KU LEUVEN

FACULTY OF ECONOMICS AND BUSINESS

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Business Process Management Assignment

MASTER OF INFORMATION MANAGEMENT

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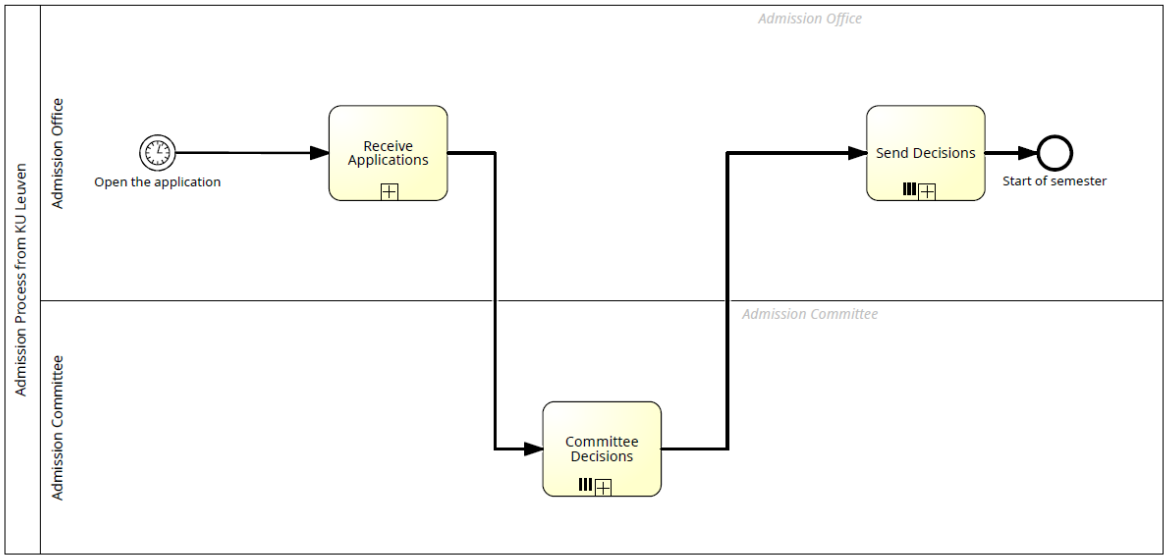
1 Task 1. Process modeling and redesign of the admissions process at KU Leuven

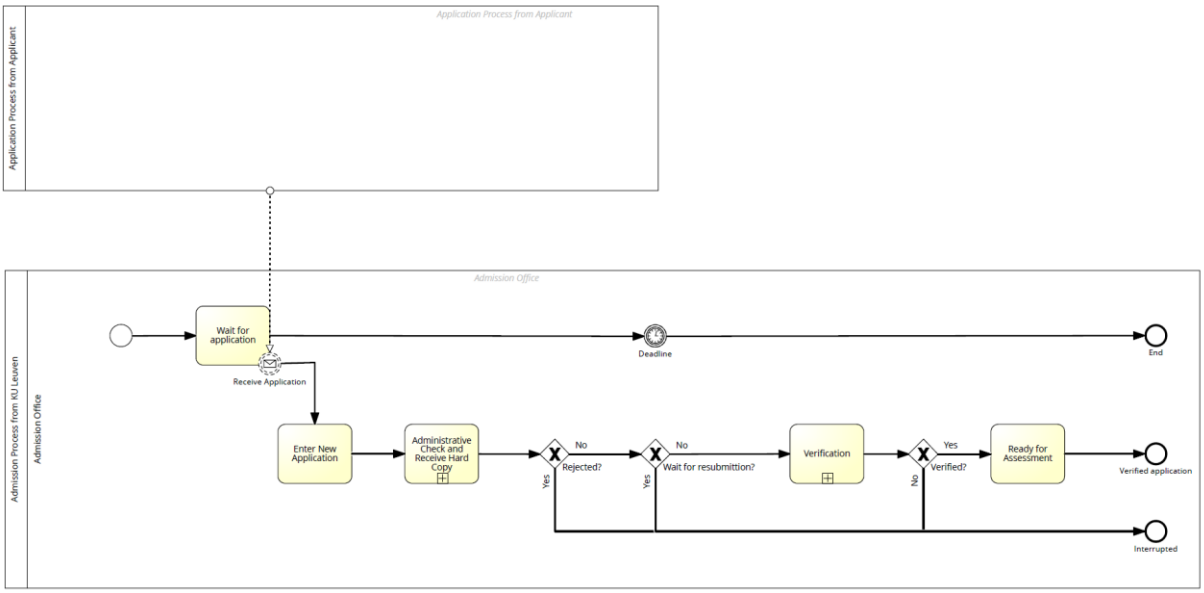
1.1 Question 1 – Model the as-is process in BPMN

1.1.1 1) A readable printout of the model (using Signavio)

