



Técnico+ Course Planning and Management

Business Process Engineering and Technology

Group 19

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Business Process Architecture

Management Processes

Class management

Marketing
management

Logistics
management

Applications
management

Core Processes

Proposal

Marketing

Sell

Applications

Deliver
classes

Plan Course
Logistics

Closure
Logistics

Support Processes

Finance
management

IT management

Legal management

Personnel
management

Information
management

Assumptions

Proposal Phase:

1. The project has specifications that must be sent to the Course Coordinator upon its creation.
2. If the results from the validation of the course proposal are negative, the Course Coordinator will recreate the proposal. Otherwise, in case the results are positive, the Executive Director proceeds with the creation of the shared folder.
3. The Shared Folder datastore is the container of all course's related resources and can be used to store resources from all Técnico+ courses.

Marketing Phase:

4. The "Website" datastore can be used to write and store descriptions from all Técnico+ courses.

Applications Phase:

5. The "Analyze Candidates" task (4.04) goes through all of the candidates.

Plan Course Logistics Phase:

6. "Set course room" task (5.01) is done by person B.
7. "Prepare Welcome Set" task (5.09) is done by person C.
8. "Schedule breaks and meals" task (5.10) is done by person A.
9. The "Moodle" datastore can be used to store resources and files from all Técnico+ courses.

Deliver Classes Phase:

10. Trainees are present in:
 - "Present course overview in first class" task (6.05).
 - "Post on course/module forum to fill out course survey and trainer(s)" task (6.07).
 - "Distribute Last Class Set + Certificates of course conclusion" task (6.10).
11. The welcome kit contains useful information regarding Técnico and the course.
12. The preparation of the trainees' reception does not offer valuable information to the course.

Closure Logistics Phase:

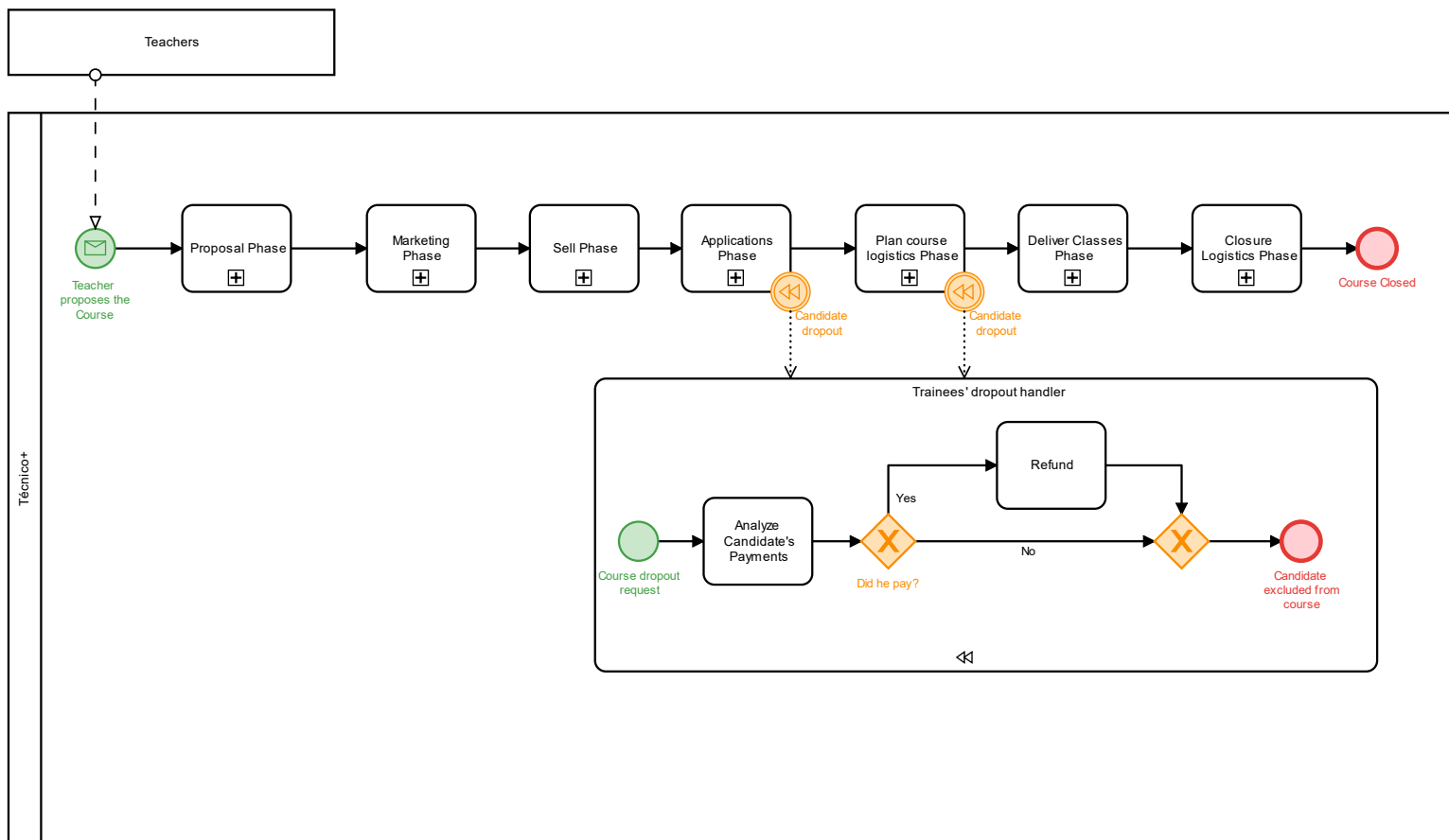
13. The course dashboard contains the evaluation from all trainees of the course.

General:

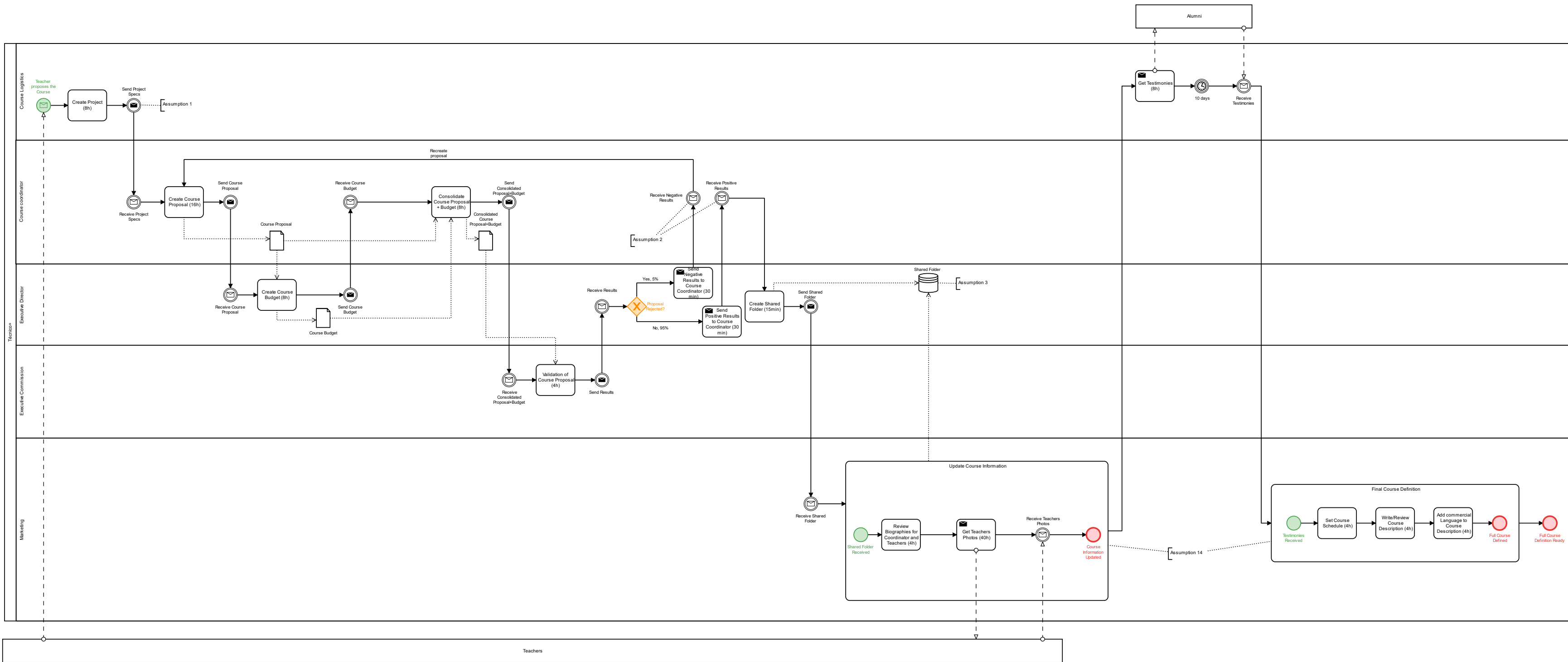
14. Tasks with the same outcome or objective can be represented as subprocesses.

