

## **MTAT.03.231 – Business Process Management**

**Prof. Marlon Dumas**

### *Project – Plant Hire Process*

**Due dates:** Monday 6 June 2011 (report) and Thursday 9 June (oral presentation)

**Teams:** 4 to 6 members – at least two from Masters of ETM, at most 3 from Masters of IT/CS/SE

**Worth:** 30 points

### **Task**

Your assignment is to design and automate a “to be” business process model for a procure-to-pay process for hiring heavy equipment at a construction company.

A description of the “as is” process and an initial list of issues are described below. You must take this description as the basis to analyze the process, identify improvement alternatives and to design a to-be process. If you find that the description below is not detailed enough, you can make your own assumptions.

According to the BPM lifecycle introduced in the lectures, you need to first understand the “as is” process model. To this end, you are asked to design a detailed model reflecting the current state of the process. This BPMN model should not only deal with the “normal course” of action, but it should also show how different types of errors or exceptions are handled, including cases where the site engineer decides the plant is no longer needed, the case where the plant is not delivered on time, and the case where the plant is rejected by the site engineer when it is delivered.

Next, you should document the most important issues in an issue register and to assess the impact of these issues. Here you should use the quantitative data given in the description of the scenario.

Based on the identified issues, you should then design a “to-be” process model in BPMN and to explain what changes are you proposing and how would these changes address the identified issues.

In addition to proposing a to-be process model, your team must build a mock-up application using either the YAWL engine or another business process management system (for example BizAgi). The purpose of this mockup application is to demonstrate how the to-be process could be automated and how would this automation affect the way the participants in the process do their work. You are not expected to deliver a “ready-to-be-deployed” system.

### **Requirements**

- The “issue register” should include the following columns: Issue Priority Number, Issue Name, Short Description, Assumptions, Quantitative Impact and Qualitative Impact. You do not need to make an exhaustive issue register with every possible issue you can think of. Instead, you should include only the most “high-priority” issues, including those mentioned in the description below.
- To complement the YAWL model, you need to define an organizational database with the roles required by the to-be process model, and a reasonable number of participants for each role.
- The YAWL model should include data types for representing Plant Hire Requests, Purchase Orders, Invoices and other documents that you deem appropriate.

- The YAWL model should perform basic checks automatically, such as ensuring that every invoice refers to a valid purchase order.
- Using an e-mail or SMS service for sending notifications to the site engineer would be considered as a bonus.

## What to Submit

You should submit by e-mail a report in PDF, RTF or OpenOffice format, containing the following sections, each on a new page:

1. A title page including the full names of all team members and the role(s) taken by each member (e.g. leader, analysis/design, YAWL modelling /testing). A table of contents is not required.
2. An “as-is” process model using BPMN as a modelling notation. If you wish, instead of including the full model in the report, you can include in the report only the top-level process model (without subprocesses), and submit the full BPMN process model as a separate file (in PDF, Visio or Bizagi format).
3. An “issue register”.
4. A description of the changes your team suggests to make in the “as is” process. For each proposed change, you should explain why do you suggest that change, and which issue(s) it would help to solve. Ideally, quantitative analysis should be used to assess the benefits to be obtained from the proposed changes.
5. A “to-be” process model using BPMN as a modelling notation. As an alternative, instead of including the full model in the report, you can include only the top-level process model (without subprocesses) in the report, and then submit the full process model as a separate file (in PDF, Visio or Bizagi format).

In addition, you should submit an executable process model in YAWL (.yawl file) and an organizational database ".ybkp" file).

You may also submit (but this is optional) the BPMN models in PDF, Visio or BizAgi format.

## Additional Notes

- The report can be written in English or Estonian.
- The report will not be made public.
- Normally, the grade that a team gets will be the grade that each team member will get. However, Masters of IT students may be penalized if the YAWL application developed by their team is unsatisfactory, while Master of ETM students will be penalized if the “to be” process model or the associated documentation (including issue register) are unsatisfactory. Also, points may be deducted from an individual team member if, according to the other team members, his/her contribution to the project was unsatisfactory.
- Your team should prepare an oral presentation and a demo to be delivered on 9 June. Each team will be given 15 minutes to present their project.
- Business students must deliver the to-be process model to the IT students no later than Monday 16 May. Otherwise their grade is reduced by 1 point per day of delay.

## Scenario

*Buildit* is a construction company specialized in public works (roads, bridges, pipelines, tunnels, railroads, etc.). Within Buildit, it often occurs that engineers working at a construction site (called “site engineers”) need a special type of equipment, such as a truck, an excavator, a bulldozer, a

water pump, etc. Buildit has some heavy equipment available in its depot, but very often, it hires equipment when needed from specialized heavy equipment suppliers.



**Figure 1. Plant for hire (image taken from Holden Plant Hire Ltd., UK)**

A piece of heavy equipment is called a “plant” in the construction jargon. When a site engineer needs to hire a plant, he/she sends a Plant Hire Request to one of the clerks at the depot. This request takes the form of a PDF document that the site engineer has to fill in. It takes on average 15 minutes for the site engineer to fill in and send the PDF file. Incoming plant hire requests usually stay about 15 minutes in the clerk’s mailbox before being processed.

