

## **Técnico+ Course Planning and Management**

Process Modeling and Redesign

Business Process Engineering and Technology

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# Chapter 1

## Introduction

This project contains an analysis of *Técnico+*'s Course Planning Process. BPMN models representing the As-Is state of the processes are shown, followed by a qualitative and quantitative analysis of the issues found during analysis. Finally, a process redesign is included, with proposed changes to the current processes, with the aim of solving the issues identified in the analysis phase, complete with justification and expected impact.

# Chapter 2

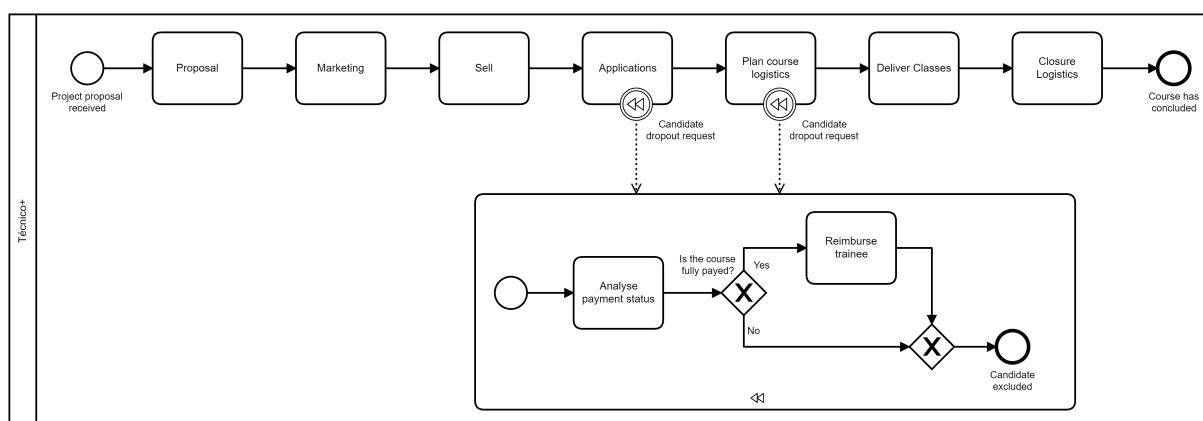
## As-Is Process Modeling

This Chapter contains the *As-Is* process modeling, according to the provided Excel File spreadsheet. Assumptions used to create the models will be specified and utilized throughout the development process to aid in the qualitative and quantitative analysis.

All of the models are represented in the report, however, due to size constraints, models are also supplied in individual PDF files.

### 2.1 *As-Is* Course Planning Process

Figure 2.1 represents *Técnico+*'s value-chain. This represents all of the different phases in the process of creating, teaching, and closing a course.



**Figure 2.1:** *As-Is* Técnico+'s Course Planning Process

The next sections will include a model of each of the tasks in the main value-chain presented above.

## 2.2 **As-Is Proposal Phase**

This diagram is too large to be displayed here. It is located in

[/as-is-models/proposal\\_process.pdf](/as-is-models/proposal_process.pdf).

### 2.2.1 **Proposal Phase Assumptions**

To create the BPMN diagram, the group assumed that the following statements were true:

- After creating the Shared Folder, the information must be updated (Tasks 1.09, 1.10 and 1.11 update information on the Shared Folder). This Shared Folder is considered to be a Data Store, as it will be needed in other processes to add more information to the course.
- Creating the course description is not dependent on receiving the testimonies (i.e. while waiting for the 10 day period, it is possible to set the schedule, review the description, and add commercial language).

## 2.3 **As-Is Marketing Phase**

This diagram is too large to be displayed here. It is located in

[/as-is-models/marketing\\_process.pdf](/as-is-models/marketing_process.pdf).

### 2.3.1 **Marketing Phase Assumptions**

To create the BPMN diagram, the group assumed that the following statements were true:

- All of the tasks that relate to the publicizing of the course performed on the same week can be done in parallel. Namely, tasks 2.09 to 2.12 and tasks 2.13 to 2.18.
- After the revision of the brochure, it needs to go back to the Course Coordinator and be approved.

## 2.4 As-Is Sell Phase

Figure 2.2 represents the Sell phase.

