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Leadership & Innovation **INNOVATION PROJECT**

Empower the future through IoT driven
digital shift and green energy

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POLITECNICO
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 **prysmian**
The planet's pathways

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The background image shows a modern office building's interior atrium. It features a large glass roof allowing natural light to illuminate the space. The ceiling is supported by a steel truss system. On the left, there's a wall with horizontal wooden slats. In the center, there's a large, open-plan area with a wooden floor, several small round tables with white chairs, and a white service counter with a coffee machine. A person is sitting at one of the tables. There are also some plants and a staircase in the background.

EXECUTIVE SUMMARY

01

Part 1: Analysis & Interpretation of the Brief

Prysmian Group, an Italian multinational, is a leader in cables for energy, telecommunications, and optical fibre applications, operating in over 50 countries. Established in 2005 after Goldman Sachs acquired Pirelli's cable segments, Prysmian went public in 2007. The company emphasizes sustainability, aiming to lead the transition to low-carbon energy with superior quality cables and cutting-edge technologies.

Reinterpretation of the Brief

Presented by Ing. Nicola Imbimbo, the brief highlighted the elevator industry's reliance on outdated technology and the potential of IoT for proactive maintenance. IoT solutions can enhance safety and efficiency through unauthorized access prevention, AI-driven destination prediction, motor sensors, and earthquake countermeasures. The team agreed on a direction: "*Empower the future through Innovative technologies, IoT driven digital shift and green energy*", aiming to create value for elevator manufacturers and real estate firms within the B2B2C framework.

Market segments

Based on the 2023 report, Prysmian operates in three main sectors:

ENERGY: Includes Energy & Infrastructure and Industrial & Network Components.

PROJECTS: Focuses on high-tech cabling systems for terrestrial and submarine applications.

TELECOM: Produces optical fiber, cables, and connectivity products.

Analysis

A comprehensive competitor analysis identifies major competitors like Furukawa, Nitto Denko, and Nexans. The STEEP framework highlights critical external factors:

Social: Managing diverse global interactions.

Technological: Climate-related innovations.

Environmental: Focus on green transition.

Economic: Benefiting from global economic improvements.

Political: Exposure to geopolitical risks.



A SWOT analysis reveals Prysmian strengths in market leadership and innovation, weaknesses in managerial complexity, opportunities in renewable energy and digitalization, and threats from macroeconomic instability and regulatory challenges. The aim is to leverage digitalization and sustainability trends to enhance Prysmian value proposition.



Part 2: The Concept of the Solution

Innovation path: idea selection

To address Prysmian Group's brief, the team split into three sub-groups, each creating distinct solutions to enhance the elevator industry with new technology, IoT integration, and sustainability.

The following were the three ideas:

1

Cold Plates and AI

Introduces cold plates to manage motor heat, enhancing durability and reducing maintenance. AI analyzes IoT data to optimize elevator movement, reducing wait times and energy consumption.

2

Kinetic Energy Recovery System (KERS)

Stores energy generated by elevator use in batteries, ensuring energy availability during malfunctions and promoting sustainability.

3

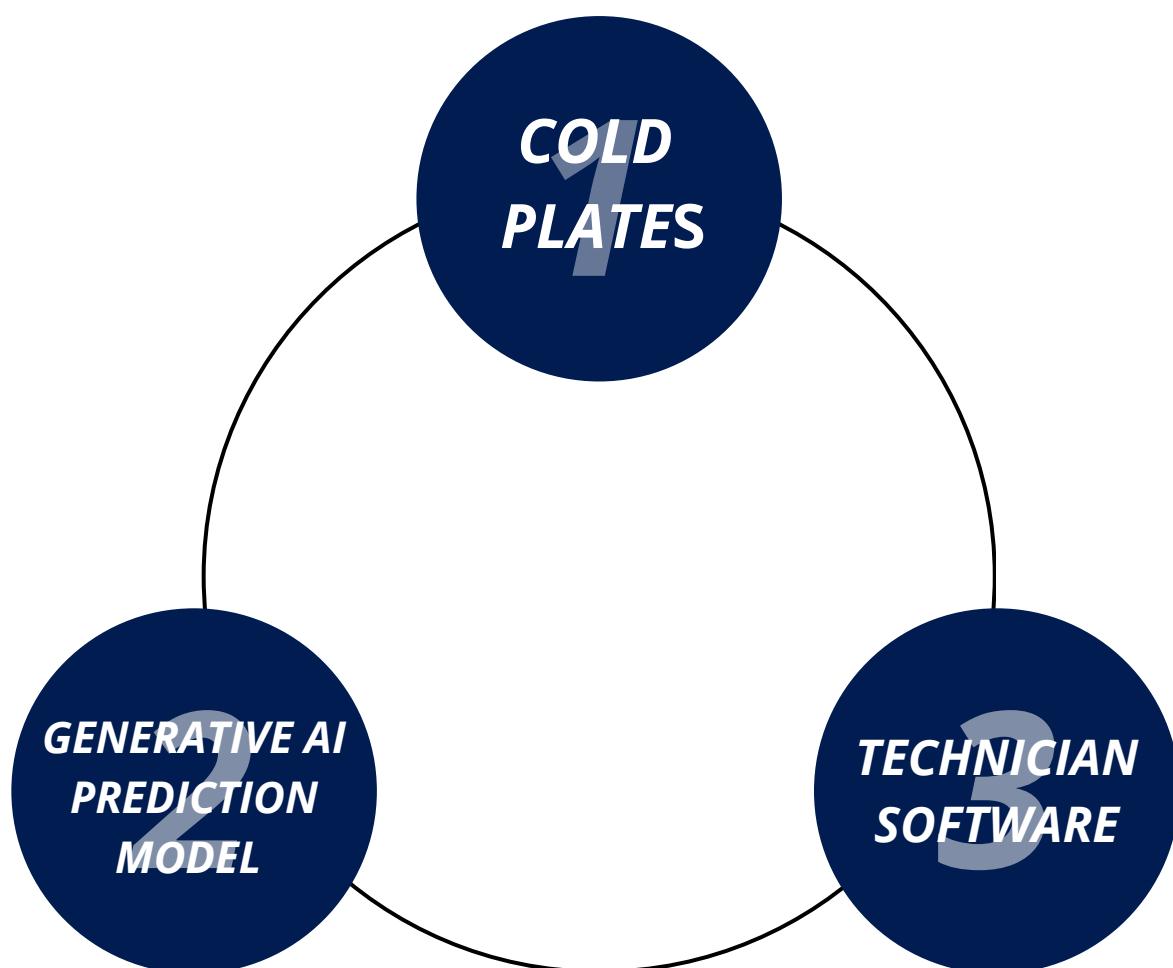
Application of AI

An app and virtual AI avatar to summon elevators, provide information, and enhance user experience with features like navigation and real-time updates.

After consulting with the Prysmian representative, the team chose the Cold Plates and AI solution for its innovation, sustainability, and alignment with Prysmian IoT enhancement goals.

Description of the solution - The Cool Elevator

The Cool Elevator integrates:



Cold Plates: Utilizing CERN's Ultralight Cold Plate technology to maintain optimal motor temperatures, improving durability and reducing maintenance.

Generative AI Prediction Model: Predicts elevator demand and optimizes movement, improving user experience and energy efficiency.

Technician Software (The Prysmian Chart): Uses IoT sensors and AI to transition from reactive to proactive maintenance, providing technicians with real-time data and predictive analytics.

EXECUTIVE SUMMARY

Value Proposition - a B2B2C framework

The Cool Elevator significantly enhances elevator durability with UCP technology, reduces maintenance needs, and supports sustainability by minimizing waste. Its generative AI optimizes operations, cutting wait times and energy use, while the Prysmian Chart software enables proactive maintenance. Despite higher initial costs, it promises long-term savings, benefiting building owners, operators, technicians, and users. This innovation improves efficiency, sustainability, and user satisfaction, offering a comprehensive value proposition.

Substainable Innovation

Dividing sustainability into three parts; environmental, economic and social, The Cool Elevator affects these aspects in different ways:



Reduced maintenance needs lower environmental impact.



Initial high costs are offset by long-term savings.



Benefits both users and technicians through improved reliability and maintenance efficiency.

EXECUTIVE SUMMARY

Economic Analysis

A NPV-analysis shows that The Cool Elevator is a profitable innovation. The choice between in-house production and outsourcing impacts cost structures and profitability, with in-house production potentially leading to higher long-term profits despite higher initial costs, and outsourcing leading to faster reaching the break-even point, but potentially lower long-term profits.

Business Model Canva

Key activities include UCP assembly, IoT monitoring, and customer follow-up. The value proposition centers on reliability, cost savings, and enhanced user experience. The solution targets both B2B and B2C segments, leveraging partnerships with elevator manufacturers and software developers for implementation.

Part 3: Evolutionary Path of Leadership Dynamics

The Personalities of Our Team Members

We used the 16 Personalities test to understand our team composition, revealing diverse personality types that influenced our group dynamics:



Maria Vittoria, Giorgio, Claudia, and Simen are rational, determined leaders, enhancing group focus and goal achievement.



Andrea and Elisa bring empathy and adaptability, fostering creativity and problem-solving.



Magnus and Silvia provide stability and order, ensuring a practical approach to challenges.



None in our team, as our group values duty and rationality over spontaneity.

EXECUTIVE SUMMARY

Managerial Grid

Using the managerial grid, we assessed each member's concern for people and production. Our group predominantly exhibited a team management approach, balancing high concern for both. This fostered a supportive and focused environment, crucial during decision-making processes, such as choosing the final idea post-review.

Full-Range Model

Initially, team members identified as either transformational or transactional leaders. Over time, we adopted situational leadership, adapting styles to fit the context. This shift was facilitated by understanding each other's strengths and working collaboratively to inspire and guide the team effectively.

Strategy Schools

We approached innovation with a technological focus, using a learning school strategy. Starting from initial ideas, we adapted based on external factors and group discussions, learning from feedback and refining our approach to ensure practical and innovative solutions.

Evolution of Team Dynamics

Our team faced initial challenges in coordinating schedules and aligning ideas. Through mutual understanding and flexible task allocation, we transitioned towards situational leadership, effectively combining our diverse perspectives and skills to achieve project goals.



ANALYSIS & INTERPRETATION OF THE BRIEF

02

2.1 Introduction

Prysmian Group is an Italian multinational company, with a direct presence in more than 50 countries. The company is a world leader in the production of cables for energy, telecommunications and optical fibre applications. They are present in a wide range of markets, but the following report will mainly look into Prysmian contribution in the elevator industry.



Prysmian's presence in the world

Prysmian was established in 2005 following acquisition of the Energy Cables, Systems and Telecom Cables of Pirelli by the Goldman Sachs Group.

The Company was listed on the 3rd of May 2007, with the market placement of 46% of the shares held by the Goldman Sachs group the following September. Prysmian is one of the few Italian industries with global reach to achieve public company status. It is a company whose shares are held by international institutional investors, in which the creation of shareholder value is a key factor when making strategic decisions at all levels.

Vision

"We provide our customers with superior cable solutions based on state-of-the-art technology and consistent excellence in execution, ultimately delivering sustainable growth and profit"

"Energy and information help communities develop. That's why it's so important that they're always available, and that they're supplied: effectively. Efficiently. Sustainably"

Mission

In line with their vision "Energy and information must always be made available in a sustainable way", Prysmian aims to become a global leader in this field. The ambition in the environmental field is to make the company one of the technological protagonists in the transition to low-carbon energy.

This long term perspective could be achieved following the mission of offering their customers superior quality cables, thanks to the adoption of cutting-edge technologies and a constant production excellence over time, promoting growth and sustainable profit. As an addition, with the aim of making energy and information always available, effectively and efficiently, they would contribute to the development of communities around the world.

2.2 Our reinterpretation of the brief

When Ing. Nicola Imbimbo presented the brief, it was apparent that the elevator industry is largely driven by old technology and a lack of innovation in the last decades.

Furthermore, Imbimbo stress the importance of data for monitoring different mechanical parts of the machine, because it could reduce the cost of unexpected maintenance, such as fostering the transition from reactive to proactive maintenance.



The technology that enables this is IoT: through sensors we can collect data and technicians can process them, in order to control remotely the needs of maintenance of the different mechanicals parts.

After the speech, we all agreed that the challenge levers on the need of technology innovation that, embedded with IoT, could bring value in the industry.

Giving that, we tried to have a better understanding of the ongoing innovations and trends related to the elevator industry:



MULTI by ThyssenKrupp:

has the aim to substitute cables with a magnetic levitation system. This allows the elevator to move both vertically and horizontally. This solution is efficient for tall and complex buildings. It is evident that if this technology gains momentum, it would be a threat to a cables producer such as Prysmian.

High speed elevator:

such as Hitachi's elevator in Guangzhou CTF Finance Centre (China), that can reach around 76 km/h.

