UNIVERSITÀ DI PISA

Department of Computer Science:

Masters degree in Data Science and Business Informatics

Business Process Modeling: Project report

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Academic year 2024/2025

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Chapter 1

Introduction

For the assigned project the main goal was to model and demonstrate the decision making process between two friends, Alice and Barbara about a decision to whether go to the cinema together, and if yes, which film and date. Initial steps included understanding the tasks, pointing out different decision points and possible outcomes through an analysis taking short notes with pen and paper.

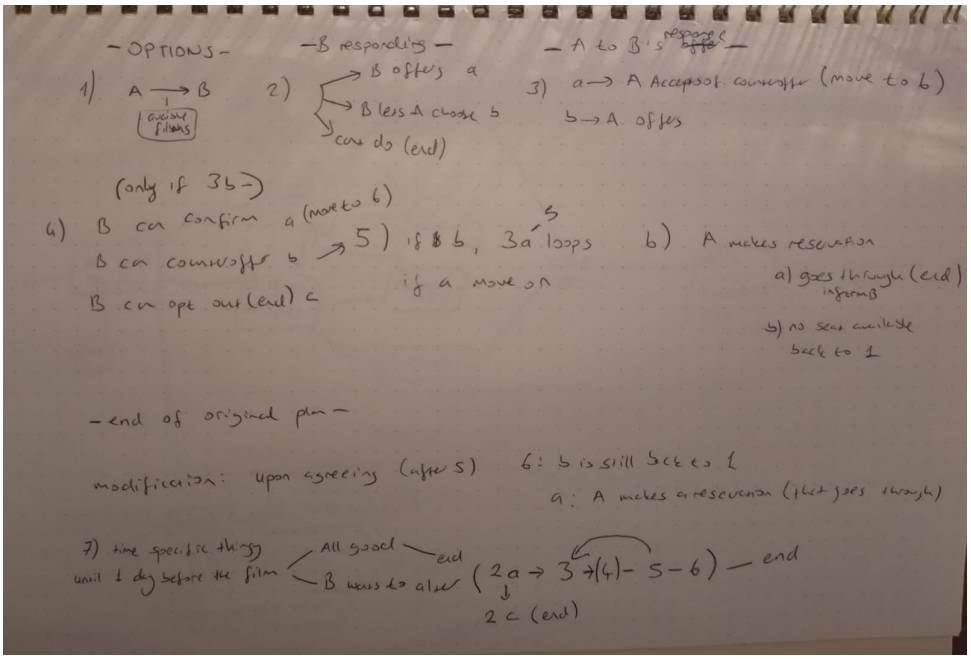

Figure 1.1: An example from the initial design process

Chapter 2

Abstract Design

Since the given model follows back and forth communication between two friends, a collabration diagram with two pools was found adaquate. Since creating collabration models is easier on BPMN (in comparison to EPC), BPMN was chosen as the language to create the abstract model.
After checking the tools suggested on course's website, Comunda was found to be the most user friendly and the diagram was created using it. Instructions given during classes and looking at online material (especially Ca- munda's BPMN overview page) made the process easy. The diagram consisted of many message flows, and thus also event based gateways. One User task was present when Alice had to interact with the website while making reservation. It was followed with an event based gateway where the outcome was depending on the website's response. For that, conditional catching events was found suitable to use.
Both pools had distinct start and ending events. Instead of merging end events, the decision was taken to keep several ending events per pool to make the diagrams easier to follow visually.