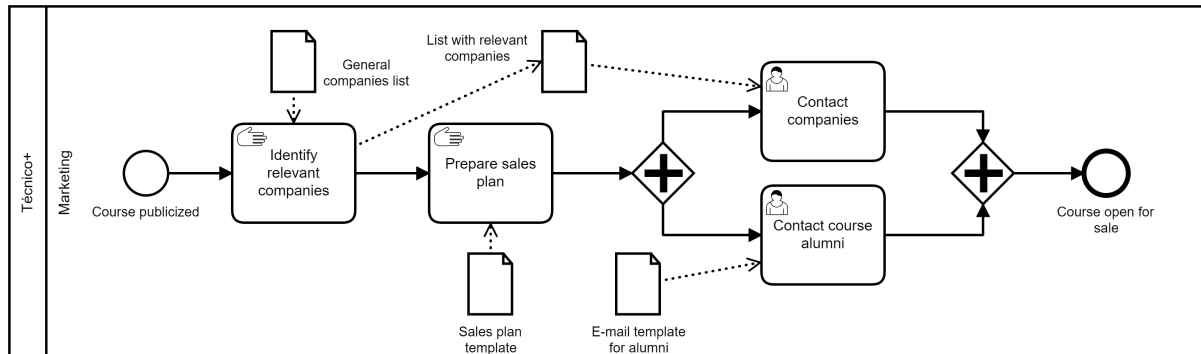


Figure 2.2: As-Is Técnico+'s Sell Process

### 2.4.1 Sell Phase Assumptions

To create the BPMN diagram, the group assumed that the following statements were true:

- Contacting companies and contracting course alumni is done simultaneously.

## 2.5 As-Is Applications Phase

This diagram is too large to be displayed here. It is located in

[/as-is-models/applications\\_process.pdf](/as-is-models/applications_process.pdf).

### 2.5.1 Applications Phase Assumptions

To create the BPMN diagram, the group assumed that the following statements were true:

- The Application process is executed only once. One instance of the process manages all the candidates.
- In order to advance and send the welcome notice and the receipts, the process has to wait for all of the accepted candidates to pay or be dropped from the course after 20 days have passed.



## 2.6 *As-Is* Plan Course Logistics Phase

This diagram is too large to be displayed here. It is located in [/as-is-models/plan-course-logistics\\_process.pdf](/as-is-models/plan-course-logistics_process.pdf).

### 2.6.1 Plan Course Logistics Phase Assumptions

To create the BPMN diagram, the group assumed that the following statements were true:

- Scheduling meal breaks, hiring catering and getting access to parking for trainees is done in parallel.
- Tasks involving the testing and creation of Moodle items is done in parallel.

## 2.7 *As-Is* Deliver Classes Phase

This diagram is too large to be displayed here. It is located in [/as-is-models/deliver-classes\\_process.pdf](/as-is-models/deliver-classes_process.pdf).

## 2.8 Closure Logistics Phase

This diagram is too large to be displayed here. It is located in [/as-is-models/closure-logistics\\_process.pdf](/as-is-models/closure-logistics_process.pdf).

### 2.8.1 Closure Logistics Phase Assumptions

To create the BPMN diagram, the group assumed that the following statements were true:

- Every Trainee receives the second message, regardless if they have answered the survey or not.

# Chapter 3

## Process Analysis

To analyse the current process, an Issue Register (Section 3.2), Pareto Chart (Section 3.3), Why-Why Diagram (Section 3.4), and Waste Analysis (Section 3.5) were performed. Additionally, to analyze the Quantitative and Qualitative Impacts, assumptions were made. These are available in Section 3.1.

### 3.1 Assumptions

1. A course has on average 40 vacancies.
2. A course costs on average €1000.
3. The average time between a course being publicized and the end of the application period is one week.
4. A course having insufficient candidates means that not all vacancies were filled.
5. The amount of insufficient candidates is never impactful enough to cancel the course.
6. 20% of courses have on average 30 enrolled Trainees (related to insufficient candidates).
7. 20% of candidates come from public companies.
8. 50% of public candidates fail the deadline to apply.
9. 40% of courses receive less than five testimonies.

10. A course that receives less than five testimonies will have 85% of vacancies fulfilled.
11. Zero or near zero communication between companies and Técnico Professors.
12. On average, 25% of companies want to create follow-up courses tailored to their needs and have the same number of Trainees attend the course.

These assumptions are used throughout the analysis and redesign processes.

## 3.2 Issue Register

An Issue Register with the four identified issues is presented in Table 6.1. This Table was used as the starting point for the analysis of the current process. The identified issues were “Insufficient candidates”, “Failed deadlines”, “Difficulty collecting testimonies”, and “Poor course offering”.

### 3.2.1 Quantitative Impact

This Section will clarify how the Quantitative Impact values of each issue were calculated.