Green elevator:

environmental attention is becoming crucial also in this sector.

Specifically talking about IoT innovative solutions of the industry:



Avoid unauthorized access:

allowing access only with fingerprints or smart cards.

Predict destination:

using AI face recognition and historical data to define the destination floor of the user.

Motor Sensor:

for monitoring the temperature of the engine.

Earthquake countermeasure:

a sensor that detect an earthquake and shut off the electricity supplies in the elevator.

The challenge that the Prysmian brief gave us is:

What are we missing in this scenario?



Due to the fact that nowadays a green transition perspective is fundamental in every long term strategy, the members of our team all converged to the fact that our proposal should also consider environmental issues.

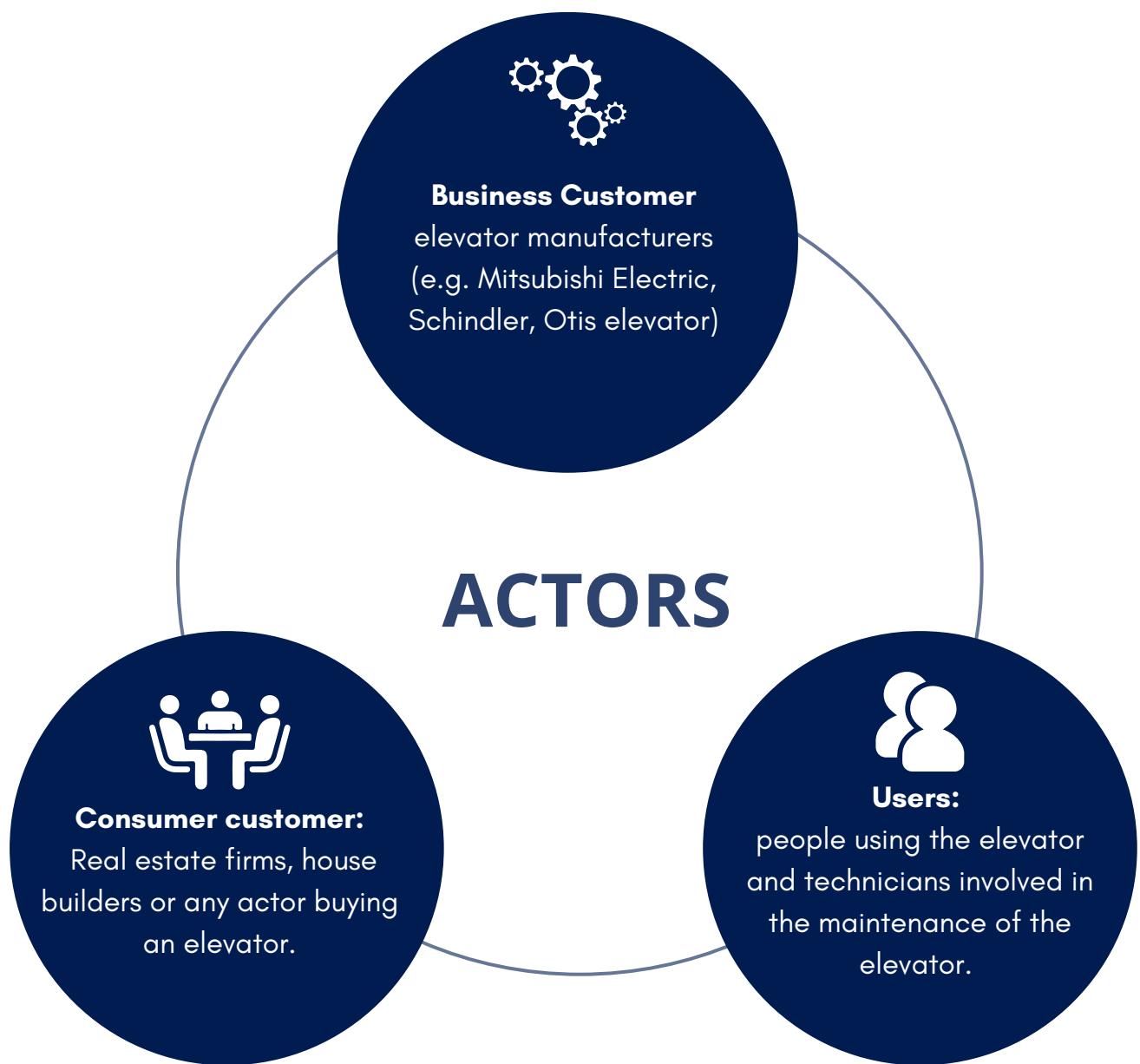
Based on that, we wrote together a sentence, representing the direction that our ideas should follow, the common denominator of all the proposals:

***"Empower the future
through Innovative
technologies, IoT driven
digital shift and green
energy"***



Having this in mind, we tried to link the brief with the B2B2C framework presented in class, in order to create value for both customers (business and consumer) and the final user.

Our first job was to identify the actors involved in this case:



We should point out for clarity that the customer cited as "Consumer" are not in this case private consumers in the common sense (private citizens buying a product), but simply actors in the next stages of the industry's value chain.

2.3 Market segments

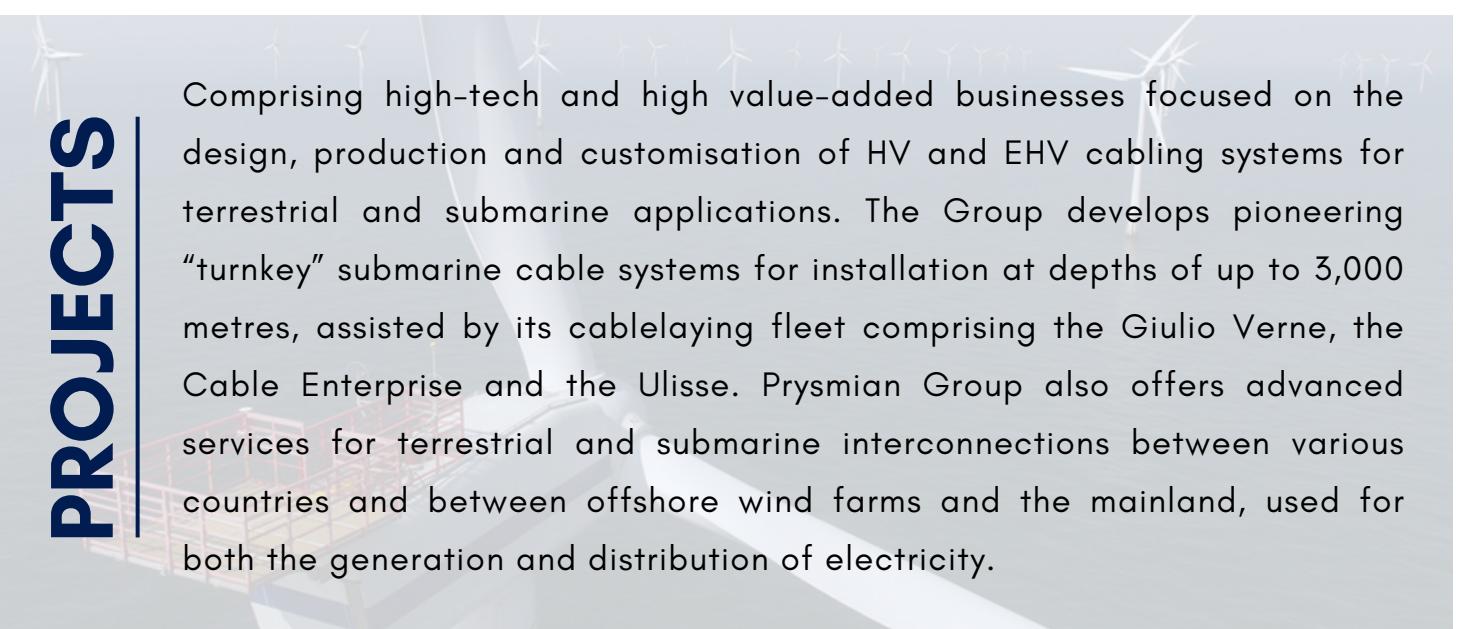
For the analysis of market segments, we relied on data from the 2023 report. We are aware that the internal organisation and the homonymous market segments, to which Prysmian refers, have changed in 2024 but we have not yet had data on this subject and we have relied on those of 2023.

From the 2023 Annual report we could say that Prysmian operates in three main sectors:



Comprising business segments that offer a complete and innovative portfolio of products designed to satisfy the many needs of the markets served. This macro-area is organised as follows: Energy & Infrastructure, which includes Trade & Installers, Power Distribution and Overhead Transmission Lines, and Industrial & Network Components, which includes Oil & Gas, Elevators, Automotive, Network Components, Specialties & OEM (serving in turn the following sectors: Cranes, Mining, Railways, Rolling Stock, Marine and Renewables - cables for the solar energy industry and for the operation and connection of wind turbines) and Electronics.

ENERGY



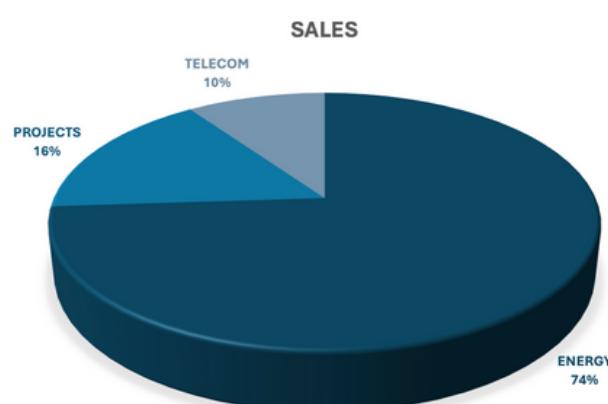
Comprising high-tech and high value-added businesses focused on the design, production and customisation of HV and EHV cabling systems for terrestrial and submarine applications. The Group develops pioneering "turnkey" submarine cable systems for installation at depths of up to 3,000 metres, assisted by its cablelaying fleet comprising the Giulio Verne, the Cable Enterprise and the Ulisse. Prysmian Group also offers advanced services for terrestrial and submarine interconnections between various countries and between offshore wind farms and the mainland, used for both the generation and distribution of electricity.

Comprising businesses devoted to making the cabling systems and connectivity products used in TLC networks. The product portfolio includes optical fibre, optical cables, connectivity components and accessories, OPGW (Optical Ground Wire) and copper cables. The Group is also among the leaders in the production of optical fibre – the essential component of all types of optical cables. A wide range of optical fibres is designed and made using proprietary technology to cater to the broadest possible spectrum of customer applications: single-mode, multimode and specialty fibres. In both cables and connectivity, the Group focuses on the design of products that provide greater density in a smaller diameter, with ease of use and optimal fibre management.

Referring only to the sales from these three macro-segments, the percentages of incidence of each are as follows:

Segment	Energy	Projects	Telecom
Sales (millions)	11.357	2.508	1.489
% sales	73.9%	16.33%	9.70%

Referring only to the sales from these three macro-segments, the percentages of incidence of each are as follows:



This analysis allows us to have a general idea of the profitability of the different market sectors.

2.4 Analysis

In order to propose a valuable idea, we want to perform competitor analysis, SWOT, and STEEP for better understanding the socio-economic context in which we are operating, such as Prysian opportunities and threats.



2.4.1 Competitors analysis

We aim to analyse the competitive arena where Prysmian is working, in order to take into account the different competitors, their products and the market they serve.



Furukawa Electric Co Ltd is a provider of telecommunication, industrial and automotive products, and equipment. Furukawa is headquartered in Tokyo, Japan. The company's product portfolio includes optical fiber and cable products, FITEL products, electric power products, industrial wires and equipment, energy infrastructure, metal communication cables, semiconductor optical devices, network equipment, optical fiber cable accessories and installations, CATV system and radio products. The company develops its products in the business fields of telecommunications, energy, automobiles, electrical parts and components and construction and architecture.

Nitto Denko Corp, a subsidiary of Secomo Co Ltd, is a manufacturer of electrical insulating materials. Nitto is headquartered in Osaka, Japan. It produces and distributes electronics, industrial and functional products such as polymer synthesis, and adhesive and coating technologies. The company offers value-added products such as optical films for liquid crystal displays, automotive materials and parts, membrane products, surface protective films, and double sided tapes. The company serves transportation, house equipment, infrastructure, materials, electrical, packaging and medical industries.





Fujikura Ltd is an electrical equipment manufacturing company. Fujikura is headquartered in Koto-ku, Tokyo, Japan. It develops, manufactures and markets telecommunication and power systems products. Its product portfolio includes optical fibers, optical fiber cables, splicers, optical connectors, optical transceivers, active optical cable assemblies, fiber lasers, magnet wires, sensors, cable assemblies, heat pipes, and automotive and injection molding components, and others. Fujikura also offers infrastructure development and commercial property rental services.