A clerk at the depot first checks if an appropriate plant (owned by BuildIt) is available at the depot for the required period of time. If it is, the request is filled within one hour and the plant is delivered to the construction site usually in 4 hours. This happens in 10% of the cases. Otherwise, the clerk checks an information system that lists all equipment offered by the suppliers and selects the most cost-effective plant that complies with the request. She then checks the availability of the selected plant with the plant’s supplier via phone or e-mail. This availability enquiry takes on average one hour. Sometimes (about 20% of the times), the selected plant is not available and the clerk has to select another plant and check its availability with its supplier, and so on.

Once the clerk has found a suitable plant available for hire, she recommends that it be engaged (to “engage a plant” is the term used to say that the plant will be hired). The engagement of every plant has to be approved by a “works engineer” who also works at the depot. The works engineer usually approves plant engagement requests twice per day. Because of that, a plant engagement approval takes on average 3 hours. In 10% of the cases, the works engineer rejects the plant engagement request. Half of the rejections lead to the cancellation of the Plant Hire Request (no plant is hired at all). The other 50% of rejections are resolved by replacing the selected plant with another plant (a cheaper plant or a more appropriate for the job). In this latter case, the clerk needs to perform another availability enquiry (or several enquiries). Once the works engineer has approved the engagement, the clerk sends a confirmation to the supplier (including a Purchase Order for hiring the plant) and she records the engagement in an Excel spreadsheet that she maintains in order to keep track of all the approved plant engagements. The clerk generates the Purchase Order using the company’s financial information system. It takes about 1 hour for the clerk to prepare the confirmation and purchase order. Most of this hour is “waiting time”.

During the process, it may happen (10% of the times) that the site engineer decides that the plant is no longer needed. In this case, he/she asks the clerk to cancel the request for hiring the plant.

When the plant is hired, the supplier delivers it to the construction site at the required date (or in about 6 working hours if the request is urgent). The site engineer inspects the plant and if everything is in order, he/she accepts the engagement and the plant is put into use. In 10% of the cases, the plant is sent back because the plant does not comply with the original specifications of the site engineer. In this case, the site engineer has to start the process all over again.

When the period of engagement is concluded, the supplier comes to pick up the plant. Sometimes (20% of the cases), the site engineer asks that the period of engagement to be extended. In this case, the site engineer requests an extension directly to the plant's supplier by e-mail or phone.

Five working days after the plant is picked up, the plant's supplier sends an invoice to the clerk by e-mail. After checking that the engagement corresponding to the invoice was fulfilled (by contacting the site engineer), the clerk forwards it to the financial department. It takes on average 10 days for an approved invoice to be paid. The approval of the invoice takes on average 5 days, oftentimes because site engineers are very busy and do not take the time to do their part of the approval. In about 10% of cases, the invoice is not approved, either because the site engineer states that the plant was not used to the stated period, or because the amounts in the invoice do not match the prices initially quoted, or because the invoice includes amounts for damages to the plant and the site engineer does not agree that those damages took place. These rejection cases take about 5 days to resolve. In some cases, the problem comes from an error of the clerk or the site engineer and the issue is resolved internally. In other cases, the problem is resolved when the supplier sends a revised invoice. This revised invoice is approved (100% of cases) and forwarded to the finance department.

BuildIT executes around 40 projects in parallel. Each project generates on average 10 plant hire requests per month, and each plant hire request involves on average 2 plants. On average, a plant is hired for a total period of 8 days (including extensions). Each plant hiring costs on average EUR 200 per day, but there is a lot of variation: some types of plant (e.g. submersible water pump) costs EUR 60 per day, while others (e.g. a large excavator) can cost up to EUR 400 per day.

BuildIT employs 60 site engineers, 6 works engineer, and 4 clerks distributed across two plant depots (two clerks per depot). The accounts payable department employs 10 people, of which 2 deal with plant hiring-related issues. You can make any "reasonable" assumptions regarding salary costs.

Several issues affect the above business process, in particular:

- The company's management team has found that the company's total expenditure in plant hiring is very high and it has been increasing steadily. By interviewing engineers and other workers, they have found that often the plant is hired for longer than needed. Sometimes site engineers keep the plant longer than needed, because they know that if the need for the plant arises again, getting the plant hired again takes too much time.
- Sometimes the site engineer rejects the plant because it does not conform to their specifications. In these cases, the supplier will send an invoice to cover for the costs of delivering and taking back the rejected plant.
- The company has received complaints from suppliers regarding the fact that payments are often received after the payment due date (which is generally 14 days after the invoice is sent). Because of these late payments, suppliers are unwilling to offer favourable prices to the construction company. Also, the company has to pay certain penalties for late payments.
- Site engineers complain that their Plant Hire Requests take too long to be fulfilled. They often get nervous about not getting any news about the plant request and call the clerk several times to enquire about the status. Sometimes, the clerk that received the request initially is not the same as the one who responds to status enquiries from the site engineer and this causes confusion because the second clerk is not aware of what the first clerk did.