UNIVERSITY OF TARTU
1632

Institute of Computer Science

MTAT.03.231 – Business Process Management

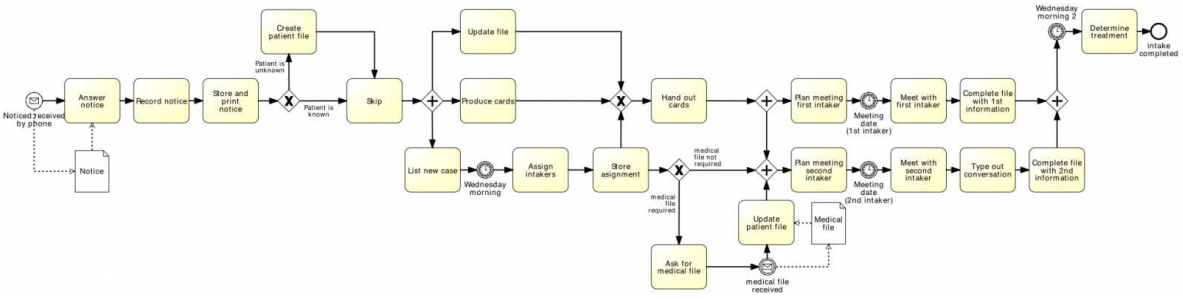
Final Exam – 2 June 2020

Notes:

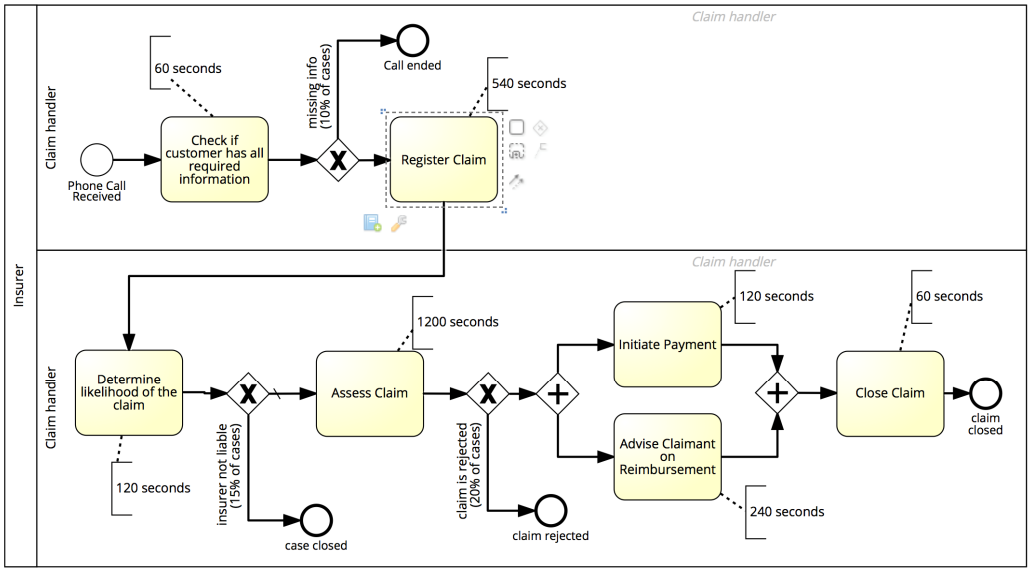
- *The exam is online, open-book, open-laptop, open-Internet. You can consult any course material during this part of the exam and you can browse the Web. Part B can be submitted on paper or electronically using the "Submit" button (as a single zip file or a single PDF file)*
- *You are not allowed to share information with anyone during the exam except with the lecturer. Your answers to this exam questions should be the output of your own intellectual effort.*

Part A. Short-Answer Questions (15 points)

A.1. [6 points] The following BPMN diagram contains two incorrect gateways. There is also one task that should not be there because it does not represent a "unit of work". Explain which gateways are incorrect and how they could be fixed, and which task should be removed and how should it be replaced/fixed?
If you wish to download and zoom-into this figure, you can download it from this URL: **http://tinyurl.com/nnnfgd5**



A.2. [4 points] Consider the following insurance claims handling process. The processing time of each task is shown as a text association in the BPMN diagram. The call centre receives 800 calls per week.



Write an arithmetic expression to calculate the theoretical cycle time of this process. You don't need to calculate the theoretical cycle time, but just to write an arithmetic expression. To give you an idea, this is an example of an arithmetic expression: 3 + 0.8*(2+2)

A.3 [5 points] We consider the same process model as in task A.2. An analyst proposes to merge the two tasks "Determine likelihood of claim" and "Assess claim" into a single task called "Assess likelihood and details of claim". The new merged task has a processing time of 1200 seconds. This new task leads to the rejection of 32% of claims. In other words, after this new task, 32% of claims are rejected and 68% are accepted. What would be the effect of this change on the theoretical cycle time (TCT) of the process.

Part B. Process Modelling, Analysis & Redesign (25 points)

Pharmak, the largest pharmacy chain in the country, introduced the tap-and-pick e-prescription delivery service in January 2019. This service allows a customer to place an order for an e-prescription with just two "taps" (or clicks) and to pick up their order at their selected pharmacy store.