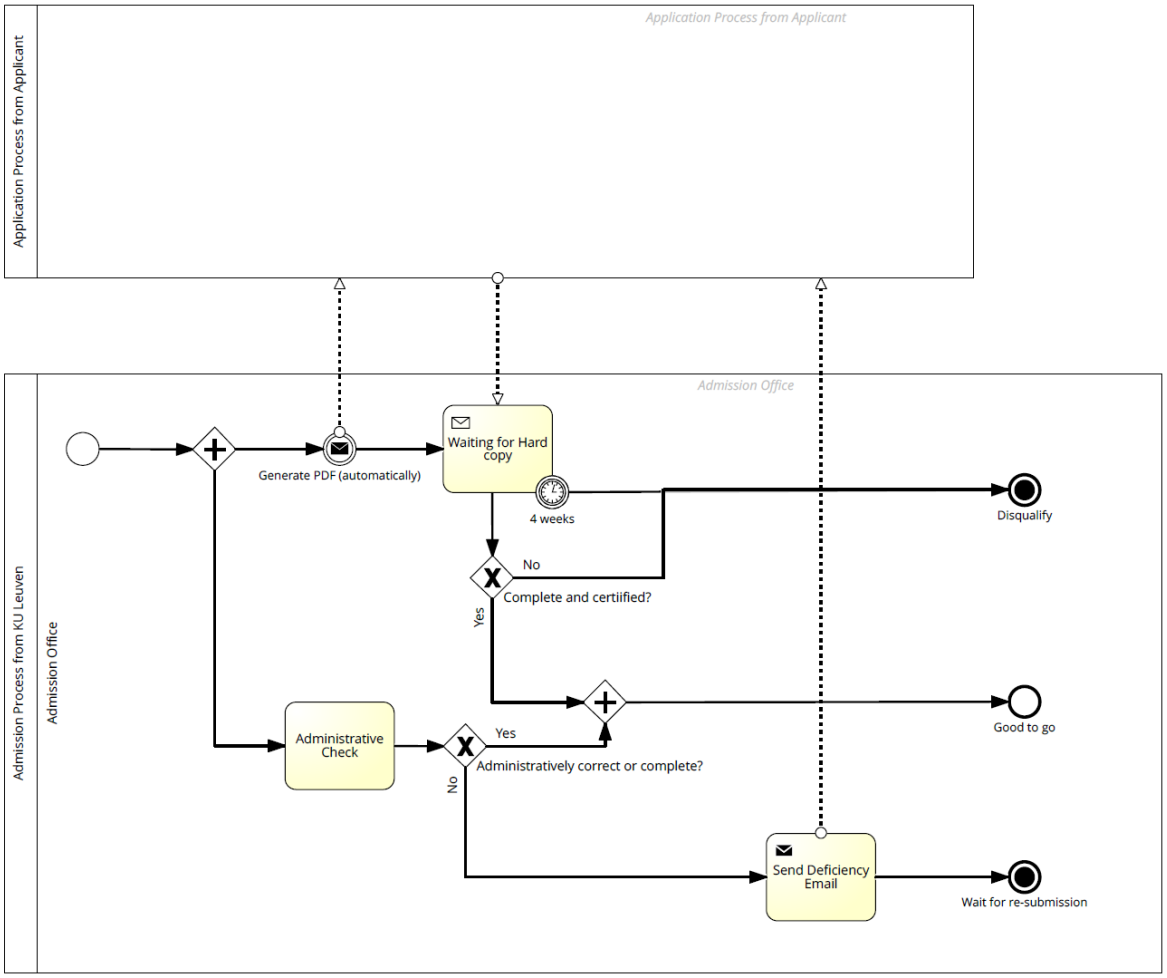
Overall (top level model)



