BPI Challenge 2020

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Abstract. The annual Business Process Intelligence (BPI) challenge is an opportunity to find and apply new techniques for process mining analyses on provided datasets, which in this year 2020 is an event log of reimbursement process at TU/e. The process owner is interested in gaining information on the compliance of their process through the discovery of a collection of process models, the analysis of throughput times process and the separation of deviating items. Multiple process models used to understand the process landscape of the TU/e.

Keywords: Process Mining · BPI challenge · PM4PY

1 Introduction

Business Process Intelligence (BPI) Challenge 2020 is a competition in process mining, as part of the International Conference on Process Mining (ICPM). BPI Challenge 2019 asks all participants to analyse data on the reimbursement process at Eindhoven University of Technology for 2017-2018.The owner of the process is particularly interested in understanding the process.BPI Challenge is divided into student and non-student works and this article attempts to analyze this dataset for compliance in a non-student category.

A number of questions need to be answered in order to achieve this goal: (Questions from the BPMIC website) [1].

It is expected that these issues will be resolved through Process Mining. Process Mining is a research discipline that aims to detect, monitor, and improve real-world processes by extracting knowledge from the event logs available in organizations' information systems [2].

2 Appreciation for a process

The data is divided into 5 logical processes in the overall compensation process.Based on the data provided were built process models for the total execution flow with noise elimination. The visualization of the logical processes is presented in the figures below (see Fig. 1-5).

Fig. 1. Filtered process workflow for domestic declaration.

Fig. 2. Filtered process workflow for international declaration.

3 Some answers

These models were built using the pm4py tool. Heuristic filtering with DECREASING_FACTOR parameter selected individually for each model was used to remove noise. On the basis of the built models was obtained an idea of how the process should be carried out under ideal conditions.

3.1 Common questions

What is the throughput of a travel declaration from submission (or closing) to paying ?

On average a full cycle takes 12 days from curing to closing or payment to DomesticDeclaration and InternationalDeclaration.

The InternationalDeclaration cycle takes 13 days, while the DomesticDeclaration cycle is 11 days. In total for the whole period 19051 declarations have been fully worked out. The average for the period is 19 declarations per day.

Is there are difference in throughput between national and international trips ?

After understanding the process, the authors made a comparison of the total time of execution of the processes of DomesticDeclaration and InternationalDeclaration. For it was used the tool get_median_caseduration from pm4py package. This function returns median of execution time for all instances of get_median_caseduration process.This function returns median of execution time for all instances of get_median_caseduration process. The obtained values better reflect the real situation since the median is more stable. The median of the total runtime is shown in the table 2.

You can see from Table 1 that instances of the InternationalDeclarations process run significantly longer than instances of the DomesticDeclarations process. This difference is due to the fact that the copies of DomesticDeclarations do not need to submit a "Permit Declaration".

Fig. 3. Filtered process workflow for travel permits.

Fig. 4. Filtered process workflow for prepaid travel costs.

Fig. 5. Filtered process workflow for requests for payments.

Are there differences between clusters of declarations, for example between cost centers/departments/projects etc. ?

Declarations by division 65456 and 64455 account for 46 per cent of the total number of declarations for all divisions (26 divisions). This distribution is due to the fact that the information in the event log for 2017 contains data for only two divisions.There was also an overspending analysis for the departments. The percentage of statements exceeding the planned expenses by departments is shown in Fig. 6.

What is the throughput in each of the process steps, i.e. the submission, judgement by various responsible roles and payment ? Where are the bottlenecks in the process ?

When searching for places that negatively affect the speed of the process is generated a table that shows how long each step of the process took. The data in table 2 are presented below

Transactions that take less than five days were grouped in a separate line, as the authors of this paper believe that this execution time is acceptable for normal execution of the process. Operations "Permit REJECTED by DIRECTOR", "Permit REJECTED by MISSING", "Request For Payment SUBMITTED by EMPLOYEE", "Permit REJECTED by MISSING", "Request For Payment FOR_APPROVAL by ADMINISTRATION" are weak links in their processes.

How many travel declarations get rejected in the various processing steps and how many are never approved ?

We will also consider the percentage of rejected applications in DomesticDeclaration and InternationalDeclaration. In DomesticDeclaration were found 12% of rejected applications at

Table 1. Table captions should be placed above the tables.