CommScope Holding Co Inc provides infrastructure solutions for communication networks. CommScope is headquartered in Hickory, North Carolina, the US. The company's product portfolio includes antennas, broadband and access network systems, broadband and video devices, cabinets, panels, enclosures, cables, connectors and enterprise networking, among others. It offers services such as data center and fiber services, managed networks, network transformation, software and integration and video services.



Nexans SA is a provider of cable and connectivity solutions for offshore wind farms. Nexans is headquartered in Paris, France. The company offers copper and fiber optic cables and cabling systems. It serves network operators, equipment and infrastructure manufacturers, and builders, installers and distributors in submarine and land, oil and gas, mining, and renewable, transportation, data centers, commercial and residential building sectors.



Belden Inc designs, manufactures, and sells cable, connectivity, and networking products. Belden is headquartered in Missouri, the US. The company's product portfolio includes cables, connectors, patch cords, cord sets and assemblies, racks, cabinets, labels, tools, and accessories. Its solutions find applications in the secure and reliable transmission of data, sound, and video for mission-critical applications. Belden markets its products through distributors, end-users, installers, and directly to original equipment manufacturers. The company's products find applications in the automotive, broadcast, real estate, energy, food and beverages, government, healthcare, oil, and gas industries.

Encore Wire Corp is a manufacturer of electrical building wire and cable for interior electrical wiring in residential, commercial and industrial buildings. Encore is headquartered in McKinney, Texas. Its major products include UF-B cable, NM-B cable, SE style cable, tray cable, metal-clad cable, armored cable, photovoltaic single-conductor cable and mobile home feeder cable. Encore sells its products through wholesale electrical distributors in the US. The company has manufacturing facilities across the US.



2.4.2 STEEP

For the External Analysis, we decided to use the STEEP framework, which has the aim of resuming all the exogenous factors that may impact on the success of our proposal.

SOCIAL

Since Prysmian needs to interface with actors (suppliers, clients and divisions) all over the world, one of the challenges of the firm is considering all the social and cultural differences of their interlocutors. That is why in the Prysmian organization chart there are 9 divisions (one for each main geographical area).

ENVIRONMENTAL

In the last years, there has been a strong acceleration of technological innovation in climate-related technologies. Prysmian has assessed the possible impact on the business of new emerging, alternative or replacement technologies linked to the climate and renewables (e.g. hydrogen, higher capacity batteries, E-Vehicle technologies, wireless technologies, etc.).

TECHNOLOGICAL

Climate change and green transition are impacting firms decisions all over the world. Prysmian put this issue at the center of gravity of its strategy creating an "impact scorecard" which indicators are based on the seventeen SDGs promoted by UN.

POLITICAL

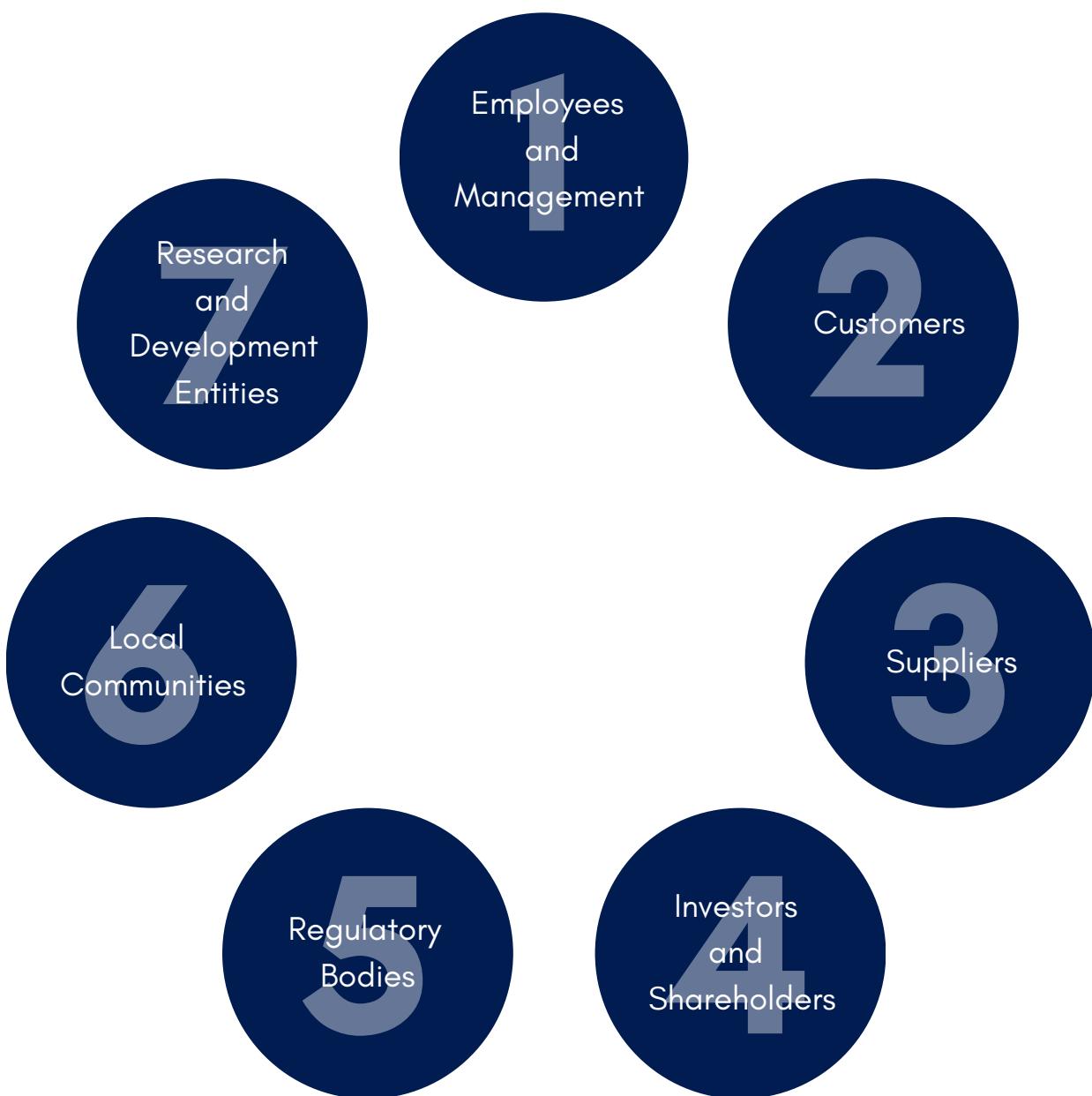
The global macroeconomic environment gradually improved over the course of 2023, mainly thanks to stronger-than-expected resilience of the US economy and various emerging markets. Inflation continued to decline as a result of the more restrictive monetary policy stance adopted by the major central banks and the decline in energy commodity prices from the previous year's peaks. Prysmian will benefit from the economic improvement of the situation just described.

ECONOMICAL

Prysmian has 108 plants spread over more than 50 countries (North America, Latin America, EMEA and APAC). Due to this level of internationalization, the firm is highly exposed to socio-political risks, even more so now with the actual situation (Russia-Ukraine war and Israeli-Palestinian conflict).

2.4.3 Stakeholders analysis

Wanting to meet the social needs and the society's demands better than the existing solutions, the proposed solution involves many stakeholders. Being a major player in the industry, Prysmian considers a market not only consisting of end users only but also other stakeholders. Taking multiple stakeholders opinion into account, a stakeholder analysis would be able to support and substantiate the proposed solution.



1

Employees are crucial stakeholders given their role in operations and innovation. Prysmian invests significantly in employee development through programs like the Prysmian Academy, which offers training and development opportunities. The company also focuses on diversity and inclusion, ensuring a welcoming environment for all employees.

Prysmian's customers include major utilities, telecommunications providers, and construction companies. They benefit from Prysmian's extensive range of products and services tailored to digital and energy infrastructure needs.

23

Suppliers play a key role in providing the raw materials and components needed for Prysmian's products. The company maintains strong relationships with its suppliers to ensure quality and sustainability in its supply chain.

Prysmian is publicly traded and engages actively with its investors and shareholders, who are interested in the company's financial performance and strategic direction. Major shareholders include investment firms like BlackRock and UBS AG

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Given the nature of its business, Prysmian must comply with numerous regulations across different countries, especially concerning environmental standards and building codes. Regulatory bodies thus significantly influence how the company operates

Prysmian's operations have a direct and indirect impact on the communities where it operates. The company is committed to responsible corporate practices and engages in various initiatives to support local development and sustainability

A large, solid blue circle with a thin white border. Inside the circle, the number '7' is written in a large, light blue, sans-serif font.

7

Innovation is central to Prysmian's strategy. The company collaborates with universities and research institutions to pioneer new technologies and improve existing ones. This includes developing more sustainable materials and enhancing the performance of cable systems

Overall, Prysmian Group's approach to stakeholder management reflects its comprehensive strategy focused on innovation, sustainability, and global market leadership

2.4.4 SWOT

By developing a SWOT, it is possible to resume the most relevant points of attention of the external and internal analysis: highlighting strengths and weaknesses, opportunities and threats. As we can read from the chart below, Prysmian has a market leader position with an innovative mindset, but its global scale and dimensions leads to managerial complexity. Also, having suppliers all around the world expose the company to the threat of macroeconomic instability and different regulatory policies. In conclusion, our project aims to transform the opportunities pointed out in the chart, specially digitalization, in future strength.



Market leadership: Prysmian is one of the largest companies in the industry. Thanks to high volume, it can benefit from economies of scale and brand recognition.

Environmental and social issue as strategy's pillar (SDGs indicators).

Highly innovative company: more than 26 R&D centers.

Strong financial position: high profitability, even in last year (+7,1% in EBITDA and +7,5% in net profit).

BoD (headquarter in Milan) is for the most part composed of Italians, becoming difficult to centrally manage diversity.

Managerial complexity typical of a multinational company.

High fixed cost, typical of the industry.

High number of suppliers: around 5600 all over the world.



OPPORTUNITIES

Renewable energy: Prysmian can guide the energy shift by developing specific solutions.

5G trend: the company can capture this trend by offering tailored solutions of 5G applications.

Digitalization trend: developing IoT solutions for the analysis of data can improve Prysmian value proposition



THREATS

Macroeconomic instability due socio-political tension and wars.

Fluctuation of price of **raw materials:** such as copper and aluminium.

Regulatory policies: since the firm works in different countries, it faces different regulatory frameworks. Furthermore, the energy sector is highly regulated.



THE CONCEPT OF THE SOLUTION

03

3. The Concept of the Solution

“ An innovation is the introduction of a new or improved product, process or method.

To create meaningful innovation we need a process whose principles are the opposite of the ideation and outside-in innovation that has populated the innovation discourse in recent years: we need criticism and to start from ourselves.

”

Overcrowded p 3/19 part 1

Following the path suggested by the professors, after we had been discussing the brief and found a common interpretation of it, we divided the team into three subgroups, to create three separate solutions. These try to grasp the problems presented throughout the brief and propose different ways these challenges could be approached and solved.

According to a technology-push approach, an inside-out approach was adopted by all the subteams. The Prysmian representative underlined the need to improve the use of their IoT technologies to better their product for the customers. Today's elevator business is built on old technology and a lack of innovation, resulting in the group wanting to introduce new technology. At the same time, our common objective was to focus on the direction of today's society, considering the aspect of social sustainability and reducing emissions.

As we will see in this chapter, two groups out of three subgroups proposed an innovation of solution, trying to reach a new “how” that could improve efficiency. One team, on the other hand, searched for an innovation of meaning, trying to find a new “why” to use the elevator.

3.1 Innovation path: idea selection

In this paragraph we will present the path that led to our final solution. Presenting the three different ideas which each subteam put forward, we will resume the most relevant pros and cons of each innovation and then explain what were the main arguments for us to pursue and develop the final choice of innovation.



COLD PLATES AND AI



KERS



APPLICATION OF AI



Cold plates and AI



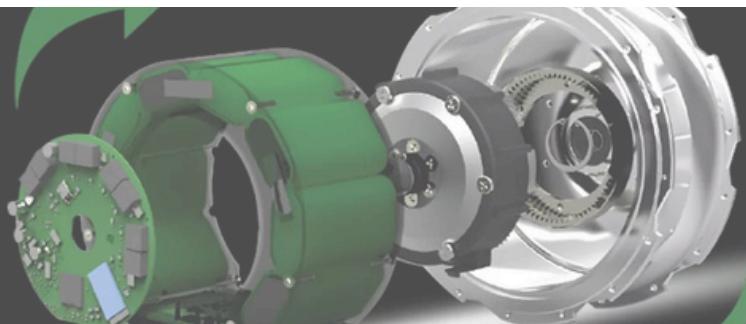
This alternative solution provides the elevator business with a revolutionary change in both sustainability and use. Cold plates which would lower the heat generated in the motor and keep the temperature at a more stable level, making the motors more durable and lower the need for mechanical parts and maintenance costs. Introducing this into elevators which are often used, like in cruise ships or office buildings, the business could save money, and at the same time increase the uservalue. In addition to the cold plates, introducing an AI which analyzes the IoT values from the elevator, gives both the opportunity to adjust the pace of the elevator, and predict the movement of the elevator to the optimal floor. This would save time spent waiting for the elevator, increasing the value for the user, and energy as the elevator could move slower to the predicted floor when not in use. This first innovation covers all the challenges put forward in the brief, cold plates as new technology, IoT in the usage of AI analyses, and making the elevator more durable and sustainable.