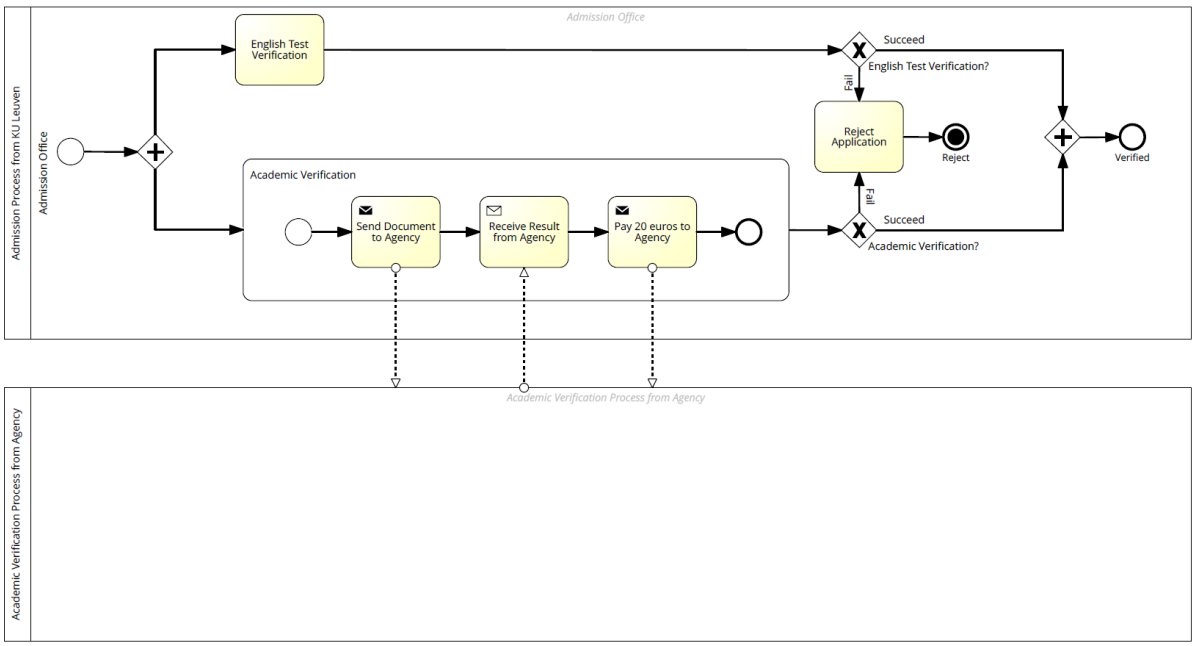
Receive Applications



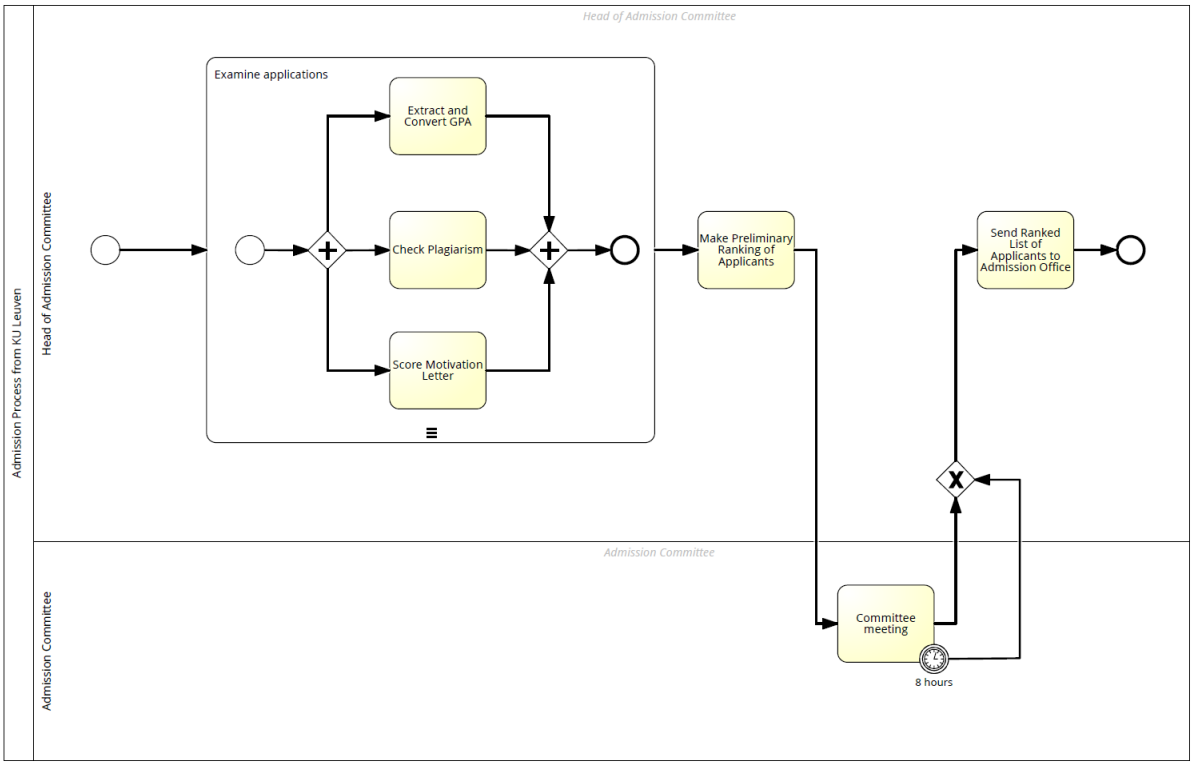
Administrative Check and Receive Hard Copy



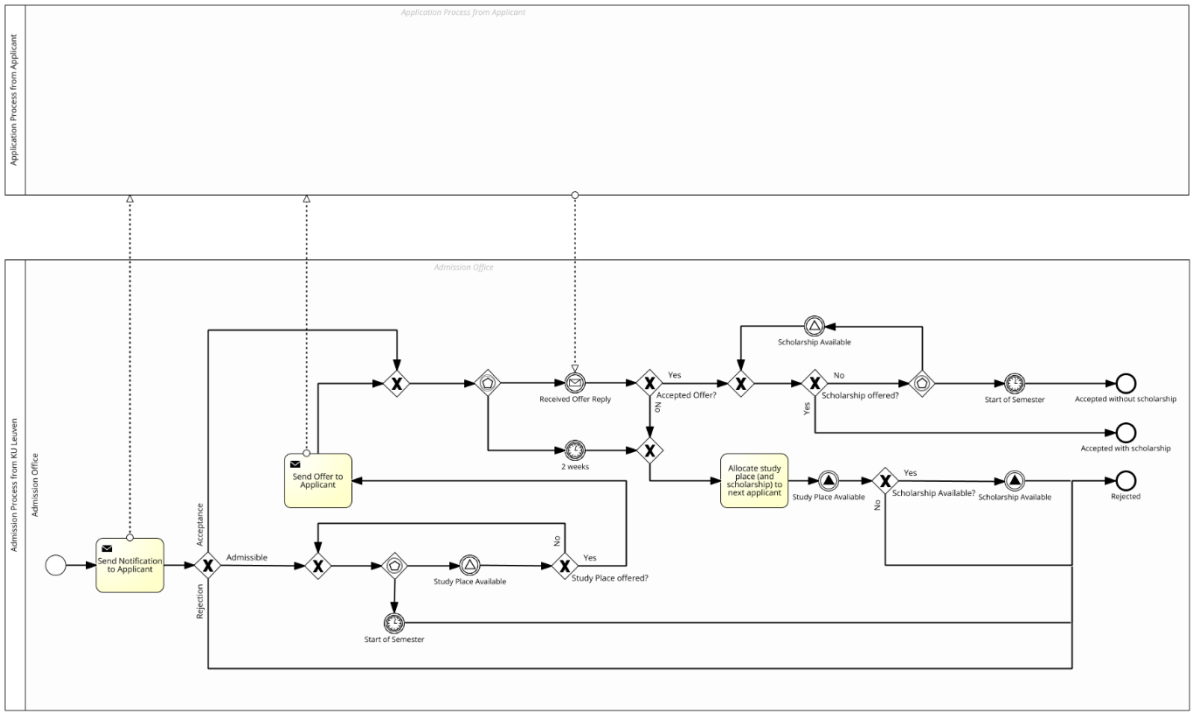
Verification



Committee Decisions



Send Decisions



1.1.2 2) A structured description of your model

We start the BPM model using a timer start event which is triggered when the application process is started. The control then shifts to the received applications subprocess which is done by the Admission Office as represented by the lane Admission Office in the model.

In the received applications subprocess, we use an activity to wait for the application from the student. If the application is not received from the student before the deadline, which is modeled by a deadline timer event, we end the subprocess. This represents the end of the entire application process of the University. On the other hand, in the activity, if an application is received, because of the non-interrupting message event, the application process of a student starts. But because we have used a non-interrupting message event, we can still process students who send applications after the first student. When each student sends an application, the non-interrupting event is triggered and, in this way, the entire received applications subprocess can be modeled without using a parallel multiple instance subprocess. In the "Enter New Application" activity the online applications are recorded in an information system. After this, a PDF file is sent to the student and the documents are received by post from the student. This is represented by the "Administrative Check and Receive Hard Copy" subprocess.

We have modeled the Administrative Check and Receiving Hard copy processes in parallel using a and gateway. If the hard copy is not received in 4 weeks, we disqualify the student and this is done using an interrupting event timer in the activity. If the administrative check comes back negative then we send a deficiency email and wait for resubmission and we represent that by an intermediate end event.

After that, we go to the Verification subprocess where both the English test verification and academic verification is done by the agency are shown in parallel using a and gateway. If either comes back as failed, the application is rejected using an intermediate end event. The academic verification subprocess represents the work done by the agency where a message is sent to the agency and a message is got back from the agency and 20 euros is paid to the agency for its services. After the double verification is done, we mark the student ready for assessment and proceed to the next part which is the Committee Decisions subprocess.

