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TRANSFORMING CHANGE MAKERS FOR SUSTAINABLE IMPACT:

WHAT IS THE CURRENT MARKET LANDSCAPE AND WHAT OPPORTUNITIES DOES IT PRESENT?

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Group Abstract

Change Makers, a NUCLIO's project with a maker space in São Domingos de Rana, aims to empower the community through educational innovation. Previously reliant on European funding, it now seeks financial sustainability. This thesis develops a value proposition for Change Makers to enhance its educational and community impact, and analyzes the financial support and subsidies required to secure financial viability. The final objective is to position Change Makers as a leading project for innovation, learning, and community engagement, by establishing a unique value proposition that aligns with its educational mission and meets the needs of a diverse community.

Individual Abstract

This module of the work project explores the potential for Change Makers' maker space to establish itself as a competitive player in the market. Through an external analysis, it conceptualizes the maker space landscape, identifies key trends, and benchmarks Change Makers against five similar initiatives in the Lisbon region. Based on these insights, a segmentation and market sizing analysis defines three primary target groups: the school community, the general community, and the maker community. Additionally, an internal SWOT analysis evaluates Change Makers' current position, highlighting strengths to leverage and weaknesses contributing to operational inefficiencies, providing the foundation for stronger value propositions.

Keywords

Social Impact, Innovation, Education, Community, Market Analysis, Segmentation, Strategy

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Abbreviations

CAD: Computer-Aided Design

CAM: Computer-Aided Manufacturing

CAGR: Compound Annual Growth Rate

CCPFC: Scientific-Pedagogical Council for Continuing Education

CNC Machine: Computer Numerical Control Machine

COGS: Cost of Goods Sold

DIY: Do-It-Yourself

EBITDA: Earnings before Interest, Taxes, Depreciation and Amortization

GGTP: Galileo Teacher Training Program

IAU: International Astronomical Union

IMI: Imposto Municipal sobre Imóveis / Municipal Property Tax

INE: Instituto Nacional de Estatísticas

IRC: Imposto sobre Rendimento Coletivo/ Tax on Collective Revenue

IUC: Imposto Único de Circulação / Vehicle Circulation Tax

IPSS: Instituição Particular de Solidariedade Social / Non-Profit Entities

ISV: Imposto sobre Veículos / Vehicle Tax

MILL: Makers in Little Lisbon

NUCLIO: Núcleo Interativo de Astronomia e Inovação em Educação

NGO: Non-Governmental Organization

NPO: Non- Profit Organization

OECD: Organization for Economic Cooperation and Development

PBL: Project- Based Learning

PhD: Doctor of Philosophy

PLOAD: Portuguese Language Office of Astronomy for Development

SEA: Agência de Empreendedores Sociais / Social Entrepreneurs Agency

STEAM: Science, Technology, Engineering, Arts and Mathematics

STEM: Science, Technology, Engineering, Mathematics

SWOT: Strengths, Weaknesses, Opportunities and Strengths

VAT: Value-added Tax

VFabLab: Vitrivius Fab Lab

YoY: Year-on-Year

3D: Three Dimensional

4Ps: Product, Price, Promotion and Place

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1. EXECUTIVE SUMMARY

This impact lab project presents a comprehensive analysis and strategic recommendations for Change Makers, a NUCLIO project focused on educational innovation and community empowerment. The main objective is to transform Change Makers to achieve sustainable impact following the recent end of its European funding.

The analysis begins with NUCLIO's context, narrowing down the scope to identify Change Makers as the focus of this study. Change Makers is revealed as a project that presents significant opportunities for improvement, currently underperforming with an inefficient use of resources, not reaching its full potential. An assessment of the market landscape and relevant benchmarks is performed, presenting key opportunities, and a target market segmentation is conducted along with market sizing calculations.

The context and market analysis chapters allow to further develop a value proposition that can better position Change Makers. The value proposition chapter dives into three different value propositions for three different offerings, each aligned with a specific target segment and Change Makers' mission pillars.

The financial analysis, based on the defined value proposition, focuses on examining Change Makers' projected cash flows over time, demonstrating that Change Makers cannot achieve financial sustainability independently, and highlighting its critical need for subsidies.

In conclusion, this thesis provides an actionable framework for Change Makers' evolution and sustainability, balancing social impact with financial viability. The primary goal is to provide innovative educational experiences and maker space access to communities, while securing sustainable operations through a combination of earned revenue and subsidies.

2. INTRODUCTION

2.1. NUCLIO's Overview

NUCLIO is a non-profit organization (NPO) and non-governmental organization (NGO) for development, composed by a group of scientists, researchers, teachers, and trainers, specialized in different scientific areas as well as in areas of educational psychology and science teaching.

NUCLIO – Núcleo Interativo de Astronomia – was founded in 2001 by a group of astronomers, astrophysicists and amateur astronomers who had the dream of changing the world through Astronomy. The team started to carry out numerous astronomy events, such as science cafes, sky observations, lectures at schools, research projects with students and teacher training. This path naturally led NUCLIO to the world of education and made them understand the power it has in building a better future for all. It was for this reason that, in 2021, NUCLIO changed its name to NUCLIO – Núcleo Interativo de Astronomia e Inovação em Educação – to clarify the importance that education had gained in their activities. Currently, the organization aims to become a reference in providing holistic and engaging educational experiences, with a strong purpose of serving the community. Hence, the organization's mission is to bring innovation and development in education to all parts of the world, especially in Portugal, and to promote diversity and inclusion. The organization believes that education is the most powerful tool that humans have to offer people a responsible, tolerant, and informed way of life.

NUCLIO's mission translates into four areas of intervention which include:

- Teacher Training: NUCLIO is a training entity accredited by CCPFC - Scientific-Pedagogical Council for Continuing Education, offering accredited training to teachers across the country. NUCLIO coordinates the Galileo Teacher Training Program (GTTP), a worldwide teacher training network born in the International Year of Astronomy (2009), which remains as a legacy of this initiative. Since 2009, GTTP has trained more

than 70,000 teachers in about 120 countries. Current relevant projects in this area also include Synapses, GeoAcademy and Otters.

- Astronomy for Development: NUCLIO coordinates the Portuguese Language Office of Astronomy for Development (PLOAD), an initiative of the International Astronomical Union (IAU), which brings together partners from Portuguese-speaking countries, and aims to use Astronomy as a vehicle for promoting development.
- Scientific Outreach: NUCLIO also intervenes in scientific outreach, with special emphasis on Astronomy and Astrophysics, conducting workshops and lectures for the general public, science cafes, and observation sessions of the sun and night sky. It also promotes scientific research in the classroom, involving students in the discovery of asteroids, search for extrasolar planets, fight against light pollution, among other topics. It has also maintained, since its inception, the Astronomer's Portal (Portal do Astrónomo), a scientific outreach site with quality information in Portuguese.
- Innovation in Education: NUCLIO develops and actively participates in significant national and international projects in the field of education, with strong connections to schools, teachers, and students. NUCLIO is also involved in coordinating and/or participating in initiatives related to education, development, and outreach. The main projects included in this area are Change Makers and EXPLORE.

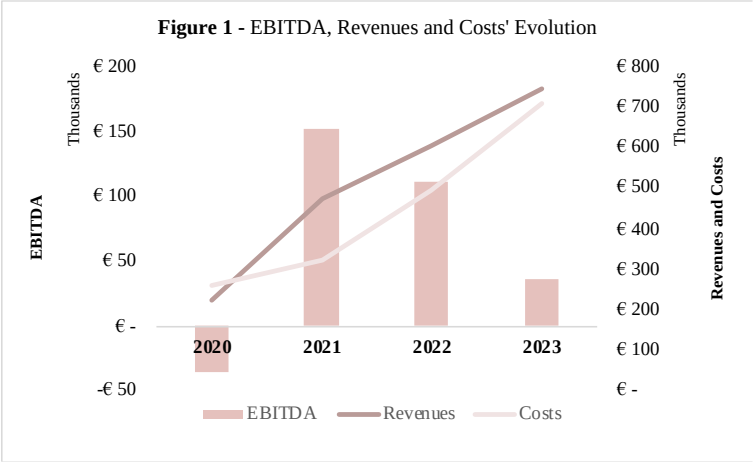
Financial Situation

Regarding the current financial situation, and after analyzing the income statements [1] for the last four years (Appendix 1), we can verify that in 2023 NUCLIO presented an EBITDA of 35,240€, corresponding to a decreasing tendency when compared with the values of 111,478€

[1] The organization's results before taxes coincides with the net result of the period. According to the codes of IRC (Tax on Collective Revenue), VAT (Value-added Tax), IMI (Municipal Property Tax), IUC (Single Circulation Tax), and ISV (Vehicle Tax), the exemption of these taxes is foreseen for non-profit entities (IPSS and other legally equated entities).

and 151,828€, in 2022 and 2021, respectively (Figure 1). This decrease is explained by total costs increasing at a higher rate than total revenues, with total revenues presenting a compounded annual growth rate (CAGR) of 25%, and total costs presenting a CAGR of 48%. From 2020 to 2021 there had been a significant improvement on EBITDA mainly due to a high increase in subsidies, donations, and legacies for exploration.

