FACULDADE DE ENGENHARIA DA UNIVERSIDADE DO PORTO

GlowTech Quality Manual

Systems Engineering

Supervisor: Cláudio Domingos Martins Monteiro

February 24, 2023

Contents

List of Figures

Chapter 1

Introduction

1.1 Purpose and disclosure of the Quality Manual

This document specifies the Quality Management System that GlowTech will follow, with the intent of reassuring that all the work associated with our company will respect the client's requests and wishes as well as all the legal and regulatory requirements. In the same way, Quality management allows the success of the companies through the implementation of a Quality Management System since it offers a way to face adversities. Nowadays, the work context is known to have rapid alterations, both from the globalization of the markets as well as the thirst for knowledge, and clients are more exigent with their needs. With that in mind, an organization that focuses on the quality of its products demonstrates its volition to satisfy those needs.

1.1.1 Manual elaboration and updating

The management and making of the present Quality Manual is the responsibility of the Director of Quality and must be followed by all employees and collaborators of the company. Therefore, this document will be updated after the validation given by all the board directors and will be available for everyone involved in each project as a pdf in the online repository chosen by the company.

1.1.2 Nomenclatures and abbreviations

This document follows the European norm NP EN ISO 9000:2015 and will use abbreviations such as:

- QM as in Quality Manual.
- QMS as in Quality Management System.
- GD as in General Director.
- QD as in Quality Director.
- PD as in Product Director

- IDD as in Information and Documentation Director
- DS as in Director of Speciality

1.2 Company vision and goal

GlowTech is a company that emerged in the course of the curricular unit System Engineering with the goal of providing our clients with quality engineering solutions that suit their needs. Our main objective is to be a flexible company that will always adapt to the client, designing a project that will try to follow the latest engineering techniques and instigate our collaborator's minds and knowledge. With that in mind, we aim to maintain a constant level of quality that will satisfy all parties.

1.2.1 Products

GlowTech is a company that provides engineering solutions that include all three branches of Electrotechnical Engineering- Automation, Energy and Telecommunications. Consequently, we can take upon us a considerable amount of challenges. A good example of that is our newest and first project "LusiTa".

1.3 GlowTech Personnel

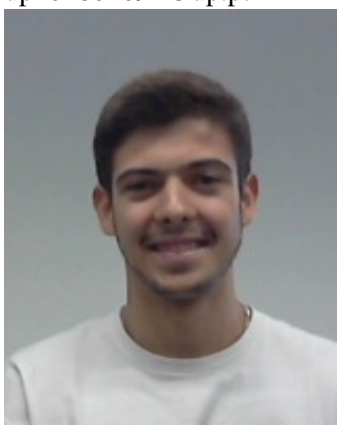
GlowTech comprises 12 elements, consisting of the following personnel:

Alexandre Araújo Pires Mourão
up201905967@up.pt

Ana Catarina Afonso Morais
up201906828@up.pt

António Pan
up201804691@up.pt

Diogo Miguel Barbosa da Silva
up201705405@up.pt



Francisco Monteiro Riesenberger
up201907825@up.pt

Manuel João Videira Silva
up201806123@up.pt

José Luís Mota Pacheco de Oliveira Monteiro
up201904993@up.pt

Maria Carla Padrão Cruz Rehbein Pinheiro
up201905075@up.pt

Ruben Miguel Gomes Santos
up201905773@up.pt

Sara Beatriz Moreira Alves de Carvalho
up201907195@up.pt

Seyed Ahmad Hoseini Dastjerdi
up202204180@up.pt

Tomás de Oliveira Cadete
up201904832@up.pt

Tomás Henrique Campos Ferreira Prior
up201906963@up.pt

1.3.1 Administrative Board

- **General Director**: Tomás de Oliveira Cadete

- **Product Director**: Sara Beatriz Moreira Alves de Carvalho
- **Quality Director**: Francisco Monteiro Riesenberger
- **Information and Documentation Director**: Maria Carla Padrão Cruz Rehbein Pinheiro
- **Project Director**: Tomás Henrique Campos Ferreira Prior
- **Director of Automation**: António Pan
- **Director of Energy**: José Luís Mota Pacheco de Oliveira Monteiro
- **Director of Telecommunication**: Alexandre Araújo Pires Mourão

1.4 Directors

1.4.1 General Director

The General Director (GD) is responsible for defining the project goal, planning tasks, and their due dates. He manages the company, allocating available resources and leading the work teams in order to have the best results possible. He/she must be present in every general team meeting and transmit relevant information to the Project Monitor.