As-Is Business Process Model

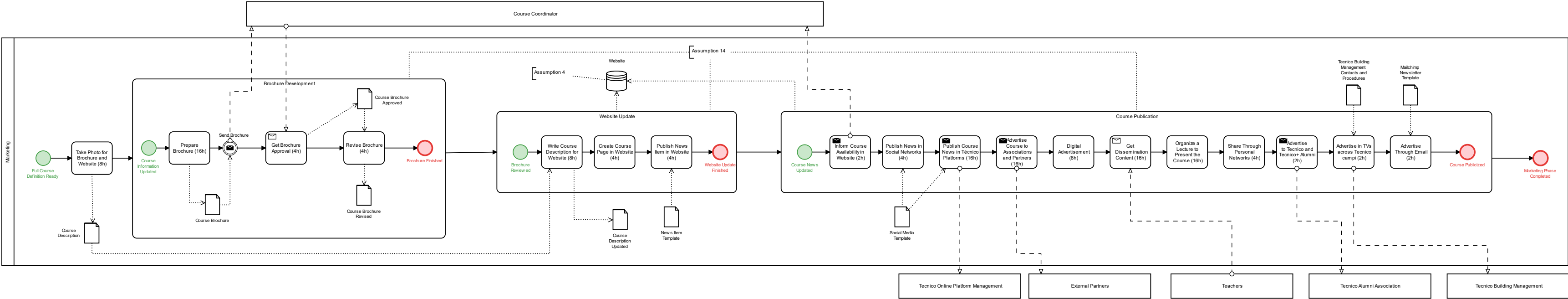
Overview



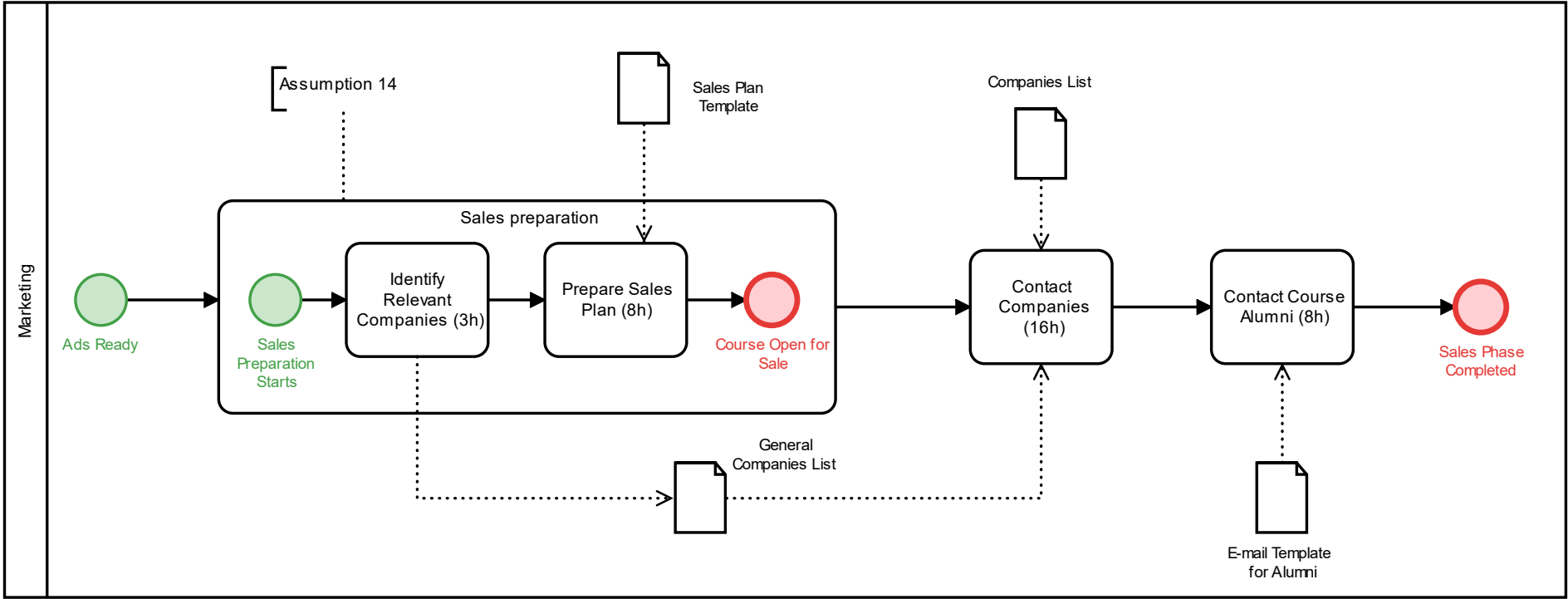
Proposal Phase



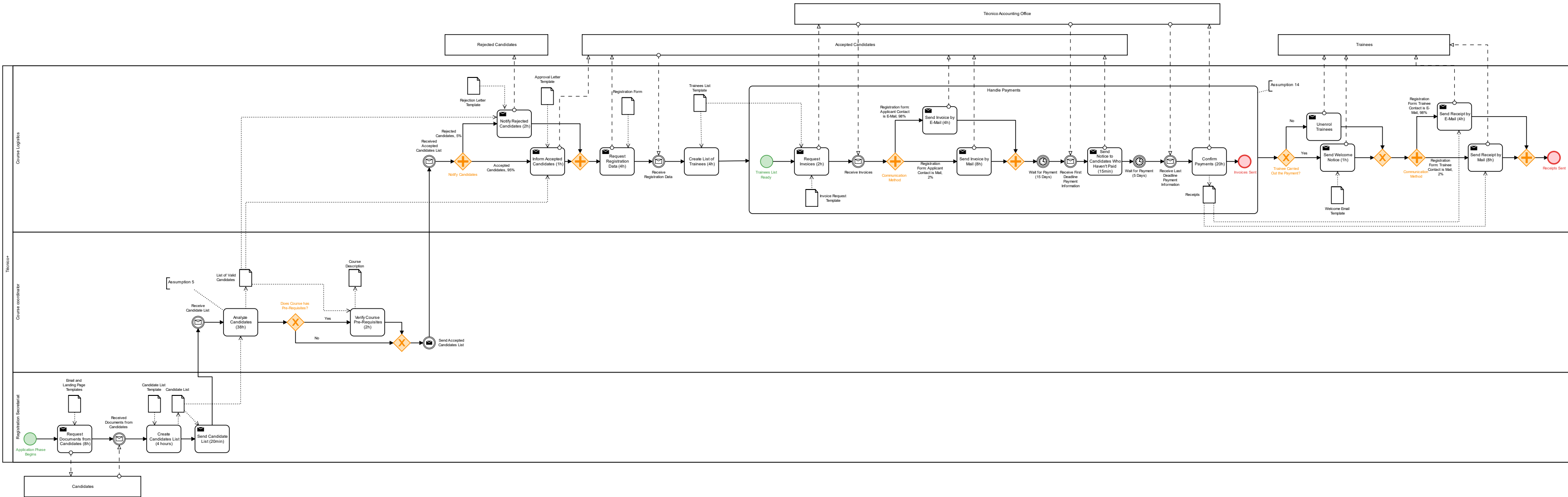
Marketing Phase



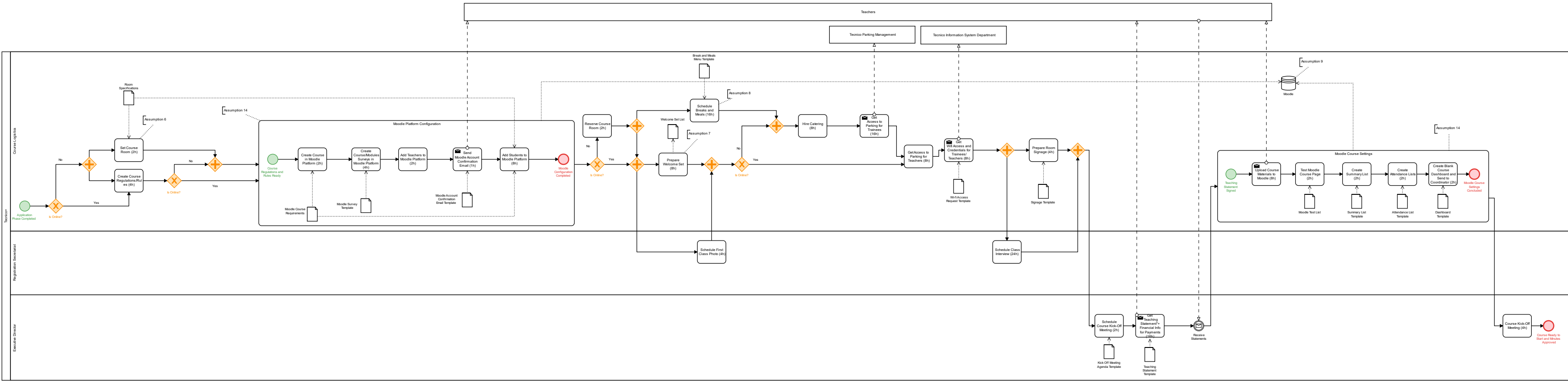
Sell Phase



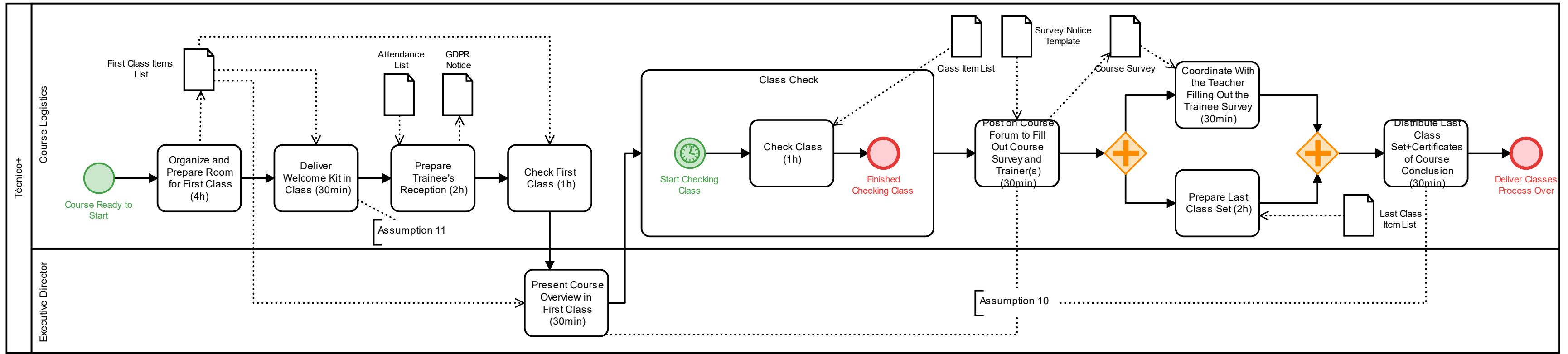
Applications Phase



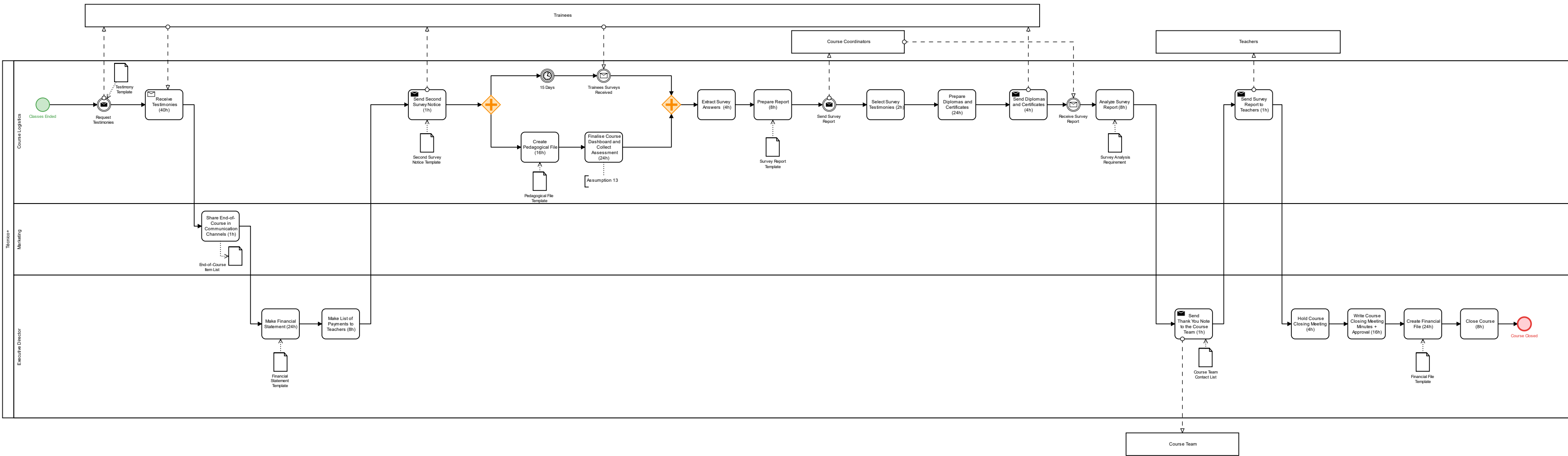
Plan Course Logistics Phase



Deliver Classes Phase



Closure Logistics Phase



As-Is Business Process Model Analysis

Qualitative analysis – Value Added Analysis

Proposal Phase:

| Task | Performer | Classification | Explanation |
|---|----------------------|----------------|--|
| Create project | Course logistics | VA | This task initiates the process and the project. |
| Create course proposal | Course Coordinator | BVA | This task provides the project description and assures the quality of the project further on. |
| Create course budget | Executive director | BVA | It provides the project budget to comply with regulatory requirements. |
| Consolidate course proposal + budget | Course coordinator | NVA | This step does not provide new information to the course proposal and budget as it only consolidates the existing information. |
| Validation of course proposal | Executive commission | BVA | This step implements validation of the course proposal and might prevent further defect corrections. |
| Inform approval of course proposal | Course coordinator | NVA | This step doesn't add value as it consists only of exchanged messages. |
| Inform rejection of course proposal | Course coordinator | NVA | This step doesn't add value as it consists only of exchanged messages. |
| Create shared folder | Executive director | BVA | This step is crucial to the development and growth of the project and offers overall structure. |
| Review biographies for coordinator and teachers | Marketing | VA | This step is important for the updating of course information and hiring personnel, which is part of the final product. |
| Get teachers photos | Marketing | NVA | This step is not crucial for the development of the product as it does not add value to the course program itself. |
| Get testimonies | Course Logistics | BVA | Relevant testimonies are very important to improve the courses' attractiveness. |
| Set course schedule | Marketing | VA | This step is important the define the schedule of the full course. |

| | | | |
|---|-----------|-----|--|
| Write/Review course description | Marketing | VA | The course must have defined objectives and evaluation methods to be complete. |
| Add commercial language to course description | Marketing | NVA | This step is not crucial for the development of the product as it does not add value to the course program itself. |

Marketing Phase:

| Task | Performer | Classification | Explanation |
|---|-----------|----------------|--|
| Take photo for brochure and website | Marketing | VA | This step will improve the quality of the brochure and overall marketing strategy. |
| Prepare brochure | Marketing | BVA | This step will contribute to the course's publicity. |
| Get brochure approval | Marketing | BVA | This step is required to comply with regulatory requirements of the final product. |
| Revise Brochure | Marketing | BVA | This step reduces the risk of mistakes in the final product. |
| Write course description for website | Marketing | VA | This step adds value to the final product as it defines a detailed course description to be read by possible candidates or interested parties. |
| Create course page on the website | Marketing | VA | The course page will help share the course information. |
| Publish news item in website | Marketing | NVA | The website news announcements are not necessarily advertising components. |
| Inform course availability in website | Marketing | NVA | This task is under context switches. |
| Publish news in social networks | Marketing | BVA | This step contributes to the product's advertisement, adding business value. |
| Publish course news in Técnico platforms | Marketing | BVA | The course news announcements are necessary to announce its components, such as the application deadlines. |
| Advertise course to associations and partners | Marketing | BVA | Getting companies and partners involved in the course can lead to these companies having trainees specialized in their respective work fields. |
| Digital Advertisement | Marketing | BVA | This step contributes tremendously to the advertisement of the product through digital mediums, reaching a broader audience. |

| | | | |
|--|-----------|-----|---|
| Get dissemination content | Marketing | BVA | This step contributes tremendously to the advertisement of the product, reaching a broader audience. |
| Organize a lecture to present the course | Marketing | VA | An overview lecture of the course leads to more potential participants getting a better understanding of what the course is about. |
| Share through personal networks | Marketing | NVA | This step is not crucial to achieve the final product, as personal networks may not share the same audience that Técnico+ is looking for. |
| Advertise to Técnico and Técnico+ Alumni | Marketing | VA | This step concerns advertising the course to the target audience. |
| Advertise in TVs across Técnico campi | Marketing | VA | This step may help with reaching more of the target audience and spread information regarding a new course. |
| Advertise through email | Marketing | VA | This step is important to spread information regarding the new course. |

Sell Phase:

| Task | Performer | Classification | Explanation |
|-----------------------------|-----------|----------------|---|
| Identify relevant companies | Marketing | BVA | Find the companies that are most aligned with the Técnico+ course offering to reduce the risk of business losses. |
| Prepare sales plan | Marketing | BVA | A carefully thought-out sales plan improves the probability of selling a course to a company. |
| Contact companies | Marketing | BVA | Companies must be contacted to present the course pitch. |
| Contact course alumni | Marketing | VA | This step concerns reaching the target audience. |

Applications Phase:

| Task | Performer | Classification | Explanation |
|-----------------------------------|--------------------------|----------------|---|
| Request documents from candidates | Registration Secretariat | VA | This task initiates the enrolment process for students. |
| Create candidates list | Registration Secretariat | BVA | This step is necessary to enroll students. |

| | | | |
|------------------------------------|--------------------------|-----|---|
| Send candidate list to coordinator | Registration Secretariat | NVA | The coordinator can retrieve the list from the database themselves. |
| Analyze candidates | Course Coordinator | VA | Analyzing applications is necessary for enrollment. |
| Verify pre-requisites | Course Coordinator | BVA | Necessary for the application to be correct. |
| Notify Rejected Candidates | Course Logistics | VA | The customer wants to know the outcome of their application. |
| Inform accepted candidates | Course Logistics | VA | The customer wants to know the outcome of their application. |
| Request Registration Data | Course Logistics | NVA | This task enables the enrolment process of accepted applicants. |
| Create List of Trainees | Course Logistics | BVA | The list is necessary data for further actions. |
| Request invoices | Course Logistics | NVA | This step is not crucial as it does not affect the course project. |
| Send invoice by email | Course Logistics | BVA | This step is required to collect revenue. |
| Send invoice by mail | Course Logistics | BVA | This step is required to collect revenue. |
| Confirm payments | Course Logistics | BVA | Confirming payments is a crucial step for collecting revenue and functioning of the course. |
| Send Welcome notice | Course Logistics | VA | Confirmation of the enrolment and welcoming actions create value for the customer. |
| Send receipt by email | Course Logistics | BVA | Receipts are crucial for the business' operation and the customers' trust. |
| Send receipt by mail | Course Logistics | BVA | Receipts are crucial for the business' operation and the customers' trust. |