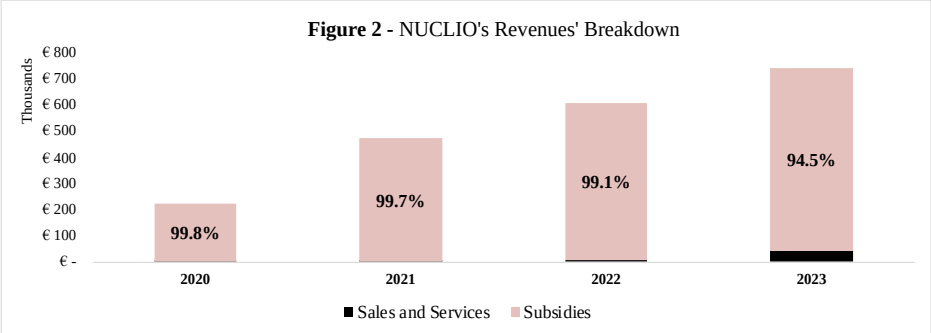
Figure 1 - EBITDA, Revenues and Costs' Evolution



Legend: NUCLIO's EBITDA has been showing a decreasing tendency since 2021, with costs increasing at a higher rate than revenues.

By analyzing the income statements of the last four years (Appendix 1), it was also possible to conclude that NUCLIO's revenues have been increasing over the years, and come mainly from subsidies, donations, and legacies for exploration, being the most substantial ones the European Union funds.

Figure 2 - NUCLIO's Revenues' Breakdown



Legend: NUCLIO's Revenues coming from sales and services are very low and not substantial when compared with subsidies, donations, and legacies for exploration.

In the figure above we can see that in 2020, approximately 99.8% of total revenues were referring to subsidies, and in 2021 and 2022, this value remained relatively constant. In 2023, this value decreased to 94.5%. However, these values remain very low and are not significant, with NUCLIO's revenues remaining heavily reliant on subsidies.

2.2. Scope Definition

The four NUCLIO's areas of intervention presented in the section above include a current total number of 19 active projects and 9 ongoing initiatives (Appendix 2), some of them financed by European funds.

Currently, NUCLIO is more focused on projects that will be concluded this year or that require more effort to achieve their goals, all of them involving Teacher Training and Innovation in Education. This impact lab project will specifically focus on the Innovation in Education area. In the Innovation in Education area, the current main projects include the following:

- EXPLORE, *the Expeditionary Program for Learning Opportunities in Analog Space Exploration*, which is an initiative designed to engage students in space exploration experiences while aligning with their STEAM (Science, Technology, Engineering, Arts and Mathematics) curriculum requirements. This Erasmus+ funded project invites students to participate in activities that simulate moon or mars environments, providing hands-on experiences of international space missions;
- SoundScapes, *Sonification Environments for STEAM Learning,* which proposes an innovative STEAM approach with an emphasis on Arts, where students design and use a sonification environment, converting numeric data related to school curricula into sound. This approach aims to increase student engagement and motivation while promoting an inclusive environment, as they learn, through exploring the hearing sense (especially relevant for the visually impaired), to communicate and connect with each other through the universal language that is music;

- Change Makers: A space for creation, learning and innovation where imagination is the limit. Change Makers offers students, citizens, and creatives the opportunity to develop projects working with cutting-edge technologies (3D printers, Laser Cutter, CNC Machine, among others) and have the dedicated monitoring of professionals with expertise in several scientific and educational fields.

In contrast to EXPLORE and SoundScapes, Change Makers is not currently funded by the European Union. Moreover, Change Makers has been characterized as a project with substantial untapped potential, with a current inefficient use of resources, despite its current low performance. This project has been underperforming but it has significant room for improvement, and for this reason, it is the focus of our impact project lab.

2.3. Change Makers Concept Introduction

Change Makers, founded in 2021, is an innovative educational initiative that empowers students, teachers, and community members to develop critical skills for a sustainable future and engage with cutting-edge technologies (Change Makers n.d.). Regarding Change Makers' mission, it is a project that aims to:

- Innovate in Education by involving schools and promoting key skills for a more educated, competent and sustainable future;
- Empower the Community offering training to all age groups, promoting skills, innovative thinking and a better profile to thrive in life;
- Raise Citizens' Voice by supporting the creation of innovative solutions that may benefit the community and that have the potential to make a difference.

The current Change Makers team dedicated to this mission is a small team of three people:

- Coordinator of Change Makers: graduated in Biology, completed a Master's in the same area, and a Postgraduate degree in Educational Psychology. She is currently pursuing a

PhD in this field and is also a certified trainer by the CCPFC. Her main goal is to involve the whole community in sharing knowledge and making learning an accessible path for everyone who wants it;

- Member 1 of Change Makers: graduated in Physics, completed a Master's in Cognitive Science and another in Anthropology. He is a researcher in Biophysics and Social Psychology and has extensive experience working with students and a strong desire to enhance education. His main interests and responsibilities within Change Makers are related to vector drawing, electronics, and programming;
- Member 2 of Change Makers: graduated and completed a Master's in Energy and Environment Engineering. He is primarily responsible for the maker space's equipment and materials, and is more focused on 3D modeling, printing and laser cutting.

Change Makers comprises a maker space in São Domingos de Rana, Cascais, with the following equipment:

- 3D Printers: allow the transformation of any 3D digital design into real objects;
- Laser Cutting and Engraving Machine: digital manufacturing machine that works through wear, allowing the creation of physical pieces through vector drawing;
- CNC machine: digital manufacturing machine that works through mechanical wear;
- Vinyl Plotter: allows transforming vector drawings into vinyl stickers;
- Mechanical welding machine: allows joining metal pieces;
- Electronic soldering station: for soldering cables and forming electrical circuits;
- Webstudio: includes a computer, microphone, screen, lights and a chroma key backdrop, for creating videos, podcasts, filming (currently it is not being used).

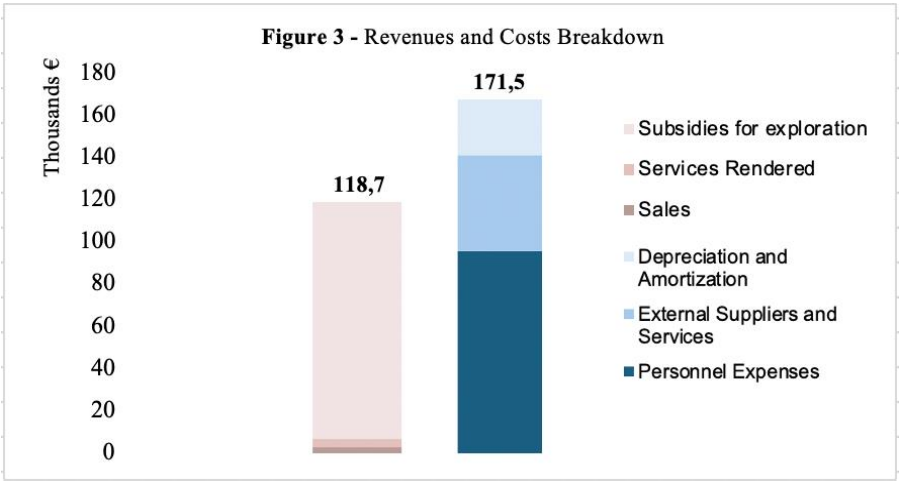
The Change Makers' project was financed by European funds from 2021 to 2023, which allowed the organization to offer some free workshops for the community and for public schools, leading to high levels of participation and engagement especially in schools. However,

and since then, only two workshops were held for free, specifically for staff conducting extracurricular activities, subsidized by the Cascais City Council. Besides these two workshops, no more workshops were held for the community. One summer course for children and young people was offered but did not happen due to a lack of participants (likely because of late promotion and a high price). There were no more attempts to offer paid workshops to the community so far.

Change Makers' Financial Performance

After an analysis of Change Makers' financial statement for 2023 (Appendix 3), which demonstrates the accumulated total revenues and costs since the project was founded in 2021, total revenues of 118,731 € and total costs of 171,450 € were concluded, resulting in a negative balance of -52,719 € at the end of this year.

Figure 3 - Revenues and Costs Breakdown



Legend: Change Makers' total accumulated revenues by the end of 2023 are mainly operating subsidies, with sales and services rendered constituting only 5.7% of total revenue. Total accumulated expenses are mainly constituted by personnel expenses.

The figure above illustrates the accumulated revenues and costs breakdown for Change Makers by the end of 2023. Total revenues are divided into sales, services rendered and subsidies. Sales and services represent approximately 5.7% of total revenue, while subsidies constitute the remaining and substantial part of it (94.3%). Regarding the total costs, personnel costs constitute the largest expense category (57.3%) (Appendix 3). The resulting net loss at the end

of the year 2023 is attributed to the fact that the last tranches of project funding for that year had not been yet received, as they were only received in 2024.

As of 31 August 2024, the total recorded costs are 177,170€ and total revenue is 187,570€, which results in an overall positive balance of 10,401€ for the project at that date (Appendix 4). From this analysis it is possible to conclude that, similarly to NUCLIO, the Change Makers project is heavily reliant on subsidies, particularly from European Union funds, and that the total project's revenues only exceed total costs due to that. However, from 2024 onwards Change Makers is no longer expected to receive European funding, and hence diversifying revenue sources and seeking other sources of financial support becomes essential.

The next chapter will focus on analyzing the market landscape and benchmarking competitors to better understand how Change Makers can position itself in the market. Based on this analysis, a new value proposition for Change Makers will be developed, through which Change Makers would improve its educational and community impact, while diversifying revenue sources to reduce financial dependency. Lastly, the financial implications resulting from this value proposition will be quantified, the need for subsidies will be evaluated, and final recommendations will be presented.