The Committee Decisions subprocess is modeled as a parallel multiple instance subprocess. It is assumed that there are different committees for different programs in the University. The head of the admissions committee assesses the applications by extracting and converting the GPA, performing a plagiarism check and scoring the motivation letter. We use parallel gateways to start and end the process to indicate that GPA, as well as plagiarism and score of motivation, need to satisfy the request. Also, we have modeled it as a sequential subprocess "Examine Applications" as we have assumed the head of the admissions committee takes the case of each application one after the other. The subprocess is closed after finishing processing the three tasks. The head of the admissions committee will mark "fail" on the applications which fail either assessments of the GPA or motivation letter. The head of the committee then makes a preliminary ranking of the applications. In the committee meeting task, the ranking is reviewed during an 8-hour committee meeting. The end of the committee meeting is modeled by using an interrupting timer event in the activity "Committee meeting". In the last activity, the head of the committee sends a ranked list of applicants to the admission office.

The next subprocess is the Send Decisions subprocess which we have modeled as a parallel multiple instance subprocess. It is assumed that different instances of the subprocess represent different applications. A notification is sent to each applicant and this is represented by a message sending activity. If the application is rejected then the subprocess ends and this is represented by an end event.

On the other hand, if the applicant is accepted, then we wait for a reply from the applicant or wait for the deadline of 2 weeks to pass. This is modeled using an event-based gateway. If the offer is not accepted or the deadline passes, then we will have to allocate the place and the scholarship to another applicant. This is modeled using a signal event “Study Place Available” which enables admissible students to get a place. One of the assumptions that we made in the model is that the signal events used affect all the instances of the Send Decisions subprocess. Also, the allocation of the scholarship place to another student who has accepted the offer but who does not have the scholarship is done using another signal event called “Scholarship Available”.

If on the other hand, the applicant accepts the offer then we check whether the applicant has a scholarship using a xor gateway. If the applicant has the scholarship then the applicant is accepted with the scholarship represented by the corresponding end event. On the other hand, if the applicant does not have a scholarship then the applicant will have to wait until he/she gets a scholarship place that may be allocated if another applicant who was eligible for the scholarship decided to give up his/her place. This is modeled using an event-based gateway which either waits for the start of the semester or waits for a scholarship place to be allocated. This is modeled using a signal event that is triggered when the signal “Scholarship Available” earlier mentioned is fired.

For applicants who are admissible on the other hand, we will have to wait and check whether a study place becomes available and this is done using an event-based decision gateway which waits either for the “Study Place Available” signal to be triggered as mentioned above or for the start of the semester which is represented by a timer event. If the timer event is triggered then the applicant is rejected. Otherwise, an offer is sent to the applicant using a message sending activity and the process described for an accepted applicant is followed.

1.2 Question 2 – Process redesign

The three proposed improvement measures are as follows:

1.2.1 Proposed improvement measure : Technology Integration; Organisation Population; Parallelism

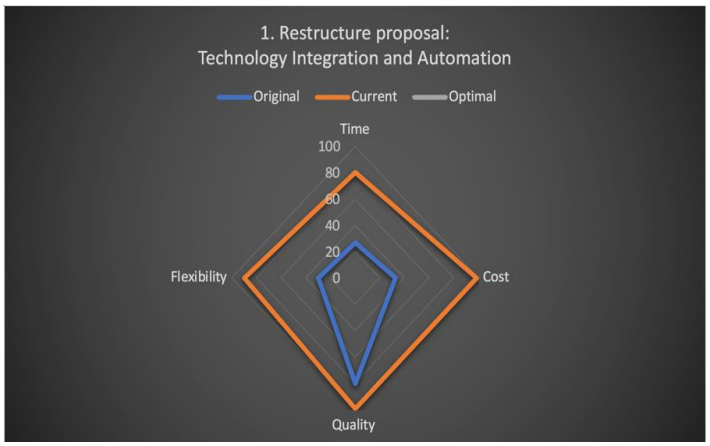
1) Description

The work presently done by the head of the admission committee can be automated and technology can be integrated in order to reduce the amount of work to be done. Also some of the work can be redistributed or outsourced. For example, the extraction and conversion of the gpa can be delegated to the other two members in the admission committee. In this way, we decreased the 5 days of work to 1. 7 days as well as reduced the cost (payment)of process. The online plagiarism checking tool costs about 17 euros per account, which costs little and highly increases efficiency and reduces human error of this process.

2) Classification

Framework Elements	Best Practice Name	Description
Technology	Task automation	1) Extraction and Conversion of the GPA 2) Plagiarism Checking
Organisation: population	Specialist-generalist	1) The head of committee makes the scoring criteria of motivation letter and guidance of ranking; make a decision on the controversial cases 2) The other two members does the scoring of the motivation letter and ranking the applications according to the criteria; report the questionable applications to the head of the committee
Behavioural View	Parallelism	The motivation letters and GPA are processed by multiple subordinates in parallel.

3) Devil's Quadrangle



According to the process manager's directives, the cycle time and the costs of the process have to be reduced. As we can see from the diagram, both have reduced by a factor of three as now the two other members of the admission committee, apart from the head, who were getting a fixed pay and not doing

any work are also now involved in the process. Also according to the process manager, no unqualified application should get admitted. By integrating technology into the process of plagiarism checking, we are able to decrease the number of unqualified applications to an estimated value of less than 1% using the best plagiarism checking software online. Earlier the value was estimated to be around 20%. Also the flexibility is improved by an estimated factor of three because there are three resources to do the task where earlier only one resource, that is the head of the committee was doing the task.