This Director delegates and supervises tasks being developed, ensuring a good work environment and relationships between teams and employees. He/she/them is responsible for the overall achievements of the company.

1.4.2 Product Director

The Product Director (PD) is in charge of the product's design, and its specifications and requirements. She manages the budget for each project and decides the most economically smart option for the product's components. Therefore, the PD is responsible for elaborating the product's datasheet.

The PD is also the one whole presents the product to potential clients.

1.4.3 Quality Director

The Quality Director (QD) defines the quality management model and the operating rules of the team. He also defines how the information and documentation system is organized.

The QD decides on the internal product quality requirements and evaluates the services provided by each worker (peer evaluation).

This director also interacts with internal and external clients, in order to infer the quality of the provided services.

1.4.4 Information and Documentation Director

The Information and Documentation Director (IDD) manages the internal communication network of the team. She organizes the team's document reports and the managing software of the project.

This director also defines the documentation templates, runs the communication and presentation platforms of the project, and creates the product publicity material.

1.4.5 Project Director

Planes and controls the development and execution of the product. He/she/them defines tasks to be given to the Specialty Teams and inquires if the previous ones have been finished, therefore adjusting the project schedule.

This director reports to the General Director about problems related to the management of the team that may appear, communicates with the Product Director about technical and financial aspects of the product and interacts with the Quality Director to discuss the performance of the Specialty Teams.

1.4.6 Director of Specialty

The Director of Specialty is responsible for the product's technical characteristics of said Specialty. He/she/they are in charge of searching for the components and technical solutions of the product, considering their price and functionalities, and reporting them to the Product and Project Directors.

This director also partakes in the testing and approval of the product in its different stages of development.

Chapter 2

Internal management

2.1 Ways of communication

In order for communication between company members to be efficient, quick and clear, the following means of communication will be used:

- Discord Server – used to hold meetings.
- WhatsApp group – used for more informal conversations and unofficial information sharing.
- GitHub Repository - where all approved official documentation is placed.

2.2 Meetings

The model of meetings agreed upon by all members follows some guidelines:

- Mandatory meetings are held weekly, every Thursday.
- If it is necessary to schedule extraordinary meetings by the GD, then it must be notified 48 hours in advance and approved by the other members.
- Any absence without justification up to 24 hours before the mandatory meeting is a penalty factor in the individual evaluation.
- There is a grace period of 15 minutes to attend the meeting.
- Decisions are made by vote, which is a necessary condition for the approval of at least 50% of the members, including the vote of the director of the department in question.

In addition, the process for running the meetings was also discussed and approved by all members:

- In the initial phase, the GD (meeting moderator) checks the tasks carried out since the last meeting and evaluates their execution and final result. Each task is assigned a workload, and therefore the workload table is also updated by the IDD.

- Everything is recorded in meeting minutes, which serves to facilitate organization and allows members to have a better view of the tasks.
- When all tasks have been viewed and new tasks planned and recorded, the moderator closes the meeting.
- The information present in the minutes must later be transferred by the IDD to an organization platform that is divided into:
  - To do – tasks not yet completed, but already assigned.
  - Under approval – tasks that are already done, but require approval (approved by the QD).
  - Approved – official company documents, already reviewed and approved.

2.3 Work assignment

The company's projects will be divided into phases (sprints). For each phase, there will be a set number of well-defined tasks that must be followed by a deadline set by the Project Director. These tasks should be agreed upon at team meetings. Every member of the team must be fully committed to the process of understanding what needs to be done and idealizing the tasks necessary to accomplish those goals. At each meeting the project manager will keep track of the tasks completed, ongoing tasks and, if need be, assign new tasks to each of the departments. The department's director is then responsible for allocating each task to the members of the department. This allocation should be done with consideration for each person's skills and workload.

