form of process modeling languages such as BPMN, EPC, Petrinet, UML activity diagram, etc. In this regard,

BPMN is widely used to represent process model in business and industry.

Figure 2 shows the model of the explored process that has been restored to the event log by applying the alpha ( $\alpha$ ) algorithm. This algorithm illustrates some of the general ideas used by many process mining algorithms and helps to understand the notion of process discovery. Moreover, the  $\alpha$ -algorithm serves as a stepping stone for discussing challenges related to process discovery [6,9].

There are various tools for the mining process, including Prom [10], Disco[11], myInvenio[12] and more. In this study, . myInvenio was used for ease. myInvenio is an enterprise-class automated business process discovery software that is able to automatically design the organization processes by reading the structured & unstructured organization information [12].

The event log log is also used from [www.processmining.org/logs/csv](http://www.processmining.org/logs/csv) [13]. Figure 2 shows an example of the event log data used.

Case ID	Activity	Start Date	End Date	Product	Service Type	Resource
Case 1	Inbound Call	9.3.10 8:05	9.3.10 8:10	MacBook Pro	Referred to Servicer	Helen
Case 1	Handle Case	11.3.10 10:30	11.3.10 10:32	MacBook Pro	Referred to Servicer	Helen
Case 1	Call Outbound	11.3.10 11:45	11.3.10 11:52	MacBook Pro	Referred to Servicer	Henk
Case 2	Inbound Call	4.3.10 11:43	4.3.10 11:46	MacBook Pro	Referred to Servicer	Susi
Case 3	Inbound Call	25.3.10 9:32	25.3.10 9:33	MacBook Pro	Referred to Servicer	Mary
Case 4	Inbound Call	6.3.10 11:41	6.3.10 11:51	iPhone	Referred to Servicer	Fred
Case 5	Inbound Call	18.3.10 10:54	18.3.10 11:01	MacBook Pro	Product Assistance	Kenny
Case 6	Inbound Call	25.3.10 17:09	25.3.10 17:13	MacBook Pro	Referred to Servicer	Harold
Case 6	Inbound Call	25.3.10 17:16	25.3.10 17:18	MacBook Pro	Referred to Servicer	Nancy
Case 6	Inbound Call	26.3.10 8:36	26.3.10 8:40	MacBook Pro	Referred to Servicer	Elena

Figure 2: the event log

After entering the event log in the myInvenio software to extract the process model, the following results are obtained. Figure 3 shows the performance and conformance overviews corresponding the eventlogs, the most critical

activities and resources can be found in process details. As shown in Figure 3, the average fitness of the process is 95% which means the process efficiency is appropriate and requires no change in the process model.

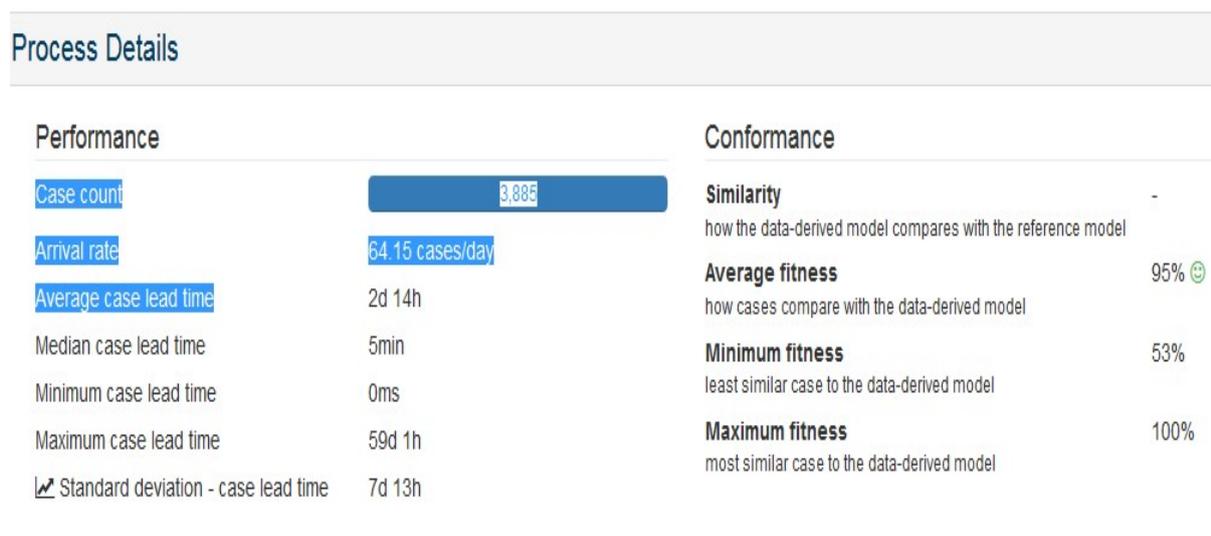


Figure 3: the performance and conformance overviews

Figure 4 shows the activities in the process. The most executed activity is “call outbound” and the

least executed activities are “Handle email” and “email outbound”.