Plan Course Logistics Phase:

| Task | Performer | Classification | Explanation |
|-----------------|------------------|----------------|---|
| Set course room | Course Logistics | VA | If the course is not online, a course room must be chosen and set for the whole duration of the course. |

| | | | |
|--|--------------------------|-----|---|
| Create Course Regulations/Rules | Course Logistics | BVA | This step is necessary to create regulations and rules that will comply with regulatory requirements. |
| Create course in Moodle Platform | Course Logistics | VA | It becomes easier to access the course resources on an online platform. |
| Create Course/Modules Surveys in Moodle Platform | Course Logistics | BVA | Getting survey answers adds valuable feedback to analyze. |
| Add teachers to Moodle Platform | Course Logistics | BVA | Teachers must have access to the Moodle platform to load valuable documentation, resources, and study material. |
| Send Moodle account confirmation email to teachers | Course Logistics | NVA | The client would not be willing to pay for this step as it consists of exchanging messages with the teachers. |
| Add students to Moodle platform | Course Logistics | VA | Students must have access to the course online platform. |
| Reserve course room | Course Logistics | VA | If the course is not online, a course room must be reserved for the whole duration of the course. |
| Prepare welcome set | Course Logistics | VA | This step improves the students' comprehension of the course, its workings and overall structure. |
| Schedule breaks and meals | Course Logistics | VA | This task motivates students to proceed with enrollment in the course, and adds a more positive image of Técnico+ |
| Hire catering | Course Logistics | VA | This task motivates students to proceed with enrollment in the course, and adds a more positive image of Técnico+ |
| Get Access to Parking for Trainees | Course Logistics | VA | If not online, students must have full access to parking to facilitate attending classes. |
| Get access to parking for teachers | Course Logistics | BVA | Teachers must have full access to parking if needed to facilitate lecturing classes. |
| Get Wi-Fi access and credentials for trainees and teachers | Course Logistics | VA | This step allows the trainees and teachers to have access to the Wi-Fi, which will allow them to access internet resources related to the course. |
| Schedule first class photo | Registration Secretariat | NVA | This task is not mandatory to the overall project. |

| | | | |
|---|--------------------------|-----|--|
| Schedule class interview | Registration Secretariat | NVA | This task is not mandatory to achieve the overall project. |
| Prepare room signage | Course Logistics | VA | Appropriate signage clarifies navigation for the enrolled students. |
| Schedule course kick-off meeting | Executive Director | NVA | This step just picks a date for the kick-off meeting, it doesn't add value to the course program. |
| Get "teaching statement" from teachers + financial information for payments | Executive Director | BVA | This step is crucial for the correct functioning of Técnico+ regarding course personnel. |
| Upload course materials to Moodle | Course Logistics | VA | The uploaded materials can be study material, documentation, and relevant information for the course. |
| Test Moodle course page | Course Logistics | BVA | This step is important to verify the integrity of the Moodle course page, which is itself a necessary component of the course. |
| Create Summary Lists | Course Logistics | NVA | If this task was removed, it wouldn't change the course program's value. |
| Create attendance lists | Course Logistics | BVA | This step is important for the course's management to plan resources allocation in accordance to expected load. In addition, it can be used as a tool to evaluate the effectiveness of classes and the importance students assign to them. |
| Create blank course dashboard and send to Coordinator | Course Logistics | NVA | The client would not be willing to pay for this step as it also consists of exchanging messages or documents, in this case a blank document. |
| Course kick-off meeting | Executive Director | BVA | This step creates an agenda for the whole course and therefore is useful for the business to operate. |

Deliver Classes Phase:

| Task | Performer | Classification | Explanation |
|---|------------------|----------------|---|
| Organize and prepare room for 1st class | Course Logistics | VA | The course room must be ready ahead of time to receive the trainees. |
| Deliver Welcome Kit in class | Course Logistics | VA | The welcome kit contains useful information regarding Técnico and the course. (Assumption 11) |

| | | | |
|--|--------------------|-----|---|
| Prepare trainees' reception | Course Logistics | NVA | This task is not crucial for the next phases of the overall course program. (Assumption 12) |
| Check first class | Course Logistics | BVA | The first course class must be checked for quality assurance purposes. |
| Present course overview in first class | Executive Director | VA | This step is important to entice students and allow them to be introduced to the course. |
| Check classes | Course Logistics | BVA | All classes must be checked for quality assurance purposes. |
| Post on course/module forum to fill out course survey and trainer(s) | Course Logistics | NVA | These surveys are not mandatory for the overall value of the course program. |
| Coordinate with the teacher filling out the trainee survey | Course Logistics | VA | The trainees might not know how to fill out the survey. |
| Prepare last class set | Course Logistics | VA | This step is important to make sure the last class meets all the defined objectives. |
| Distribute Last Class Set + Certificates of course conclusion | Course Logistics | VA | The handover of course conclusion certificates is a necessary step of the course. |

Closure Logistics Phase:

| Task | Performer | Classification | Explanation |
|---|--------------------|----------------|---|
| Ask for and get testimonials | Course Logistics | BVA | Relevant testimonies are very important to improve the courses' attractiveness. |
| Share end-of-course in communication channels | Marketing | BVA | It is necessary to notify the target audience of the end-of-course, as critical information is being shared. |
| Make financial statement | Executive Director | BVA | Required to comply with regulations. |
| Make list of payments to teachers | Executive Director | BVA | This step is necessary to complete the payment for the work provided by the teachers. |
| Send 2nd Message in the course/module Forum to fill in the course and teacher(s) survey | Course Logistics | NVA | This step is not crucial to achieve the final product, nor the client would be willing to pay as it consists only in exchanging messages. |

| | | | |
|--|--------------------|-----|---|
| Create Pedagogical File | Course Logistics | NVA | This file does not add value to the course program. |
| Finalize course dashboard and collect assessment | Course Logistics | BVA | This step is important since the gathered and collected assessment data contains the trainees' evaluation. (Assumption 13) |
| Surveys - Extract answers (deadline of answers ended) | Course Logistics | BVA | Surveys add valuable feedback to analyze. |
| Surveys - Prepare a Report and send it to Coordinators | Course Logistics | BVA | Surveys add valuable feedback to analyze. |
| Surveys - Select testimonies | Course Logistics | BVA | Selecting the most relevant testimonies is very important to improve the courses' quality and allure. |
| Prepare Diplomas and Certificates | Course Logistics | VA | The diplomas and certificates must be prepared to be sent out to the trainees. |
| Send Diplomas and Certificates | Course Logistics | VA | The trainees must be sent the diplomas and certificates to prove the course's conclusion. |
| Analyze Survey Report | Course Logistics | BVA | This step is required to improve the business, as verifying the reports helps reduce the risk of business losses. |
| Send thank you note to the course team | Executive Director | NVA | The client would not be willing to pay for this step as it consists of exchanging messages. |
| Surveys - Send Report to teachers (PDF) | Course Logistics | BVA | This task offers feedback to teachers for improving their performance in the course lectures. |
| Course closing meeting | Executive Director | BVA | This meeting offers valuable information about the course's execution, along with discussing improvement opportunities and strategies for it. |
| Write course closing meeting minutes + approval | Executive Director | BVA | This meeting offers valuable information about the course, and it is important that this information is registered for later use. |
| Create financial file | Executive Director | BVA | This step is important to organize and manage the financial resources. |
| Close course | Executive Director | NVA | The client would not be willing to pay for this step. |

Qualitative Analysis - Issue Register

Issue 1: Courses have insufficient candidates

Description: A few of the proposed courses had insufficient candidates due to no market interest, people without knowledge of the course or their applying deadlines and lack of financial support to enroll in these courses.

Data and assumptions:

- 20% of the courses had insufficient candidates.
- Based on a preliminary analysis of a survey on this issue:
 - 40% answered there is no market interest.
 - 20% did not know the course.
 - 35% knew about the course but forgot the deadlines to apply.
 - 5% needed financial support.
- There are currently 34 available courses (These courses are the 80% that got sufficient candidates).
- 2000 people have access to the published advertising and course website.
- 1000 people have answered the surveys.
- Advertisement is displaying information about the course for 120 days.
- To advertise news regarding the course it costs 100 Euros per day.
- Each course costs 800 Euros per year.
- Each candidate applies to 1 course.

Qualitative impact:

- Companies' dissatisfaction due to lack of applications to the proposed courses in their respective work areas.
- Interested applicants become annoyed due to the lack of information regarding the application deadlines.
- Técnico+ reputation and confidence in their proposed courses start to decline and companies begin to lose interest in applying to Técnico+ courses.

Quantitative impact:

- Number of courses with insufficient candidates per year:
 - $[0.2 * 34 \text{ courses}] / [0.8] = 8.5 \sim 8$ courses with insufficient candidates.
- Number of people with no market interest per year:
 - $1000 \text{ people} * 0.4 = 400$ people with no market interest
- Number of people without knowledge of the course existence per year:
 - $1000 \text{ people} * 0.2 = 200$ people did not have knowledge of the course
- Number of people who forgot to apply to the course per year:
 - $1000 \text{ people} * 0.35 = 350$ people forgot about the course enrollment deadlines
- Number of people with need of financial support per year:
 - $1000 \text{ people} * 0.05 = 50$ people who need financial support to enroll in the proposed courses.
- Estimate candidates number loss percentage per year:
 - $1000 \text{ people out of } 2000 = 50\%$ of people
- Advertisement cost per year:
 - $120 \text{ days} * 100 \text{ Euros} = 12.000 \text{ Euros}$
- Amount of lost money per year due to lack of candidates:
 - $1000 \text{ people} * 800 \text{ Euros} = 800.000 \text{ Euros}$
- Total money loss per year:
 - $800.000 \text{ Euros} + 12.000 = 812.000 \text{ Euros}$

Issue 2: Public companies fail to meet deadlines for applying employees to the courses.

Description: Public companies fail to meet the deadlines for applying employees to the courses due to specific public procurement procedures. These procedures take additional time and require that Técnico+ issues proposals or submits proposals through public procurement platforms.

Data and assumptions:

- There are 15 public companies that failed to meet the deadlines.
- Each public company, on average, would assign 20 employees to the course program.
- Each course costs 800 Euros per year.
- Each candidate applies to 1 course.

Qualitative impact:

- Public companies' dissatisfaction due to not being able to apply their employees to the proposed courses in their respective work areas.
- Interested applicants become annoyed because they will not attend the course.
- Técnico+ reputation and confidence in their proposed courses start to decline and companies begin to lose interest in applying to Técnico+ courses due to the current process not supporting issuing proposals or submitting proposals on public procurement platforms.

Quantitative impact:

- Number companies that fail to meet the deadlines, per year: 15 public companies
- Number of lost candidates per year:
 - 15 public companies * 20 employees = 300 candidates.
- Amount of lost money per year:
 - 300 candidates * 800 = 240.000 Euros

Issue 3: Difficulties in getting relevant testimonies.

Description: A recent survey noticed that testimonies are very relevant to improve attraction to the courses, however it is difficult to get relevant testimonies.

Data and assumptions:

- The testimonies are accessible to 2000 people.
- Only 30% of people answered the testimonies.
- Only 20% of testimonies are relevant.
- The number of candidates in the next iteration increases by 10% of the number of additional relevant testimonies.
- Each course costs 800 Euros per year.
- Each candidate applies to 1 course.

Qualitative impact:

- Técnico+ does not get enough relevant feedback from testimonies leading to not having enough information to apply changes and improvements to the course program.

Quantitative impact:

- Number submitted testimonies, per year:
 - $2000 \text{ people} * 0.3 = 600 \text{ submitted testimonies.}$
- Number of relevant testimonies per year:
 - $600 \text{ testimonies} * 0.2 = 120 \text{ testimonies}$
- Estimate number of lost candidates per year:
 - $[1400 \text{ people (who have not answered testimonies)} + 480 \text{ non-relevant testimonies}] * 0.10 = 1848 * 0.1 = 184.8 \sim 184 \text{ candidates.}$
- Amount of lost money per year:
 - $184 \text{ candidates} * 800 = 147.200 \text{ Euros}$

Issue 4: Companies' needs not fully aligned with Técnico+ course offering

Description: Companies have much interest that their employees learn from academia, however courses can only be proposed by Técnico Professors and sometimes the companies' needs are not fully aligned with Técnico+ course offering.

Data and assumptions:

- There are 40 companies that have interest in the Técnico+ course offering.
- 30% of companies are not fully aligned with Técnico+ course offering.
- Each company, on average, would assign 20 employees to the course program.
- Each course costs 800 Euros per year.
- Each candidate applies to 1 course.

Qualitative impact:

- Companies' dissatisfaction due to a lack of proposed courses in their respective work areas that meet their requirements and expectations.
- Interested applicants become annoyed because they will not attend the course.
- Técnico+ reputation and confidence in their proposed courses start to decline and companies begin to lose interest in applying to Técnico+ courses.

Quantitative impact:

- Number of companies not fully aligned with Técnico+ course offering per year:
 - $40 \text{ companies} * 0.3 = 12 \text{ companies.}$
- Number of lost course candidates per year:
 - $12 \text{ companies} * 20 = 240 \text{ candidates}$
- Money loss per year:
 - $240 \text{ candidates} * 800 \text{ Euros} = 192.000 \text{ Euros}$

Issue 5: Sending invoices and receipts by mail and email to some applicants/trainees take additional time.

Description: Applicants/trainees can choose during the application form whether they want to receive invoices and receipts through mail or e-mail.