To use this service, a customer should first register via Pharmak's Tap-and-Pick app, (or via the equivalent Web app available in Pharmak's web site). When a registered customer has an active e-prescription recorded in the national e-prescription system, the customer is able to see this e-prescription in the Tap-and-Pick app. They can then select an active e-prescription, select the pharmacy store where they wish to pick up the medicines, and pay for the medicines. Thirty minutes after paying (or whenever they wish within 48 hours of placing their order), the customer can pick up their e-prescription order at the selected pharmacy store.

When an order is submitted (and paid) by a customer, it is first routed to the pharmacy's *backend technician* at the pharmacy store. The technician takes an empty bag, writes the name of the customer on the bag, collects the medicines listed in the e-prescription and puts them in the bag. Then she puts the bag in a "quality assurance"

(QA) area. The bags in the QA area are those that have not yet been checked by the pharmacist.

From times to times, the *pharmacist* picks up a bag from the QA area, types the name of the customer into the pharmacy information system, and verifies that the medicines in the bag are the correct ones (and that all required medicines are there). If anything is incorrect or missing, they fix the issue. If the pharmacist finds any medicine in the prescription that requires special instructions or attention (e.g. a medicine that may cause strong secondary effects to the customer), she writes an "X" with a red marker on the bag. This means that the bag cannot be handed off to the customer without an interview with the pharmacist. The pharmacist then puts the bag in the pick-up area.

When a customer arrives, they give their ID card to the *customer service representative*. The customer service representative enters their ID code to retrieve the details of the customer's e-prescription order. The customer service representative then looks for the bag with the name of the customer in the pick-up area. If the bag does not have an "X" mark, the customer service representative hands in the bag to the customer and marks the e-prescription as delivered. If it has an "X", the customer service representative gives the bag to the pharmacist (who sits in another counter at the pharmacy store). The pharmacist asks some questions from the customer and decides whether or not it is safe to give the medicines to the customer. If any of the medicines is unsafe, the pharmacist removes it from the bag, and records this removal in the pharmacy information system. The customer will get an automatic refund if they have paid for a medicine but the medicine could not be served to them.

In 95% of cases, the delivery process works as expected. But in 5% of cases, the medicines are not yet ready when the customer arrives. This typically happens during busy periods. In these cases, the customer service representative needs to manually figure out where the bag is located. It might be stuck in the quality assurance area, or it might be that the technician is still collecting the medicines from the shelves, or sometimes the technician has so much backlog that they might not yet have started to collect the medicines for that particular e-prescription when the customer arrives. Such "where's the bag?" episodes are stressful. They consume time from everyone, and lead to long delivery queues.

On average, the customer service representative takes 3 minutes to serve one customer. But there is a lot of variability: sometimes it takes her 10+ minutes to serve one customer, particularly when the e-prescription is not yet ready.

At peak times, 15 customers arrive per hour on average.

In a pharmacy store, there is one customer service representative, one technician, and one pharmacist.

Customers complain frequently about long waiting and serving times when picking up their e-prescription. Customers are particularly annoyed when their e-prescription order is not ready yet, and especially when the customer service representative is unable to tell them right away how much time it will take for their e-prescription order to be ready. The pharmacy estimates that they lost 500 customers in 2019 due to long queueing times and slow serving times. A customer typically consumes 200 euros per year in medicines on average.

Tasks.

a) Capture this process in BPMN from the perspective of the pharmacy (i.e. only the tasks that involve pharmacy workers). **[5 points]**

b) Identify wastes in this process using the 7+1 waste classification by Taiichi Ohno et al. (cf. Lecture 6). For each identified waste in the process give a brief explanation of the waste and indicate what type of waste it is according to the classification of Taiichi Ohno et al. **[5 points]**

c) Analyze the waiting times during pick-up using queueing theory. Explain what inputs did you give to the queuing theory calculator to get your answer. **[3 points]**

d) Due to the Covid situation, the manager wants to know how many people on average can be found in the store picking up prescriptions at peak time. Can you answer this? Explain how you solved this question. **[2 points]**

e) Write an issue register for this process. **[5 points]**

f) Propose a set of changes to this process that have the potential to contribute to reducing customer dis-satisfaction and churn due to long pick-up times. Analyze each proposed change in terms of its potential benefits and its feasibility (cost). **[5 points]**

Part C. Process Mining (10 points)

We consider again the Repair log that you analyzed in Homework 5, and which can be found in the Apromore server you used for the homework.

C.1. [3 points] A case is completed if the "Archive repair" task has been performed. Are there cases that have not yet completed (or for which the completion has not been recorded in the system)? How many? Explain how you obtained your answer, and give a screenshot of Apromore where the answer to this question is displayed.

C.2. [2 points] Normally, the user should always be informed during this process, at least once. Are there cases where the user is not informed? How many? Explain how you obtained your answer, and give a screenshot of Apromore where the answer to this question is displayed.

C.3. [3 points] Normally, every repair should be tested right after the repair. Are there cases where this rule is NOT fulfilled? How many? Explain how you obtained your answer, and give a screenshot of Apromore where the answer to this question is displayed.

C.4. [2 points] According to the SLA of this process, 90% of cases should be fully resolved and archived within 90 minutes of their start. Is this SLA being fulfilled? Explain how you obtained your answer, and give a screenshot of Apromore where the answer to this question is displayed.