This impact lab project aims to answer the following key question:

"*How can Change Makers adapt to improve its educational and community impact while ensuring financial sustainability?"*

3. MARKET ANALYSIS AND BENCHMARK

3.1. Maker Spaces

Change Makers operates within the dynamic landscape of maker spaces, which are collaborative environments that promote hands-on learning and foster a community of innovators, creators, and educators. These spaces have emerged as transformative elements in modern education and technological advancement, representing a significant shift towards experiential learning and practical skill development (Valente De Jesus Rosa et al. 2018).

Firstly, these maker spaces are characterized by their hands-on learning, allowing users to apply theoretical knowledge, engage in experimentation, and develop tangible solutions, through practical experimentation and project-based learning (Lakehead University n.d.). Secondly, they are also characterized by their access to equipment and technologies for prototyping and digital fabrication, such as 3D printing, CNC machines, and electronics, enabling participants to engage in digital fabrication and prototyping, thus bridging the gap between theory and practice (Lakehead University n.d.). Moreover, a critical focus of these spaces is the promotion of STEM (Science, Technology, Engineering, and Mathematics) education, fostering people's engagement by creating environments that encourage community involvement and participation in STEM fields (Lloyd's Register Foundation 2022). Finally, these maker spaces are also characterized by offering workshops, courses, and other educational programs, typically offered to support individual learning and community engagement, and often linked to broader educational goals of fostering creativity and entrepreneurship.

Thus, within this ecosystem, Change Makers positions itself by offering access to state-of-the-art equipment and educational workshops at its Cascais-based initiative. Indeed, by providing courses and fostering a focus on education and innovation, Change Makers aligns with the core values that define maker spaces, being a key driver of creativity and technological advancement.

As a final note, it is important to distinguish between maker spaces and Fab Labs (shorter for Fabrication Laboratories or Fabulous Laboratories), which are digital fabrication laboratories to play, create, mentor, and invent (Fab Labs n.d.), supported by a global FabLab association. A key distinction of Fab Labs is their requirement to adhere to the Fab Charter, which outlines specific principles and guidelines. In contrast, maker spaces operate without a predefined structure, instead focusing on providing an open, accessible environment that encourages creativity, exploration, and hands-on experimentation within the maker mindset (Valente De Jesus Rosa et al. 2018, 7). Although Change Makers defines itself as a maker space rather than a FabLab, this thesis will use the term “maker space" broadly to also include Fab Labs. Given their overlapping core activities, understanding the maker spaces’ market requires equal consideration of Fab Labs.

Global and Local Trends

The global landscape of education, in which maker spaces are included, is shaped by several significant trends that present ample opportunities for growth and alignment. One of the most prominent trends is the rise of STEAM education (European Commission 2022), which extends the traditional STEM framework by integrating the Arts into the curriculum (Institute for Arts Integration and STEAM n.d.). This interdisciplinary approach emphasizes creativity alongside technical skills, promoting a more holistic education, which is being widely adopted in various educational settings. Consequently, this rising trend increases the diversity of maker space users and enhances the flexibility and utility of these spaces.

Another key trend is project-based learning (PBL), an educational method that encourages students to engage actively with real-world projects. Maker spaces are particularly conducive to PBL, as, for example, they provide the necessary environment and tools for students to apply their knowledge in tangible ways, thereby enhancing their learning experience (Farber 2017).

Furthermore, there is a growing trend of collaboration between industry and education, where businesses partner with educational institutions to ensure that students acquire the skills necessary for the modern job market (University of Minnesota 2024). This collaboration fosters the development of maker spaces as venues for real-world problem-solving.

At the local level, Portugal—specifically Lisbon and Cascais—exhibits trends that align with the global maker space and educational innovation movement. There is a growing interest in technological education, driven by Portugal's ongoing digital transformation, which has led to an increasing demand for programs that teach digital literacy, coding, and other technological skills. These initiatives reflect a broader effort to equip the next generation with the skills necessary to accelerate the country's digital transformation (Portugal Digital 2022).

Additionally, the Portuguese government has introduced various initiatives to promote innovation, aimed at fostering technological education, entrepreneurship, and innovation. Naturally, these efforts create opportunities for partnerships and funding for maker spaces and educational hubs (FCT 2021).

Finally, as industries become increasingly digitized, there is a local demand for enhanced digital skills within the workforce (IT Insight 2021). Maker spaces, with their focus on digital fabrication, can serve as an ideal platform for equipping individuals with relevant technical expertise, thus responding to this growing demand.

3.2. Competitive Landscape

The benchmarking process conducted for Change Makers aims to better understand the landscape in which the initiative operates. The objective was to identify the leading institutions and innovation hubs in a relevant area, as well as the types of programs and services provided. As a result, this benchmarking seeks to identify potential opportunities for Change Makers to grow and broaden their impact.

Given that Change Makers is based in Cascais, located within the Lisbon metropolitan area, the benchmark focused on maker spaces and FabLabs within this region, analyzing their offerings and the scope of their reach within the community (Appendix 5). In this sense, within the Lisbon metropolitan region, five key players were chosen: FabLab Lisboa, MILL (Makers in Little Lisbon), FabLab Sintra, Vitruvius FabLab, and EDP FabLab. Before proceeding with the analysis of these competitors, it is important to recognize the presence of other competitors, such as FabLab Benfica, FCT FabLab, and Inetum FabLab. However, they have been excluded from this competitive analysis for two primary reasons. Firstly, FabLab Benfica and FCT FabLab, both located within educational institutions - specifically, the Higher School of Education at the Polytechnic of Lisbon and the Faculty of Sciences and Technology at Universidade Nova de Lisboa - share a similar business model with Vitruvius FabLab at ISCTE and as such, to avoid redundancy and maintain clarity, these labs will not be assessed.

Secondly, Inetum FabLab adopts a more corporate-oriented approach, focusing primarily on serving professionals through specialized workshops, and, as such, this emphasis on professional collaboration and tailored commercial solutions sets them apart, making them less aligned with Change Makers' community-focused mission of broader public engagement.

In this benchmarking process, a comparison of these competitors will be performed, and the analysis of each competitor will begin by providing a general overview. Then, an analysis of the main segments that each space aims to reach will be conducted to understand their target audience and demographics. Following this, a detailed examination of the 4Ps (product, place, price, and promotion) will be conducted, as these elements are essential in helping businesses create successful strategies that meet customer needs by offering the right product, at the right place, with appealing pricing, and effective promotion (Novak 2024). Therefore, analyzing these aspects in competitors is crucial for gathering insights that will sustain Change Makers' value proposition development, ensuring it aligns with market demands and opportunities.

Additionally, given the importance of financial sustainability for Change Makers, a focus on financing and revenue sourcing will also be incorporated.

Finally, relevant considerations specific to each organization will be highlighted, as they might provide insights into unique strengths or areas for improvement that could inform Change Makers' strategic decisions. Note that to gather the information presented below, a comprehensive approach was taken, utilizing multiple sources, including the websites and social media channels of these competitors, as well as direct meetings and communication with their representatives in the case of FabLab Lisboa and EDP FabLab.

- **FabLab Lisboa**

FabLab Lisboa, established in 2013 and fully funded and operated by Lisbon's City Council, is a digital fabrication and prototyping space. As a public facility, its core mission is to democratize access to technology, providing the local community with a platform to transform ideas into tangible projects.

Regarding its target audience, it aims to serve citizens of all ages and backgrounds. Its inclusive approach focuses on serving a wide range of people within the local community, which includes individual hobbyists and makers, young learners and students, entrepreneurs and startups, and even general citizens who wish to explore digital fabrication, regardless of having no technical expertise. Regarding schools, they occasionally visit the space, but no specific workshops or activities are organized for field trips or other school-related programs.

When it comes to products, FabLab Lisboa offers a wide range of industrial-grade digital fabrication equipment, including CNC machines (large and small), 3D printers, laser cutters, vinyl cutters, and electronics workbenches, as well as access to CAD and CAM software for digital design, with machine operation assistance included. Furthermore, they have also conducted workshops on diverse topics, such as laser cutting, embroidery, and ceramics. It is

worth noting that these workshops are held in collaboration with external experts, due to lack of in-house expertise. While this provides flexibility in covering a larger number of topics, it also restricts the lab's ability to deliver fully comprehensive learning experiences, from within. As a last note, these workshops are primarily part of their push strategy, used to attract people to the space.

Regarding its price model, they offer free "open days" on Mondays and Tuesdays, allowing users to explore and experiment with the equipment at no cost. On the other days, they engage in collaborative projects with universities and entrepreneurs. While these initiatives have no monetary compensation, participants contribute with their knowledge or through organization and maintenance of the space. Additionally, workshops are generally free, reinforcing their mission of democratizing access to digital fabrication. This approach is sustainable as FabLab Lisboa is fully operated and financed by the Lisbon City Council, through its Municipal Directorate of Economy and Innovation.

Concerning the place, it is located in Mercado do Forno de Tijolo, a central public space in Lisbon. It is important to note that the FabLab has identified a significant challenge with its location, as it isn’t easily accessible, lacking wider public transportation options.