ADVANTAGE

- Sustainable
- Lower costs
- Increase customer value
- Less maintenance
- Improve technicians life
- Increased profits/savings for Prysmian
- New technology

DISADVANTAGE

- Increased initial cost
- Might not be as appealing to customers
- New technology
- Mechanics need training
- Production costs of the coldplates

2**KERS**

This option provides the elevator business with the ability to store energy in batteries. The energy is generated from the usage of the elevators, and stored in batteries. In the case of an energy-malfunction of the elevator or the need for more energy, this can be taken directly from the electrical energy in the battery. The KERS technology will let the business save energy, and at the same time ensure a more sustainable use. This would also ensure the users that they would not rarely get stuck as there is always an energy-source connected to the elevator if the main energy-supplier would malfunction. This second idea proposal answers both the challenges of introducing new technology, and also making the elevator more sustainable.

ADVANTAGE

- Energy saving
- Sustainable
- Energy reuse
- Lower cost due to need of energy
- Security in case of malfunction
- Increased value for users

DISADVANTAGE

- Cost of new technology
- increased cost for customer
- Technician might need more training
- Cost and time
- More time to do maintenance
- Maybe lead to more maintenance



The third option introduces both an app and an AI as a virtual avatar installed inside the elevator. The App could be used to call the elevator to a floor before going there, lowering waiting time, and increasing the customer value. The app could also be implemented with many other functions, as maps guiding the users to certain rooms making a maybe unknown travel feeling more secure. The introduction to a built in AI into the elevator could increase the experience as it could give information about whatever the user is requesting, such as the bus schedule, weather, etc. The idea also includes the virtual avatar being able to comfort the people in the elevator in case of a breakdown. Thanks to these functionalities, we are able to create a new reason to use the elevator: not just to go to the right floor, but to gather needed information or to discuss with an artificial human being about anything we want. This solution could create an innovation of meaning, adding a new "why" for not taking the stairs. Also being able to answer the first problem from the brief, introducing AI as a new technology to change the meaning of using elevators.

ADVANTAGE

- Modern adaptation
- Innovation of meaning
- Easy to use
- Predictable
- No need to wait for elevator
- A huge increase in the user experience
- If a map is introduced, could also use to guide - Less need to interact with strangers to find their way
- Better for the user

DISADVANTAGE

- Completely new technology
- Cost of development could be huge
- Need more employees to keep the app and AI up to date → Increased cost
- Implementation into elevators could be costly

Conclusion of the selection

After consulting with the Prysmian representative, ing. Imbimbo, and discussing internally, the group decided to pursue the idea about introducing cold plates technology into the elevator industry, because of the novelty that this technology represents and for the improvement in durability of mechanical parts that this innovation could bring. Furthermore, the need for improving the usage of IoT data was also pointed out by the Prysmian representative. Thus, the group decided to expand the solution by the installment of sensors to gather data and foster the transition from reactive to proactive maintenance.

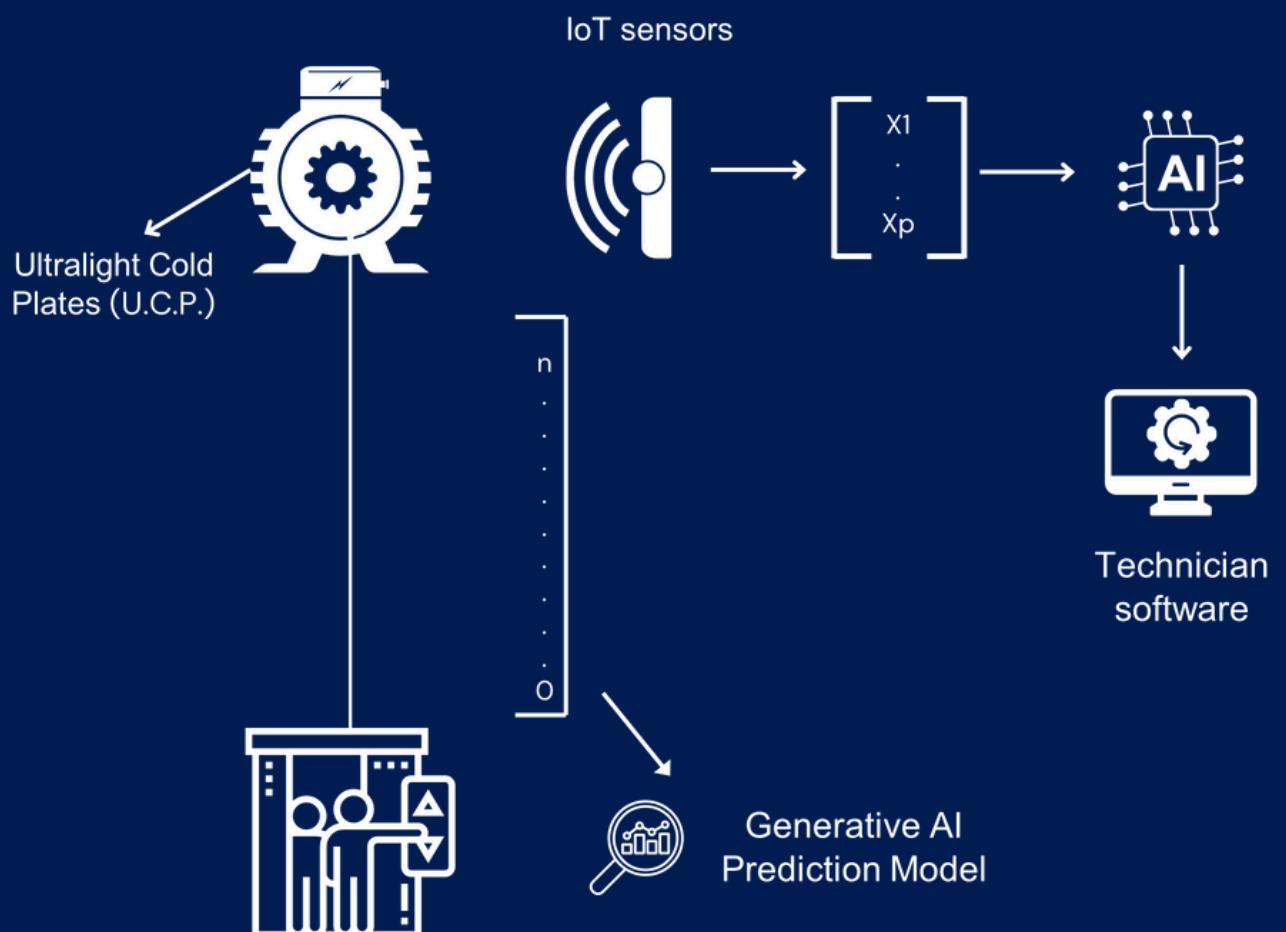
With the elevator industry being an embedded sector using older solutions and technologies, the need for innovation is apparent. However, introducing a new meaning or radical solution for the whole market could be difficult or in the best case optimistic. Therefore, the introduction of the cold plates focuses on a more niche part of the market, targeting elevators with motors which are more stressed, i.e. high-use elevators and/or elevators in tall buildings.

After deciding on the solution, the group started working together to build a clearer value proposition, "the cool elevator", that will be further explained in the following chapter.



3.2 Description of the solution - The Cool Elevator

Our solution is divided into three main parts that are all interconnected; cold plates, a generative AI prediction model, and technician software. The figure below summarizes all the functionalities of our solution. The cold plates allows for the implementation of the prediction model, while also being a key part in the implementation of sensors that gather data that ultimately are visualized in the technician software. In the following, these three parts will be further explained.



Cold plates

Ultralight Cold Plates (U.C.P.)



In 2022 CERN introduced a completely new technology for thermal management: the Ultralight Cold Plate (UCP). Later, they have made this an open-source technology, inviting the world to use it to innovate other industries. The UCP has applications in high-energy physics, cryogenics and drug production (CERN, 2024).

As cited by CERN: "The UCP can be used for the cooling of power dissipating elements, based on micro-macro vascular pipes embedded in high thermal conductive carbon substrate" (2024). In an elevator, the motor, if exposed to high frequency use, can reach high temperatures that can lead to worse performance, or in the worst case malfunction. And here comes our idea; installing the UCP on the motor, which allows it to operate at more optimal temperature levels. This way the elevator will become more durable, allowing it to move more often and faster, while at the same time lowering the need for maintenance and the usage of spare parts.

The UCP has two main components: the inner barrel, which is produced at CERN facilities, and the outer barrel, which is produced five different places, the closest to Milan being Torino. However, the technical structure of these parts are publicly published, which opens the possibility to produce them internally. Lastly, the components needs to be assembled, which should be done internally, customizing the UCP to fit the motor of the elevator (CERN, 2024).

Generative AI prediction model



In addition to the UCP, our solution will include a generative AI prediction model which allows the elevator to preemptively move to the floor which it is most likely to be needed next, based on variables such as the weekday, time of day and placement of the elevator from the IoT. The AI continuously learns based on scores which it gains from either predicting correct or wrong. The preemptive movement is feasible because the UCP is making the elevator more durable, so an increased movement due to the prediction model will not be a problem. Thus, the combination of the UCP and the preemptive movement will increase the availability of the elevator, shortening the average wait and ultimately making a better experience for the end-user.

Technician software Prysmian Chart

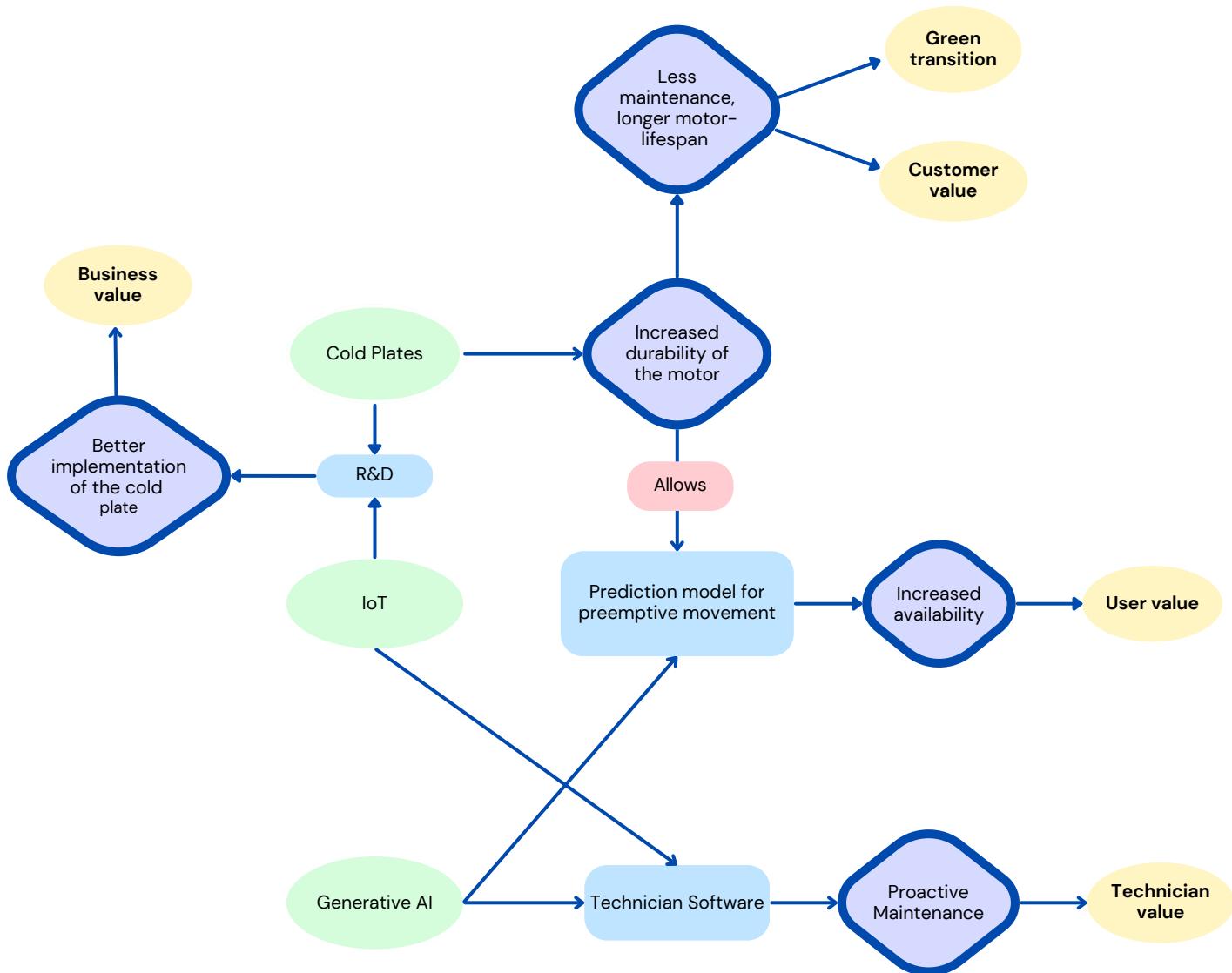


As mentioned in section 2.2, an important part of the brief was to foster the transition from reactive to proactive maintenance with the use of IoT. Leveraging the fact that we are already adding the UCP to the motor, we also want to install sensors on the UCP for better monitoring the elevator as a whole. The p-variable taken from the system could be processed by a generative AI model, and then shown, through data visualization tools, into a technician software, The Prysmian Chart, to enhance the availability and visibility of the information from the IoT.