Name	Days
DomesticDeclarations	7.2
InternationalDeclarations	66.6

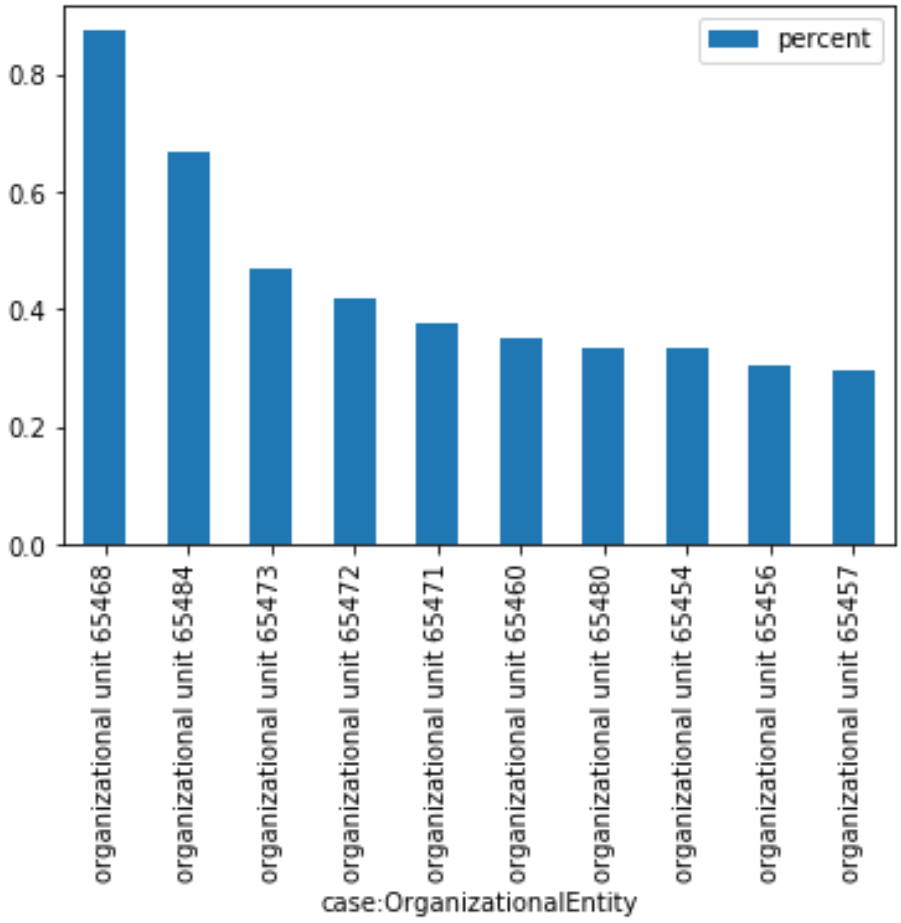

Fig. 6. The percentage of statements exceeding the planned expenses by departments.

Table 2. Table captions should be placed above the tables.

File	**Activity**	**Median of runtime in days**
PermitLog	Send Reminder	56.0
RequestForPayment	Request For Payment FOR_APPROVAL by ADMINISTRATION	50.0
InternationalDeclarations	Send Reminder	39.0
PrepaidTravelCost	Permit REJECTED by MISSING	32.0
InternationalDeclarations	Start trip	29.0
PermitLog	Permit SAVED by EMPLOYEE	21.0
InternationalDeclarations	Permit REJECTED by DIRECTOR	20.0
PermitLog	Start trip	20.0
PermitLog	Permit REJECTED by MISSING	14.0
PrepaidTravelCost	Request For Payment SAVED by EMPLOYEE	13.0
InternationalDeclaration	s Declaration SAVED by EMPLOYEE	9.0
PrepaidTravelCost	Request For Payment SUBMITTED by EMPLOYEE	8.0
PermitLog	Permit FOR_APPROVAL by SUPERVISOR	7.0
Other	operations in all logs Other operations in all logs	1.0

some stage and in InternationalDeclaration were found 27% of rejected applications.For requests that have never been approved were obtained the following values : 3% of applications in DomesticDeclaration and 0.31% in InternationalDeclaration.

3.2 Detailed questions

How many travel declarations are booked on projects ?

4116 travel declarations booked under the project, all of them International.

How many corrections have been made for declarations ?

1019 domestic and 1405 international declarations were sent more than once. 2890 - total number of corrections.

Are there any double payments ?

Double payments not detected.

Are there declarations that were not preceded properly by an approved travel permit ? Or are there even declarations for which no permit exists ?

626 declarations have been filed without 'Permit FINAL_APPROVED by SUPERVISOR' from international declarations.

There was a request for permission. Without taking that fact into account 1064. This is probably due to the fact that we do not see the actual start of the process in the log.

How many travel declarations are submitted by the traveler and how many by a mandated person ?

For international 5916 - employee. 6057 - 5916 = 141 - system. There's no such thing on internal trips.

Next to travel declarations, there are also requests for payments. These are specific for non-TU/e employees. Are there any TU/e employees that submitted a request for payment instead of a travel declaration ?

There were 174 such declarations.

References

1. BPI Challenge – Process Mining Conference 2020. https://icpmconference.org/2020/bpi-challenge/. Accessed: 2020-08-19
2. Wil van der Aalst, W.: Process mining: discovery, conformance and enhancement of business processes, vol. 2. Springer (2011)