Lastly, and regarding promotion, FabLab Lisboa primarily relies on social media, particularly Instagram, to promote its services and workshops, as its website is currently under development. Their workshops are a central element of their promotional strategy, serving as a push mechanism to engage users and encourage them to explore the space further.

As a final regard, it is relevant to note that FabLab Lisboa has expressed a desire to implement more regular and structured training programs, as opposed to their current somewhat irregular workshops. They recognize the value of establishing consistent schedules for both staff and participants, as regularity not only helps the users plan their engagement, but also ensures the

staff can better manage their resources and time (Interview, FabLab Lisboa, October 16, 2024; Câmara Municipal de Lisboa n.d.).

- **MILL (Makers in Little Lisbon)**

MILL is a vibrant, multi-disciplinary space designed for invention and creativity, equipped with tools and machines that cater to a wide range of creative projects. Unlike traditional maker spaces, MILL encourages residents to bring their own equipment, fostering a differentiated environment where artists, designers, and technologists collaborate to bring their ideas to life.

Regarding its target audience, MILL's primary emphasis is on assisting artists in realizing their artistic projects. However, as it embraces a collective approach dedicated to sharing knowledge and collaborative work, individuals from various backgrounds are welcome to participate in the creative process. Additionally, it welcomes collaborations with corporate teams and schools, especially concerning their workshop offerings.

Concerning its products, it offers various services designed to support creativity and innovation, such as workshops and training sessions in areas like programming, robotics, and 3D printing. Moreover, the space is equipped with a variety of tools and machines for different types of fabrication, including laser cutting, CNC, woodworking, and metalworking, as well as a specialized electronics station with soldering, testing equipment, and other tools for hardware projects.

When it comes to the price model, MILL operates on a model supported by monthly contributions from its residents. Moreover, the pricing for activities varies based on duration and type, with both free and paid options available. This flexible pricing structure allows for a range of events accessible for individuals and groups with differing budgets.

Regarding the place, it is located in the heart of Lisbon, near Avenida da Liberdade, being well-positioned to attract a diverse group of people and serve as a hub for sharing ideas and creating inventions.

Finally, concerning its promotion, MILL promotes its offerings through its website and social media channels, as it believes that by utilizing these platforms, it can effectively communicate upcoming events, workshops, and collaborative opportunities to its community (MILL 2024).

- **FabLab Sintra**

FabLab Sintra is the result of a partnership between the Agência de Empreendedores Sociais (SEA) and the Sintra City Council. Designed with the local community in mind, it fosters informal, peer-to-peer technical education, creating an ideal environment for invention and innovation. Its mission is to serve as a space for experimentation, prototyping, and turning ideas into tangible projects.

Regarding its target audience, FabLab Sintra caters to a diverse audience, ranging from entrepreneurs and NPOs to professionals, university students, children, youth, and the general community. Additionally, the lab hosts school groups for open lessons, reinforcing its commitment to education and community engagement.

In terms of products, FabLab Sintra is equipped with cutting-edge tools, including laser cutting and engraving machines, 3D printers, Vinyl Plotters, sewing and digital embroidery machines, and carpentry tools. Moreover, the lab offers a broad range of workshops, covering topics such as AI Illustrator, art and entrepreneurship, creative sewing, 3D printing, embroidery, and laser cutting and engraving.

Concerning its price model, FabLab Sintra offers a balanced pricing model that ensures accessibility while also generating revenue, from more intensive or commercial use. On the one hand, workshops are free, as is experimentation and prototyping on "Open Days" held on

Wednesdays and Saturdays. On "Closed Days" (Thursdays and Fridays), however, the use of equipment for production or commercial projects involves a fee, charged based on time of use. Additionally, there are costs associated with file preparation and staff assistance, even on Open Days, ensuring that when needed, users have access to relevant expert guidance. Importantly, similar to FabLab Lisboa, FabLab Sintra's operations are funded by the municipality, ensuring financial sustainability regardless of demand.

Regarding its place, located in Queluz, Sintra, FabLab Sintra offers a spacious and unique facility in its region, providing ample room for experimentation and workshops. Its location offers accessibility for the local community, aiming to be a supportive resource for innovation in the area.

Lastly, concerning promotion, FabLab Sintra promotes its activities and services through its website and social media platforms, including Instagram and Facebook. Furthermore, the lab also benefits from promotion and support by the Sintra City Council, which helps boost its visibility and outreach within the local community and beyond.

As a final regard, a notable feature of FabLab Sintra is its structured schedule. The lab operates with dedicated "Open Days" for prototyping and experimentation (Wednesdays and Saturdays), "Closed Days" for production work that involves paid equipment use (Thursdays and Fridays), and a specific day for workshops and presentations open to the community, schools, universities, and associations (Tuesdays). This regularity is important for both users and staff, as it allows for better planning and organization, resulting in a maximization of engagement with the local community (FabLab Sintra 2024).

- **Vitruvius FabLab ISCTE-IUL**

Vitruvius FabLab (VFabLab) is a digital fabrication laboratory that caters primarily to the academic and research community. The main aim of this laboratory is to develop CAD/CAM

models to produce architectural models, explore modular construction systems, and design solutions based on participatory design processes, therefore providing solutions for communities that address real and local problems.

Regarding its target audience, VFabLab serves a broad audience, but its main focus is ISCTE students, particularly those in the Master's program in Architecture, followed by research projects from different departments. Moreover, while external clients are not its primary focus, the lab also serves a diverse range of users, including individuals with personal projects, small businesses, schools, municipalities, and companies, especially those in the fields of architecture, design, and construction.

In terms of products, VFabLab specializes in CAD design and CAM production, but offers other digital fabrication tools and services, and is equipped to handle projects in product design, architecture, and other related fields. In addition to these core services, the lab offers 3D scanning technology for high-resolution digitization of objects and artifacts, with post-production services for various applications. Finally, it also conducts workshops, primarily focused on topics related to architecture.

Concerning its price policy, VFabLab charges for machine use, with pricing calculated in half-hour increments and with ISCTE students benefiting from discounted rates, while external users pay higher fees. Similarly, the workshops offered by the lab are also fee-based, with lower costs for ISCTE students compared to external participants. This tiered pricing model aligns with their target audience, ensuring affordability for students while generating revenue from external clients.

Regarding its place, as part of ISCTE University, VFabLab is situated within their well-established academic institution in Lisbon. Its integration into the university provides it with a

steady flow of student and research-based projects, while its open-door policy to external clients helps maintain its relevance in the broader community.

Lastly, in terms of promotion, VFabLab promotes its services mainly through its website and social media platforms. Additionally, within the university, the lab uses posters and other physical advertising to reach the student population, ensuring its visibility on campus and attracting participants to its workshops and services (Vitruvius FabLab n.d).

- **EDP FabLab**

EDP Fab Lab is an innovation hub created by the EDP Group to foster a culture of problem-solving. Currently, its primary mission is to promote creativity and innovation within the EDP Group. Initially conceived as a more community oriented FabLab, it has since developed a more corporate focus, but remains committed to its community values, boosting entrepreneurship and active citizenship.

Regarding its target audience, EDP FabLab primarily caters to two main segments: the internal EDP community and the university academic sector. However, as mentioned earlier, EDP FabLab continues to uphold its community-oriented approach, welcoming visits from vocational and secondary schools, and individual entrepreneurs.

In terms of products, EDP FabLab offers access to a large assortment of equipment, including electronics workbenches, 3D printers (both filament and resin), waterjet cutting machines, laser cutters, and CNC machines. However, unlike some other FabLabs, users do not operate the machines directly: instead, the lab's staff handle the equipment, providing guidance and support for projects. In addition to offering machine access, the lab also conducts workshops on topics such as BBC microbit and programming.

Regarding its price policy, EDP FabLab offers workshops and machine usage free of charge as part of its community support efforts, particularly for academic users. For corporate clients,

however, there is a fee structure in place. Therefore, while students can access machine usage without any costs, companies are required to pay for these services, allowing the lab to balance its community-driven mission with its more corporate focus, strategically supported and financed by its parent company.

Concerning its place, EDP FabLab is situated in Moscavide within a research institute, presenting a more formal and less creative environment than the previously mentioned labs. Also, a notable drawback is that it is not easily accessible by public transportation, which may pose a challenge for the general community.

Lastly, when it comes to promotion, the lab promotes itself primarily through internal channels, such as Microsoft Viva Engage, an internal social network platform that connects the EDP network across multiple countries, being the key communication tool. Additionally, the lab maintains an external presence through Facebook, further expanding its outreach to a broader audience (Interview, EDP FabLab, October 17, 2024; EDP 2024).

Regarding the competitive landscape, it is important to note that although FabLab competitors exist abroad, the scope and activities of the analyzed local maker spaces closely mirror those of their global counterparts. Thus, this competitive analysis focused exclusively on local players, avoiding redundancy, and ensuring that the research remained relevant and insightful for understanding the specific dynamics and opportunities of the local Portuguese market.

In conclusion, this competitive landscape reveals a diverse set of competitors, each with distinct approaches and business practices. FabLab Lisboa and FabLab Sintra, both municipally operated and focused on broad community access, align most closely with Change Makers' mission, providing a key insight into the need for subsidies to ensure financial sustainability. Nonetheless, all the competitors provide valuable insights into how Change Makers can

structure its operations, learn from best practices, and differentiate itself, particularly in the Cascais and Oeiras region.