It is difficult to conclude if the solution is radical or incremental. Introducing a new technology to the market could be seen as radical, depending on how the market responds to the innovation. On the other side, the UCP, the AI and the software are just solutions which enhances the current situation for the actors in the value chain, meaning it is an incremental innovation. Hence, the characterization of our solution depends on the reaction of the market.

3.3 Value proposition - a B2B2C framework

We ideated a flow chart to better explain for whom and how our solution is creating value, also pointing out what are the resources needed. In this chapter we will explain step by step the logical flow behind the chart, that has also the aim of summarizing our vision.



Caption

- (Green circle) Resources
- (Yellow circle) Created Value
- (Light Blue rectangle) Activities
- (Blue diamond) Improvements

“

“The UCP, embedded with IoT and Generative AI, will significantly improve the durability of a high-use elevator in a sustainable way, leading to less maintenance, less costs and an increased user experience, for both the final user and technicians.”

”

Our solution, “the cool elevator”, is structured to create value for different stakeholders involved in the industry. Through the explanation of the scheme of the logical flow, we are able to explain each benefit in detail.

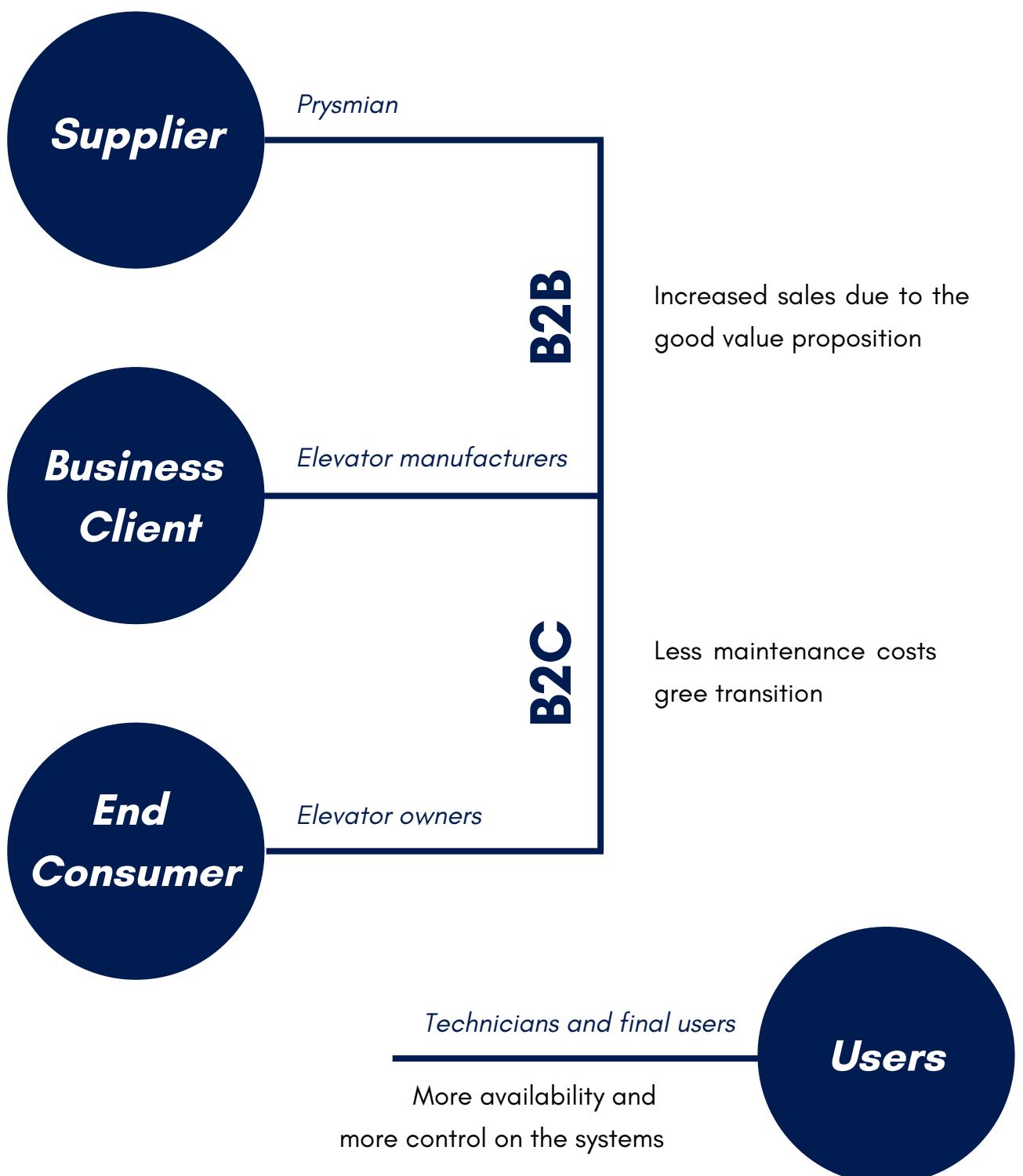
The first feature that the UCP brings is *durability*, meaning a longer life for the elevator and less need of maintenance. This creates value for the actor, in the framework the **customer**, that pays for the elevator and for the maintenance. Also, using less resources on maintenance has an **environmental impact**, reducing waste and creating value for the whole society.

Thanks to the technology behind the UPC, the engine is less overheated and can be used with a higher frequency. Leveraging AI for analyzing the historical series of the floors to which the elevator goes during each hour of the day, we are able to move the elevator where it is asked before the request, reducing the waiting time for the user and creating a **better experience**.

Furthermore, the data read from the motor by IoT sensors and processed by generative AI could create **value for technicians**. If the analyzed data are sent to a professional software used to control data this could improve the work for technicians as they can utilize the software to decide if it is a need for maintenance. The adoption of this technology could make maintainers more in control of the systems they work with, passing from reactive to **proactive maintenance**. As pointed out in the Prysmian brief, this is one of the most important challenges nowadays in the elevator industry, because having control on data could sensibly decrease maintenance costs.

Thanks to this reasoning, we identified a new user, **the maintainer**, for which this solution is creating value.

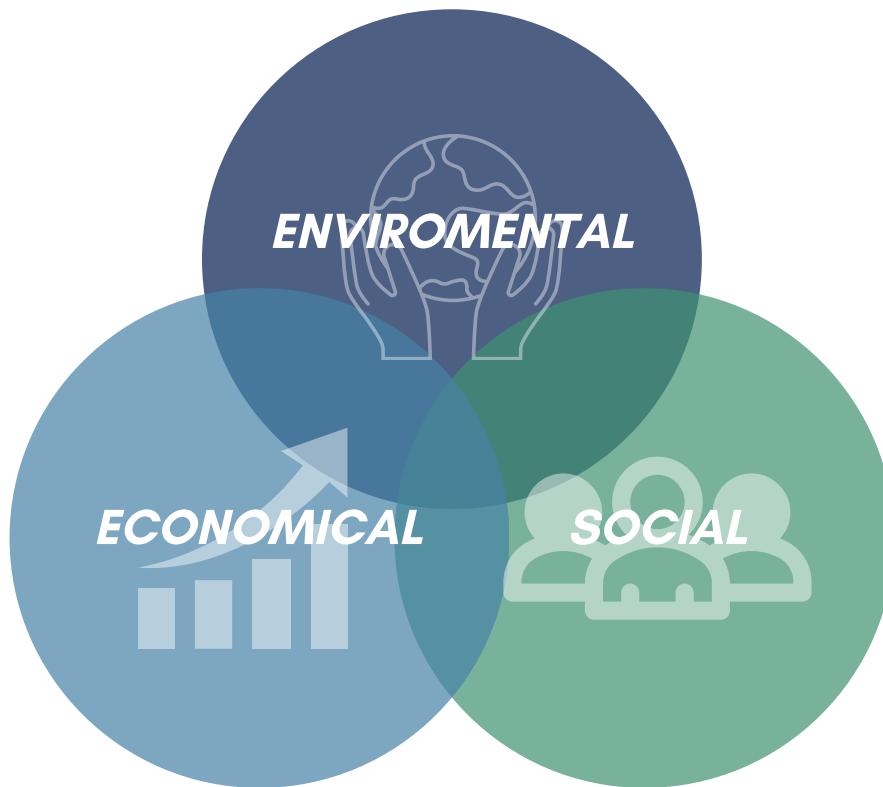
At the end, we believe that the Cold Plates are a valuable innovation not just inside the elevator industry, but also in other fields in which Prysmian is operating. We think that the combined use of this technology and IoT could have applications that have a strong **business value** for the company, through leveraging the strong **R&D** culture present in it.



3.4 Sustainable innovation

A sustainable innovation requires companies to intentionally change their processes, product and practices trying to reach the goal of delivering environmental, social or economic value through innovation. As elevators count for about 8 to 10% of the overall building energy-consumption, we wanted to focus on improvement and changing of hardware to move the elevator business towards a green transition and requiring less mechanical parts.

The Triple Bottom Model, seeing sustainability as a merging of economic enterprise, social well-being and environmental integrity, is therefore a great tool to better understand how the proposed solution encompasses three fundamental factors for sustainability.



Environmental: Due to increased durability, the need for mechanical parts are decreasing, resulting in a more sustainable solution.

Economical: Despite an increased initial cost, the economical analysis shows that the proposed solution reduces the “in use” cost, resulting in economic profits/savings after only X years in use.

Social: Our solution would benefit two final users; the maintainers (thanks to proactive maintenance) and people using the elevator (thanks to increased availability).

This technological innovation would shift the evolution of elevator business towards a greener transition and a more sustainable use of elevators, as it reduces negative impacts on the environment through the minimization of usage of spare parts. In addition, the utilization of data coming from IoT would sensibly simplify maintainers work, as they would know beforehand what would be wrong with the elevator. This would lead to more control of the systems and also the possibility of better organizing their week workload, minimizing emergency calls from their customers.

3.5 Economic analysis

For computing the economic analysis, we considered the **niche market** of the "high frequency" elevator, because we believe that in those applications our technology could be most beneficial. In the paragraphs below, we will go through all the assumption and the computation we made for reaching our results, showing the profitability of our idea. We want to clarify that estimates are based on many assumptions, some originating from conversations with people connected to the technology and others from the collective and logical thinking of the team.



Assuming that the customer **will save €200** each year because of less maintenance costs and higher durability, we think that the **price of €450** for transforming an already existent elevator in a "Cool Elevator" might be competitive. Furthermore, there is the option of producing new "Cool Elevators": we suppose for sake of simplicity that the increase in price for the end customer on the purchase of the elevator is **still €450** in comparison to a simple elevator.



The elevators more exposed to overheating are present for example in skyscrapers, hospitals or cruises. These applications are estimated as **5% of the market**: assuming that this solution reaches **10% of this niche**, we would be able to make a turnover of **€ 2,7M each year**.



$$\begin{aligned}
 & 5\% \text{ of the market} * 6\,400\,000 \text{ elevators} * 10\% \text{ sales to the market} \\
 & = \\
 & \mathbf{32\,000 \text{ elevators in the niche}}
 \end{aligned}$$



The plates can be produced **internally** or **outsourced**. We will show the comparison of the two approaches in a NPV analysis below (pag. 49-50)

The two main components for the cold plate, the **Inner Barrel (IB)** and the **outer barrel (OB)** are produced in different places. The IB is produced at CERN, while the closest producer of the OB (from Milan) is in Torino. The assembly of the cold plate is done internally in both cases of "make or buy". Furthermore, we will hire an expert of this technology to follow the project and gain useful expertise for the future.