1.2.2 Proposed improvement measure : Behavioral view and Operation view

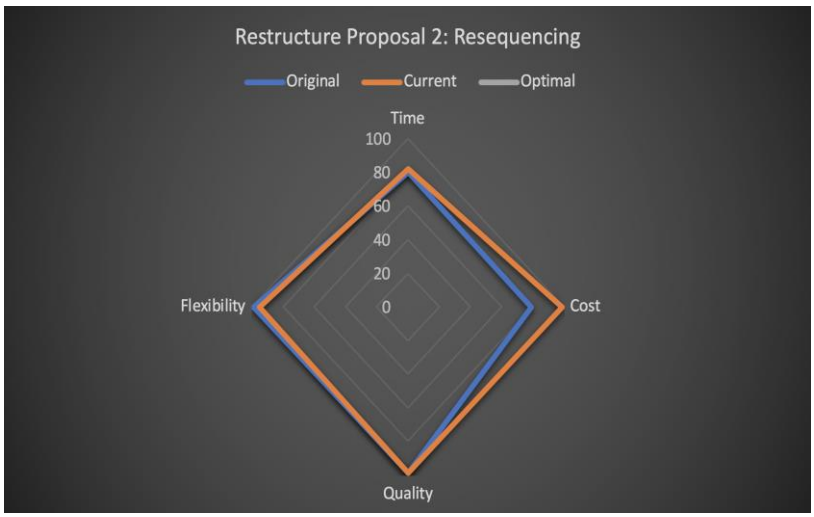
1) Description

Doing the English Test Verification and the Academic Verification sequentially. This resequencing will prove beneficial as presently the English test verification and the Academic Verification are being done in parallel with the Academic Verification part taking much longer than the English Test Verification. As 2% of the applications are rejected due to failing of the English test, by performing the English test verification first, we can omit the time and cost of performing the academic verification. If it comes back negative, the extra costs of the Academic Verification are still incurred.

2) Classification

Framework Elements	Best Practice Name	Description
Behavioural View	Resequencing	By first performing the English test verification task, we potentially decrease the academic verification time by 2%, which saves 20% of the original cost.
Operation View	Task Elimination	By eliminating the 2% of applications with invalid English Test, 2% of academic verification tasks is eliminated.

3) Devil's Quadrangle



According to the process manager's directives, the cycle time and the costs of the process have to be reduced. As we can see from the diagram, by the proposed resequencing, the cost decreases by an estimated 20% and the time taken increases by a nominal value of 2%.

1.2.3 Proposed improvement measure : Operation view

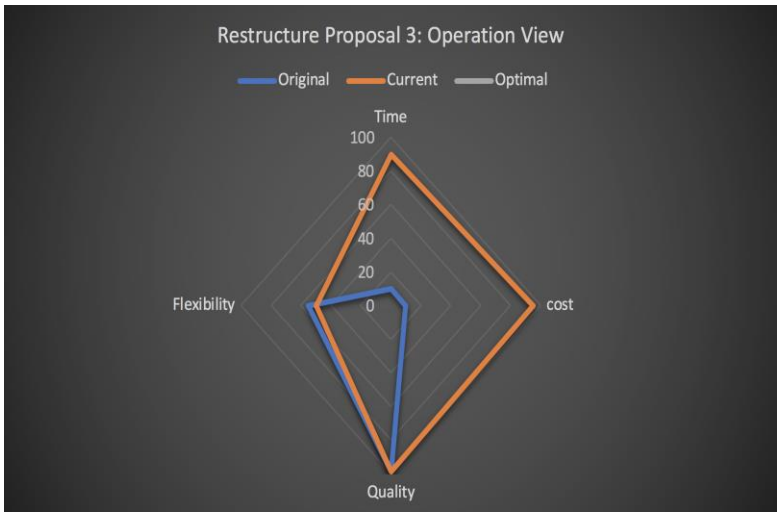
1) Description

In the original model, the academic verification is done by an external agency and the documents are sent one after the other for each individual application. However, this is inefficient and sending the documents in bulk will help in saving the time of the resources. Based on the information provided in the text, about 1080 sets of documents will be sent to the academic verification agency. If we assume that 5 minutes are spent to send each application, 90 man-hours in total are needed. By sending all the applications in one batch, we expect to save 81 hours for this process, which indicates a saving of 90% of the time and payment to the admission officers for this specific task. Each post costs 2 euros, which makes about 2160 Euros for posts. By restructuring, we expect to save at least 1000 Euros with the weight of posts taken into consideration.

2) Classification

Framework Elements	Best Practice Name	Description
Operation View	Task composition	By sending the collected applications for academic verification in a batch, we expect to decrease the cost of sending post and the time of processing.

3) Devil's Quadrangle



According to the process manager's directives, the cycle time and the costs of the process have to be reduced. As we can see from the diagram, the proposed improvement measure will improve the time and cost approximately by a factor of 10 and thus is very effective.

2 Task 2. Process Mining analysis of the insurance claim process in a travel agency

2.1 Question 1 – Analyzing the basic 2014 event log with Disco

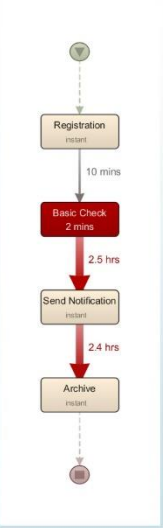
1) The main characteristics of the log can be got from the statistics tab. Here the activities and the resources can be arranged according to their mean and median durations. Also, the maximum time taken for them can also be obtained.
2) In the cases tab, we are also able to see the most frequent control flow variants and the number of times that each variant can be seen in the event log.
3) From the map tab, we are able to recognize that the whole process is a very structured process. The map tab also features a simulation that shows us how the events actually take place and give an excellent visual representation of the whole series of events along with the bottlenecks. Using the filters tab at the bottom left of the screen we can analyze the data in a more in-depth way.
4) Looking at the map, we can find the absolute frequency for each type of application check. We can find how often we perform each check type and calculate the percentage of the usage for each.
5) The performance of the process can be checked by going to the map tap and then choosing to look at the map from the" performance" dimension instead of "Frequency". The performance can be seen as a mean, median, maximum or minimum duration. The bottlenecks can be recognized from the same map since Disco software can show as on the map which tasks are taking the most time or which tasks require more waiting time on average.
6) Which resources participate in the process? What is their involvement?
   By going to the "statistics" tap in Disco, we can click "Resources" to see the detailed information for each resource involved in the process, this will show us the general information for each resource (Relative Frequency, Median, mean, maximum and duration time). Moreover, if we want more details for what tasks each resource is being involved in we can filter out the certain activity and see the resources involved.
7) There are many additional data attributes at the system logs that could be potentially useful. These data attributes could be found by going to the "statistics" tap. These data attributes could be potentially useful for the next business processes but not for the current analysis.