3.3. Target Market Segmentation

Market segmentation involves viewing a heterogeneous market as a set of smaller homogeneous segments, each responding to different product preferences (Smith 1956, 6). In the context of Change Makers, understanding that various groups may have different needs and expectations regarding maker spaces, it becomes essential to identify and analyze potential market segments. Through such, Change Makers can customize its value proposition and ensure that each target group is served effectively.

The most common criteria for segmentation include demographics, psychographics, and behavioural factors. Demographic segmentation relies on easily measurable variables such as age, income, and education, thus providing a more straightforward way to categorize users. In contrast, psychographic and behavioural criteria focus on more qualitative aspects, including lifestyle, values, interests, and specific behaviours related to product or service usage (Kotler, Keller and Chernev 2021, 154-161).

Based on these factors, the following segmentation approach will reflect previous conclusions on market trends and the benchmarked competitors' segmentation, as the needs within each segment are similar and can be readily identified and grouped. Additionally, Change Makers' past offerings are also considered. Thus, it is possible to present a clear target group segmentation for Change Makers:

Target Group 1 – School Community

In terms of demographics, this group is primarily composed of children aged from 3-18 years old, encompassing all educational levels within the Cascais, Oeiras, Sintra, Amadora and

Lisbon municipalities. This demographic is readily accessible, supported by the relative proximity of Change Makers' location and schools' location.

In terms of psychographics, the School Community segment—which reflects the perspectives of students, parents, and educators—demonstrates a strong interest in educational innovation, particularly in hands-on learning approaches. Behaviorally, this target group is likely to engage with the maker space occasionally, primarily through participation in educational experiences such as workshops organized by Change Makers.

Target Group 2 – General Community interested in Lifelong Learning

In terms of demographics, this group consists of a wider age range between 18 and 64 years old, who reside in Cascais and Oeiras municipalities and its nearing parishes. Psychographically, they value lifelong learning and personal development, motivating them to seek out new experiences that involve technology, creativity, and DIY activities (UNESCO Institute for Lifelong Learning 2022, 103). Behaviourally, this segment is likely to engage with the maker space on a moderate basis, as they seek out on-going learning opportunities, fulfilled by participating in various workshops and community events.

Target Group 3 – Maker Community

In terms of demographics, this group is primarily composed of adults aged 20 to 54, and includes occupations such as entrepreneurs and crafters, coming from the regional Cascais and Oeiras' municipalities. In terms of psychographics, these individuals are characterized by a creative, hands-on, innovative mindset. Behaviourally, this target group tends to engage occasionally or frequently with the maker space, utilizing its equipment for projects and prototyping, and fostering collaboration and knowledge sharing (Oswald and Zhao 2021, 8).

Overall, considering Change Makers' mission of innovating in education, empowering the community, and raising citizens' voice by supporting impactful solutions, the three defined segments are key targets for Change Makers, and will benefit from a tailored value proposition.

The School Community constitutes a key target for Change Makers because it directly supports innovative education. Change Makers can help students develop important skills like problem-solving and teamwork, thus aligning with its mission to improve education.

Furthermore, the General Community interested in Lifelong Learning segment is well-aligned with Change Makers' emphasis on lifelong learning and empowering the community. As this target group actively searches for opportunities to learn new skills and participate in creative activities, Change Makers can encourage them to explore technology and innovation.

The Maker Community segment, mainly consisting of creatives, entrepreneurs and DIY-ers, aligns with Change Makers' goal of raising citizens' voice and supporting impactful solutions. Change Makers can empower them to develop projects, which will drive for the creation of impactful solutions and dynamism of the local community and economy.

Market Sizing Analysis

After identifying the most relevant target segments for Change Makers, it is essential to conduct a market sizing analysis. An important conceptual note must be made here. Market sizing is a flexible concept and tool which can be used to estimate the potential market either in terms of revenues or in terms of users (Kotler et al. 2021). This analysis will therefore estimate market size in terms of potential participants (for the School Community and General Community interested in Lifelong Learning segments) or users (for the Maker Community segment).

To reflect this broad community focus, and to provide a more comprehensive perspective, we will use a top-down approach.

Firstly, in this chapter, we will conclude a broad estimate of the potential market size. This number represents the total theoretical market for Change Makers, encompassing all individuals who could potentially engage with the project and maker space. It is based on broader demographic criteria such as age and geographical location, as set forth previously in this

chapter. The relevance of this approach lies in understanding the overall market opportunity before refining it further to consider the practical reality of Change Makers. Later, in chapter *5. Financial Analysis,* we will narrow down this estimate by factoring in the Change Makers' specific value propositions developed, with its capacity limitations, thus determining the realistic projected customer base.

A critical factor in this market sizing analysis is geography. Change Makers is centred on a physical maker space in São Domingos de Rana, within the municipality of Cascais, thus inherently posing geographical constraints. Therefore, the primary catchment area is defined as Cascais and Oeiras municipalities, both with a reasonable proximity to the maker space.

Then, for certain segments, other neighbouring municipalities with their bordering parishes—such as Sintra, Amadora, and Lisbon—may be considered, based on travel distance reasonable limits and competition considerations (Appendix 6.1).

Target Group 1 – School Community

For the first segment, which refers to the school community (ages from 3 to 18 years old), private and public schools within the Oeiras and Cascais Municipalities were considered, as well as in Amadora, Sintra and Lisbon municipalities, making up a total of 972 schools (Instituto Nacional de Estatística (INE) 2024).

Through simple calculation - summing the total number of students across all municipalities - it is possible to reach a total market sizing value for this segment of 264,587 students (Appendix 7). Complementary calculations show that the public-school sub-segment accounts for 173,539 students, while the private school sub-segment comprises 91,048 students (INE 2022).

Target Group 2 – General Community interested in Lifelong Learning

For the second segment, and by targeting the General Community aged 18 to 64, a more straightforward demographic approach is applicable due to the broader scope of this group.

It is important to note that, based on a survey conducted for assessing this target segment (Appendix 11) that gathered approximately 200 responses, 100% of respondents answered "Agree" and "Strongly Agree", with only one respondent answering "Neutral (Neither agree nor disagree)", to the question 11: "To what extent do you agree with the statement: *"Personally, I see lifelong learning as an important part of my personal and career progress*"". Therefore, for assessing the potential market size for this target segment, it is considered that the General Community has this interest in Lifelong Learning.

Unlike the previous segment, which is dependent on specific institutions like schools, this segment considers the total number of potential participants for this age range, in the Cascais and Oeiras municipalities, as well as in the bordering parishes of the neighbouring municipalities of Lisboa, Sintra and Amadora (Appendix 6.2).

Through the aggregation of population data from each municipality and parish, it can be concluded that the market size for the General Community interested in Lifelong Learning segment of Change Makers corresponds to a total of 376,074 potential participants, reflecting a robust segment worthy of exploring (Appendix 8).

Target Group 3 – Maker Community

For the third segment, focused on the Maker Community as previously described in this chapter, our approach starts by considering a more geographic limited area for market sizing, only including the municipalities of Oeiras and Cascais. This limit results from the fact that the primary appeal for this segment is the access to specialized equipment, and we must recognize that other Fab Labs and maker spaces – located in Lisbon and Sintra - already serve users in a very similar way, as concluded in the chapter *3.2. Competitive Landscape.*

For concluding the market size estimates for this segment, we assume that people within this age range (20 to 54 years old) and geographic region will be potential users, and consequently

may potentially fit into this Maker Community category. Hence, and based on INE, we conclude that the market size for this segment corresponds to a total of 170,585 people, with 76,259 people from Oeiras municipality and 94,326 from Cascais municipality (Appendix 9).

It should be noted that this group is particularly difficult to quantify due to the lack of reliable data on the percentage of population identifying with or interested in this Maker Community. Consequently, only through further analysis using competitor proxies in chapter *5. Financial Analysis* we will derive a realistic number of people interested in the service, in this case, equipment usage.

3.4. Change Makers' SWOT Analysis

Given our assessment of the competitive landscape and target market segmentation, it is now crucial to conduct a thorough internal analysis of Change Makers to assess its current position and identify opportunities for growth and improvement. The SWOT analysis, defined as a strategic planning tool that helps an organization identify its strengths, weaknesses, opportunities, and threats (Dalton 2019) will consequently allow us to make a more informed choice, based on Change Makers' resources and objectives, on how to effectively define a unique value proposition.

Strengths

Change Makers boasts several distinct strengths that when elevated to their true potential, can contribute to its success. The most noteworthy strength lies on their commitment to offer innovative and hands-on education and cutting edge-technology, setting it apart from other more traditional educational institutions. As opposed to more conventional education programs which tend to focus on theory, Change Makers emphasizes hands-on experimental learning, as seen both through their vision and offered workshops, such as learning mechanics through an electric motor board experiment or using 3D printers. Here associated is another strength of Change Makers, of already having tangible resources, as by having a well-equipped space with

3D printers, CNC machine and Laser Cutting machine, in which users can engage in real-world applications of their theoretical ideas (Change Makers n.d.).

Moreover, another of Change Makers' strengths is its multidisciplinary team with very diverse backgrounds (biology, physics, engineering, educational psychology, cognitive science, and anthropology), enabling the project to offer a wide range of workshops and provide comprehensive STEAM education experiences. This advantage is especially notable when compared to other benchmarked competitors, who often lack specialized knowledge or pedagogical expertise. Furthermore, the geographical area in which it is based can also be considered a differentiated strength, in the sense that currently, there are no nearby maker spaces or competition in the Cascais and Oeiras' municipalities, especially with the recent closure of FabLab Cascais.