€ 120,000 annual salary for an expert consultant hired to lead the project. This expert should be experienced on both the thermodynamics and artificial intelligence themes. He is expected to run the innovation process and manage the resources on high level, playing the role of project manager in a dedicated task force.

This cost has been accounted once a year for the overall horizon time of the investment analysis.

€ 1,000,000 assembly equipment. Assembly equipment is needed to assemble the layer of plates to give the required shape.

This is an initial cost accounted once at the beginning of the period as a new fixed asset.



€ 3,000,000 factory equipment (random guess)

This equipment is needed for the production of the plates, therefore it would be an important investment cost to be considered if and only if the company decides to internally integrate the production instead of outsourcing.

The make or buy strategic decision affects how the profits are split in time: in case of **internal production**, it could lead to higher profit on a very long run although the break-even point will be surely reached later. **On the contrary**, going through an outsourcing production decision might lead to lower profits on a long time span, while the break-even point can be reached sooner.

€ 10,000 for implementation of a generative AI prediction model (outsourced)

€ 100,000 for developing and running the application Prysmian Chart.

In both make or buy solutions, the company need to buy IoT sensors and install them.

As mentioned, the outsourcing production would concern only the thermal plates, while all the other manufacturing and assembly activities are carried inside the plants.

IoT sensors: 10€/unit

€ 100 **installation cost** per unit (salaries mainly)

The following are variable costs which are mutually exclusive since one decision would lead to discarding the other.

Internal production specific costs: € 100 raw material costs per unit sold

Outsourced production specific cost: € 150 per unit bought



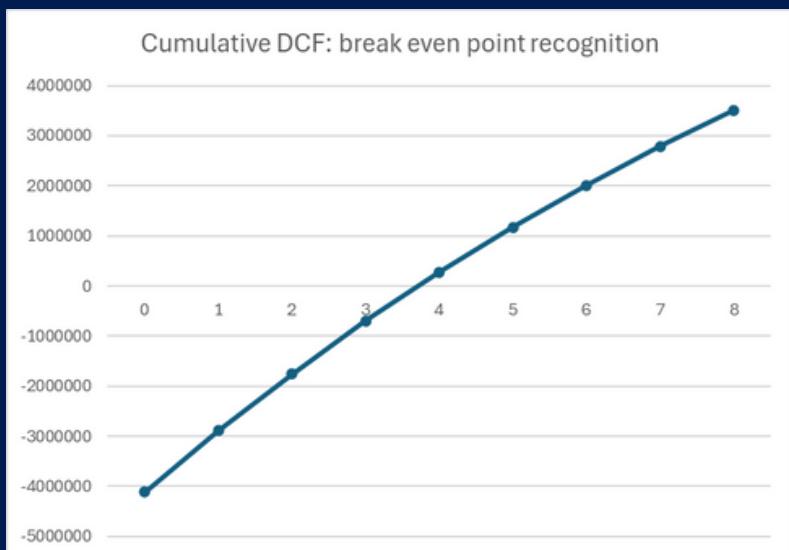
Internal Production

Present Value

3.510.229,75 €



Index	0	1	2	3	4	5	6	7	8
FIXED COSTS	4110000	120000	120000	120000	120000	120000	120000	120000	120000
VARIABLE COSTS	0	1260000	1260000	1260000	1260000	1260000	1260000	1260000	1260000
TURNOVER	0	2700000	2700000	2700000	2700000	2700000	2700000	2700000	2700000
CASH FLOW	-4110000	1320000	1320000	1320000	1320000	1320000	1320000	1320000	1320000
DISC. CF	-4.110 M	1.223 M	1.134 M	1.051 M	974.563	903.377	837.391	776.224	719.525



Assumptions

- WACC = 7.88%
- No growth for the investment terminal value
- Constant unit sold

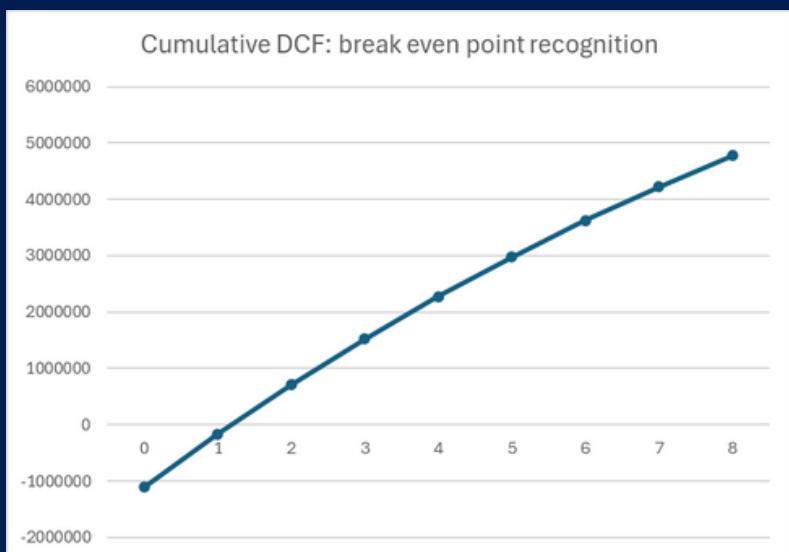
Outsourced Production

Present Value

4.778.359,35€



Index	0	1	2	3	4	5	6	7	8
FIXED COSTS	1110000	120000	120000	120000	120000	120000	120000	120000	120000
VARIABLE COSTS	0	1560000	1560000	1560000	1560000	1560000	1560000	1560000	1560000
TURNOVER	0	2700000	2700000	2700000	2700000	2700000	2700000	2700000	2700000
CASH FLOW	-1110000	1020000	1020000	1020000	1020000	1020000	1020000	1020000	1020000
DISC. CF	-1.110 M	945.494	876.432	812.413	753.071	698.064	647.074	599.809	555.997



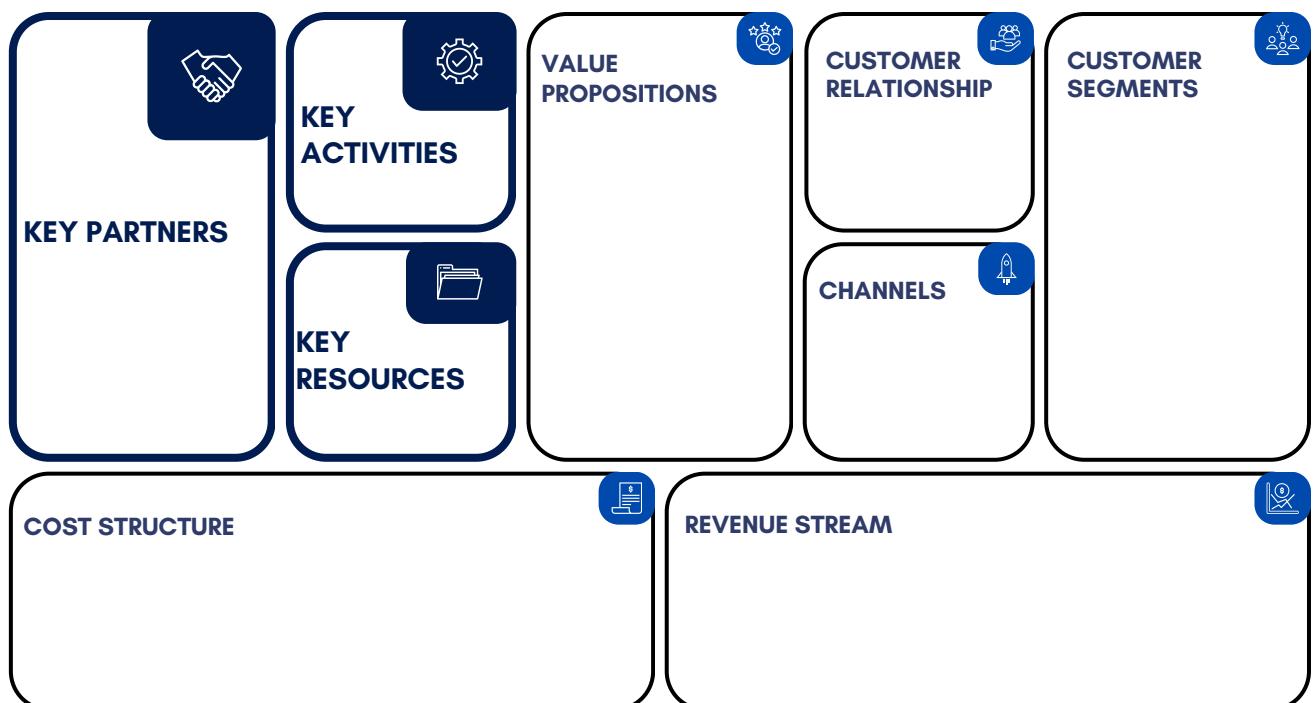
Assumptions

- WACC = 7.88%
- No growth for the investment terminal value
- constant unit sold

Following the **NPV analysis** it is apparent that the innovation is profitable.

A big choice is to be made about whether to produce the parts of the cold plates internally or outsource the production. Given that the technology is new and that it is not clear how much traction the solution is going to get, it might be in the best interest to start by outsourcing the production, and then invest in the necessary equipment after some time if the solution reaches a set threshold in popularity.

3.6 Business model Canvas



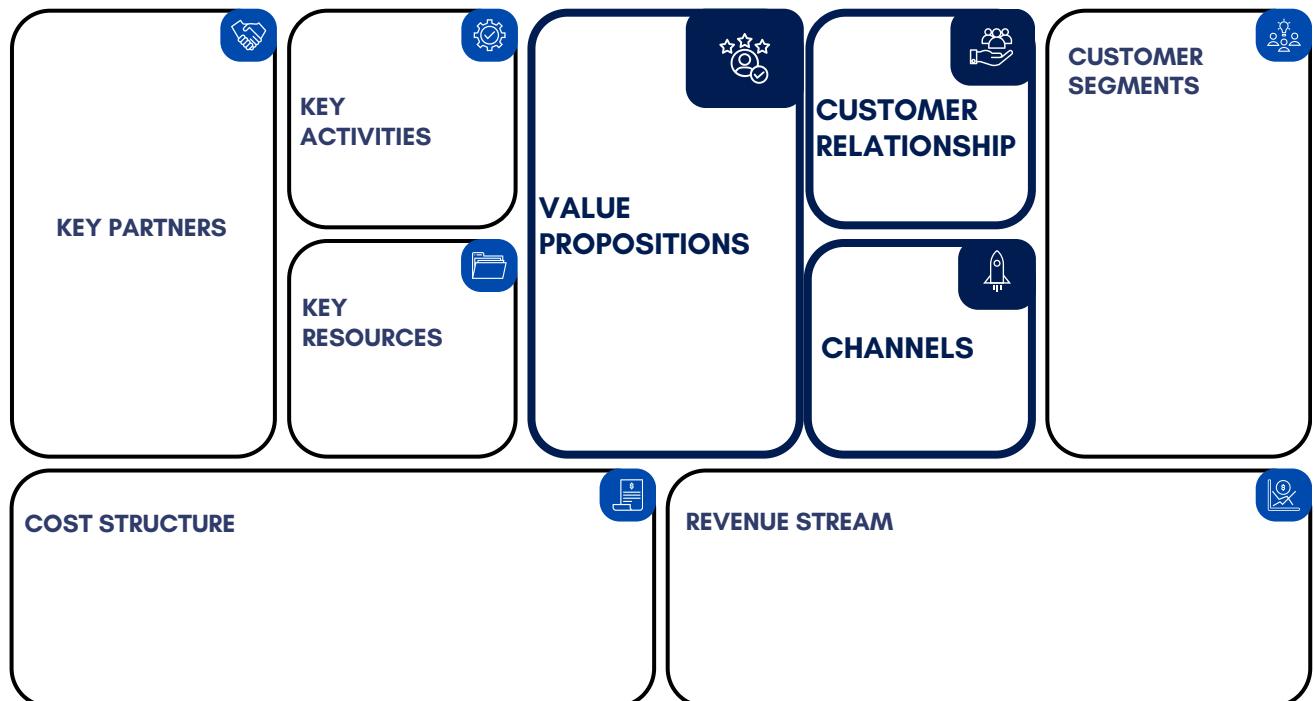
- CERN
- Resource providers (carbon rowing, fleece, prepeg and carbon foil)
- Elevator manufacturers
- Software developer (e.g. IBM MAXIMO)



- UCP assembly
- Business customer “lobbying”
- UCP installation
- Follow-up
- IoT monitoring



- Technical installers
- Information providers / In-house expertise
- Assembly equipment
- Data storage