Additionally, each task should have a set of requirements (criteria) that must be met for the task to be considered complete or partially completed. These requirements should be set by both the QD and the PD with help from the team.

Furthermore, for evaluation purposes, the tasks will be assigned a value. This value comes in the form of the expected number of hours needed to complete said task. The number of hours given for each task should be weighted by the following aspects:

- Complexity (Ex: A task has a lot of small details that should be considered)
- Laboriousness (Ex: A task requires a lot of "hands-on" work regardless of productivity)
- Research-intensity (Ex: A task requires a lot of market surveying or theoretical study)

The completion of a task will be rewarded by giving the executor the hours that task was valued at. This will be a point system, where the points are the true-value hours worked. This value is set à priori and is not dependent on how many real hours the team member took to complete the task. The partial completion of a task will also be rewarded, although with a penalty set by the PD, GD, and respective SD. This penalty should be scaled by the "percentage" of work completed.

For each task, the team member responsible for its execution should state the number of real hours he/she took to accomplish that task. If the task required more time than initially planned, then the executor should explain why that was and what difficulties he/she encountered. If the executor believes the initial valued hours assigned to the task were not adequate, he/she may appeal to the directors for a re-evaluation of this metric. It will then be up to the PD, GD and respective SD to scrutinize the work done and award, or not, the number of real hours needed for completion. The number of extra hours to be awarded may not exceed 2 times the initial true-value hours.

For each team member, there will be a scoreboard. This individual scoreboard should state the total number of true-value hours allocated before any appeal or penalty and the number of hours awarded after appeals or penalties. The total hours counted, in both cases, will be the cumulative sum. The directory should seek to allocate the same total amount of true-value hours to every team member. The difference between the total hours allocated (H0) and the total hours awarded (H1) will be used in the quantitative part of the evaluation. (If H1-H0 > 0 -> Positive evaluation, H1-H0<0 -> Negative evaluation)

2.4 Evaluation distribution

2.4.1 Quantitative Criteria

A – Work hours - 45%: This component is quantitative. It is not subjective. It is based purely on the hours worked scoreboard. As stated before, the assessed components are the total number of awarded hours (H1) and the total number of hours assigned (H0). More specifically, the difference between them Δ H (H1-H0).

B – Punctuality and attendance - 30%: This component evaluates the assiduity and commitment of each team member in team meetings. It also works like a cumulative sum scoreboard. The sum of these points shall be referred to as PAP (punctuality and attendance points).

1. Everyone starts each meeting with 10 points.
2. The required meeting attendance period is of one hour and a half (1h30min). If the meeting ends before this duration, the real duration shall be used for this purpose on that occasion.
3. One point is awarded for every 15 minutes attended after the required attendance time (4 points per hour).
4. Two points are deducted for every 15 minutes not attended of the required attendance time.
5. Attendance for 15 minutes or less is considered no attendance.
6. The absence at a meeting is authorized for 3 meetings. For each the score awarded is 10.
7. After the 3 permitted absences, the score will be 0 at each absent meeting.

Absences, tardiness or early exit should all be reported prior to the meeting to the GD so that the meeting agenda can be changed to better fit the participants.

Normalization:

In the interest of fairness, consistency and to meet the request of the supervisor of the project, the final scores of A and B criteria shall be normalized to a gaussian (normal) distribution with an average of zero.

$$Mscore_{\Delta H} = \frac{\Delta H - \mu_{\Delta H}}{\sigma_{\Delta H}} \qquad Mscore_{PAP} = \frac{PAP - \mu_{PAP}}{\sigma_{PAP}} \tag{2.1}$$

Where μ is the average of ΔH's and PAP's, σ is the standard deviation and Mscore is the modified scores.

Where μ is the average of ΔH's and PAP's, σ is the standard deviation and Mscore is the modified scores. From here we can calculate the final score (Fscore) with the function:

$$Fscore = \frac{20}{e^{-k \cdot Mscore}} \tag{2.2}$$

A proposed k value is 0.9. However, this may be subject to change. A Final Score will be calculated for each criterion.