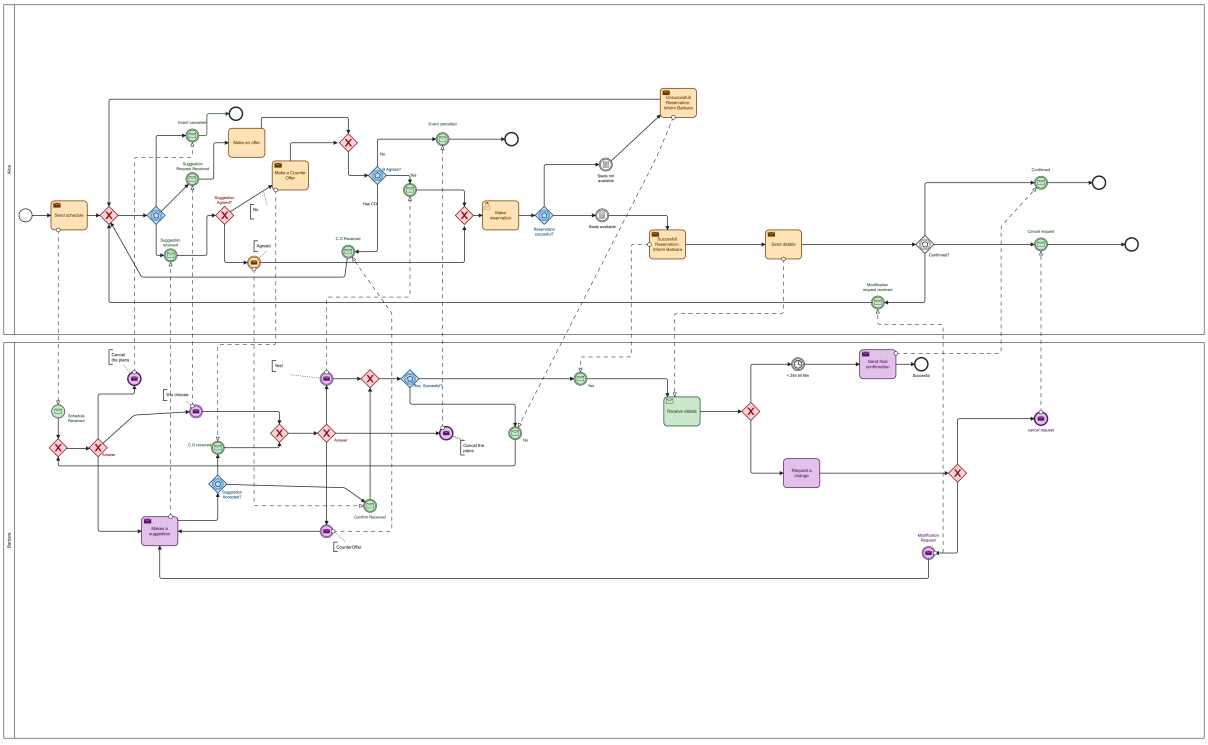

Figure 2.1: BPMN Diagram

Chapter 3

Workflow Net Transformation

After checking available tools to create workflow nets, Woped was found to be the most user friendly and the transformation from BPMN notation to workflow net took place on it. As mentioned on the course's website, since there wasn't any alternative, this transformation took place manually. Following the instructions given in the classroom through the steps
1) Converting sequence and message flows into places.
2) Converting flow objects into transitions
3) (if needed) enforcing unique start and end places.
In the BPMN diagram there were one start but several end events present. During the transformation, these several endings were merged together.
Since our abstract model was a collabration one, our transformation consisted of each pool to be converted into a separate workflow net to be examined individually at the beginning. Initial transformation to workflow nets took place effortlessly. Both pools of the BPMN diagrams were transformed into nets following the three steps mentioned earlier. Upon analysis it was observed that both of the individual nets were sound. But as expected, this did not guarantee the final system after merging two modules to be sound as well,