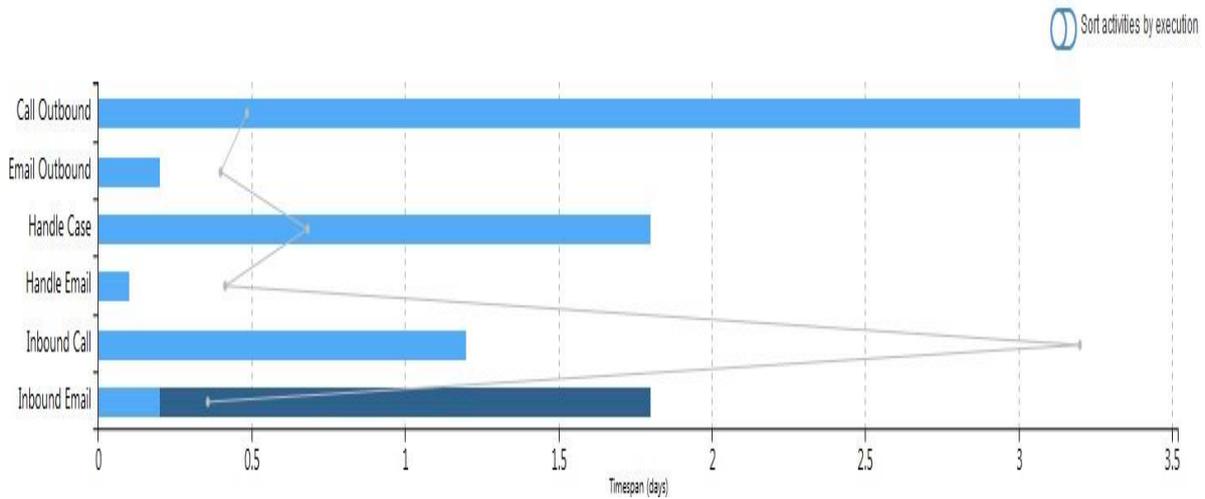


Figure 4: the activities in the process

Figure 5 shows the process model corresponding the event log. Each of the numbers on the lines between activities indicates the number of times the execution of the same activity.

figure, the most executed activity is related to “call outbound”.