Data and assumptions:

- It takes 4 hours to send all invoices or receipts by email.
- It takes 8 hours to send all invoices or receipts by mail.
- Only 2% of applicants request to receive these by mail.
- 100 applicants are accepted, and all of them pay (and as such receive the receipt). This is only for simplifying the numbers in the quantitative impact.

Qualitative impact:

- Impacts customers' perception of the efficiency of the process due to the inherent delays of mail delivery.
- Since the deadline for payment counts from the invoice emission, those who receive the invoice by mail have less time to pay. This also applies, and is more impactful, to the "5 days left to pay" notice.

Quantitative impact:

- Total time spent sending invoices or receipts:
 - $4 + 8 = 12$ hours
- Portion of total time for each person:
 - $4 / 98 = 0.0408$ hours = 2.448 minutes per email
 - $8 / 2 = 4$ hours per letter

Issue 6: Several tasks take too much time to be processed.

Description: Several tasks, mostly of the send/receive type, can be automated, therefore removing the time cost associated.

Data and assumptions:

- Proposal:
 - Send negative & positive results to course coordinator (30 minutes each)
- Applications:
 - Create candidates list (4 hours)
 - Send candidate list (20 minutes)
 - Notify accepted & rejected candidates (3 hours total)
 - Create list of trainees (4 hours)
 - Request invoices (2 hours)
 - Send invoices by mail & e-mail (12 hours total)
 - Send receipt by mail & e-mail (12 hours total)
- Plan course logistics:
 - Send Moodle account confirmation email (1 hour)
 - Add students to Moodle platform (8 hours)
- Closure logistics:
 - Send second survey notice (1 hour)
 - Extract survey answers (4 hours)
 - Send diplomas and certificates (4 hours)
 - Send thank you note to the course team (1 hour)
 - Send survey report to teachers (1 hour)

Qualitative impact:

- Communication tasks, especially of the request/receive type, introduce latency to the process, due to the time spent sending the request and waiting for a reply.
- This latency can be noticed by the customer when their request takes time to be answered, making Técnico+ be perceived as cumbersome and overly bureaucratic.
- Internally, the same effect applies, leading to employee discontent at having to navigate bureaucratic steps for common tasks.

Quantitative impact:

- Time spent in redundant tasks - Proposal:
 - $30 + 30 = 60$ minutes

- Time spent in redundant tasks - Applications:
 - $4 + 0.33 + 3 + 4 + 2 + 12 + 12 = 37.33$ hours
- Time spent in redundant tasks - Plan course logistics:
 - $1 + 8 = 9$ hours
- Time spent in redundant tasks - Closure logistics:
 - $1 + 4 + 4 + 1 + 1 = 11$ hours

Qualitative Analysis – Pareto Charts

We did two Pareto charts with the idea of combining the results and deriving an issue priority. One of the charts was focused on the estimated candidate loss and the other was focused on the estimated money loss. As the impact of the issues is the same, it became easy to prioritize the selected issues.

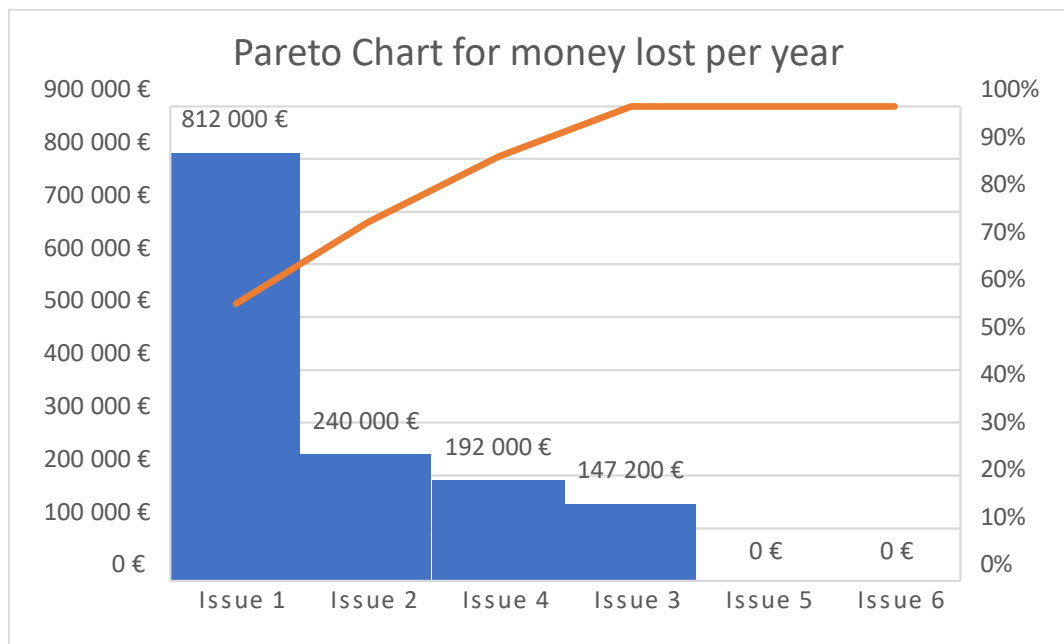


Fig. 1: Pareto chart for lost money per year.

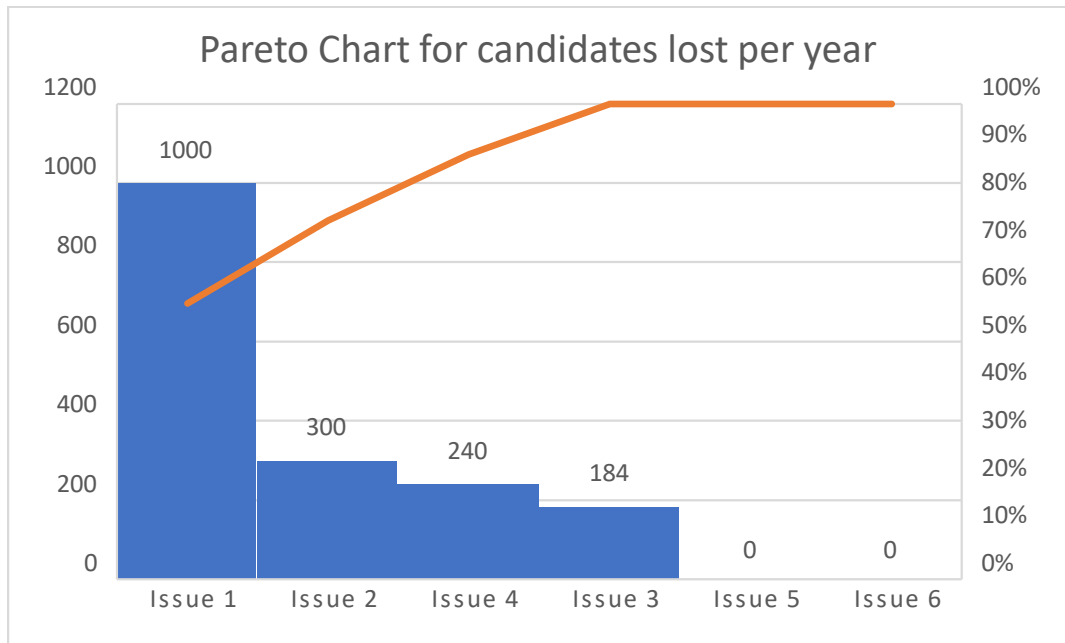
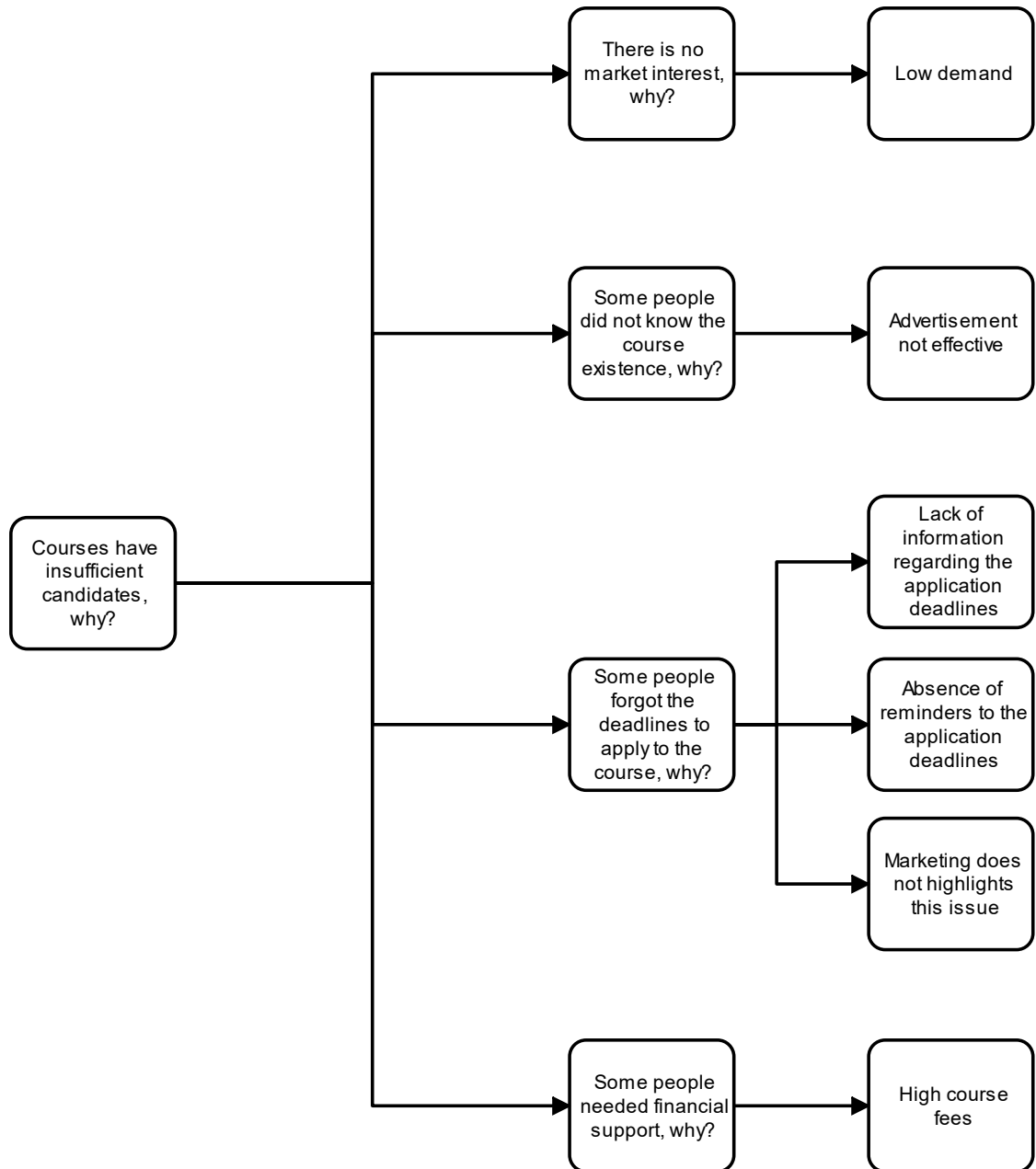


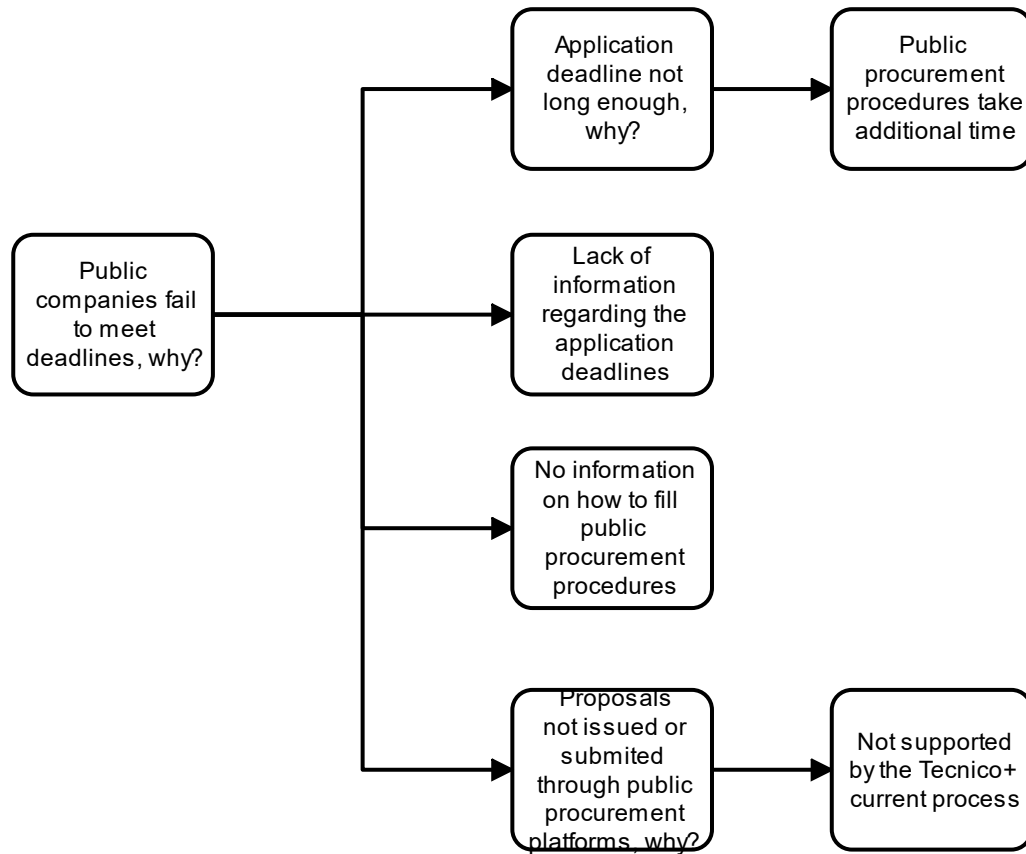
Fig. 2: Pareto chart for lost candidates per year.