#### Insufficient Candidates

The quantitative impact is calculated as the amount of possible loss per course, in euros, due to having insufficient candidates. Namely, 2000€ is the difference between having a course with 40 enrolled Trainees, each one paying 1000€ to enroll and having a 20% chance to have a course with 10 open slots.

$$(40 * 1000) - (0.2 * 30 * 1000 + 0.8 * 40 * 1000) = 2000$$

#### Failed Deadlines

The quantitative impact of this issue is also calculated as loss per course. Namely, 2500€ is the difference between having a course with 40 enrolled Trainees, each one

paying 1000€ to enroll and having a 10% chance to have only 15 enrolled Trainees, due to missed deadlines by public companies.

$$40 * 1000 - (0.9 * 40) * 1000 - (0.1 * 15) * 1000 = 2500$$

### **Difficulty Collecting Testimonies**

The quantitative impact is calculated as an estimated impact on revenue per course. 2400€ is the difference between having a course with no vacancies, and having a 40% chance of filling up only 85% of vacancies, due to the lack of testimonies on the course.

$$(40 * 1000) - (0.4 * 40 * 1000 * 0.85) - (0.6 * 40 * 1000) = 2400$$

### **Poor Course Offering**

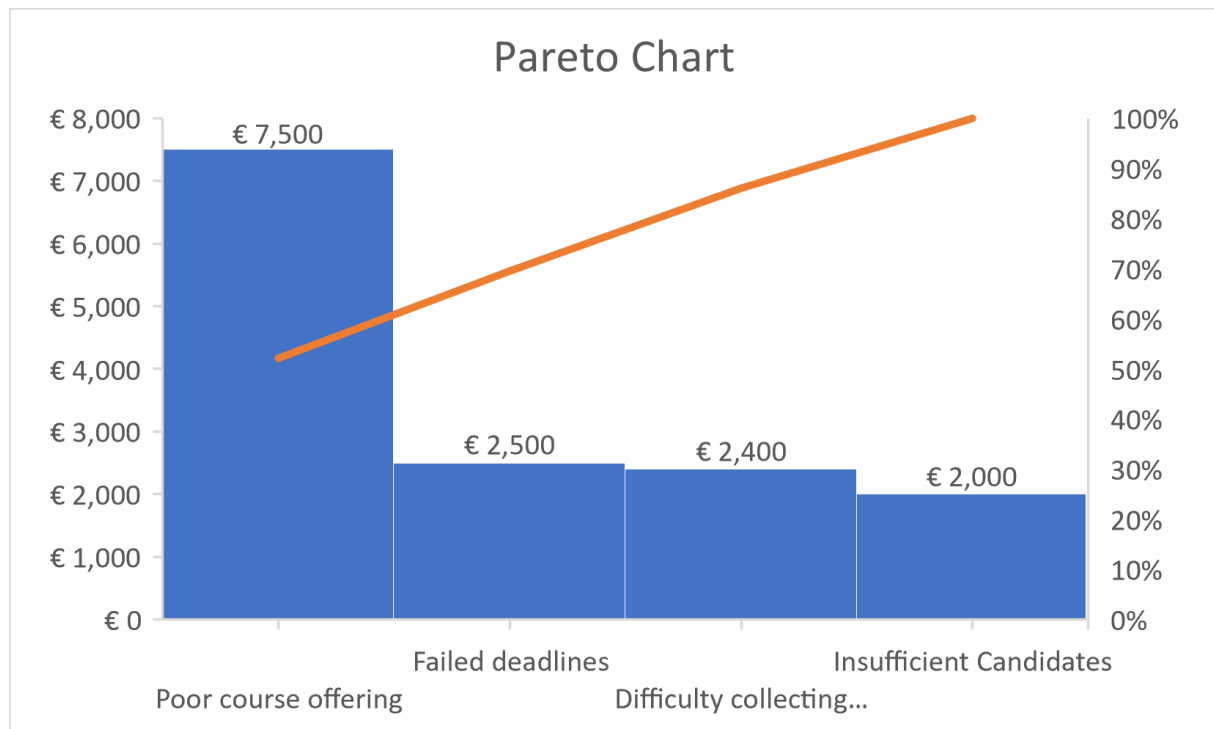
The quantitative impact for this issue is calculated as the estimated revenue loss per course that could have been proposed by an external company. 7500€ is the result of having a 25% chance to create a new course with either 40 or 20 vacancies (50% probability for each) that is filled by Trainees from that company.

$$0.5 * (0.25 * 40 * 1000) + 0.5 * (0.25 * 20 * 1000) = 7500$$

## **3.3 Pareto Chart**

Figure 3.1 contains the Pareto Chart showing the relative impact of each of the identified issues.

According to the Quantitative Analysis performed, the “Poor Course Offering” issue contributes to 52% of the total impact. The “Failed Deadlines” and “Difficulty collecting testimonies” each make up for around 17% of the impact, and the remaining 14% are associated with the “Insufficient Candidates” issue.