Chapter 4

Workflow System

Upon merging the 2 workflow modules, it was observed that even if two individual nets were sound, the final product failed to satisfy "proper completion". Upon examination it was found to be caused by some actions being grouped as one action (such as Alice giving the initial suggestion and Alice giving a counter offer to Barbara's offer both being marked as the same transition ("Make a suggestion")) causing to create tokens that will not always be used by the other participant -since merging 2 sequences into 1 transition was creating output tokens for both of the 2 sequences, not just the intended one-.
This problem was addressed through making sure that each event (especially if they were a part of any event based gateway) was marked as distinct transitions in the net (i.e "Alice making a suggestion" being a different transition than "Alice making a counteroffer") so that their pre-sets and post-sets were not creating any leftover tokens while the process continued.
One big challenge during this process was to reflect the changes made during this process on the BPMN diagram and the workflow-system simultaneously. This struggle could be avoided if the initial BPMN diagram could be created perfectly without any problems, then the transformation to the workflow system would be almost automatic, just following the three steps mentioned during the class. But since the BPMN diagram had several problems that were discovered only upon creation of the nets, it was not easy to keep them synced with each other.
Moreover, creation of the nets and correcting the mistakes was the most time consuming part since the process was visually hard to follow and it was easy to make small mistakes that led to drastic problems over the whole process.
Please note that the source files provided are the final, synchronized versions. However, minor inconsistencies may still exist, as changes were made across all files in response to issues encountered during the workflow system analysis, goping back and forth between files.

Chapter 5

Analysis of the Workflow System

Analysis took place through Woped. Final system was evaluated as sound, satisfying all the needs (please see Figure 5.1 for results). Since liveliness implies deadlock freedom, the final system was also free from deadlocks. As expected by a collaboration system, it was not Free-Choice since a big majority of the transitions had to take input from the other participant to be able to fire. Therefore some transition's presets were overlapping without being exactly the same, resulting in a not-free-choice final product. Also being a result of a collaboration net, PT and TP handles were present as expected, since the interdependent nature of this decision making process resulted in creating PT-handles (multiple outgoing arcs from places) and TP-handles (multiple outgoing arcs from transitions). 16 S-Components were found, and all of the places were covered by at least 1 S-component. Suggesting that the final system is strongly connected.