Qualitative Analysis – Why-Why Diagrams

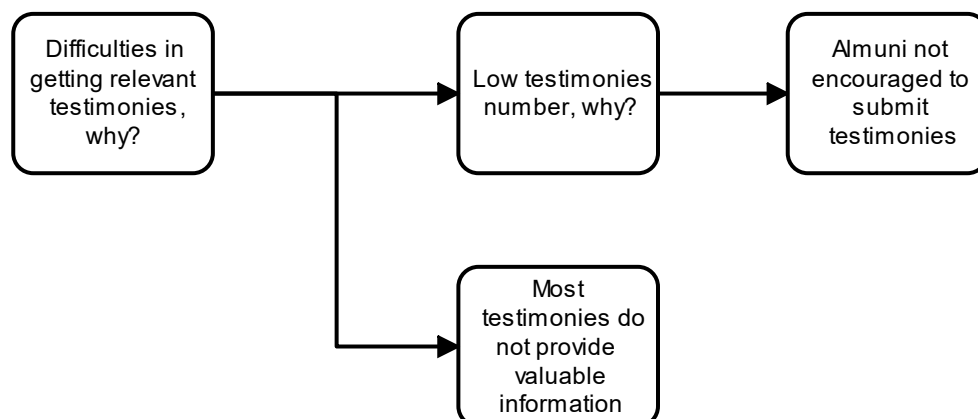
Issue 1: Courses have insufficient candidates



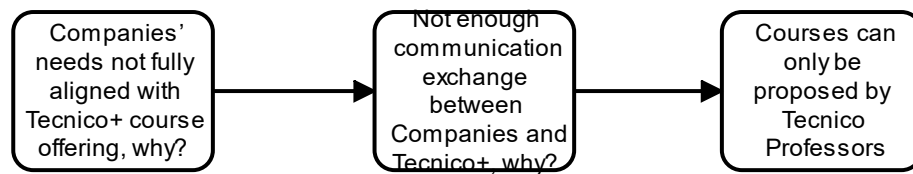
Issue 2: Public companies fail to meet deadlines for applying employees to the courses.



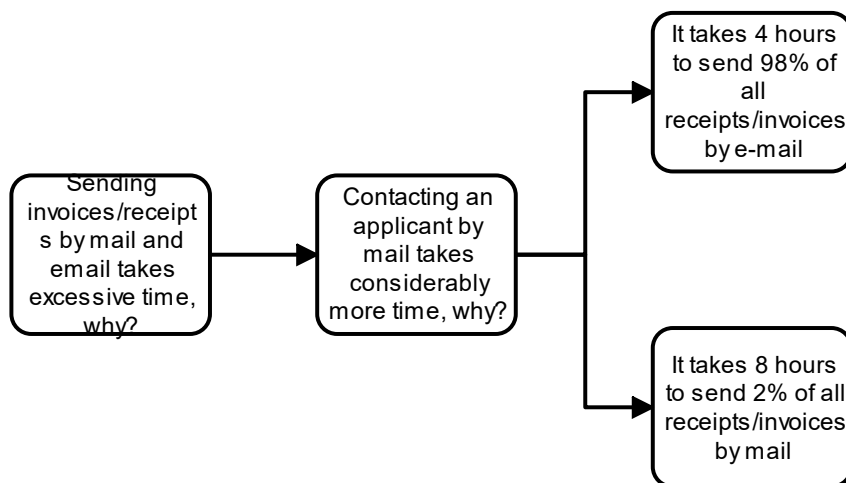
Issue 3: Difficulties in getting relevant testimonies.



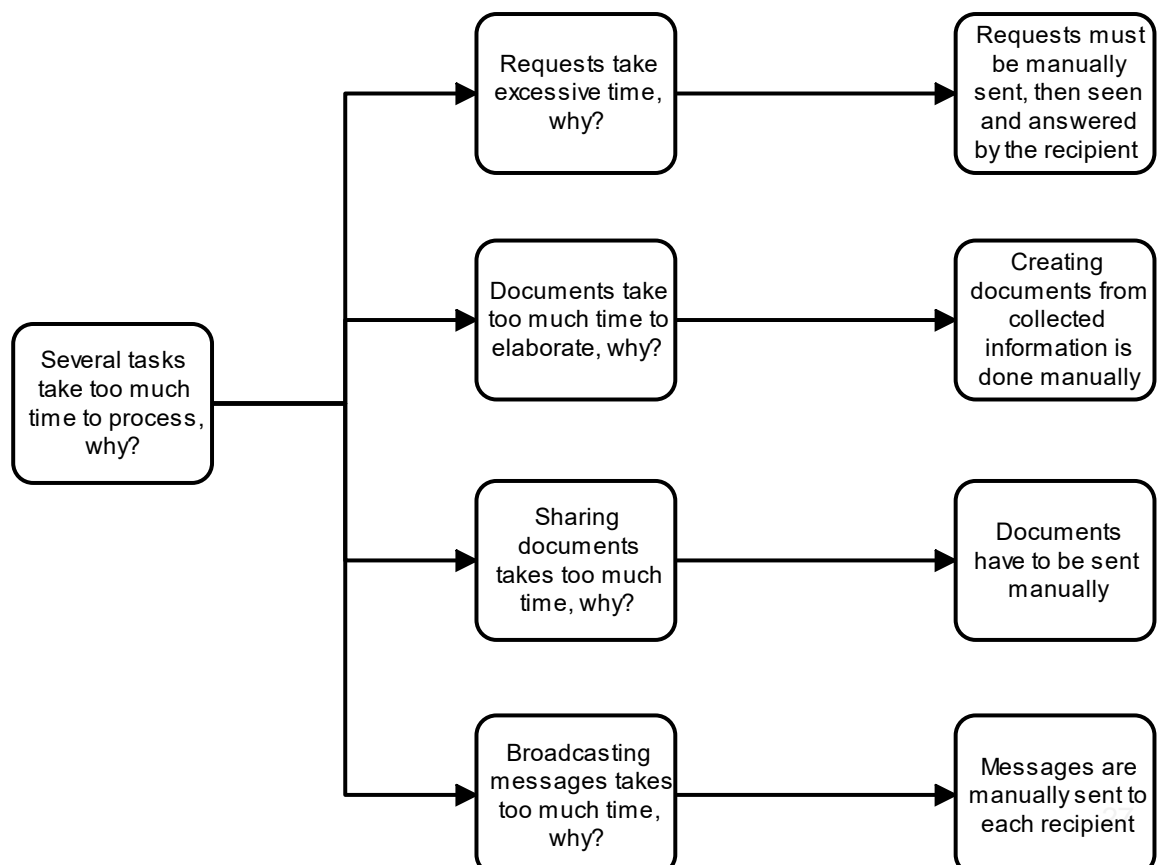
Issue 4: Companies' needs not fully aligned with Técnico+ course offering.



Issue 5: Sending invoices and receipts by mail to some applicants/trainees.



Issue 6: Several tasks can be automated.



As-Is Business Process Simulation

Taking into consideration the Issue Register Analysis, we chose to only simulate the phases and respective tasks mentioned in issues 5 and 6. The relevant data will be highlighted in yellow. We intend to decrease the highlighted average time and total time of all the processes' simulations below. The used distribution for all tasks and start events was the Negative Exponential Distribution to simulate the Poisson Distribution, as explained in the Bizagi tool demo class session.

Resources Cost per hour:

| Resource | Cost per hour |
|--------------------------|---------------|
| Registration Secretariat | 20 € |
| Course Logistics | 25 € |
| Course coordinator | 30 € |
| Executive Director | 44 € |
| Marketing | 25 € |
| Executive Commission | 20 € |

Proposal Phase Simulation:

Parameters:

| Start Events | Max. arrival count | Poisson Distribution |
|---|--|----------------------|
| Teacher proposes the Course | 10 | Mean = 12 |
| Tasks | Processing Time | |
| Send Negative Results to Course Coordinator | Poisson Distribution: 30 min | |
| Send Positive Results to Course Coordinator | Poisson Distribution: 30 min | |
| Gateways | Probability | |
| Exclusive Gateway | Accepted Proposals = 95% Rejected Proposals = 5% | |

Resources:

| Resource | Utilization | Total fixed cost | Total unit cost | Total cost |
|--------------------|-------------|------------------|-----------------|------------|
| Executive Director | 0.61 % | 0 | 192.91 | 192.91 |
| | Total | 0 | 192.91 | 192.91 |

Process:

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|--|-------------|---------------------|-------------------|------------|------------|------------|-------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Técnico+ | Process | 10 | 10 | 6m 26s | 2h 35m 39s | 1h 14m 21s | 12h 23m 31s | | | | | 8h 27s | 0 |
| Teacher proposes the Course | Start event | 10 | | | | | | | | | | | |
| Full Course Definition Ready | End event | 10 | | | | | | | | | | | |
| Proposal Rejected? | Gateway | 10 | 10 | | | | | | | | | | |
| ExclusiveGateway | Gateway | 10 | 10 | | | | | | | | | | |
| Send Negative Results to Course Coordinator (30 min) | Task | 2 | 2 | 2h 12m 12s | 2h 21m 43s | 2h 16m 57s | 4h 33m 55s | 2h 4m 7s | 2h 11m 26s | 2h 7m 46s | 3m 39s | 4h 15m 33s | 0 |
| Send Positive Results to Course Coordinator (30 min) | Task | 8 | 8 | 6m 26s | 2h 35m 39s | 58m 41s | 7h 49m 35s | 0 | 57m 1s | 28m 6s | 20m 54s | 3h 44m 54s | 0 |

Applications Phase Simulation:

Parameters:

| Start Events | Max. arrival count | Poisson Distribution |
|----------------------------|-------------------------------|----------------------|
| Application Phase Begins | 6 | Mean = 12 |
| Trainees List Ready | 6 | Mean = 12 |
| Tasks | Processing Time | |
| Create Candidates List | Poisson Distribution: 240 min | |
| Send Candidate List | Poisson Distribution: 20 min | |
| Inform Accepted Candidates | Poisson Distribution: 60 min | |
| Notify Rejected Candidates | Poisson Distribution: 120 min | |
| Create List of Trainees | Poisson Distribution: 240 min | |
| Request Invoices | Poisson Distribution: 120 min | |
| Send Invoice by E-Mail | Poisson Distribution: 240 min | |
| Send Invoice by Mail | Poisson Distribution: 480 min | |
| Send Receipt by E-Mail | Poisson Distribution: 240 min | |
| Send Receipt by Mail | Poisson Distribution: 480 min | |
| Subprocesses | | |
| Handle Payments | | |
| Gateways | Name | |
| Parallel Gateway | Notify Candidates | |
| Parallel Gateway | Invoices Communication Method | |
| Parallel Gateway | Receipts Communication Method | |

Resources:

| Resource | Utilization | Total fixed cost | Total unit cost | Total cost |
|--------------------------|-------------|------------------|-----------------|------------|
| Registration Secretariat | 4.11 % | 0 | 591.35 | 591.35 |
| Course Logistics | 27.03 % | 0 | 4,864.89 | 4,864.89 |
| Course Coordinator | 1.01 % | 0 | 217.81 | 217.81 |
| | Total | 0 | 5,674.05 | 5,674.05 |

Process:

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|----------------------------------|-------------|---------------------|-------------------|----------------|----------------|----------------|-----------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Técnico+ | Process | 6 | 6 | 2d 18h 12m 1s | 8d 2h 30m 54s | 6d 18h 24m 22s | 36d 15h 13m 13s | | | | | 31d 12h 36m 10s | 0 |
| Receipts Sent | End event | 6 | | | | | | | | | | | |
| Send Receipt by Mail (8h) | Task | 6 | 6 | 7h 41m 25s | 2d 1h 31m 33s | 1d 8h 28m 51s | 8d 2h 53m 8s | 7h 18m 51s | 1d 19h 15m 35s | 1d 5h 20m 52s | 11h 8m 53s | 7d 8h 5m 13s | 0 |
| Send Receipt by E-Mail (4h) | Task | 6 | 6 | 9h 12m 37s | 2d 1h 37m 14s | 1d 11h 46m 45s | 8d 22h 40m 31s | 7h 41m 25s | 2d 1h 31m 33s | 1d 8h 28m 51s | 12h 34m 52s | 8d 2h 53m 8s | 0 |
| Inform Accepted Candidates (1h) | Task | 6 | 6 | 1h 7m 34s | 5h 20m 24s | 2h 55m 5s | 17h 30m 30s | 0 | 4h 35m 44s | 1h 42m 28s | 1h 43m 16s | 10h 14m 52s | 0 |
| Notify Rejected Candidates (2h) | Task | 6 | 6 | 2h 53m 48s | 1d 10h 44m 12s | 1d 2h 45m 15s | 6d 16h 31m 30s | 0 | 1d 9h 26m 15s | 1d 1h 3m 8s | 11h 23m 32s | 6d 6h 18m 50s | 0 |
| Send Candidate List (20min) | Task | 6 | 6 | 5m 11s | 1d 3h 9m 19s | 13h 21m 11s | 3d 8h 7m 8s | 0 | 1d 2h 34m 10s | 13h 6m 44s | 9h 34m 51s | 3d 6h 40m 29s | 0 |
| Application Phase Begins | Start event | 6 | | | | | | | | | | | |
| Create Candidates List (4 hours) | Task | 6 | 6 | 45m 46s | 1d 3h 16m 48s | 10h 27m 6s | 2d 14h 42m 37s | 0 | 14h 20m 8s | 5h 45m 52s | 5h 44m 5s | 1d 10h 35m 13s | 0 |
| Create List Of Trainees (4h) | Task | 6 | 6 | 57m 54s | 1d 13h 57m 25s | 1d 47m 57s | 6d 4h 47m 46s | 0 | 1d 12h 39m 28s | 18h 38m 3s | 12h 3m 3s | 4d 15h 48m 22s | 0 |
| ParallelGateway | Gateway | 6 | 6 | | | | | | | | | | |
| ParallelGateway | Gateway | 6 | 6 | | | | | | | | | | |
| ParallelGateway | Gateway | 6 | 6 | | | | | | | | | | |
| ParallelGateway | Gateway | 6 | 6 | | | | | | | | | | |
| Handle Payments | Process | 6 | 6 | 1d 15h 47m 35s | 2d 8h 31m 39s | 2d 3h 16m 6s | 18d 3h 53m 50s | | | | | 13d 15h 5m 28s | 0 |