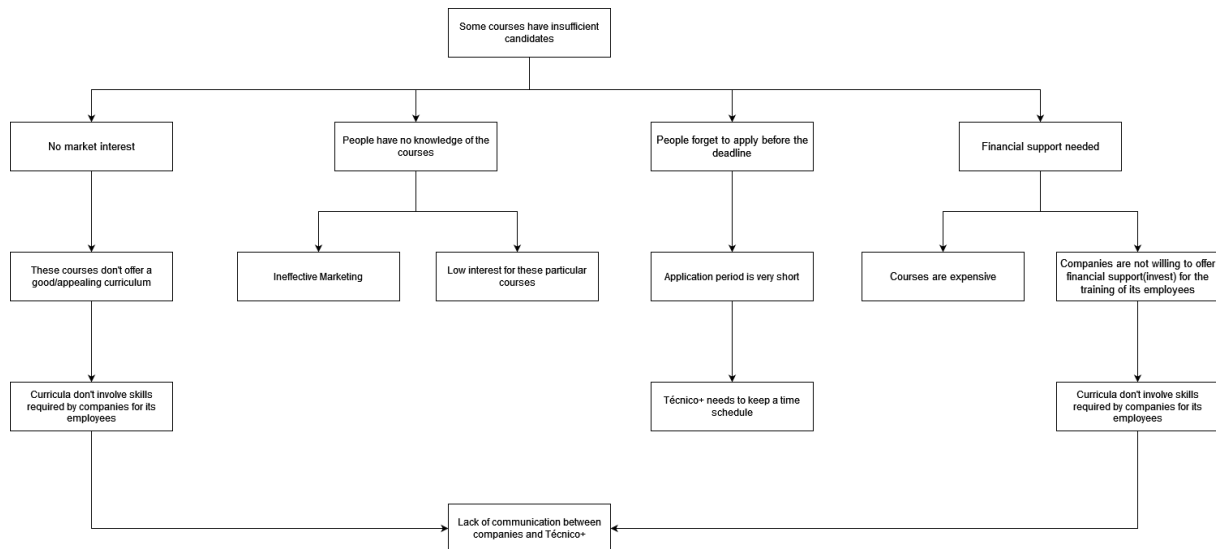
**Figure 3.1: Pareto Chart**

### 3.4 Why-Why Diagram

The figure 3.2 shows the why-why diagram for the insufficient candidates issue. We are able to see that there is a common point of interest which is the lack of communication between companies and Tecnico+, so this should be the main solving point. Other points refer to a bad marketing strategy, expensive courses and the need to keep a time schedule. For the failed deadlines issue, we went as far as to try to identify legal requirements, but to solve this issue, we just focused on the implementation of course proposals going through a public procurement platform. For the testimonies issue, we identify some factors regarding the structure of courses(difficulty and schedule) but we discarded these as the source of the issue, instead we attributed to the lack of incentive to give testimonies. For the poor course offering issue, the diagram in Figure 3.5 shows that is caused by the lack of communication between companies and Tecnico+.

### 3.5 Waste Analysis

To further analyse the current course planning process, a Waste Analysis was performed. Table 6.2 contains the identified wastes per phase.



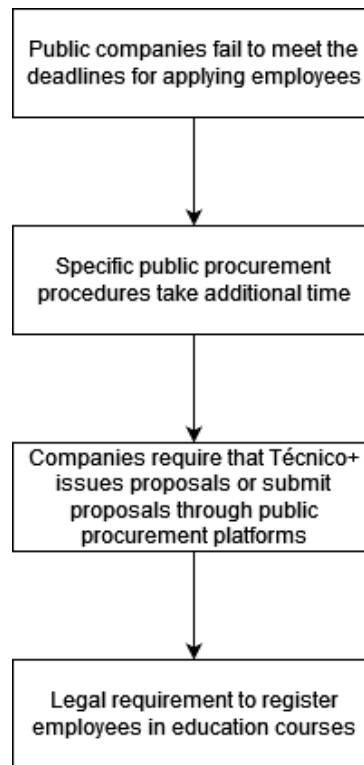
**Figure 3.2:** Insufficient Candidates Why-Why Diagram

Some noteworthy wastes include:

- Is is required to wait 10 days to collect testimonies during the Proposal phase.
- Contacting companies that decide to not send employees to take the course during the Sell phase.
- Forwarding of data items to other lanes/resources. For example, the sending of the candidate list from the Registration Secretariat to the Course Coordinator in the Application process.
- Brochure was not approved, revision needed in the Marketing process.
- Creating a course proposal with a budget and be rejected in the Proposal process.
- Have candidates that get accepted into the course and then drop from the course and be reimbursed in the Plan Course logistics process.

## 3.6 Flow Analysis

To analyze the flow, a Cycle Time Analysis was performed. The estimated working hours for each task were used, alongside a set of new assumptions, needed to calculate exclusive gateways and other nuances. These assumptions are specified in Section 3.6.1.