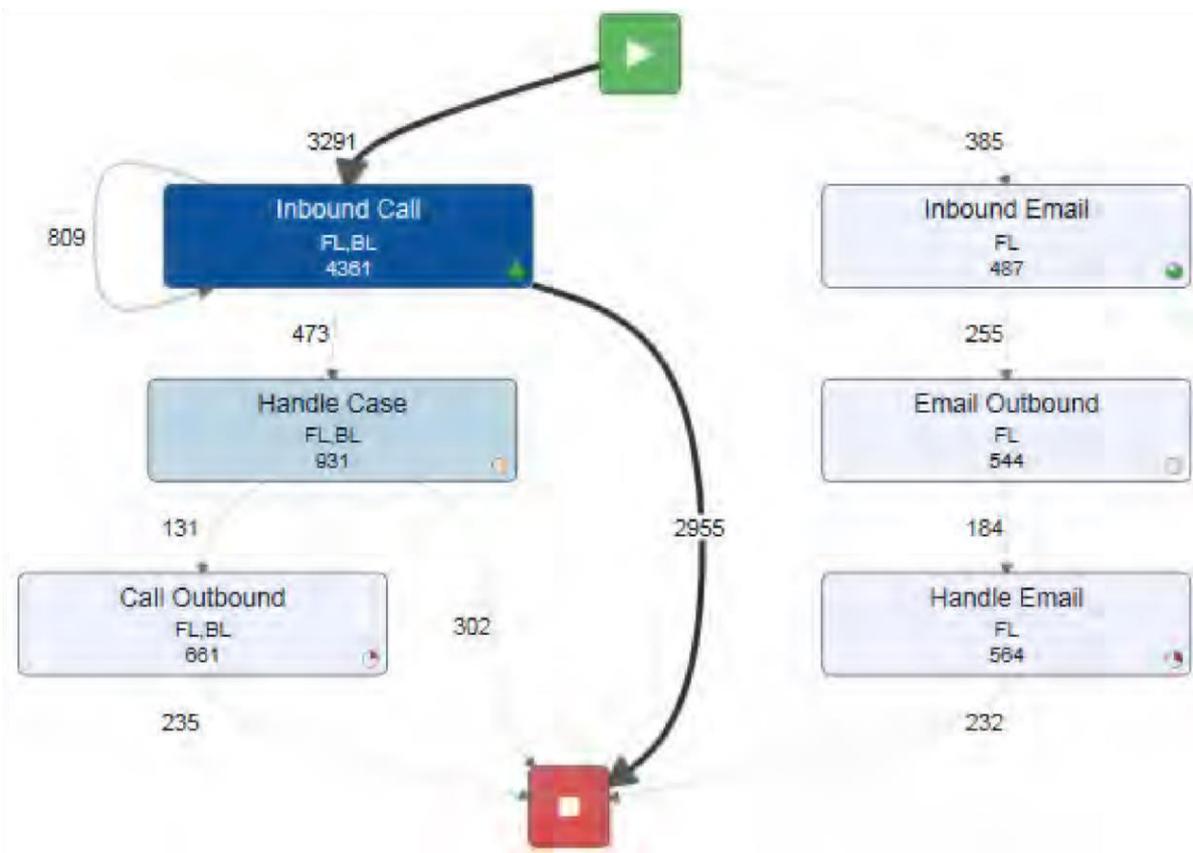


Figure 5: the process model

The model can be used to reduce complexity so that desired and desirable features are displayed in the model and other features are eliminated. A process model is a graphical representation of a business process that outlines interdependencies between activities that are integrated and implemented to

fulfill a given business goal. This model includes a set of "modeled activities" and communication and conditions among them. AS BPMN has become widely supported and used by business and industry, for better comparability, this process model has also shown in BPMN model in Figure 6.

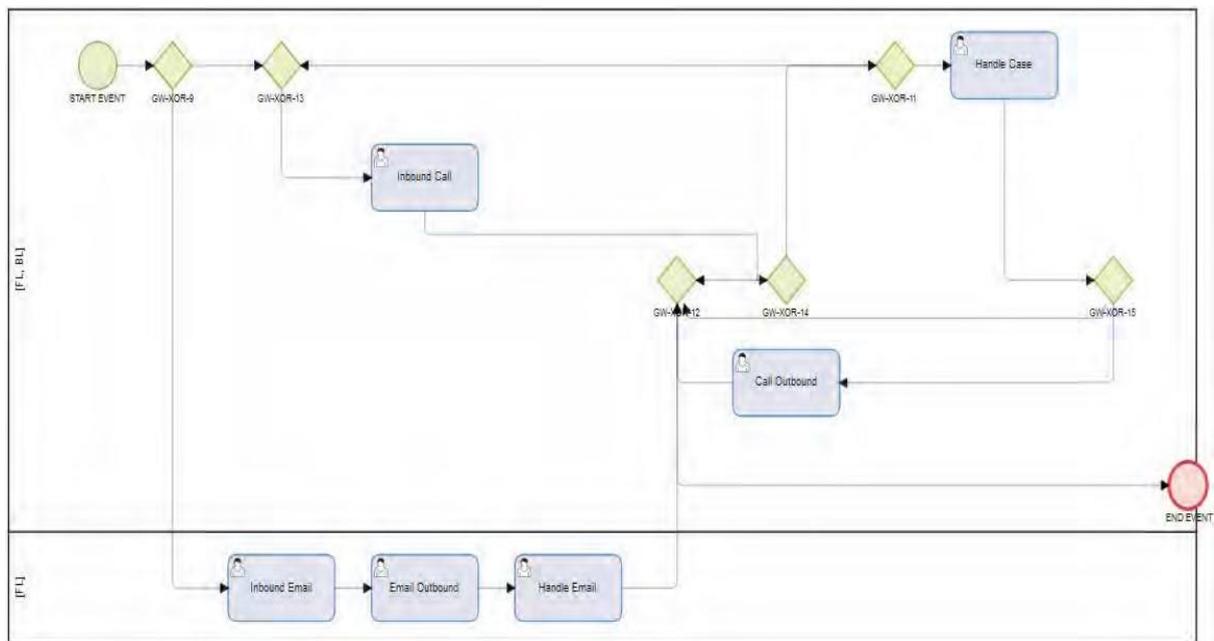


Figure 6: the BPMN model

## Conclusion

The 21<sup>st</sup> century business environment has to face the challenge of ever-increasing uncertainties in business management. These uncertainties have enforced enterprises to utilize business process management system. In this challenging context, business administrators prioritize more novel business processes and IT requirements, which, in turn throughout time, shifted to IT-based business processes. To this effect, process mining, as a highly capable paradigm in IT, has been increasingly used in enterprise information systems. Process Mining involves techniques, tools, and methods for discovery and actual improvement of the process by extracting knowledge from a log event. process mining is used to discover, monitor, and enhance a specific process in various application domain. The first step in process mining is process discovery which is very important for analyzing and optimizing processes.

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