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|-----------------------------|-------------|---------------------|-------------------|----------------|----------------|----------------|----------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Handle Payments | Process | 6 | 6 | 1d 15h 47m 35s | 2d 8h 31m 39s | 2d 3h 16m 6s | 18d 3h 53m 50s | | | | | 13d 15h 5m 28s | 0 |
| Invoices Sent | End event | 6 | | | | | | | | | | | |
| Send Invoice by E-Mail (4h) | Task | 6 | 6 | 3h 6m 25s | 1d 23h 37m 11s | 21h 22m 51s | 5d 8h 17m 9s | 0 | 1d 20h 46m 52s | 20h 5m 41s | 15h 58m 32s | 5d 34m 9s | 0 |
| Send Invoice by Mail (8h) | Task | 6 | 6 | 12h 41m 52s | 2d 4h 12m 58s | 1d 12h 57m 18s | 9d 5h 43m 50s | 3h 6m 25s | 1d 23h 37m 11s | 21h 22m 51s | 16h 4m 21s | 5d 8h 17m 9s | 0 |
| Trainees List Ready | Start event | 6 | | | | | | | | | | | |
| Request Invoices (2h) | Task | 6 | 6 | 3m 43s | 1d 3h 5m 43s | 14h 18m 48s | 3d 13h 52m 50s | 0 | 1d 2h 31m 31s | 13h 2m 21s | 9h 7m 55s | 3d 6h 14m 9s | 0 |
| ParallelGateway | Gateway | 6 | 6 | | | | | | | | | | |
| ParallelGateway | Gateway | 6 | 6 | | | | | | | | | | |

Plan Course Logistics Phase Simulation:

Parameters:

| Start Events | Max. arrival count | Poisson Distribution |
|--|-------------------------------|----------------------|
| Application Phase Completed | 10 | Mean = 12 |
| Course Regulations and Rules Ready | 10 | Mean = 12 |
| Tasks | Processing Time | |
| Send Moodle Account Confirmation Email | Poisson Distribution: 60 min | |
| Add Students to Moodle Platform | Poisson Distribution: 480 min | |
| Subprocesses | | |
| Moodle Platform Configuration | | |

Resources:

| Resource | Utilization | Total fixed cost | Total unit cost | Total cost |
|------------------|-------------|------------------|-----------------|------------|
| Course Logistics | 8.37 % | 0 | 1,505.95 | 1,505.95 |
| Total | | 0 | 1,505.95 | 1,505.95 |

Process:

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|---|-------------|---------------------|-------------------|------------|----------------|----------------|-----------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Tecnico+ | Process | 10 | 10 | 5h 29m 56s | 2d 9h 45m 14s | 1d 13h 44m 51s | 0 | | | | | 0 | 0 |
| Application Phase Completed | Start event | 10 | | | | | | | | | | | |
| Course Ready to Start and Minutes Approved | End event | 10 | | | | | | | | | | | |
| Moodle Platform Configuration | Process | 10 | 10 | 5h 29m 56s | 2d 9h 45m 14s | 1d 13h 44m 51s | 15d 17h 28m 35s | | | | | 13d 5h 14m 18s | 0 |
| Moodle Platform Configuration | Process | 10 | 10 | 5h 29m 56s | 2d 9h 45m 14s | 1d 13h 44m 51s | 15d 17h 28m 35s | | | | | 13d 5h 14m 18s | 0 |
| Course Regulations and Rules Ready | Start event | 10 | | | | | | | | | | | |
| Send Moodle Account Confirmation Email (1h) | Task | 10 | 10 | 12m 52s | 15h 30m 24s | 7h 24m 34s | 3d 2h 5m 42s | 0 | 14h 3m 57s | 6h 17m 59s | 4h 48m 29s | 2d 14h 59m 57s | 0 |
| Add Students to Moodle Platform (8h) | Task | 10 | 10 | 5h 17m 3s | 1d 18h 14m 49s | 1d 6h 20m 17s | 12d 15h 22m 52s | 2h 17m 11s | 1d 15h 7m 49s | 1d 1h 25m 26s | 12h 4m 20s | 10d 14h 14m 21s | 0 |
| Moodle Configuration Completed | End event | 10 | | | | | | | | | | | |

Parameters:

| Start Events | Max. arrival count | Poisson Distribution |
|--|-------------------------------|----------------------|
| Classes Ended | 7 | Mean = 12 |
| Tasks | Processing Time | |
| Send Second Survey Notice | Poisson Distribution: 60 min | |
| Extract Survey Answers | Poisson Distribution: 240 min | |
| Send Diplomas and Certificates | Poisson Distribution: 240 min | |
| Send Thank You Note to the Course Team | Poisson Distribution: 60 min | |
| Send Survey Report to Teachers | Poisson Distribution: 60 min | |

Resources:

| Resource | Utilization | Total fixed cost | Total unit cost | Total cost |
|--------------------|-------------|------------------|-----------------|------------|
| Course Logistics | 10.15 % | 0 | 1,827.31 | 1,827.31 |
| Executive Director | 0.77 % | 0 | 244.06 | 244.06 |
| | Total | 0 | 2,071.37 | 2,071.37 |

Process:

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|---|-------------|---------------------|-------------------|-------------|----------------|----------------|----------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Tecnico+ | Process | 7 | 7 | 2d 17m 54s | 3d 2m 27s | 2d 19h 58m 17s | 19d 19h 48m 3s | | | | | 16d 13h 9m 42s | 0 |
| Classes Ended | Start event | 7 | | | | | | | | | | | |
| Send Second Survey Notice (1h) | Task | 7 | 7 | 5m 38s | 7h 49m 27s | 4h 13m 30s | 1d 5h 34m 35s | 0 | 5h 10m 5s | 3h 10m 27s | 1h 45m 24s | 22h 13m 14s | 0 |
| Extract Survey Answers (4h) | Task | 7 | 7 | 1h 31m 11s | 1d 10h 39m 29s | 19h 20s | 5d 13h 2m 24s | 0 | 1d 18m 14s | 14h 29m 37s | 7h 52m 59s | 4d 5h 27m 21s | 0 |
| Send Diplomas and Certificates (4h) | Task | 7 | 7 | 11h 51m 20s | 1d 12h 30m 5s | 1d 5h 52m 56s | 8d 17h 10m 38s | 7h 15m 41s | 1d 9h 31m 24s | 1d 1h 42m 12s | 7h 56m 52s | 7d 11h 55m 30s | 0 |
| Send Thank You Note to the Course Team (1h) | Task | 7 | 7 | 11s | 1h 46m 34s | 51m 18s | 5h 59m 10s | 0 | 26m 21s | 3m 45s | 9m 13s | 26m 21s | 0 |
| Send Survey Report to Teachers (1h) | Task | 7 | 7 | 3h 37m 59s | 1d 9h 22m 49s | 14h 10s | 4d 2h 1m 16s | 3h 11m 31s | 1d 9h 7m 15s | 13h 18m 10s | 10h 14m 22s | 3d 21h 7m 14s | 0 |
| Course Closed | End event | 7 | | | | | | | | | | | |

The Process Redesign

BPR Principles

1. Make sure that information is captured fresh.
2. Information processing work is to be integrated with the real work.
3. Those who have an interest in the output of a process should drive it all the way.

Proposed Process Changes and Discussion of its Expected Benefits:

Regarding Issues 1 to 5

Improvements per phase:

Proposal Phase:

1. Creation of scholarships: This improvement can reduce the number of candidates that need financial support (Issue 1).
2. Allow companies to submit course proposals (3rd BPM Principle): This improvement could prevent companies' needs from misalignment with the Técnico+ course offering (Issue 4).

Marketing Phase:

3. Create a monthly newsletter adapted for courses related announcements (1st BPM Principle): This improvement can reduce the number of candidates that did not know of the course or candidates who forgot the deadlines to apply (Issue 1).
4. Create an online forum for possible questions (1st BPM Principle): An extension of the previous improvement (Issue 1).

Sell Phase:

5. Add to the sales plan a discount for early enrollment in the course (under 2 weeks): This improvement could help with increasing the market interest of the Técnico+ course offering (Issue 1).
6. Search for public procurement platforms (2nd BPM Principle): This improvement aims to reduce the number of public companies that fail to meet the deadlines for applying their employees due to specific public procurement procedures (Issue 2).
7. (3rd BPM Principle) Contact companies that have proposed courses previously (Issue 4).

Applications Phase:

8. Create weekly reminders of the course's enrollment deadlines (1st BPM Principle): This improvement can reduce the number of candidates that forget the deadlines to apply to the course (Issue 1).
9. (2nd BPM Principle) Given that candidates already use platforms such as Moodle, which require email, in addition to using email and the web landing page for their application, it is reasonable to require an email for the application phase and to restrict the distribution of invoices and receipts to it (Issue 5).

Plan Course Logistics Phase:

10. Add a reward program where credits are given to individuals that provide testimonies. These credits can later be used in further applications to other courses: This improvement aims to increase the number of people who submit testimonies and, subsequently, the number of relevant testimonies (Issue 3).

Closure Logistics Phase:

11. Attribute credits to all trainees that sent testimonies: an extension of the previous improvement (Issue 3).

Regarding Issue 6**Proposal Phase:**

12. Send negative & positive results to course coordinator (30 minutes each) – Database

Applications Phase:

13. Create candidates list (4 hours) - Script
14. Send candidate list (20 minutes) – Database
15. Notify accepted & rejected candidates (3 hours total) – Script
16. Create list of trainees (4 hours) – Script
17. Request invoices (2 hours) – Database
18. Send invoices by mail & e-mail (12 hours total) – Script
19. Send receipt by mail & e-mail (12 hours total) – Script

Plan Course Logistics Phase:

20. Send Moodle account confirmation email (1 hour) – Script
21. Add students to Moodle platform (8 hours) – Script

Closure Logistics Phase:

22. Send second survey notice (1 hour) – Script
23. Extract survey answers (4 hours) – Script
24. Send diplomas and certificates (4 hours) – Script
25. Send thank you note to the course team (1 hour) – Script
26. Send survey report to teachers (1 hour) – Script

Improvements:

- Tasks marked as database (2nd BPM Principle): These tasks involve requesting and/or sending information/documents. This can be resolved through the use of databases, whereby rather than requesting/sending the information, the relevant participant simply retrieves them from a database. As an example, during the applications phase, Course Logistics requests invoices from the Técnico Accounting Office. With our proposed change, Course Logistics would access the Accounting Office's database, and retrieve the invoices themselves rather than requesting and waiting to receive them.
- Tasks marked as script (2nd BPM Principle): These tasks involve the processing (usually compilation onto a document or mass sending of messages) of data. These processes can be replaced by automatic scripts which produce the same results (3rd BPM principle). As an example of a compilation task, we have "create candidates list" in the application phase. The information necessary for this task is already in a database. As such, a script that "prints" the database onto a document achieves the same function in far less time than doing it manually. For message sending tasks, a similar process applies. As an example, "Notify accepted & rejected candidates" in Applications. In this case, lists of rejected and accepted candidates, along with their contact information, are already in the database. A script that iterates through said lists and sends an acceptance/rejection email automatically can be implemented, replacing several hours of manual work.

Updated Assumptions

Proposal Phase:

1. The project has specifications that must be sent to the Course Coordinator upon its creation.
2. If the results from the validation of the course proposal are negative, the Course Coordinator will recreate the proposal. Otherwise, in case the results are positive, the Executive Director proceeds with the creation of the shared folder.
3. The validation of the course proposal is now uploaded to the "Proposal Results" datastore.
4. The "Proposal Results" datastore can store several proposals of other courses.
5. The validation results are now retrieved from the "Proposal Results" datastore, and it takes 15 minutes to retrieve these results.
6. The created shared folder is the container of all course related resources.
7. Companies are now allowed to submit proposals.
8. The course must have a scholarship program description.
9. The "Add Scholarship Program Description to the Course" takes 1 hour to be completed and it is performed by the Executive Director.

Marketing Phase:

10. The “Website” datastore can be used to write and store descriptions from all Técnico+ courses.
11. A monthly newsletter for course announcements was added to this phase.
12. The “Create a Monthly Newsletter for Courses Announcements” task takes 8 hours to be completed and it is performed by Marketing.
13. An online forum for possible course questions was added to this phase.
14. The “Create an Online Forum for Possible Course Related Questions” task takes 4 hours to be completed and is performed by Marketing.

Sell phase:

15. A discount plan for early enrollment (Under 2 Weeks) is developed during the “Sales Preparation” subprocess.
16. The “Plan Discount for Early Enrollment [Under 2 Weeks]” task takes 8 hours to be completed and it is performed by the Marketing.

Applications Phase:

17. The “Analyze Candidates” task (4.04) goes through all the candidates.
18. Informing accepted candidates and notifying rejected candidates are now supported by scripts and each take 15 minutes to be completed.
19. All invoices and receipts are now sent only by email.
20. All invoices and receipts emails are now sent through the execution of a script and take 15 minutes to be sent.
21. The list of candidates is now generated by a script, and it takes 15 min to create it.
22. The list of trainees is now generated by a script, and it takes 15 min to create it.
23. Técnico Accounting Office participates in the “Obtain Invoices from ATC Database” task.
24. The “ATC” datastore contains invoices for all of the course’s accepted candidates.
25. The “Obtain Invoices from ATC Database” task takes 15 min to be completed and it is performed by Course Logistics.
26. Reminders of the course’s enrollment deadlines are now published every week.
27. The “Publish Reminders of the Course's Enrollment Deadline” task takes 10 minutes each week and it is performed by the Registration Secretariat.