**Figure 3.3:** Deadline Issues Why-Why Diagram

### 3.6.1 Additional Assumptions

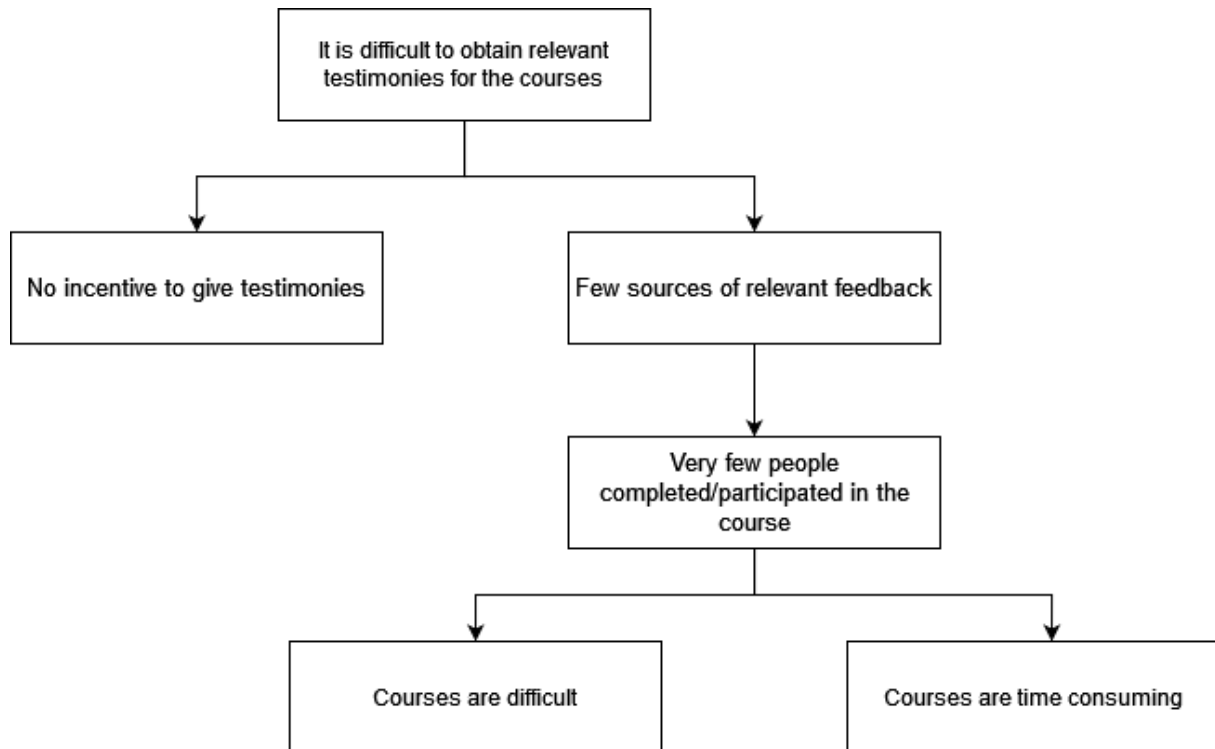
1. 10% of courses have some kind of pre-requisite - used to calculate the Applications phase's Cycle Time.
2. 20% of courses are on premises (they have at least some classes requiring a room) - Used to calculate the Plan Course Logistics phase's Cycle Time.
3. The number of classes per course is on average 20 - Used to calculate the Deliver Classes phase's Cycle Time.

### 3.6.2 Cycle Time Analysis

Table 3.1 contains the calculated Cycle Times for each Phase, in working hours, taking into account the assumptions shown before.

## 3.7 Objectives

Aided by the analysis presented above, objectives were defined for each issue.



**Figure 3.4:** Collect Testimonies Issues Why-Why Diagram

Phase	Cycle Time
Proposal	101
Marketing	140
Sell	35
Applications	89
Plan Course Logistics	123
Deliver Classes	32
Closure Logistics	218

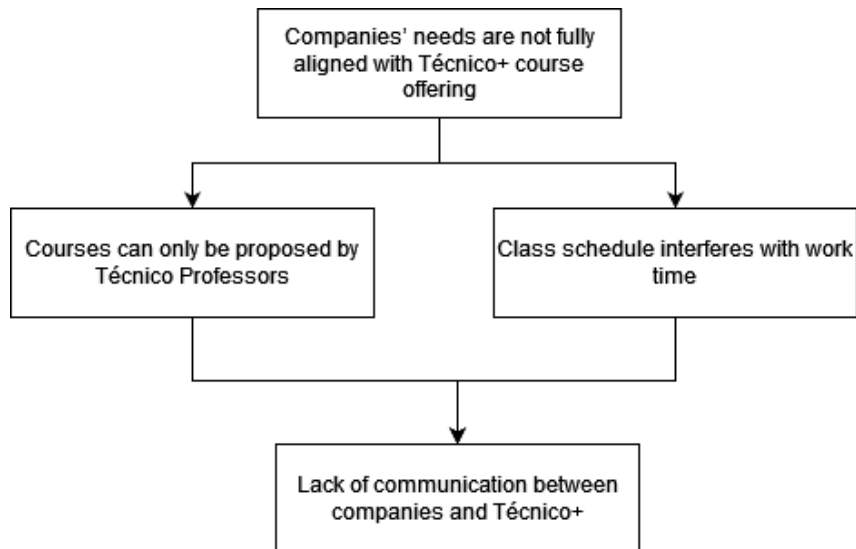
**Table 3.1:** Cycle Times of each Phase