Change Makers' clear mission is also an important strength to consider, as it will allow the organization to maintain focus on its core objectives, guide decision-making, and help communicate its value proposition to potential partners and customers.

Lastly, another important strength of Change Makers' is its unique value proposition, which combines a maker space environment with a strong educational focus. Unlike competitors that typically prioritize either innovation or community engagement, with education as a secondary objective, Change Makers places education at the forefront. This concept can attract different target groups or satisfy newer, different needs.

Weaknesses

Despite the above-mentioned strengths, Change Makers faces some internal challenges, with financial constraints being a significant weakness. Specifically, Change Makers currently generates minimal commercial revenue. This affects the financial sustainability of the organization and likely impacts its ability to have a community and educational impact.

Additionally, the project's heavy past reliance on European funds (subsidies) constitutes an important weakness to consider, since Change Makers has very recently stopped receiving this funding. Associated with this weakness, the shift from offering free access to equipment and the current need for payment may constitute a potential price barrier (WEF 2021).

Another relevant weakness is the limited staff, with no current team member fully dedicated to this project, with responsibilities and total working hours divided with NUCLIO's other initiatives. Consequently, this leads to underutilization of the maker space and its resources, not being fully leveraged for revenue generation and social impact.

Another weakness that must be mentioned is their current insufficient marketing efforts, which hinder Change Makers' ability to effectively communicate its opportunities and current value proposition, as well as the attraction of new participants. In addition, there is limited current community engagement, with no current attempts of offering paid workshops or initiatives for the community and schools.

Finally, the location of Change Makers in São Domingos de Rana, on the outskirts of the Cascais region, benefits from a lack of competition but also faces the challenge of a limited catchment area. This smaller geographic reach restricts access to the broader entrepreneurial audience with a maker mindset, typically concentrated in the Lisbon metropolitan area, where additional services like digitalization and coworking hubs are more readily available.

Opportunities

Our earlier assessment of the overall market indicates that the external environment offers numerous opportunities and trends for Change Makers to explore. Firstly, the growing emphasis on STEM education in Portugal presents a significant opportunity to align with national educational trends and meet the rising demand for STEM-related skill development, particularly through workshops targeting the school-aged segment. Additionally, Change

Makers can leverage the previously mentioned STEAM movement, which integrates Arts into the traditional STEM framework, allowing for a more creative and holistic approach to learning, as well as Problem-Based Learning, which fully align with Change Makers' vision and mission (Governo de Portugal 2024).

Furthermore, the growing focus on innovation and entrepreneurship in Portugal facilitates and increases the demand for spaces such as the maker spaces, as these spaces are where collaborative innovation can happen. As the Portuguese Government increasingly develops a start-up-friendly environment, the demand and need for spaces that support creativity and experimentation also grows (Portugal Start-Up 2022).

Another significant opportunity for Change Makers lies in forming partnerships with local schools, municipal councils, small businesses, and organizations. The establishment of strategic collaborations, even with entities outside of their primary scope, has become increasingly sought after in today's business environment, as they can bring in additional resources, broaden outreach and contribute to the community's overall development (Hanson et al. 2021, 278-283). Partnerships with tertiary education institutions, such as Nova School of Business and Economics, can be particularly valuable, enabling simultaneous exploration of various segments, blending educational innovation development and project development through equipment access.

Finally, the opportunity for revenue diversification is also something important to consider since there is potential to increase income through expanded offerings of workshops and equipment usage.

Threats

Despite the opportunities, Change Makers also faces external threats that could impede its progress. Primarily, it faces competition from other maker spaces or Fab Labs, which offer

similar access to spaces or resources, such as 3D printing machines (Associação de FabLabs Portugal n.d.). The existence of alternatives can result in a limitation of Change Makers' market share, as potential users have multiple options for a same need. Moreover, the organization faces competition from an educational perspective, as various educational institutions, museums, and programs target similar student demographics, such as the Pavilhão do Conhecimento, which also offers interactive and experiential learning opportunities (Pavilhão do Conhecimento 2024).

Another threat results from the rapid evolution of technology. As technological advancements continue to emerge and develop, organizations directly involved with such, need to continually update their equipment, which leads to strains on their capabilities and resources (European Parliament Research Service 2020) which in turn impacts the quality of their offer and hinders business growth.

In conclusion, the SWOT analysis of Change Makers presents a framework characterized by significant opportunities and challenges. Strengths such as its dedication to innovative education and its multidisciplinary team, help position it advantageously within the global and local emphasis on STEAM education. However, to ensure sustainable growth, it is imperative for Change Makers to also consider and address its financial limitations and improve its marketing strategies, as well as remaining vigilant of external threats posed by competition and the rapid evolution of technology. Overall, by considering the SWOT's comprehensive insights, Change Makers' value proposition developed will accurately reflect its operational reality and therefore, potentially maximise their positive impact.

Following the context presented, the market analysis and the competitive benchmarking performed, it is crucial to develop an enhanced value proposition to transform Change Makers for a sustainable impact.

6. FINAL RECOMMENDATIONS AND CONCLUSION

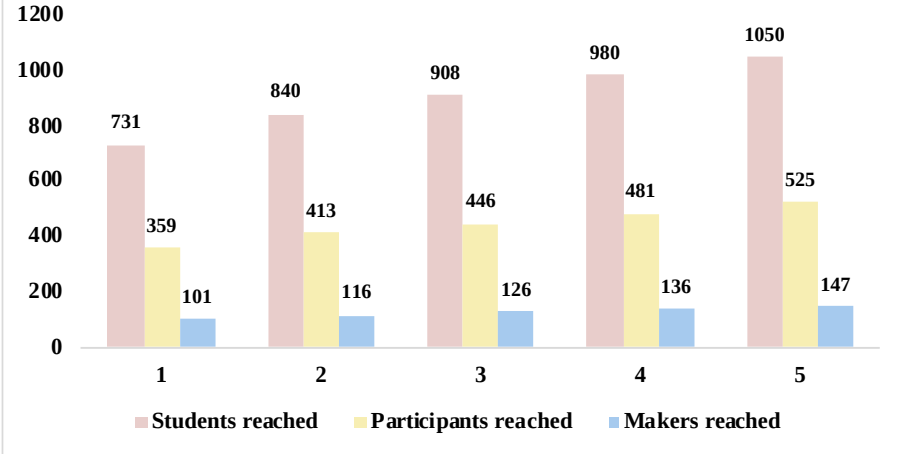
Social Impact

The comprehensive financial analysis presented above, demonstrating a sustained need for subsidies, must be viewed through the lens of Change Makers' fundamental purpose as a non-profit organization project. This persistent need should not be seen as a failure but rather as an inherent aspect of Change Makers' social mission.

"The NPOs differs fundamentally from the POs because of the reason for existence and social mission. (…) Against to POs, the first aim of NPOs is not financial, it is about to realize the social requests, to accomplish social needs/goals and to pursue social public welfare" (Ayyildiz, Akmermer and Akyüz 2017, 181).

By looking at the baseline scenario's projected reach over the 5-year period, Change Makers' social impact in terms of numbers can be concluded (Appendix 16). The figure below summarizes this impact for the three value propositions:

Figure 17 - Social Impact over the 5-year period



Legend: Students reached show the highest numbers with a value of 1050 for the fifth year, followed by community workshops' participants.

The school workshops' total reach for the 5-year period of approximately 4,509 students fulfills Change Makers' mission of innovating in education, by gaining access to hands-on STEAM

experiences and fostering key skills for a more educated and sustainable future. Through community workshops, Change Makers advances its goal of community empowerment, with a total of 2,224 participants over the 5 years being offered opportunities to develop practical skills and innovative thinking, contributing to lifelong learning. Lastly, by providing approximately 626 users/makers with equipment' access and usage, Change Makers enables citizens to raise their voices through tangible innovation, transforming creative ideas into solutions that may benefit the community. This impact demonstrates that subsidies are not only a necessity but a justified investment for Change Makers' social impact.

Recommendations

During this project, we have proposed several changes, suggestions, and recommendations that we believe would add significant value to the Change Makers project.

First, and as we have explained during the project, it is our recommendation that Change Makers charges for both community and school workshops, including those offered to private and public schools. While we acknowledge and respect Change Makers' objective of providing educational experiences in the most accessible way for everyone, the reality is that for the project to become more financially sustainable, it must consider implementing this change.

Secondly, as outlined in the value proposition chapter, we propose implementing a structured weekly schedule, which allocates specific days and times for each type of activity. We believe that this would enable Change Makers to maintain operational efficiency and avoid potential conflicts between different user groups. It is important to note that in formulating this suggestion, we considered insights from FabLab Lisboa, which detailed that such a system makes it easier for both the organization and its users to plan and organize their time effectively.

Moreover, we highly recommend that Change Makers enhances its website and social media platforms, more specifically, Facebook and Instagram. With these digital platforms containing

specific sections dedicated to school workshops, community workshops, and equipment usage in the maker space, Change Makers can better and more clearly communicate its message and offerings to its different target segments.

Additionally, and regarding strategic differentiation, we recommend a focus on the offer of both school and community workshops. After the comprehensive analysis of the relevant benchmarks and with the value proposition developed, we conclude that workshops represent a unique offering in which Change Makers can differentiate itself the most. However, if there is a need for Change Makers to concentrate on a specific target segment, we suggest focusing on school workshops' target segment, the school community. This recommendation comes mainly from financial insights, as the analysis of the projected cash flows indicates that a very significant part of revenues would be generated from these workshops.