Plan Course Logistics Phase:

- 28. "Set course room" task (5.01) is done by person B.
- 29. "Prepare Welcome Set" task (5.09) is done by person C.
- 30. "Schedule breaks and meals" task (5.10) is done by person A.
- 31. The "Moodle" datastore can be used to store resources and files from all Técnico+ courses.
- 32. The Moodle account confirmation email is sent through the execution of a script, and it takes 15 min to be execute.
- 33. A credit reward program for testimonies is now created.
- 34. The "Create a Credit Reward Program for Testimonies" takes 4 hours to be completed and is performed by the Executive Director.

Closure Logistics Phase:

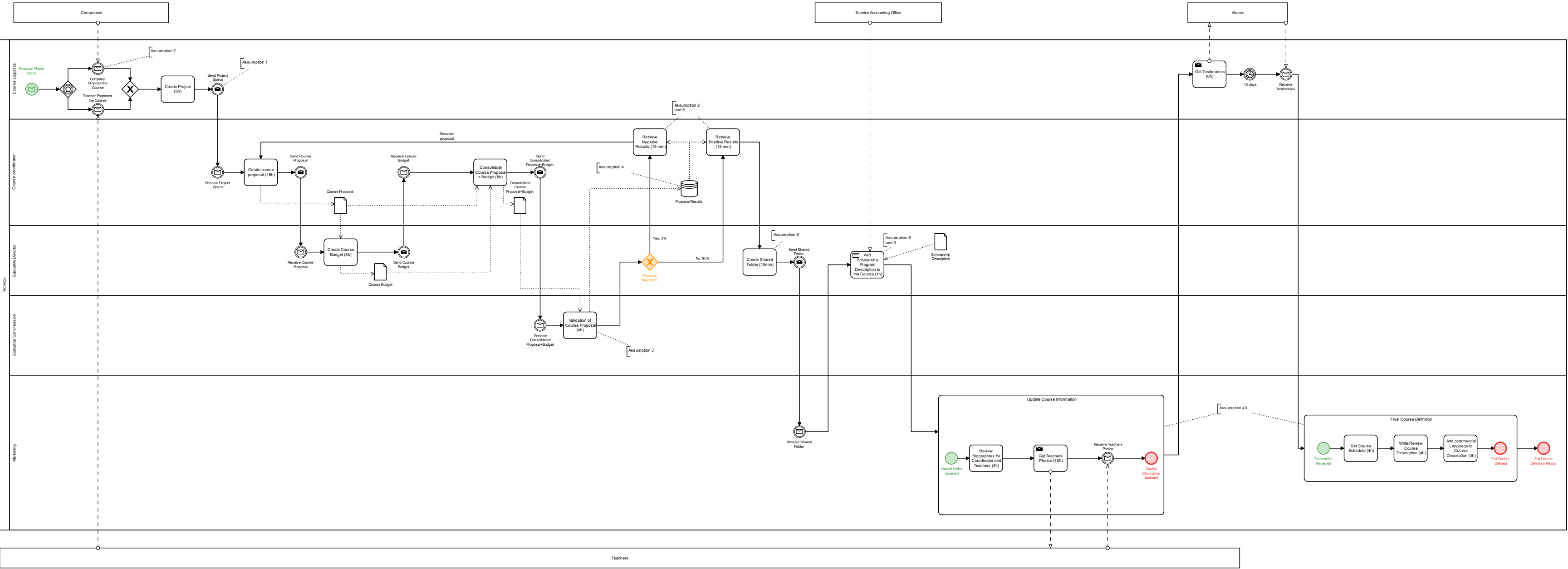
- 35. The course dashboard contains the evaluation from all trainees of the course.
- 36. Credits can now be attributed to trainees that submitted testimonies.
- 37. The "Attribute Credits to All Trainees that Sent Testimonies" takes 8 hours to be completed and it is performed by the executive director.
- 38. The second survey notice is now sent through the execution of a script, and it takes 15 minutes to execute it.
- 39. The survey answers extraction is now done through the execution of a script, and it takes 15 minutes to execute it.
- 40. The diplomas are now sent through the execution of a script, and it takes 15 minutes to execute it.
- 41. The thank you note to the course team is now sent through the execution of a script, and it takes 15 minutes to execute it.
- 42. The survey report is now sent to the teachers through the execution of a script, and it takes 15 minutes to execute it.

General:

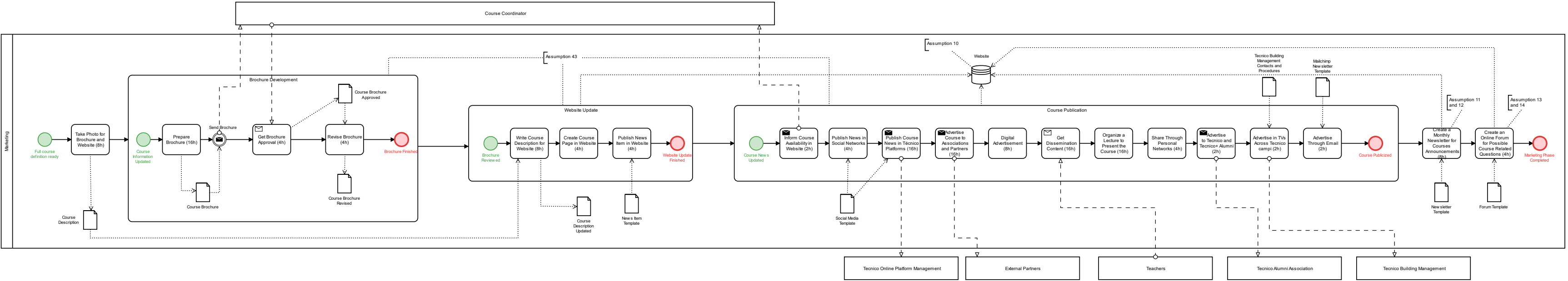
- 43. Tasks with the same outcome or objective can be represented as subprocesses.

To-Be Business Process Model

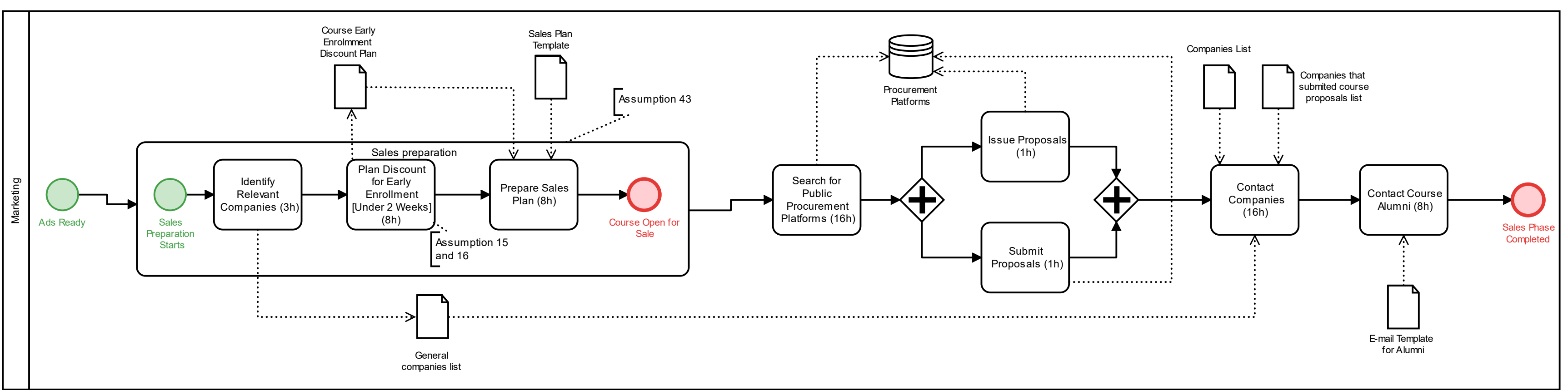
Proposal Phase



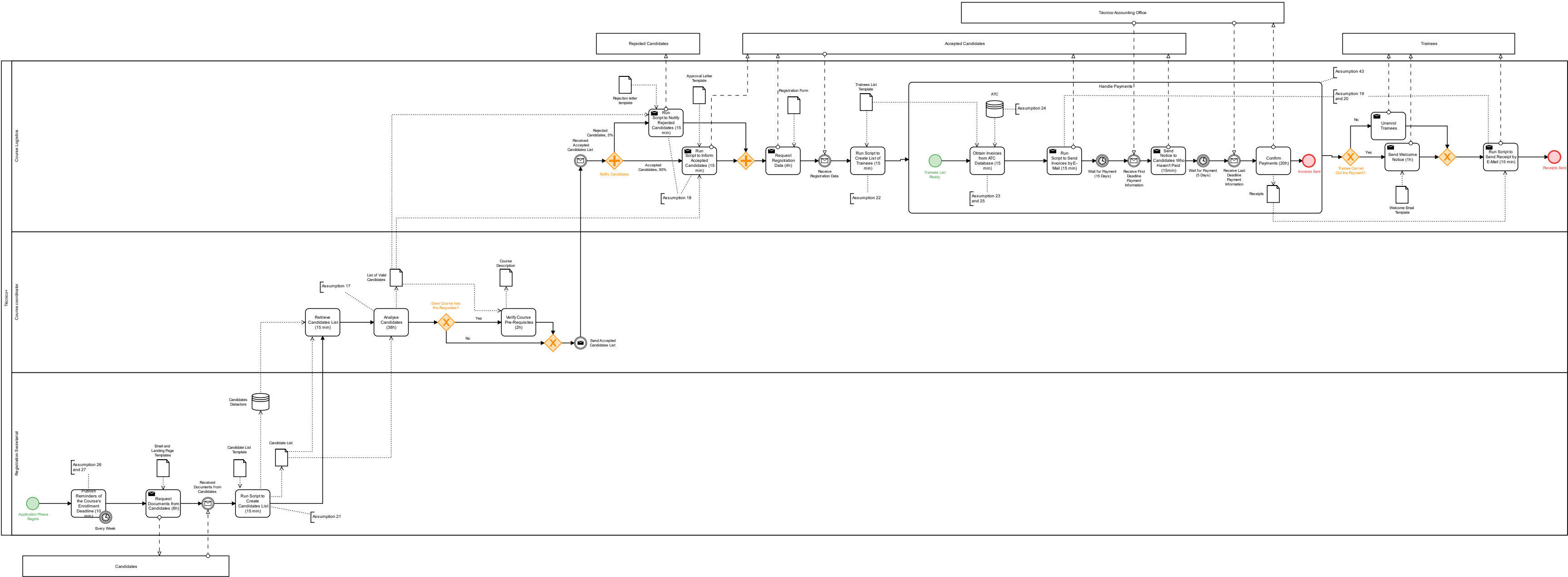
Marketing Phase



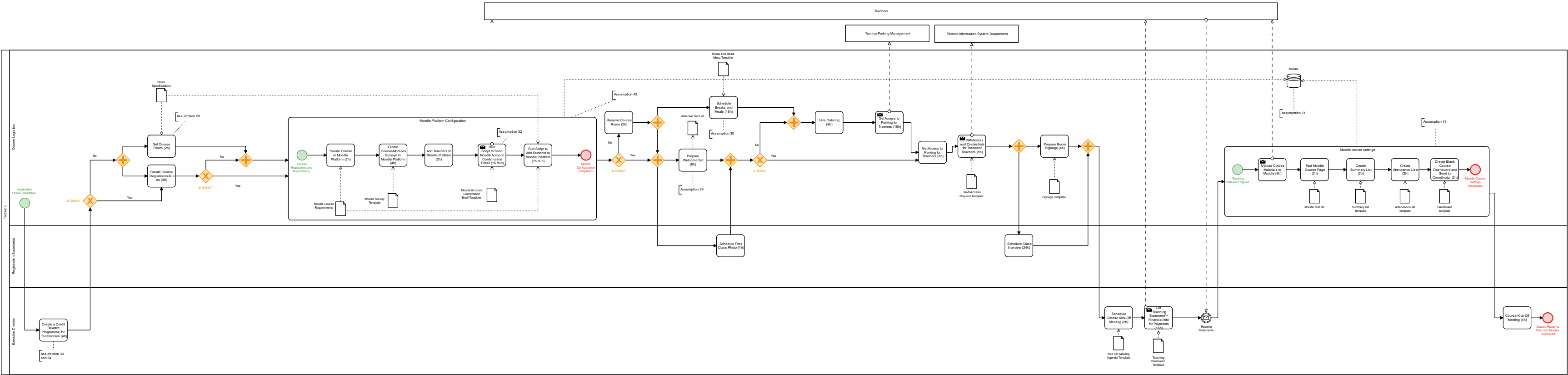
Sell Phase



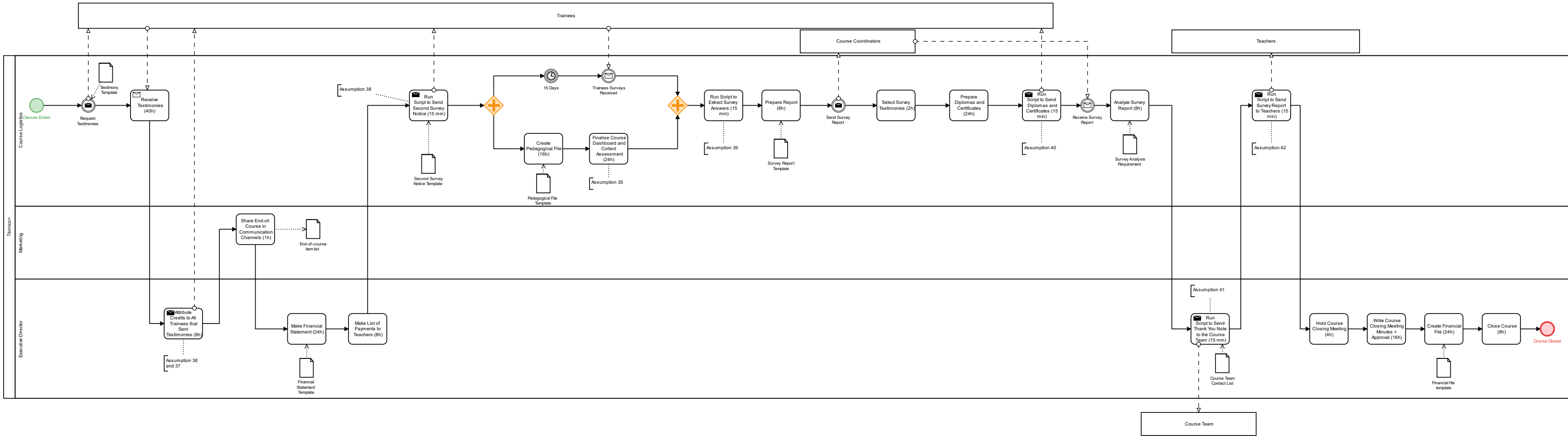
Applications Phase



Plan Course Logistics Phase



Closure Logistics Phase



To-Be Business Process Simulation

By comparing the As-Is process simulation results with the To-Be process simulation, we concluded that the average time and the total time of the analyzed processes and tasks reduced significantly, and the same can be observed for the Total Cost of each process. As mentioned before, the used distribution for all tasks and start events was the Negative Exponential Distribution to simulate the Poisson Distribution, as explained in the Bizagi tool demo class session.