### 3.7.1 Insufficient Candidates

According to the Why-Why diagram (Figure 3.2), one of the reasons that causes this issue is the short application period. Therefore, reducing the time needed to publicize the course would result in a lengthier application period, allowing for more candidates to apply.

Additionally, several candidates seem to forget to apply to the course altogether. This motivates an increase in marketing campaign quality.





**Figure 3.5:** Poor Course Offering Issues Why-Why Diagram

### 3.7.2 Failed Deadlines

This issue is related to the fact that public companies require public procurement proposals, that require additional time to be created. To mitigate it, an increase in quality to the proposal process is needed. Namely, supporting the creation of public procurement proposals right after the course proposal.

### 3.7.3 Difficulty Collecting Testimonies

Testimonies are important to appeal to more candidates. However, currently, there are no worthwhile incentives to provide testimonies. To mitigate this issue, the quality of the testimony collecting process must be increased, while also increasing the overall cost, such that Trainees feel rewarded for providing a testimony.

### 3.7.4 Poor Course Offering

Técnico+ suffers from having interest from companies in certain courses and areas, while not being able to provide them with meaningful courses and material. To improve this aspect, improving the quality of communication between Técnico+ and external companies could yield better designed courses.

# Chapter 4

## Process Redesign

After analyzing the known issues, some processes were redesigned to mitigate them. This Chapter contains a description of those changes and why they were made, the expected benefits of each, and the resulting BPMN models.

### 4.1 Insufficient Candidates

#### Applied Heuristics

According to the analysis done in chapter 3.7 the heuristics that fits the best this problem are the triage (H3), more parallelism (H5) and process specialization (H6). The first heuristic, the triage (H3), proposes a solution that aims to analyze the course, its benefits and its engagement before accepting it. If a certain course doesn't have a market interest it can be dropped. The second heuristic, more parallelism (H5), aims to diversify and updating and upgrading the marketing of the course. The objective is to reduce the number of people that do not know the existence of this course by using all social platforms at the same time to publicize it. The last heuristic, the process specialization (H6), has the purpose of reducing the amount of forgotten applications. The solution presented creates reminder to the customer that they did not apply to a certain course a few days before the start of the course. It also provides another solution to separate the trainees that belong to a certain companies in order to apply discounts for people that need financial support. Finally, to mitigate the amount of candidates that require financial aid, a triage (H3) is performed. A candidate from a public company

that is about to enroll, will have a discount (special invoice).

Having a more impactful marketing campaign could lead to more courses filling out their vacancies, ultimately improving the expected revenue per course. The 2.000€ expected impact could be reduced (instead of having 20% of courses with insufficient candidates, we would have 9%, equivalent to removing the 55% related to forgetting about the course or not knowing it) to 900€.

## **4.2 Failed Deadlines**

### **Applied Heuristics**

According to the analysis done in chapter 3.7 the heuristic that fits the best this problem is the process specialization (H6). This heuristic present a solution that right after the proposal being accepted, a public procurement proposal should be prepared, in case an external public company wants to enroll their employees in the course. Additionally, in the application period, if a company wants to enroll their employees, the procurement proposal should be sent to them, to avoid delays.

Having a well-designed public procurement process would decrease the amount of candidates left out from missing the deadline. The estimated impact of 2.500€ could be mitigated to as low as 500€ (10% of the time, courses have only 5 vacancies, instead of 25).

## **4.3 Difficulty Collecting Testimonies**

### **Applied Heuristics**

According to the analysis done in chapter 3.7 the heuristic that fits the best this problem is the task composition (H2). To solve the problem of difficulty collecting testimonies the proposed solution is creating a reward system that provides a discount for the future for those people that answer the survey. This task will verify if each candidate answered the survey and if they answered they will be rewarded with a 15% for future purchases.

## 4.4 Poor Course Offering

### Applied Heuristics

According to the analysis done in chapter 3.7 the heuristics that fits the best this problem are the process specialization (H6) and communication optimization (H8). The first heuristic, the process composition (H6), aims to differentiate the process of suggesting a course to be integrated in the platform. Both companies and professors can suggest courses to the platform. The communication optimization, the (H8), proposes a better solution to improve communication between external companies and people and Técnico+ in order improve this platform.