Lastly, as a final suggestion, we strongly recommend that Change Makers prioritize securing subsidies or other forms of financial support. As previously stated, we have already engaged with Cascais City Council, which is informed about the project and appeared open to it, and, as such, we recommend establishing contact with them. However, we also suggest seeking additional sources of support, as the project's success and sustainability depend on securing a minimum level of subsidies.

Conclusion

This impact lab project addressed the key question: "How can Change Makers adapt to improve its educational and community impact while ensuring financial sustainability?". The value proposition chapter examined in detail how should Change Makers be adapted, focusing on three distinct value propositions, while the financial analysis chapter revealed that Change Makers requires subsidies to ensure financial sustainability, with insufficient revenue streams to cover total cash outflows.

The success of Change Makers' project will depend on its ability to secure subsidies and financial support, and on how it implements the recommendations developed throughout this project. By securing subsidies and following these recommendations, Change Makers can improve its educational and community impact and may become a standout project, empowering both the educational and general community especially in the Cascais and Oeiras areas.

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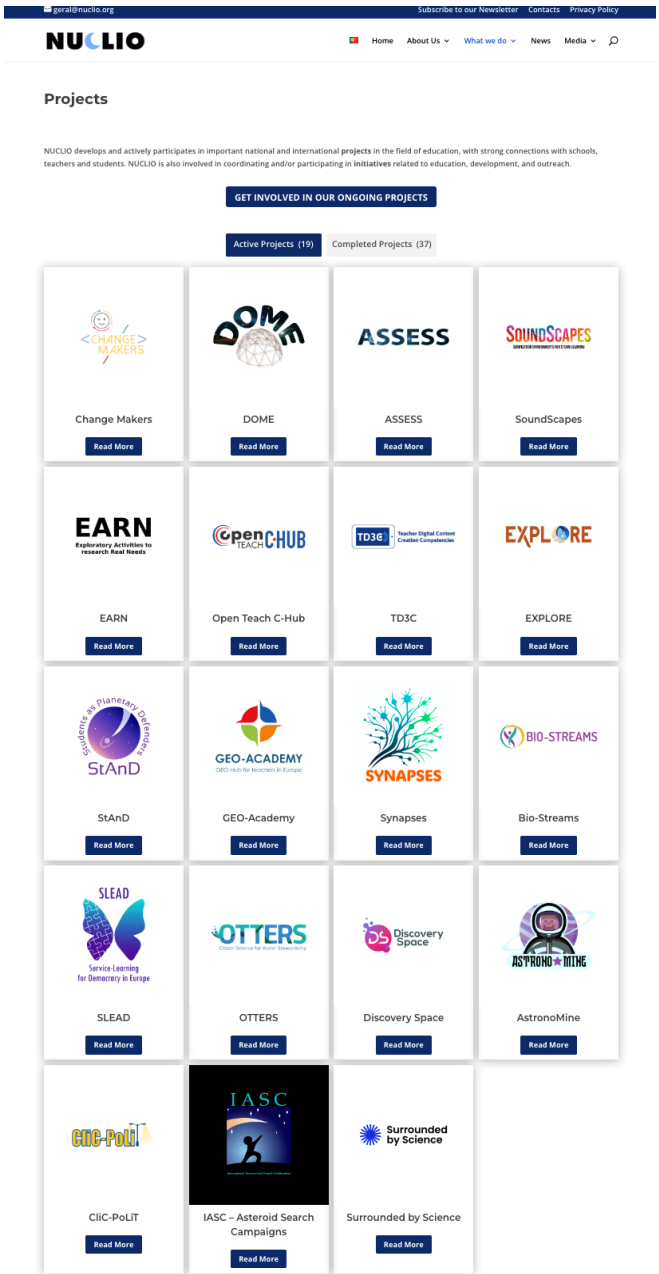
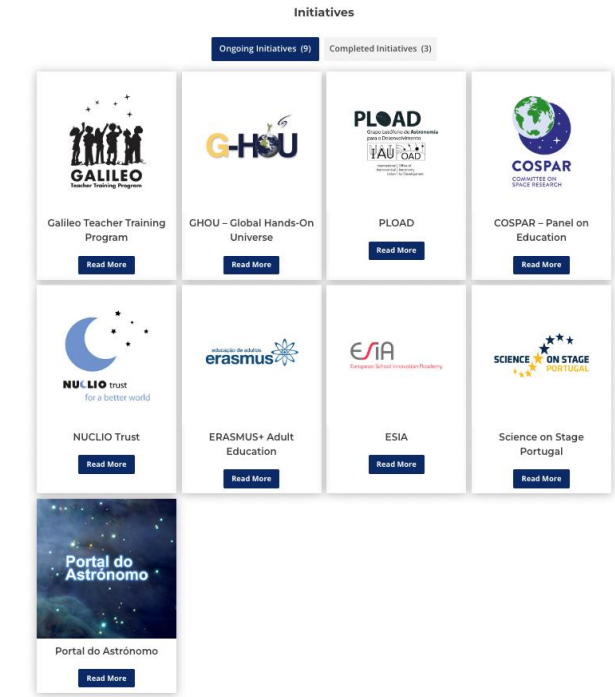
8. APPENDIXES

Appendix 1 – NUCLIO's Income Statements for the Last 4 Years

Income Statement	**2020**	**2021**	**2022**	**2023**
Sales and Services provided	400	1290	5574	40841
Subsidies, donations and legacies for exploration	224122	474251	600207	704536
External Suppliers and Services	-58199	-102518	-166924	-327002
Personnel expenses	-202962	-221185	-327370	-383124
Other expenses and losses	-8	-10	-9	-10
EBITDA	**-36648**	**151828**	**111478**	**35240**
Depreciation and Amortization	-1479	-9859	-10839	-10602
EBIT	-38126	141969	100639	24638
EBT	-38126	141969	100639	24638
Net Income	-38126	141969	100639	24638

Appendix 2 – NUCLIO´s Active Projects and Ongoing Initiatives





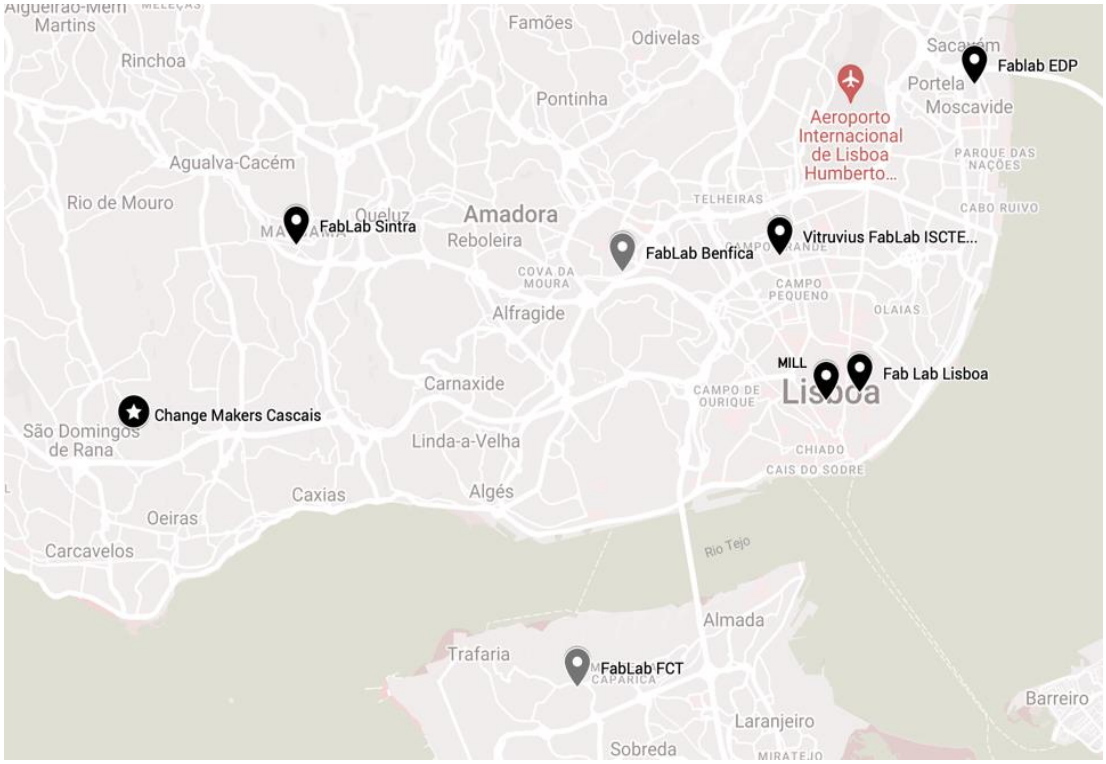
Appendix 3 - Change Makers' Financial Statement (Balancete) 2023

Balancete Change Makers 2023		
Sales	€	3 081
Services Rendered	€	3 720
Total Sales and Services Rendered	€	6 801
Subsidies for exploration	€	111 931
Total Revenues	€	118 731
Personnel Expenses	€	98 226
External Suppliers and Services	€	46 390
Depreciation and Amortization	€	26 835
Total Expenses	€	171 450
Net Balance	-€	52 719