Main Characteristics of the Log

- Period: 2014.01.02 10:10:00 – 2015.01.30 01:13:00
- Cases: 2143
- Events: 14911 in total (6.96 per case on average)
- Activities: 10
- Median duration: 6 days
- Mean duration: 10.9 days
- Shortest duration: 3 hours 29 minutes
- Longest duration: 39 days 7 hours
- Resources: Systems + 9 human workers

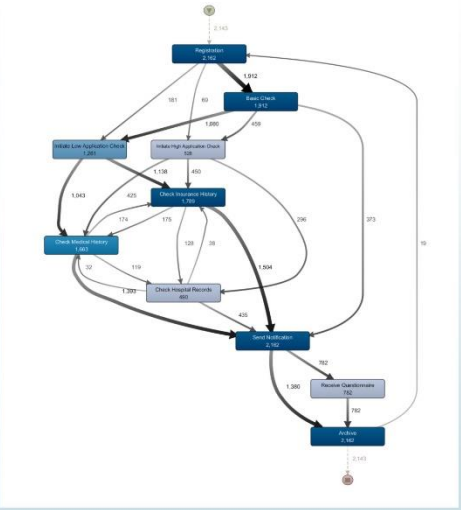
Most frequent control-flow variants

- Failed basic check
- 351 CASES
- 16% Cases
- 9% EVENT



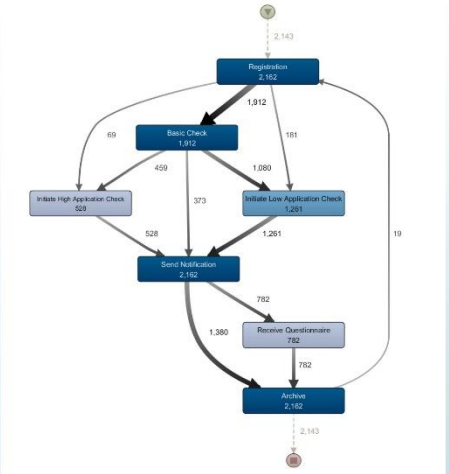
Structured or Unstructured?

- Structured
- Like what it is described in the question
- Application checks:
  - Check Insurance History
  - Check Medical History
  - Check Hospital Records
- Although the activities do have an order and the process is structured, in some cases, the ordering is suspect, and it would be more efficient if some of the activities are done in parallel.



Application Check

- Low Application Check (58.3%)
- High Application Check (24.4%)
- Failed Basic Check (17.3%)



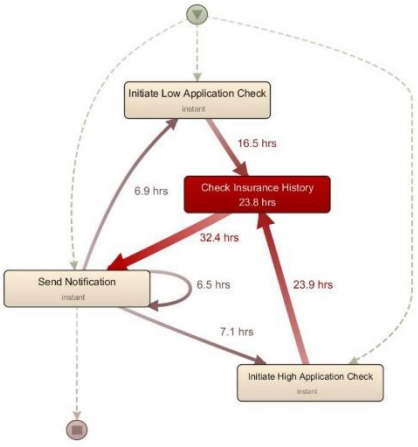
Performance Insights

	Median	Mean	Maximum
Basic Check	2 mins	2 mins 1 sec	6 mins
Check Insurance History	23 hours 41 mins	23 hours 49 mins	2 days 4 hours
Check Medical History	23 hours 47 mins	23 hours 43 mins	2 days 2 hours
Check Hospital Records	4 days 1 hour	4 days 1 hour	6 days 6 hours

- All other activities are instant
- The tasks between Initiate Application Check and Send Notification will be examined in detail in the next slides

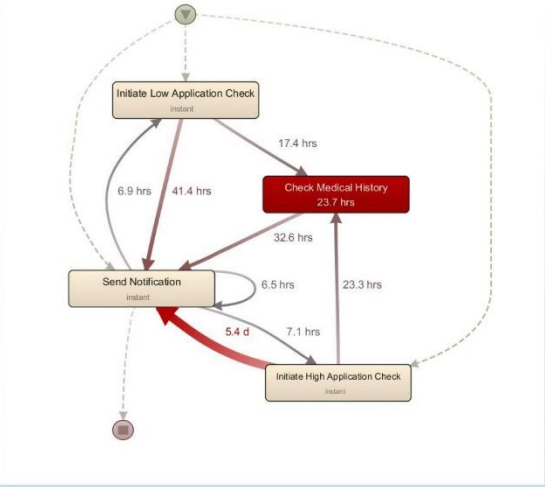
Check Insurance History

- It takes a longer time to launch "check Insurance History" after "High application check" compared to launching it after "Low application check".
- In all cases Insurance History must be checked.



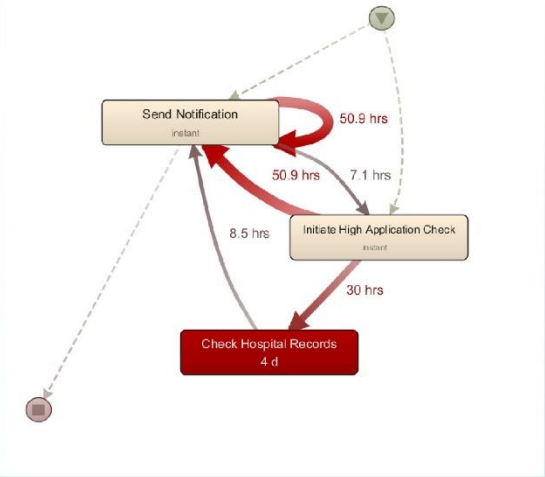
Check Medical History

- It takes a longer time to launch "Check Medical History" after "High application check" compared to launching it after "Low application check".
- In some cases they don't Check Medical History



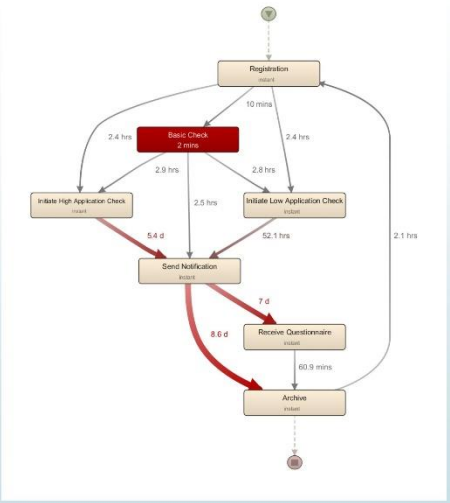
Check Hospital Records

- Only in the High Application cases are the hospital records checked.
- It takes a longer time to launch check hospital records compared to other checks
- Check Hospital Records is the activity that takes the longest duration on average.
- It is quickest to move to the send notification stage after the Check hospital records stage.