Allowing course proposals from external companies could reduce the 7500€ impact to less than half (depending on the quality of the proposals from those companies). Both Técnico+'s revenue and the interest from external companies would increase.

## 4.5 To-Be Process Modeling

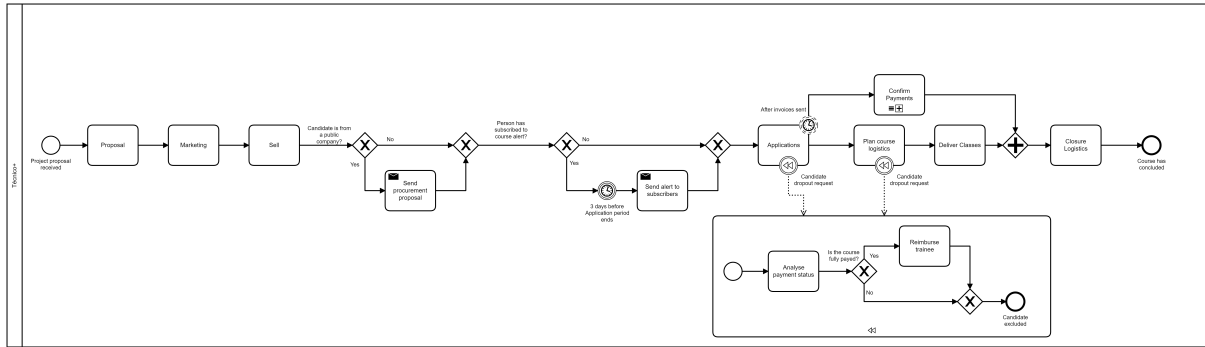
This Section contains the modified BPMN files to mitigate the issues that were found. All of the models are represented in the report, however, due to size constraints, models are also supplied in individual PDF files.

### 4.5.1 To-Be Course Planning Process

Figure 4.1 represents the redesigned Course Planning Process. Changes include the new "Send procurement proposal task" targeting the external companies, a new "Send alert to subscribers" task, that mitigates the problem of candidates forgetting to apply. Finally, the "Confirm Payments" sub-process was extended, to allow candidates to pay the course through several monthly payments.

### 4.5.2 To-Be Proposal Process

This diagram is too large to be displayed here. It is located in [/to-be-models/proposal\\_process.pdf](/to-be-models/proposal_process.pdf).



**Figure 4.1:** To-Be Técnico+’s Course Planning Process

This model suffered the most changes. In the beginning of the process there is a difference to accommodate the course ideas brought by other companies and to do a market study before accepting the course idea. This is valid to teach course suggestions and company course suggestions (market study is included in the verify pre-requisites task). The other proposed optimization is to create a parallel task to publish procurement proposals on public platforms, after accepting the proposal.

### 4.5.3 To-Be Marketing Process

This diagram is too large to be displayed here. It is located in [/to-be-models/marketing\\_process.pdf](/to-be-models/marketing_process.pdf).

In this model the optimization idea was to increase the number of parallel of tasks in the publicize course sub-process to decrease the time needed to do this sub-process.

### 4.5.4 To-Be Sell Process

This process was not redesigned according to the identified problems.

### 4.5.5 To-Be Applications Process

This diagram is too large to be displayed here. It is located in [/to-be-models/applications\\_process.pdf](/to-be-models/applications_process.pdf).

After the task "Request registration data", the candidates are split into Partnered Trainees and Simple Trainees, modeling the fact that Trainees from public companies require a special procurement process to enroll ("Create List of Simple Trainees", "Create List of Partnered Trainees", and "Request Special invoices" were created).

### **4.5.6 *To-Be* Plan Course Logistics Process**

This process was not redesigned according to the identified problems.

### **4.5.7 *To-Be* Deliver Classes Process**

This diagram is too large to be displayed here. It is located in

[/to-be-models/deliver\\_classes\\_process.pdf](/to-be-models/deliver_classes_process.pdf).

The optimization idea for this model is to skip the preparation of the room for the 1st Class if the course is online or the class is online, by creating an exclusive gateway.

### **4.5.8 *To-Be* Course Logistics Process**

This diagram is too large to be displayed here. It is located in

[/to-be-models/closure\\_logistics\\_process.pdf](/to-be-models/closure_logistics_process.pdf).

In this model only one task was changed, it was the select testimonies. This task was changed in order verify if each student answered or not the survey. It was also created a reward system for each person that answered the survey, applying a 15% discount voucher to be used in the next purchase of Técnico+ courses.

## **4.6 Additional Possible Changes**

The main focus of the group's work was to identify and mitigate the four presented issues. Nevertheless, there were found some other issues whose analysis and consequent redesign could benefit Técnico+ and the process.