2.4.2 Qualitative criteria

C – Hetero-evaluation - 25%: This component is subjective. It shows how much a member was valued by the team. Each person will assign a score from -20 to 20 (only integers) to every team member (excluding him/herself). The sum of the scores must be zero.

The score given to each person should be weighted by factors such as: - Teamwork - Responsibility - Friendliness - Quality of work - Commitment to the project - Etc...

In the end, it should reflect the thoughts of the team about a person's contribution to the project and the team's environment.

To discourage retribution and improve fairness, this process should be secret. Each team member will do this evaluation alone and individually and then send the results to the information director. She must take an oath of secrecy and responsibility in this matter.

2.5 Minutes

The management of GlowTech recognizes the importance of effective internal communication and documentation to ensure the successful implementation of our Quality Management System (QMS). To facilitate this, we will maintain accurate and timely records of all internal meetings and discussions.

Minutes of all meetings will be recorded and distributed to all relevant parties. These minutes will include a record of attendance, a summary of discussions and decisions, and any action items or follow-up required.

All minutes will be retained in accordance with our Document Control Procedure, and access to these records will be controlled to ensure confidentiality and integrity.

The management of GlowTech recognizes that effective internal communication and documentation are critical to the success of our QMS. By maintaining accurate and timely records of all internal discussions and meetings, we can ensure that our quality objectives are clearly communicated and effectively implemented throughout the organization.

Chapter 3

Company projects and workflow

GlowTech is a company that provides engineering solutions that include all three branches of Electrotechnical Engineering- Automation, Energy and Telecommunications. Consequently, we can take upon us a considerable amount of challenges. A good example of that is our newest and first project, “LusiTa”.

3.1 Products and Services

GlowTech is committed to providing smart solutions for money-saving energy consumption optimization that help reduce energy usage and promote sustainability. Our products are designed to be cost-effective, easy to use, and environmentally friendly. This section outlines our products and services, including our table lamp, "LuSiTa," which changes its colour according to the price of electricity at the moment.

Our LuSiTa table lamp is a smart lighting solution that helps users save money on their energy bills by monitoring electricity prices in real time and changing its colour accordingly. This innovative feature allows users to adjust their energy consumption habits and take advantage of lower electricity prices, ultimately leading to significant savings over time. Some of the key elements of our LuSiTa table lamp include:

- Dynamic Color Change: The lamp changes colour according to the current electricity prices, allowing users to monitor energy usage and adjust their consumption habits to save money on their energy bills.
- User-friendly Design: The lamp is designed to be easy to use and convenient, having the possibility of working wireless.
- Durable and Long-lasting: Our LuSiTa table lamp is built to last, using high-quality materials and state-of-the-art technology to ensure durability and longevity.

At GlowTech, we are committed to providing excellent customer service and support to our clients. We offer a range of services designed to ensure that our clients receive the assistance and guidance they need, including:

- Product Maintenance: We offer regular product maintenance services to ensure that our products continue to perform at their best and last as long as possible.
- Warranty: We provide a warranty for our products to ensure that our clients receive high-quality products that meet their expectations.

At GlowTech, we are dedicated to developing smart solutions that help our clients save money on their energy bills while promoting sustainability and energy efficiency. Our LuSiTa table lamp is a prime example of our commitment to innovation and excellence, featuring a dynamic colour-changing system that helps users adjust their energy consumption habits and take advantage of lower electricity prices. We also offer a range of services designed to provide our clients with the support and guidance they need, to get the most out of our products.

3.2 Work philosophy

GlowTech's work philosophy is centered on innovation, collaboration, and continuous improvement, which helps to enhance every aspect of the project, product, and company. By fostering a culture of innovation, GlowTech encourages its team members to think creatively and outside the box, resulting in the development of new and unique ideas. Through collaboration, team members work together to share knowledge, skills, and expertise, allowing them to develop a deeper understanding of the project and product, which can lead to a more cohesive and effective solution.