Bottlenecks

- There are possible bottlenecks after Send Notification
- More time is needed to finish High Application Check than Low Application Check
  - The hospital Check makes High application Check longer



Resources – Systems

- The system is responsible for all instant activities:
  - Registration
  - Initiate Low Application Check
  - Initiate High Application Check
  - Send Notification
  - Receive Questionnaire
  - Archive
- 60.74% of the events

Resources – Human Workers

- 9 human workers
  - Anne, Bart, Bob, Jenny, Marc, Mike, Pete, Sarah and Tom
- They are responsible for all the checks:
  - Basic Check
  - Check Insurance History
  - Check Medical History
  - Check Hospital Records
- 39.26% of the events

Event duration statistics per human worker

Worker	Freq.	Median	Mean	Maximum
Sarah	1021	3 mins	10 hours, 14 mins	2 days, 29 mins
Anne	1015	1 day, 5 hours	2 days, 4 mins	7 days, 11 hours
Jenny	797	17 hours, 43 mins	15 hours, 40 mins	2 days, 4 hours
Mike	716	3 mins	7 hours, 53 mins	2 days, 3 hours
Tom	639	23 hours, 41 mins	23 hours, 36 mins	2 days, 2 hours
Marc	592	23 hours, 57 mins	23 hours, 44 mins	2 days, 17 mins
Bob	499	1 day, 4 hours	1 day, 22 hours	6 days, 10 hours
Bart	300	2 mins	2 mins, 1 sec	6 mins
Pete	275	2 mins	2 mins	5 mins

Additional data attributes

- First name
- Last name
- Age
- Coverage
- Credit score
- Net Promoter Score
- Outcome
- Plan
- Rate Charged
- Reason
- Result

Usefulness of additional data attributes

- Potentially useful?
  - Yes!
  - When? the next business processes
- Example
  - Understand decision logic behind major decision points
- Not useful for current analysis

2.2 Question 2 – Social aspects, performance and conformance in Disco

1) To construct a handover-of-work model in Disco we should import our data but this time by identifying activities as resources and resources as an activity. This will enable us to see the handover of work between resources.
2) By filtering certain worker, we can see how efficient their performance was for each task, we can see also the responsivities for each worker and detailed information about the duration they spent to finish the tasks.
   From the data, we see deduce that workers are specialized in certain activities. But at the same time, there is no significant difference between specialized workers in terms of efficiency for the same tasks they perform.
3) To find out which cases take much longer to finish than others we can use performance filer to filer out the cases that take more than usual. We filer out the cases for more than 30 days, looking at the waiting time/activity time that takes long which produces represent a bottleneck.
4) Which kind of infrequent behavior can you identify? Would you consider it incorrect? Is there a link with the resources performing the activities?

We can find the infrequent behavior by looking at the less frequent behaviors (looking at the least frequent sequence of events). We can then use the filer to see the follower activity of the related events. We found three infrequent behaviors in this model. And by looking into statistics we see no link with the resources performing the activities.

Handover-of-work frequency

From/To	System	Bart	Pete	Mike	Sarah	Jenny	Marc	Tom	Anne	Bob
System	3213	300	275	690	968	738	529	563	863	391
Bart	300	/	/	/	/	/	/	/	/	/
Pete	275	/	/	/	/	/	/	/	/	/
Mike	692	/	/	/	/	/	/	7	11	8
Sarah	940	/	/	/	/	/	/	16	49	21
Jenny	704	/	/	/	/	/	/	19	55	24
Marc	505	/	/	/	/	/	/	24	40	29
Tom	540	/	/	6	19	16	19	26	33	11
Anne	810	/	/	14	26	31	38	10	39	20
Bob	425	/	/	7	13	14	9	5	23	10

Handover-of-work model

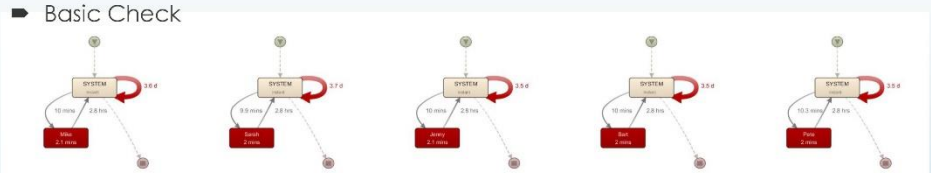
- Most frequent handover is the system to system handover itself
- Handover exists mostly between System and human workers
- The handover between human workers is due to the ordering of the applications checks.
- In theory, as the applications checks are assumed to be all parallel to each other, there should be no handover between human workers
- In practice however, sometimes the end of a parallel applications check happens earlier than the start of another parallel applications check, in this case Disco no longer consider them in parallel but in sequence instead.