As it is, when the course is on premises there is no offer of online classes. This can be done by having a suited room for video-conference calls and show the class online and in person. This offers more schedule freedom to the students and can enhance their performance, this also makes possible to have students far from the course classroom, meaning more candidates for courses on premises. Some other issues that we considered but decided not to solve/redesign, due to our lack of time and knowledge to make assumptions, were lack of teachers for the courses, classes not delivered and high number of students that drop from the courses.

In our approach to the Redesign, we developed specific solutions for the given issues, and so, we focused little on the objectives of the heuristics (Time, Cost, Quality or Flexibility) and did not use them as the main "motivator" for the redesign models because we considered them too much abstract and limiting in our proposed solutions.

Alternatively, for example, we could've used the Pareto chart and concluded that the issue with the highest cost, should be solved using heretics that aim to reduce Costs. Also, use the cycle time of the processes to pick heretics that aim to reduce Time of the longer processes.

We did not use simulation on the quantitative analysis because we did not consider the information returned to be relevant for solving the issues.

# Chapter 5

## Conclusion

After the analysis we can conclude that the most problematic issue is the lack of communication between Tecnico+ and companies as this is the issue with the most impact. Not only it affects Tecnico+ in the present moment by lacking to offer and discuss relevant courses for the companies, which will make the companies not interested in Tecnico+ and therefore Tecnico+ will lose clients, and future clients because of the bad reputation it gives to the companies. We can also conclude that although there is room for internal optimization of time and resources, the main issue is the candidates which are Tecnico+'s clients and this is because Tecnico+ the current issues makes them lose a lot of candidates which translates to less revenue and potential loss of money. So the focus of our solution is to improve the Marketing department and its functions and improving communication with companies. This will lead to an increase of the cost but this can be covered by the expected increase in revenue that these changes will provide, so that in the end it is profitable to make these changes.



## **Chapter 6**

### **Attachments**

The Tables are kept here due to size restrictions.

Issue	Explanation	Assumptions	Qualitative Impact	Quantitative Impact	Impact Details
<b>Insufficient Candidates</b>	Several courses get insufficient candidates (20%). - Low market interest (40%) - People don't know the course (20%) - People forget deadlines (35%) - Financial support needed (5%)”	- A course has on average 40 vacancies. - 20% of courses have on average 30 enrolled Trainees. - A course has an average a cost of €1000.	-Waste of resources on courses with few attendants - Possible loss of money (resources >revenue) -Frustrated teachers	€2,000	Average impact on revenue per course
<b>Failed deadlines</b>	Companies often miss the deadlines for applying employees. Public procurement procedures take additional time and require additional proposals issued by Técnico+.	- On average, 20% of candidates come from public companies - On average, 50% of public candidates fail the deadline - Técnico+ does not support submitting proposals through public procurement platforms - Application period is 1 week	- Very few candidates attend the course - Waste of resources on courses with few attendants	€2,500	Average impact on revenue per course
<b>Difficulty collecting testimonies</b>	Trainees that have concluded the course will often not provide a testimony. Testimonies are known to be important when advertising a course.	- On average, 40% of Courses receive less than five testimonies. - On average, a course that receives less than five testimonies will have 85% of vacancies fulfilled.	-Poor reputation	€2,400	Estimated impact on revenue per course
<b>Poor course offering</b>	Companies are not offered the option to propose courses based on their needs. This leads to a misalignment between the course offerings and the companies' needs.	- Zero or near-zero communication between companies and Técnico Professors - On average, 25% of companies want to create follow-up courses tailored to their needs and have the same number of Trainees attend the course.	-Poor reputation, companies may prefer other training schools -Frustrated companies -Loss of possible students which leads to loss of revenue - Possible loss of interest in subsequent courses (i.e. companies would be willing to propose and finance courses that are relevant to them).	€7,500	Estimated revenue loss per suggested course

Table 6.1: Issue Register

Processes\Wastes	Transportation	Inventory	Waiting	Defects	Over-Processing	Over-Production
<b>Proposal</b>	Every time the lane changes		Waiting for testimonies		Course being proposed and then rejected	
<b>Marketing</b>				Course brochure was not approved, sent for revision		
<b>Sell</b>						Contacting companies not interested in the course offered
<b>Applications</b>	Every time the lane changes	Applications are handled concurrently			Candidates being rejected	
<b>Plan Course Logistics</b>	Every time the lane changes		- Course Logistics waiting for Registration Secretariat and Executive Director - Waiting for "Teaching Statement" from teachers			Trainees can drop from the course and be reimbursed
<b>Deliver Classes</b>	Every time the lane changes		Have to wait 1 week to check classes		"Post on course/module forum to fill out course survey and trainer(s)", some or many may not answer the survey	
<b>Closure Logistics</b>	Every time the lane changes		-Waiting for the testimonials -Waiting 15 days for the answers to the surveys	Sending a second message in the course/module Forum to fill the survey		

**Table 6.2:** Waste Table