Finally, GlowTech's commitment to continuous improvement means that they are always looking for ways to enhance its products, processes, and procedures, which can lead to increased efficiency and better outcomes for both the company and its customers.

Overall, GlowTech's work philosophy promotes a culture of excellence, innovation, and growth, which helps to improve everything around the project, product, and company.

3.2.1 Decision-making process

Our decision-making process is structured to provide a frictionless mechanism for problem-solving and project development. However, it still allows for individual freedom and flexibility to nurture creativity and self-accountability.

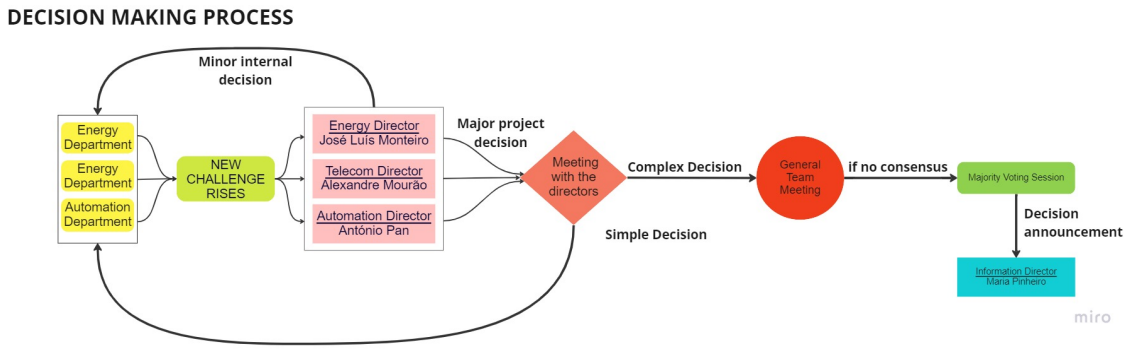


Figure 3.1: Graphical representation of the decision-making process

3.2.2 Validation Process

At GlowTech, customer satisfaction is of utmost importance. As such, the quality of our products is guaranteed as a result of our validation processes and workflow. These are the basis of all our projects. Their intent is to forge a reliable workflow that utilizes successive project iterations, which allows us to build products of the highest standards.