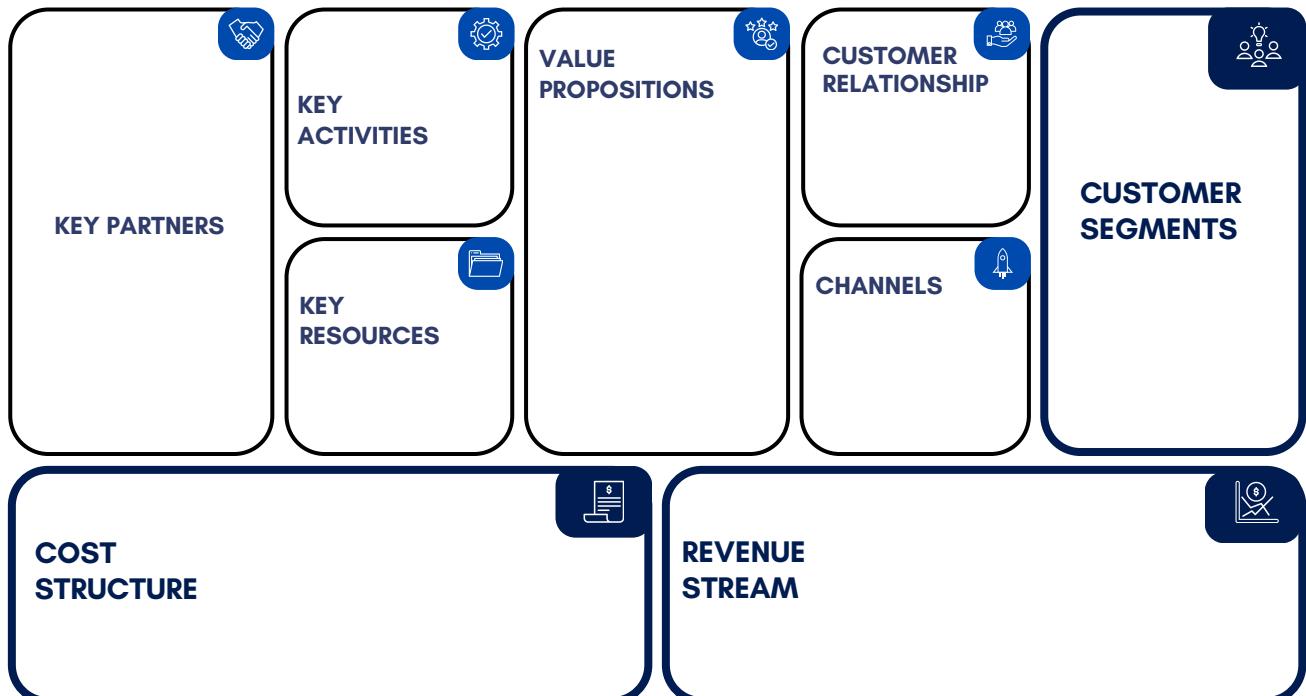
- Provide a low-cost solution which will decrease maintenance costs.
- Making the elevator more reliable by letting it operate at more healthy temperature levels.
- Increase the control for the technicians and have a better overview of the elevator system.
- Increased availability of the elevator for the end user.



- Long term partnership to create profitable and loyal clients, while at the same time reaching optimal implementation of the new technology.



- Attending and inviting to events/seminars/meetings to spread information to clients about the new technology and create word-of-mouth.
- Lobbying



- **B2B:** Providing elevator manufacturers with the new technology and chasing long-term partnerships can be important to standardize the implementation of the UCP on the motors and enhance the data visualization in the technician software.
- **B2C:** Direct installation on motors is important for end-customers that doesn't want to change the whole elevator/motor. Therefore, providing an option to install the UCP for an end-customer directly on an already existing motor is important.



- Investment costs (equipment, personnel, software)
- Material and production costs
- Costs of internal coordination/administration
- Installation costs
- R&D costs



- Charge on sale for end-customers.
- Partnerships with manufacturers: receiving a cut of each sale that the manufacturer makes





EVOLUTIONARY PATH OF LEADERSHIP DYNAMICS

04

4.0 Our Team



Name: Magnus

Surname: Aas

Academic Background: Industrial Economics and Technology Management (Norwegian University of Science and Technology)

Role: "the listener"

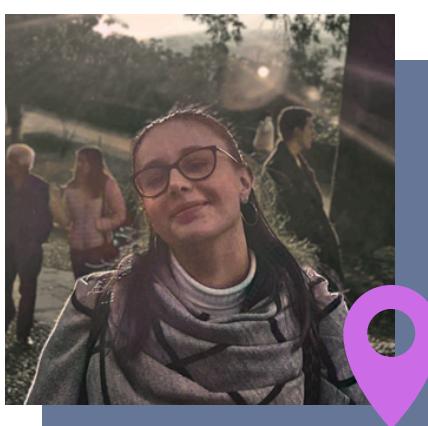


Name: Silvia

Surname: Attanasio

Academic Background: Mathematical Engineering (Politecnico di Milano)

Role: "the technician"



Name: Maria Vittoria

Surname: Benedini

Academic Background: Management Engineering (Politecnico di Milano)

Role: "the coordinator"



Name: Elisa

Surname: Bianchessi

Academic Background: Management Engineering (Politecnico di Milano)

Role: "the versatile"



Name: Giorgio

Surname: Capuana

Academic Background: Management Engineering
(Politecnico di Milano)

Role: "the researcher"



Name: Andrea

Surname: Comerlati

Academic Background: Management Engineering
(Politecnico di Milano)

Role: "the integrator"



Name: Claudia

Surname: De Chirico

Academic Background: Economics and Management
(University of Milan)

Role: "the flexible"



Name: Simen Frantzen

Surname: Øiseth

Academic Background: Industrial Economics and
Technology Management (Norwegian University of
Science and Technology)

Role: "the specialist"

4.1 The personalities of our team members

In the following chapter , we discuss the team dynamics from an individual and team organization perspective through some theoretical tools.

We delve into team composition, team development, leadership, discussing about the right balance between the level of concern for people and concern for production.

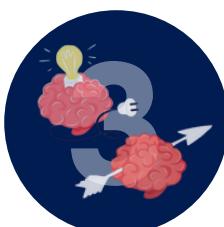
To start we think that is important to give a picture of the group. Everyone have some peculiarities and behaviours that characterize each of us, and thanks to a test (16 personalities) we were able to present ourselves based on five different topics:



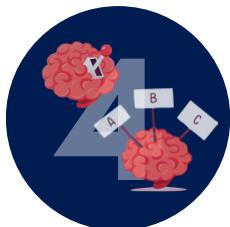
The inclination to be more extraverted or introverted



The inclination to be more intuitive or observant



The propensity to follow more the rational part (thinking) or the emotional one (feeling)



The propensity to be more judging or more prospecting



The inclination to be assertive or turbulent

Through a series of questions, these five dimensions identify 16 types of different personalities that can be grouped in four main categories with some common traits.

ANALYSTS		DIPLOMATS	
Commander	Architect	Advocate	Protagonist
Debater	Logician	Campaigner	Mediator
SENTINELS		EXPLORERS	
Consul	Logistician	Virtuoso	Entrepreneur
Executive	Defender	Adventurer	Entertainer

Intuitive and thinking personality types, known for their rationality, impartiality and intellectual excellence.

We can find four members of our group belonging to this category:

Maria Vittoria, Giorgio, Simen and **Claudia**. In particular they are all commanders. They are natural-born leaders and, belonging to their charisma and confidence, have led the group to achieve common goals. They are characterized by a ruthless level of rationality, determination and this allowed the group to focus on the objectives without any distraction.

DIPLOMATS

Intuitive and feeling personality types, known for their empathy, diplomatic skills and passionate idealism.

In this category we find two members of the Group:

Andrea and **Elisa**. Their exuberance and inventiveness allowed the group to explore new ideas in complete freedom. Their adaptability and ability to think outside the box led the group to explore different solutions.

SENTINELS

Observant and judging personality types, known for their practicality and focus on order, security, and stability.

In this group we can distinguish two different specific personality types among us:

Magnus resulted as an Executive and **Silvia** as a Consul. In fact, Magnus immediately stood out for his stabilizing force in our team, offering solutions rather than creating adversity. Silvia, brought positive energy in the group and also she was always helpful, offering guidance to others.

EXPLORERS

Observant and prospecting personality types, known for their spontaneity, ingenuity, and flexibility. In our team no one is placed in this particular group. The explorers are characterized by an initially strong determination but they end up procrastinating all the jobs and activities that someone else give to them. Usually they are not so confident in situations in which there are limits or constraints, and are more comfortable in situations in which they could explore their fantasy. Our team is characterized by a strong sense of duty and rationality so, as we can imagine, it is difficult to find this personality type in our group.

Based on the results of the test it is possible to see that the group is formed from different typologies of people, with different attitudes and also different cultural backgrounds. One of the main difficulties through the project was trying to cooperate and overcome possible problems through sharing our opinion and trying to find the best solution.

This test also allowed us to understand the first and second cognitive function within each of us. Starting from the model seen in class, the main four cognitive function are:





From this further analysis it emerged that the “analysts” group has a more rational way of thinking because they tried to adopt a model and analyze the problem to arrive at a conclusion in most situations. From this, one can say that the primary cognitive function is **thinking**.

Moreover, in our group, the ones in this group usually based their conclusion on the intuition that allowed them to understand the reality at another level, underlining the fact that their secondary cognitive function is **intuition**.



For the group of “diplomats” it’s possible to carry out a similar analysis. They tend to arrive at a conclusion based both on the rational and emotional part. We could say that the primary function is **feeling**. Also for the “diplomats” as emerged from the analysis, the secondary function is the **intuitive** one.



Lastly the group of “sentinels” are characterized by a strong attitude to feel and analyze the situation around them in a rational and emotional way. They strongly highlight that **feeling** is their first cognitive function.



The main difference between them and the previously analyzed groups is the second cognitive function. From the analysis it emerged that the ones in this group are more oriented to observe the reality and then take a decision, resulting in **sensation** as second cognitive function.

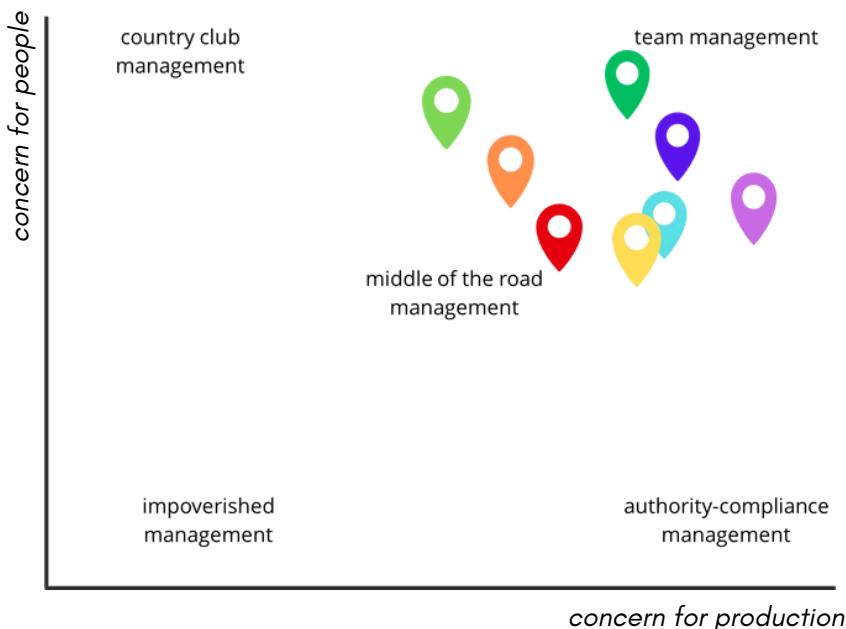
We decided to start with this test and analyze the results because our personality traits are deeply connected with our attitude and behavior in group dynamics. So to better understand the further analysis we decided to provide this short description. In the following paragraph, using different theoretical models, we try to underline and explain the group dynamics and also present our leadership growth.

4.1.1 Managerial grid

The first tool that we use to explain the group dynamics is the managerial grid. This tool is a grid that presents on the x-axis the concern for production, while on the y-axis the concern for people.

To fill this grid everyone in the group had to fill his/her personal managerial grid of the different team members and then the different visions were united, giving the result that is presented.

Such a course of action allows us to compare the individual vision of each team member to the vision that the other members have.



Through this model we describe the different leader behaviors and attitudes in our group. We decided to use this theoretical model because, thanks to our different attitudes, we managed to reach the optimal balance and also overcome the problems that arose during the project.

From a superficial analysis it is possible to underline the fact that in general the group is oriented to a team management approach. In this approach there is a high level of both concern for people and for the product. This situation allowed us, throughout the entirety of the project, to be focused on the final result but also be sympathetic towards the other group members. As it is possible to imagine, during this project, which had a duration of three months, each of us had some problems of different kinds but we always tried to be comprehensive and open to solutions regarding this. This contributed to maintaining a peaceful environment in which every participant felt free to express their opinion and point of view.