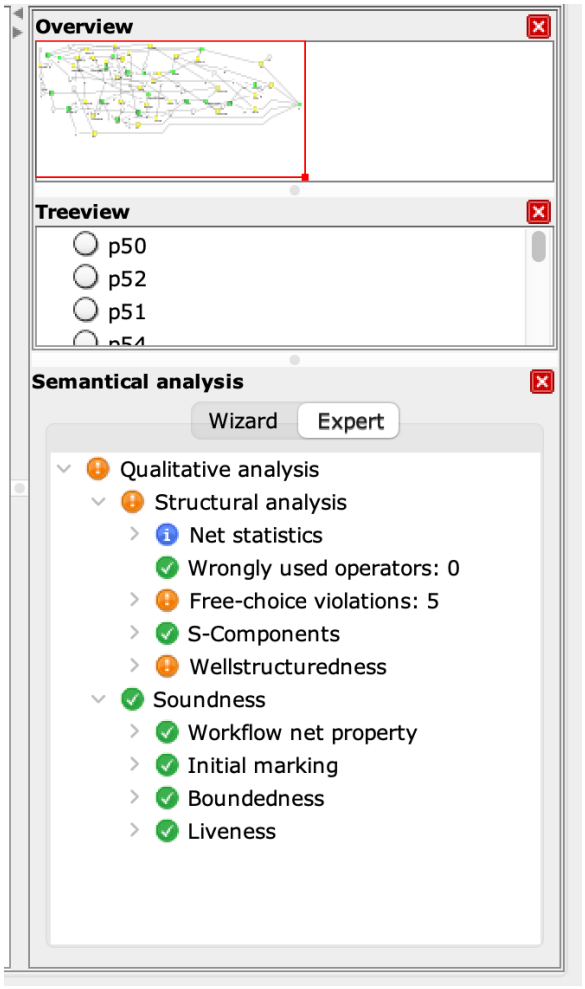

Figure 5.1: Analysis results

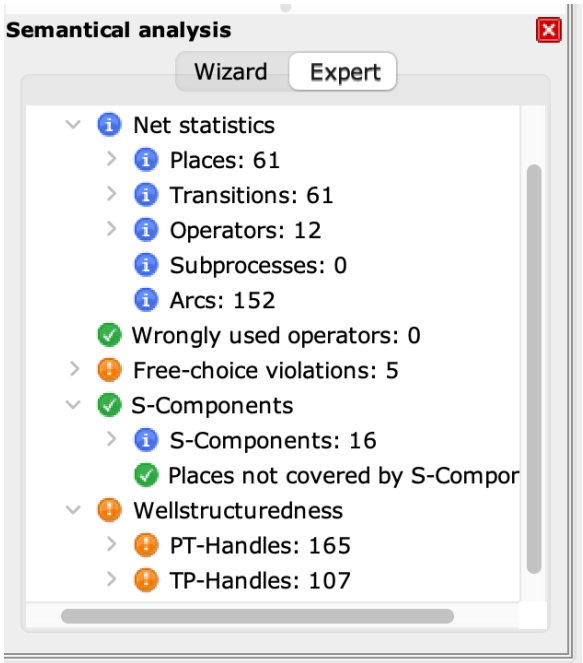

Figure 5.2: Statistics of the Net

5.1 Reachability Graph

Since the net is bounded, results of the reachability graph and the coverability graph are the same. Since Woped does not provide statistics on the graph itself, it is not possible to give details on the size, however one visual inspection can suggest that the graph goes into 24 nodes depth, with many intersecting arcs.

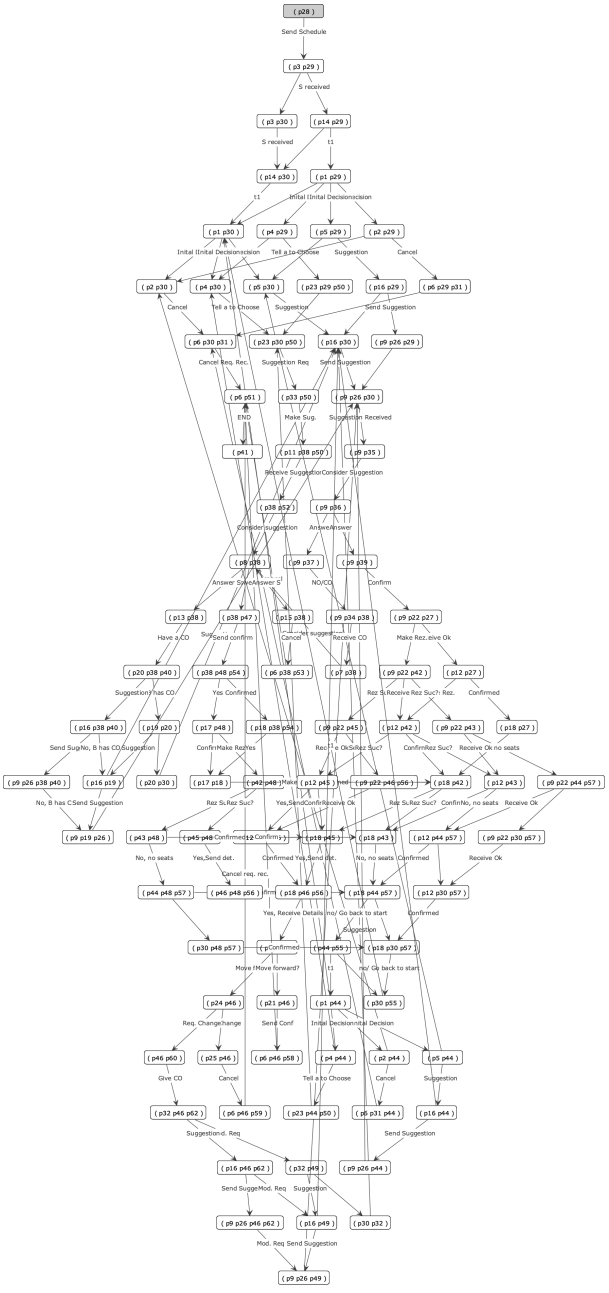

Figure 5.3: Reachability Graph