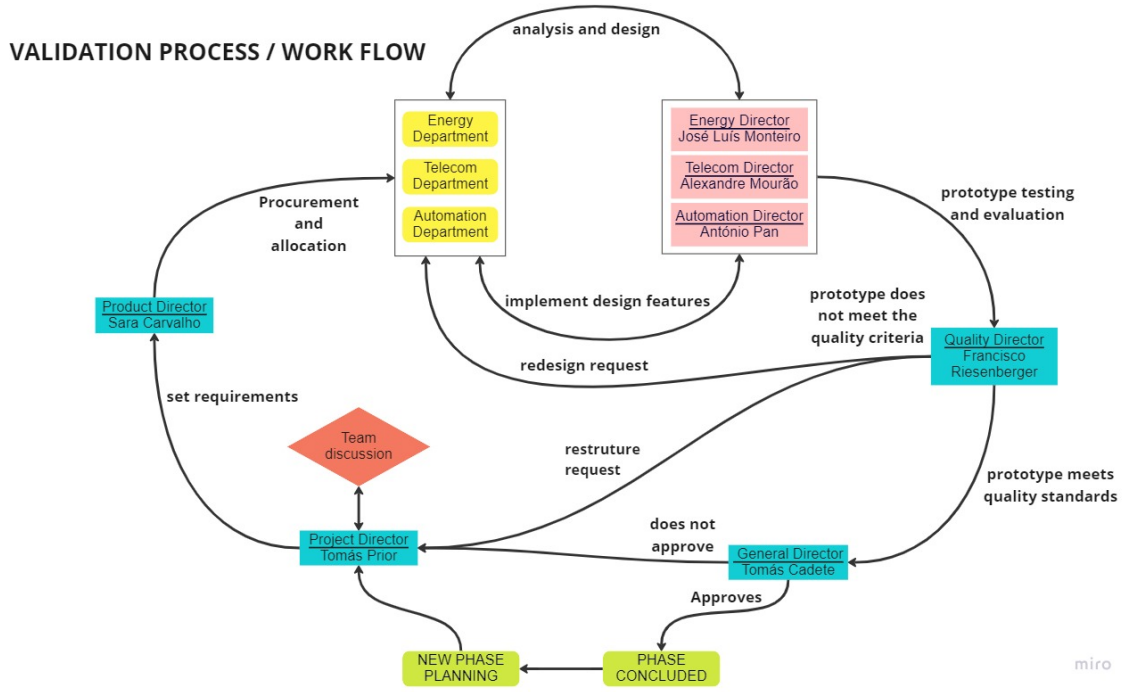


Figure 3.2: Graphical representation of the validation process

Chapter 4

Quality management

4.1 Quality policy

Glowtech is responsible for delivering high-quality products that match our customers' needs while adhering to all applicable regulatory requirements. We are committed to continuously improve our products and services.

To achieve this, we have established the following quality objectives:

- Customer Focus: Satisfy our client's needs and guarantee further support for our products.
- Process Improvement: Increase the efficiency and quality of all of the processes.
- Compliance: Comply with all regulatory requirements and adhere to the related standards present on the market.
- Continuous Improvement: Continuously improve our products and related services.

We will communicate this quality policy throughout our organization, and all employees are expected to uphold our commitment to quality. Our quality management system will be regularly reviewed and improved to ensure its ongoing effectiveness.

At GlowTech, we are committed to meeting or exceeding our customers' expectations by providing high-quality products and services that are reliable, safe, and environmentally responsible.

4.2 Team operating rules

For the good functioning of the team, every member must comply with the following rules:

- The team should clearly define the purpose and scope of the team, including its objectives, and scope of authority.
- We will specify the roles and responsibilities of each team member.
- The rules of the meetings should be established, including the frequency, agenda, documentation requirements and which platform will use.
- If any of the members can't be present for the meeting, they must warn the team in advance.
- Every task should be scheduled and noted in the platform (GitHub).
- If an extra meeting needs to be scheduled, then every team member should know.
- If any of the members can't meet the delivery deadline, then only this member should be punished.
- All the tasks, work, documentation and information must be uploaded and updated on the team platform (GitHub).
- All the members must be aware and informed of the work of other members.
- The difficulties experienced must be exposed to the team.
- All the members should help each other.
- Decisions must be taken by vote, the majority wins.
- The taken decisions must be respected.
- All members must strive to maintain a good teamwork environment.
- If there is a conflict between members, then it has to be solved in private with the GD.
- Each member should make a note in the logbook to inform the team of what's been done that day.
- The product director should register the product prices and justify what's been bought.
- All the rules above must be followed by each of the team members.

4.3 Risk Management

Risk management is one of the most important parts of project management, because it can help identify and control problems before they turn into big obstacles to the project. For good risk management, the team should make a list of all possible risks that could cause problems to the project, like technical, financial, deadlines, among others. The team should evaluate each risk and develop a plan against each risk. This plan should include specific strategies to minimize or eliminate each risk. The team must monitor regularly the status of each risk and make changes as necessary. It is also very important to communicate the risks regularly to the team, to create awareness and to implement the plans developed against them.

GlowTech's workflow is designed to minimize and mitigate risk. By using a spiral workflow, problems can be diagnosed early and in time for rectification. This allows the company to meet the quality criteria with consistency.

The potential risks can be identified by regularly reviewing the processes and operations. This review should consider such aspects as past experiences, changes in regulation or technology, and feedback from customers and stakeholders.
Once risks have been identified, those are analyzed and evaluated by the potential impact they may cause on quality. Then a plan to reduce the occurrence or the impact of the risk, and ensure the continuity of our products and services is activated.
Furthermore, keeping track of everyone's work, accomplished tasks and ongoing progress tasks allows us to manage the project in a way that unforeseeable problems can be identified quickly and dealt with accurately.