Expert resources

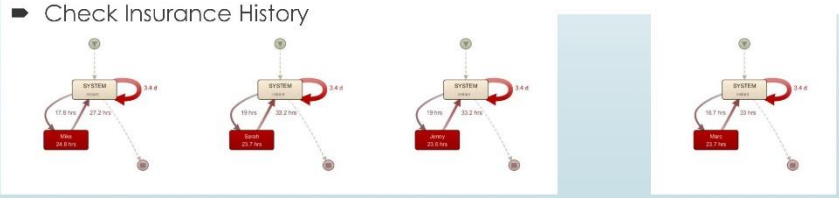
- Basic Check: Mike, Sarah, Jenny, Bart and Pete
- Check Insurance History: Mike, Sarah, Jenny and Marc
- Check Medical History: Anne, Bob and Tom
- Check Hospitals Records: Anne and Bob
- The same activities handled by different resources have similar durations.
- The conclusion
  - There is no significant difference for workers who handle the same activity
  - But all workers are specialized in doing certain tasks only

Expert resources (Basic Check/Check Insurance History)

- Basic Check

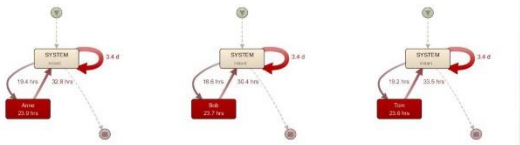


- Check Insurance History

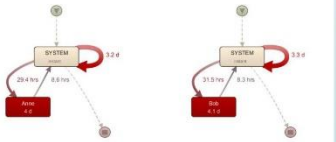


Expert resources (Check Medical History/ Check Hospitals Records)

- Check Medical History

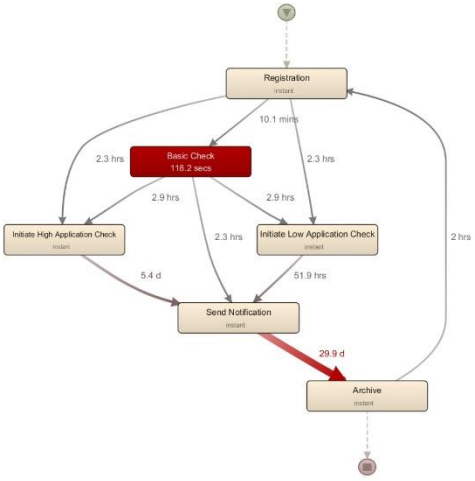


- Check Hospitals Records



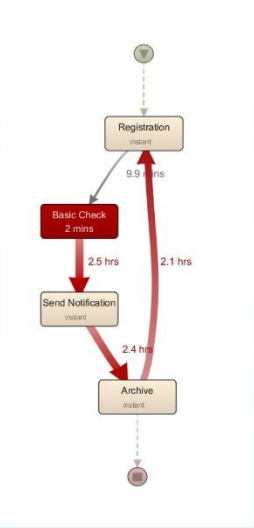
Cases taken longer than 30 days

- 18 % Cases
- 18 % Events
- No questionnaires are received in those cases
- Bottlenecks exist mostly in waiting for archive after Send Notification
  - Can be explained by 30-day waiting time for the questionnaires



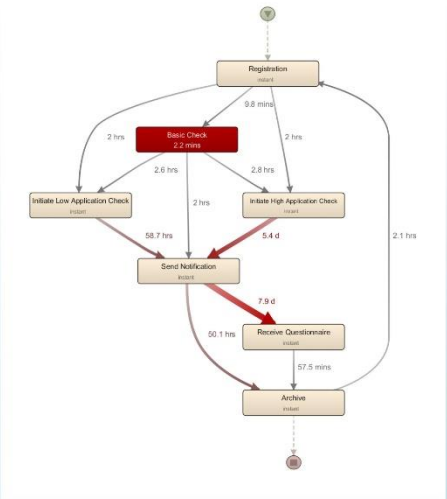
Cases taken less than 18 hours

- 16 % Cases
- 9 % Events
- Failed basic check
- Cover all cases in the most frequent control-flow variants



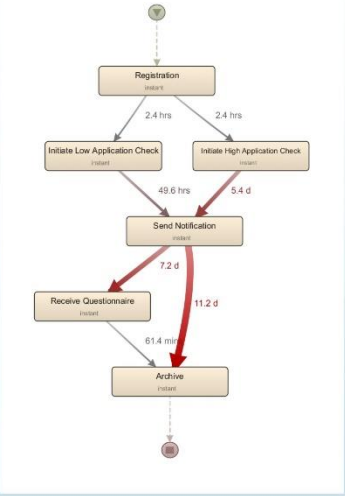
Infrequent Behavior – Registration after Archive

- 19 Cases (1 %)
- Correct
- No link with the resources performing the activities



Infrequent Behavior – Skipping the Basic Check

- 248 Cases (11 %)
- Reason for skipping Basic Check is unknown
- No link with the resources performing the activities



Infrequent Behavior – sequential applications check

- Incorrect
- In theory, as applications checks are assumed to be all parallel to each other, there should be no handover between human workers
- In practice, sometimes the end of a parallel applications check happens earlier than the start of another parallel applications check, in this case Disco no longer consider them in parallel but in sequence instead.

2.3 Question 3 – Decisions and working with other data

1) When do you see a basic check failing or registration being rejected?

By using Disco's filter, we discovered that the basic check fails under 2 circumstances:

a) When the first name or the last name fields are empty or the age field has a value of -1.
b) For cases which come under Plan A if the age attribute is 70 or above the basic check fails.
c) For cases which come under Plan B if the age attribute is 100 or above years the basic check again fails. Also, in the data we have observed that there are no cases where the age attribute is between 80 to 100.

2) When do you see a high versus low application check?

By using Disco's filters, we discovered that for the cases which come under Plan A if the age attribute comes between 18 and 34 or between 75 and 80, a low application check is compulsorily performed. We also discovered that for the cases which come under Plan B if the age attribute comes between 18 and 44 or between 75 and 80, a low application check is again compulsorily performed. For all other cases, no discernible rule can be seen.

3) What is the main difference in decision logic between Plan A and Plan B?

	Plan A		Plan B	
Value	Frequency	Relative frequency	Frequency	Relative frequency
Application was accepted	900	54.88%	274	52.29%
Basic check failed	285	17.38%	90	17.18%
Credit score too low	280	17.07%	108	20.61%
Hospital records risk level too high	97	5.91%	29	5.53%
Stop code present for application	39	2.38%	8	1.53%
Some medical conditions present	35	2.13%	13	2.48%
Severe medical conditions present	4	0.24%	2	0.38%

The main difference between plan A and plan B is the age criteria which determine whether the case failed a basic check. They are also different in the age criteria which determine whether the application check is High or Low.