For example, after the review with the company representative we had to choose the final idea to pursue. We were all agreed about the fact that the best option was the cold plate installation, but a part of the group would like to add the part of AI integration and collection of real time data to add more value to the final customers. In this small conflict everyone felt secure and free to express their idea without problems and the other ones listened very closely to the others idea as the main focus was to provide the most optimal solution. This was only possible thanks to the different personalities inside the group and our ability to listen to each other.

From a deep analysis it is possible to see, as said before, that the different personalities also influenced the team members position in the managerial grid. The "commanders" are distributed in an heterogeneous way, this is because each of us has some differences in terms of how we approach the work. The "diplomats", as can be expected, has a position characterized by a higher concern for the people due to their attitude to combine rationality and emotion. Then the "sentinels" that are placed in the "middle-of-the-road management" allowed the group to be aligned and connected. This link to the attitude to each of us to be a transactional or a transformational leader could give a better understanding of our group dynamics.

4.1.2 Full-range model

As we discussed above, our group was heterogeneous in terms of personality types. In this paragraph we focus in particular on our different styles of leadership. In the following paragraphs we will try to find some kind of connection with all our personalities.

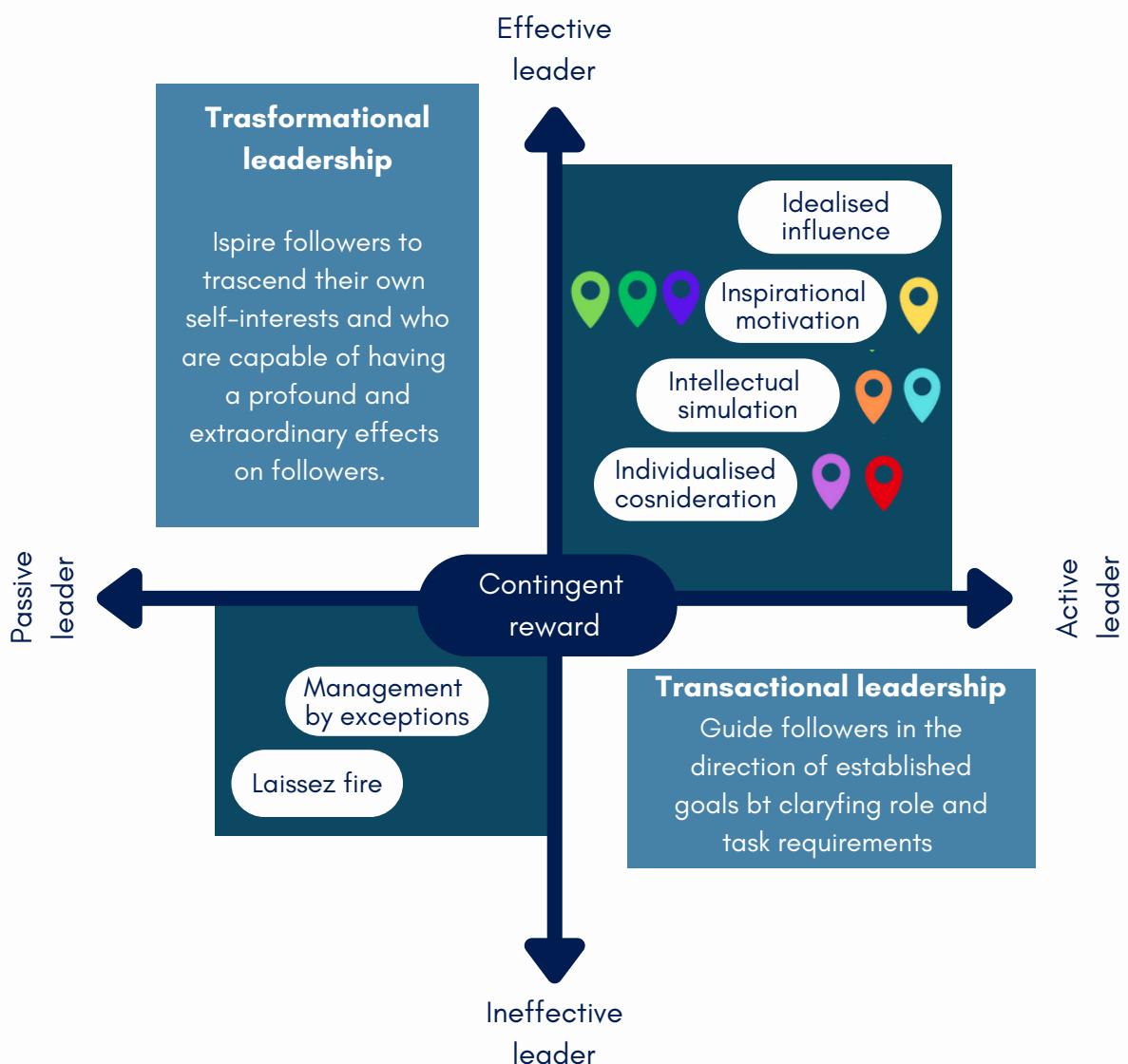
At the beginning of the group work, every member was asked to describe their own type of leadership. All of us describe ourself as either transformational and transactional leaders, while at the end we all managed to collaborate according to the different situations and we moved towards a position of situational leadership.

In fact, situational leadership theory focuses on the idea that a leader should behave according to the situation, considering not only the activities but also the team members to engage. The direction towards situational leadership was made possible by the fact that working together allowed us to know each other better, adapting our behaviour accordingly.

However, at the beginning some of us were more inclined to inspire others with suggestions or different perspectives, and therefore classified themselves as transformational leaders, while others were guiding the teammates through clarifying goals and expectations and identified themselves as transactional leaders.

The Full-range Model analyses both the Situational Leadership model and the Transformational/transactional model, trying to merge them as a continuum model.

Our initial situation:



4.1.3 Strategy Schools

Finally, before closing and telling the different problems that we overcame during the process, it is important to understand the approach of each of us to the innovation strategies.

As we know from the theory, there are different approaches to develop an innovation strategy. Two that starts the strategy from the internal environment and two that have the opposite starting point: the external environment.



In our case the situation of the group was quite homogeneous because, for all of the three ideas developed at the beginning, the starting point was based on a technological approach. Starting from this and through inside out perspective, we try to understand the different needs of the customers to create and propose an innovation that could be useful to them.

Using a learning school approach, we firstly started from a strategy that we consider the base (the three different ideas) and then we implemented it based on the external factors and the dialogue within the group.

For example, a great learning moment was the period after the first review that allowed us to talk about the three different ideas and try to understand how we could improve them in a coherent way. When we decided to eliminate some of the ideas we didn't see it as a failure but as a moment in which we understood what wasn't right and learned from it, rather than repeating the same mistake.

4.2 Evolution of team dynamics

The real challenge at the beginning of the group project was to agree on times when we were available to meet and work together. All of us are attending different courses and so we all have different schedules and preferences, in particular the transactional leaders (as we can see in the paragraph above) were less inclined to compromise, because they were more focused on the goals and the tasks organisation.

The first week we started working together, Maria Vittoria and Andrea had different ideas on how to organise the work. As transactional leaders, they were both really inclined to guide the other team members towards the common goals, dividing the different tasks in their own way.

Maria Vittoria was convinced that as a team we had to work all together during the meeting, then splitting the different tasks between different pairs which had to be the same throughout the entire project, changing only the activities and content on which couples worked on. She was convinced that in this way couples had the opportunity to connect and therefore work more productively.

Andrea instead supported a different idea: he thought that, as a team, we had to work dividing tasks in different pairs, that had to change during the project, in order to get to know each other better.

However, Maria Vittoria explained to him that, if all of us worked together, sharing ideas and common goals during the main part of the meetings, we still had a great opportunity to know the different points of view and ideas. Finally after a few days we were able to resolve the conflict, especially thanks to Elisa, who as a diplomat and transformational leader, helped the group. Reflecting upon this, it might be because of her empathy, trying to reach agreeable terms.

Some couples worked well together and stayed the same throughout most of the project, other couples changed, and sometimes some tasks were even split in groups of three people.

At the end, everyone was glad that we trusted each other enough to split the different activities according to our preferences and knowledge. We were able to become more flexible, and according to the different situations, the tasks were split in different ways. This is why we think our group moved towards situational leadership.

Moreover, at the beginning, the contribution of the transactional leaders were essential to meet the deadlines and work in a coherent and organised way. Transformational leaders, especially Simen and Magnus, were really passionate about their innovative proposal of Cold Plates and were able to explain their vision to the whole group.

As we expected, it was more difficult to combine and merge our ideas at the beginning, for different reasons; each of us had some peculiarities that the other members didn't know, resulting in difficulties to align the group. Working together at the end was easier than before because we started to know each others different perspectives.

In conclusion, we can say that working together has not been easy but that we have always been able to listen and improve, especially because of the mutual comparison.

We are convinced that at the end of the project, the work was divided naturally and carried out in a coherent way. Everyone was able to focus on different tasks depending on the situation in which they could contribute, depending on the individual knowledge, intuition, and personal preference



ANNEX

05

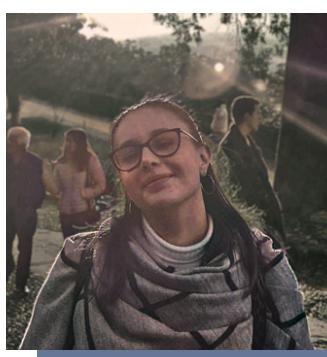
In this appendix, we would like to share our personal reflections on this group work, which allowed each of us to understand new aspects of our personalities and attitudes.



"A group project provides lasting knowledge about cooperation and development. In this leadership and innovation project, my leadership skills have been reshaped and made more efficient. Shifting the focus towards collaboration to achieve an optimal result has been prominent."



"I have had both highly positive and extremely negative group experiences in the past, so I wasn't sure what to expect from this group project. However, I was very hopeful about the diversity of personalities, perspectives, and approaches that I would encounter, despite being somewhat concerned about the random group assignment given my meticulous and detail-oriented nature. In the end, this project proved to be a rewarding experience through which I developed new and interesting skills: on the interpersonal side, I improved in areas such as dialogue, listening, and assertiveness; academically, I gained technical skills in audio-video editing, production, and post-production, as well as in overall organization and rational, targeted planning."



"In general I am not a person who likes to work in a group but also prefers to work alone, for this reason I was particularly worried initially about this group project. Still, this work allowed me to put myself in the game trying to be always open to thoughts and methodologies different from mine. I learned to listen and see things from a new perspective, enriching myself every time thanks to the comparisons I had with my teammates"



"Working in a group was an incredibly enriching experience for me. I learned to collaborate with my colleagues, appreciating the different perspectives that each of us led to the project. During the course of the project, I noticed growth in my organizational and time management skills. I learned to keep the motivation of the group high, even in the most difficult moments. This experience taught me the importance of flexibility in a collaborative context"



"This project has represented an important personal growth opportunity under different perspectives, spanning from playing a team-based orientation on decisions and interactions, to the knowledge acquired dealing with the technical challenges proposed. I feel to be a step closer to the understanding of the words leadership and team."



"Working in this team has been a great opportunity: I really appreciated how everyone was able to bring value to the project. Personally, I think that the moment of brainstorming and problem solving were the most interesting in helping me understand what is my style of leadership."



"This project work gave me the opportunity to improve my ability to collaborate with others, coordinating schedules with group mates and adapting to changes. During my bachelor I didn't have the chance to work in group and I mainly studied by myself, this is why I think this experience was so valuable for me and my future career"



"Being an exchange student, this project has provided some great social and learning experiences that I will bring back with me to Norway. Settling into a different culture, I have learned to adapt and appreciate different ways of working in a team. Throughout the process, I also feel like the versatility in the team has made me able to think more outside the box and that there always has been room for errors."

A stack of approximately ten books is shown against a light blue background. The books are stacked vertically, with their spines visible on the left and their fore-edge on the right. The colors of the book covers vary from dark blue to red, orange, and grey. The top book is open, showing its pages. The title 'REFERENCES' is overlaid in white text on the middle section of the stack.

REFERENCES

06

02. Analysis & interpretation of the brief

<https://www.prysmian.com/sites/www.prysmian.com/files/2024-03/Integrated-Annual-Report-2023.pdf>

<https://www.prysmian.com/it/la-societa>

<https://www.globaldata.com/company-profile/prysmian-spa/competitors/>

0.3 The concept of the solution

<https://www.tkelevator.com/it-it/prodotti/multi/>

<https://www.hitachi.com/New/cnews/month/2019/09/190927.pdf>

<https://cernventureconnect.web.cern.ch/ultra-light-cold-plate>

<https://www.intuz.com/blog/guide-iot-solutions-for-smart-elevator-management>

0.4 Evolutionary path of leadership dynamics

<https://www.16personalities.com/free-personality-test>