Resources Cost per hour:

| Resource | Cost per hour |
|--------------------------|---------------|
| Registration Secretariat | 20 € |
| Course Logistics | 25 € |
| Course coordinator | 30 € |
| Executive Director | 44 € |
| Marketing | 25 € |
| Executive Commission | 20 € |

Proposal Phase Simulation:

Parameters:

| Start Events | Max. arrival count | Poisson Distribution |
|------------------------------------|--|----------------------|
| Proposal Phase Starts | 10 | Mean = 12 |
| Tasks | Processing Time | |
| Retrieve Negative Results | Poisson Distribution: 15 min | |
| Retrieve Positive Results (15 min) | Poisson Distribution: 15 min | |
| Gateways | Probability | |
| Exclusive Gateway | Accepted Proposals = 95% Rejected Proposals = 5% | |

Resources:

| Resource | Utilization | Total fixed cost | Total unit cost | Total cost |
|--------------------|-------------|------------------|-----------------|------------|
| Executive Director | 0.30 % | 0 | 95.08 | 95.08 |
| | Total | 0 | 95.08 | 95.08 |

Process:

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|------------------------------------|-------------|---------------------|-------------------|-----------|-----------|-----------|------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Técnico+ | Process | 10 | 10 | 1m 48s | 40m 17s | 19m 26s | 3h 14m 25s | | | | | 1h 4m 46s | 0 |
| Retrieve Negative Results (15 min) | Task | 2 | 2 | 8m 31s | 20m 44s | 14m 38s | 29m 16s | 0 | 8m 7s | 4m 3s | 4m 3s | 8m 7s | 0 |
| Retrieve Positive Results (15 min) | Task | 8 | 8 | 1m 48s | 40m 17s | 20m 38s | 2h 45m 9s | 0 | 36m 16s | 7m 4s | 12m 53s | 56m 38s | 0 |
| Proposal Phase Starts | Start event | 10 | | | | | | | | | | | |
| Full Course Definition Ready | End event | 10 | | | | | | | | | | | |
| Proposal Rejected? | Gateway | 10 | 10 | | | | | | | | | | |
| ExclusiveGateway | Gateway | 10 | 10 | | | | | | | | | | |

Applications Phase Simulation:

Parameters:

| Start Events | Max. arrival count | Poisson Distribution |
|--------------------------|--------------------|----------------------|
| Application Phase Begins | 6 | Mean = 12 |
| Trainees List Ready | 6 | Mean = 12 |

| Tasks | Processing Time |
|--|------------------------------|
| Run Script to Create Candidates List | Poisson Distribution: 15 min |
| Retrieve Candidates List | Poisson Distribution: 15 min |
| Run Script to Inform Accepted Candidates | Poisson Distribution: 15 min |
| Run Script to Notify Rejected Candidates | Poisson Distribution: 15 min |
| Run script to create list of trainees | Poisson Distribution: 15 min |
| Obtain Invoices from ATC Database | Poisson Distribution: 15 min |
| Run Script to Send Invoices by E-Mail | Poisson Distribution: 15 min |
| Run Script to Send Receipt by E-Mail | Poisson Distribution: 15 min |
| Subprocesses | |
| Handle Payments | |
| Gateways | Name |
| Parallel Gateway | Notify Candidates |

Resources:

| Resource | Utilization | Total fixed cost | Total unit cost | Total cost |
|--------------------------|-------------|------------------|-----------------|------------|
| Registration Secretariat | 0.14 % | 0 | 20.53 | 20.53 |
| Course Logistics | 1.34 % | 0 | 240.49 | 240.49 |
| Course Coordinator | 0.47 % | 0 | 101.55 | 101.55 |
| Total | | 0 | 362.58 | 362.58 |

Process:

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|---|-------------|---------------------|-------------------|-----------|------------|------------|---------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Tecnico+ | Process | 6 | 6 | 2h 20m 7s | 8h 49m 23s | 7h 2m 6s | 1d 7h 41m 48s | | | | | 21h 1m 37s | 0 |
| Receipts Sent | End event | 6 | | | | | | | | | | | |
| Run Script to Notify Rejected Candidates (15 min) | Task | 6 | 6 | 7m 6s | 1h 58m 42s | 1h 2m 7s | 6h 12m 47s | 5m 41s | 1h 41m 37s | 50m 22s | 35m 7s | 5h 2m 17s | 0 |
| Run Script to Inform Accepted Candidates (15 min) | Task | 6 | 6 | 5m 41s | 1h 41m 37s | 50m 22s | 5h 2m 17s | 0 | 1h 16m 41s | 38m | 33m 5s | 3h 48m 4s | 0 |
| Application Phase Begins | Start event | 6 | | | | | | | | | | | |
| Run Script to Create Candidates List (15 min) | Task | 6 | 6 | 5m 37s | 35m 27s | 13m 18s | 1h 19m 52s | 0 | 7m 13s | 3m 2s | 2m 47s | 18m 17s | 0 |
| Retrieve Candidates List (15 min) | Task | 6 | 6 | 3m 56s | 2h 52m 25s | 47m 3s | 4h 42m 18s | 0 | 51m 40s | 13m 12s | 18m 18s | 1h 19m 12s | 0 |
| Run Script to Send Receipt by E-Mail (15 min) | Task | 6 | 6 | 16m 33s | 1h 45m 4s | 1h 10m 31s | 7h 3m 9s | 0 | 1h 34m 38s | 49m 38s | 33m 14s | 4h 57m 49s | 0 |
| Run script to create list of trainees (15 min) | Task | 6 | 6 | 2m 51s | 2h 34m 53s | 1h 13m 33s | 7h 21m 23s | 0 | 1h 46m 20s | 55m 59s | 32m 10s | 5h 35m 55s | 0 |
| ParallelGateway | Gateway | 6 | 6 | | | | | | | | | | |
| ParallelGateway | Gateway | 6 | 6 | | | | | | | | | | |
| Handle Payments | Process | 6 | 6 | 47m 31s | 3h 48m 42s | 2h 35m 31s | 15h 33m 6s | | | | | 12h 11m 25s | 0 |

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|---|-------------|---------------------|-------------------|-----------|------------|------------|------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Handle Payments | Process | 6 | 6 | 47m 31s | 3h 48m 42s | 2h 35m 31s | 15h 33m 6s | | | | | 12h 11m 25s | 0 |
| Invoices Sent | End event | 6 | | | | | | | | | | | |
| Trainees List Ready | Start event | 6 | | | | | | | | | | | |
| Run Script to Send Invoices by E-Mail (15 mi) | Task | 6 | 6 | 25m 23s | 2h 3m 13s | 1h 22m 5s | 8h 12m 32s | 23m 51s | 1h 59m 36s | 1h 10m 37s | 29m 23s | 7h 3m 44s | 0 |
| Obtain Invoices from ATC Database (15 min) | Task | 6 | 6 | 22m 7s | 1h 54m 16s | 1h 13m 25s | 7h 20m 33s | 0 | 1h 32m 15s | 51m 16s | 33m 45s | 5h 7m 41s | 0 |

Plan Course Logistics Phase Simulation:

Parameters:

| Start Events | Max. arrival count | Poisson Distribution |
|--|------------------------------|----------------------|
| Application Phase Completed | 10 | Mean = 12 |
| Course Regulations and Rules Ready | 10 | Mean = 12 |
| Tasks | Processing Time | |
| Run Script to Send Moodle Account Confirmation | Poisson Distribution: 15 min | |
| Run Script to Add Students to Moodle Platform | Poisson Distribution: 15 min | |
| Subprocesses | | |
| Moodle Platform Configuration | | |

Resources:

| Resource | Utilization | Total fixed cost | Total unit cost | Total cost |
|------------------|-------------|------------------|-----------------|------------|
| Course Logistics | 0.60 % | 0 | 107.74 | 107.74 |
| | Total | 0 | 107.74 | 107.74 |

Process:

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|---|-------------|---------------------|-------------------|-----------|------------|-----------|------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Tecnico+ | Process | 10 | 10 | 26m 13s | 2h 18m 23s | 1h 32m 6s | 0 | | | | | 0 | 0 |
| Application Phase Completed | Start event | 10 | | | | | | | | | | | |
| Course Ready to Start and Minutes Approved | End event | 10 | | | | | | | | | | | |
| Moodle Platform Configuration | Process | 10 | 10 | 26m 13s | 2h 18m 23s | 1h 32m 6s | 15h 21m 1s | | | | | 11h 2m 26s | 0 |
| Moodle Platform Configuration | Process | 10 | 10 | 26m 13s | 2h 18m 23s | 1h 32m 6s | 15h 21m 1s | | | | | 11h 2m 26s | 0 |
| Course Regulations and Rules Ready | Start event | 10 | | | | | | | | | | | |
| Run Script to Send Moodle Account Confirmation Email (1 | Task | 10 | 10 | 3m 13s | 1h 22m 51s | 42m 28s | 7h 4m 47s | 0 | 1h 1m 14s | 25m 50s | 18m 18s | 4h 18m 21s | 0 |
| Run Script to Add Students to Moodle Platform (15 min) | Task | 10 | 10 | 23m | 1h 11m 20s | 49m 37s | 8h 16m 13s | 12m 43s | 1h 4m 28s | 40m 24s | 20m 9s | 6h 44m 5s | 0 |
| Moodle Configuration Completed | End event | 10 | | | | | | | | | | | |

Closure Logistics Phase Simulation:

Parameters:

| Start Events | Max. arrival count | Poisson Distribution |
|--|------------------------------|----------------------|
| Classes Ended | 7 | Mean = 12 |
| Tasks | Processing Time | |
| Run Script to Send Second Survey Notice | Poisson Distribution: 15 min | |
| Run Script to Extract Survey Answers | Poisson Distribution: 15 min | |
| Run Script to Send Diplomas and Certificates | Poisson Distribution: 15 min | |
| Run Script to Send Thank You Note to the Course Team | Poisson Distribution: 15 min | |
| Run Script to Send Survey Report to Teachers | Poisson Distribution: 15 min | |

Resources:

| Resource | Utilization | Total fixed cost | Total unit cost | Total cost |
|--------------------|-------------|------------------|-----------------|------------|
| Course Logistics | 0.95 % | 0 | 171.66 | 171.66 |
| Executive Director | 0.19 % | 0 | 61.02 | 61.02 |
| Total | | 0 | 232.67 | 232.67 |

Process:

| Name | Type | Instances completed | Instances started | Min. time | Max. time | Avg. time | Total time | Min. time waiting resource | Max. time waiting resource | Avg. time waiting for resource | Standard deviation waiting resources | Total time waiting resource | Total fixed cost |
|--|-------------|---------------------|-------------------|------------|------------|------------|-------------|----------------------------|----------------------------|--------------------------------|--------------------------------------|-----------------------------|------------------|
| Tecnico+ | Process | 7 | 7 | 1h 33m 56s | 6h 8m 47s | 5h 17m 10s | 1d 13h 13s | | | | | 1d 4h 45m 2s | 0 |
| Classes Ended | Start event | 7 | | | | | | | | | | | |
| Run Script to Send Second Survey Notice (15 min) | Task | 7 | 7 | 1m 24s | 1h 44m 7s | 49m 19s | 5h 45m 13s | 0 | 1h 4m 16s | 33m 33s | 21m 49s | 3h 54m 52s | 0 |
| Run Script to Extract Survey Answers (15 min) | Task | 7 | 7 | 5m 41s | 1h 53m 21s | 1h 18m 47s | 9h 11m 35s | 0 | 1h 44m 24s | 1h 1m 52s | 34m 38s | 7h 13m 8s | 0 |
| Run Script to Send Diplomas and Certificates (15 min) | Task | 7 | 7 | 17m 13s | 2h 14m 46s | 1h 47m 16s | 12h 30m 58s | 0 | 2h 26s | 1h 31m 36s | 38m 5s | 10h 41m 16s | 0 |
| Run Script to Send Thank You Note to the Course Team (| Task | 7 | 7 | 2s | 26m 38s | 12m 54s | 1h 30m 23s | 0 | 7m 10s | 1m 1s | 2m 30s | 7m 10s | 0 |
| Run Script to Send Survey Report to Teachers (15 min) | Task | 7 | 7 | 18m 13s | 2h 26m 38s | 1h 8m 52s | 8h 2m 4s | 9m 41s | 2h 8m 14s | 58m 21s | 41m 16s | 6h 48m 33s | 0 |
| Course Closed | End event | 7 | | | | | | | | | | | |