4.4 Conflict Resolution

Resolving a conflict between team members might seem a little bit challenging, but all members must strive to maintain a good work environment between each other. These are some of the rules all members should follow for that:

- Clearly communicate team expectations, it is important that all members understand their responsibilities and expectations.
- Establishing rules of communication to prevent misunderstandings and conflicts related to lack of communication.
- Listening carefully and trying to understand the point of view of other team members to avoid conflicts and find solutions to problems.
- Trying to involve all the members and getting suggestions from them to help resolve the conflict.
- Always trying to focus on the problem and not letting the conflict turn personal or emotional.

- Considering getting help from a mediator, like GD or QD, or a person who can give a neutral opinion, to help resolve the conflict.

If the conflict can't be resolved by the members involved, then the involved must schedule a meeting with GD in private. GD will decide what to do in that situation.

4.5 Documentation

4.5.1 Archive System

In order to maximize the efficiency of the processes and accessibility to the documents, a repository was created on the platform GitHub, where all created documentation will be stored. Every collaborator will have access to the repository contents, which can be downloaded and modified.

The repository's main branch, the only one used, is composed of four folders:

- docs, used to store the quality manual, minutes, evaluation sheets, account book, and attendance sheet.
- Tele, where the Telecommunications Department documents are stored.
- Energy, where the Energy Department documents are stored.
- Auto, where the Automation Department documents are stored.

4.5.2 System Documentation Structure

The following documents comprise the quality management system documentation structure:

- Quality manual, which is edited in accordance with section **1.2. Manual elaboration and updating**.
- Minutes, which are used to summarize important information and decisions discussed during the meetings.
- Logbook, updated by every collaborator after doing a task, so that the team can keep track of the work's progress.
- Account book, updated after every purchase, so that the team can keep track of the budget and the equipment purchases.
- Attendance sheet, which is used to register attendance in each meeting.
- Evaluation sheet, which is used to evaluate the performance of each collaborator in accordance with section **2.3 Evaluation Description**.

Appendix A

Minute

U.PORTO
FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

Meeting Minutes nº__

Location: [Address or room number]

Date: __/__/2023 **Begin** ___h:___min **End** ___h:___min

Attendees:
General Director: _____
Product Director: _____
Quality Director: _____
Information and Documentation Director: _____
Project Director: _____
Director of Automation: _____
Director of Energy: _____
Director of Telecommunication: _____

Purpose of the meeting:

Discussion:

Taken decisions:

Appendix B

Attendance sheet

GlowTech - LuSiTa

Attendance Sheet

U.PORTO
FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

Attendees	Data	Duration: _____ Time of stay	Points	Date	Duration: _____ Time of stay	Points
Alexandre Araújo Pires Mourão						
Ana Catarina Afonso Morais						
António Pan						
Diogo Miguel Barbosa da Silva						
Francisco Monteiro Riesenberger						
José Luís Mota Pacheco de Oliveira Monteiro						
Manuel João Videira Silva						
Maria Carla Padrão Cruz Rehbein Pinheiro						
Ruben Miguel Gomes Santos						
Sara Beatriz Moreira Alves de Carvalho						
Seyed Ahmad Hoseini Dastjerdi						
Tomás de Oliveira Cadete						
Tomás Henrique Campos Ferreira Prior						

Appendix C

Task schedule

GlowTech - LuSiTa

Task Scoreboard

U.PORTO
FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

Executors	Task nº1				Task nº2				Total allocated Hours	Total Awarded Hours	Difference
	Start Date	Allocated Hours	Conclusion Date	Awarded Hours	Start Date	Allocated Hours	Conclusion Date	Awarded Hours			
Alexandre Araújo Pires Mourão											
Ana Catarina Afonso Morais											
António Pan											
Diogo Miguel Barbosa da Silva											
Francisco Monteiro Riesenberger											
José Luís Mota Pacheco de Oliveira Monteiro											
Manuel João Videira Silva											
Maria Carla Padrão Cruz Rehbein Pinheiro											
Ruben Miguel Gomes Santos											
Sara Beatriz Moreira Alves de Carvalho											
Seyed Ahmad Hoseini Dastjerdi											
Tomás de Oliveira Cadete											
Tomás Henrique Campos Ferreira Prior											