Appendix 4 - Change Makers' Financial Statement (Balancete) as of August 31, 2024

Balancete Change Makers 2024 (as of August 31)		
Total Revenues	€	187 570
Total Expenses	€	177 170
Net Balance	€	10 401

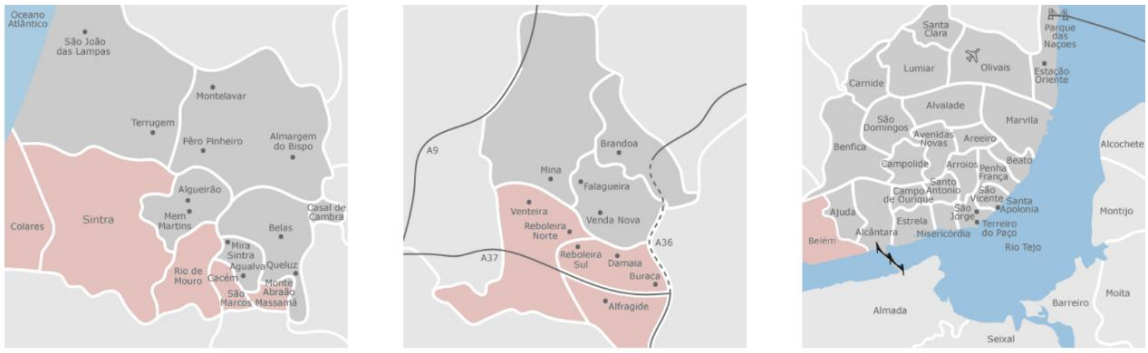
Appendix 5 – Map with Benchmarked Competitors' Locations



Legend: There are five relevant Fab Labs who provide services in the same market as Change Makers: FabLab Lisboa, MILL (Makers in Little Lisbon), FabLab Sintra, Vitrivius FabLab and EDP FabLab. FabLab Benfica and FabLab FCT were excluded from the analysis to avoid redundancy.

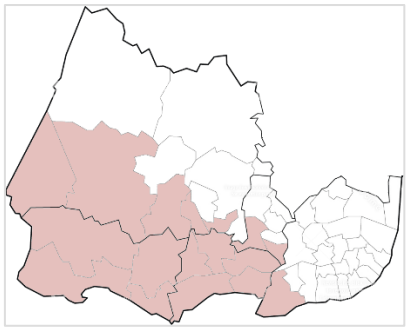
Appendix 6 – Target Market Segmentation Geographic Limitations

6.1– Map of Cascais and Oeiras municipalities and Sintra, Amadora and Lisbon municipies' bordering parishes



Legend: The images above show Cascais and Oeiras municipies, and the bordering parishes of Sintra, Amadora and Lisbon municipies considered, respectively.

6.2- Catchment Area for General Community interested in Lifelong Learning segment



Legend: This image shows the total catchment area for segment 2.

Appendix 7 – Number of Students under 18 Years Old by Municipality and by Type of Institution

Number of students	Public Schools	Private Schools	Total
Cascais	20749	17796	38545
Oeiras	20241	6653	26894
Sintra	48675	10545	59220
Amadora	20900	5315	26215
Lisboa	62974	50739	113713
Total	173539	91048	**264587**

(INE 2022)

Appendix 8 – Number of People aged 18-64 in Oeiras and Cascais Municipalities and Bordering Parishes

Number of people aged 18-64	
Cascais	127376
Oeiras	100568
Sintra (Colares, Sintra, Rio de Mouro, Cacém e São Marcos and Massamá parishes)	112855
Amadora (Alfragide and Venteira parishes)	26090
Lisboa (Belém parish)	9185
Total	376074

(INE 2021)

Appendix 9 – Number of People aged 20-64 in Oeiras and Cascais Municipalities

Number of people aged 20-54	
Cascais	94326
Oeiras	76259
Total	170585

(INE 2021)

Appendix 10 – Interviews with the Schools' Directors

10.1 – Summarized Interview with the Directors of "Colégio São Francisco De Assis"

Introduction	
Sofia: I would like to thank you for having this conversation! We are 3 students from Nova SBE, working on a thesis focused on developing a business plan for the non-profit organization NUCLIO (here Sofia explained more about the organization and its several projects). The thesis focuses on *Change Makers*, an initiative that promotes the development of essential skills for a sustainable future through creativity. This initiative offers workshops to schools, as part of their mission to innovate in education. This meeting was required to better understand the interest and relevance of this proposal for schools, by gathering opinions, suggestions, and feedback from educational representatives. This input will help enrich their thesis and enhance the value the project offers to the schools.	
Most Important Questions & Answers	
Sofia: **What are the school grade levels you have at your school?**	***Director 1:*** Our school offers daycare, preschool, and first-cycle education, covering up to the fourth grade.
(Sofia presented the various workshops available for these school grade-levels) *Sofia:* For this school level, we have two presented workshop offerings: "Painting	***Director 2*****:** The proposals are interesting, specifically in terms of creativity. While they are not entirely new concepts, they stand out as original, because of their use

Robots" and "Electric Cars." **What do you think about the relevance of these proposals for the educational community, and would they interest you?**	of recyclable materials. Overall, these workshops interest our school, as they join three very important areas: robotics, programming, and sustainability.
Sofia: **Would you prefer Change Makers going to your schools, or would you rather visit?**	***Director 2*:** It would have to be here at the school; we need to be at the school.
Sofia: **The price we are considering at the moment for the three-hour workshops is 11€, what is your opinion on it?**	***Director 2*:** I think it is a fair price; it is reasonable and aligns well with what is being offered.
Sofia: **And regarding schedules, would you have any preference for specific days or times of the week?**	***Director 2*:** The only one we would prefer to avoid is Monday, as the children are still adjusting after the weekend. Also, for the younger children in preschool, morning sessions are better, as many of them take an afternoon nap.
Sofia: **Do you have any extra suggestions?**	***Director 1:*** Perhaps the 3-hour workshop might be a bit too long for the preschool students.

10.2 – Summarized Interview with the Director of "Agrupamento de Escolas Aquilino Ribeiro"

Introduction	
Sofia: I would like to thank you for your availability! We are 3 students from Nova SBE, working on a thesis focused on developing a business plan for the non-profit organization NUCLIO. Within NUCLIO, there's a specific project called *Change Makers,* and, in this area, this project involves offering workshops to schools. This interview aims to gather your insights on these workshops and on whether they align with school needs, and if there are areas for adaptation.	
Most Important Questions & Answers	
(School workshop brochure was shown) **What do you think about the relevance of these proposals for your school groupings?**	***Director:*** The proposals were interesting and very necessary for the schools. Schools still rely on traditional methods, but it's important to employ more hands-

	on methods like the ones here. For instance, using practical tools (instead of paper) to teach mathematical concepts would help students overcome difficulties in abstraction.
Sofia: **Which workshops generate more or less interest?**	***Director:*** It's hard to say, as they all align with current societal needs. However, I would say that it important for the workshops to keep students motivated. By being hands-on, playful and engaging, I think these workshops would be beneficial. Another important aspect is that first, teachers needs to be convinced of the workshops' relevance to the curriculum and their teaching goals.
Sofia: Based on common price analysis, the proposed price is €11 per student. **Does this seem reasonable?**	***Director:*** The price itself is adequate. Still, an issue could be whether schools have the budget for this type of program.
Sofia: If this type of funding can't be secured, how would this offer be received? **Is it feasible for students to pay individually?**	***Director:*** It can be an option; some schools already ask families to cover the costs.
Sofia: **Would schools prefer workshops at their location or at an external space?**	***Director:*** In programs like Oeiras+, transportation is usually included. In other cases where we must cover the cost, it would be preferable for workshops to go to schools, as buses are very expensive.
Sofia: We plan to offer certificates of participation for students in workshops like programming and robotics. **Do you think this would add value?**	***Director:*** For students, this would always add value, as the curriculum is crucial nowadays, and so this certificate could be an integral part of their academic record, adding value to it.

Appendix 11 – Survey's Questions

Question 1 regarding eligibility (being 18 or above and living in Portugal)

Question 2 requesting consent for survey answers' analysis.

Section 1 - Interest in Maker Spaces' Workshops

Imagine a Maker Space. A Maker Space is a collaborative workspace equipped for making, prototyping and digital fabrication that may offer workshops and educational programs based on hands-on learning. Now consider a Maker Space offering hands-on workshops of 3 hours on the following topics:

- **Electronics and Programming** – These workshops guide participants through electronics basics, including circuit design, Arduino boards, virtual simulations, and soldering.
- **Introduction to 3D Printing and Modeling** – In this workshop, participants learn to create digital models and transform them into physical objects with a 3D printer.
- **Engraving and Laser Cutting for Crafts** – In this workshop, participants master basic vector drawing and laser cutting techniques to design and create a self-made item to take home.
- **Create Your LED Lamp** – In this workshop, participants learn laser cutting basics by designing and producing a custom LED lamp.
- **Introduction to Vector Drawing in Inkscape** – Participants learn the main tools of Inkscape for freehand vector drawing and manipulating pixelated images.

3.From the list above, which Maker Space workshop topic would you be more interested in attending? (Please select only one option)

- Electronics and Programming
- Introduction to 3D Printing and Modeling
- Engraving and Laser Cutting for Crafts
- Create your LED Lamp
- Introduction to Vector Drawing in Inkscape
- None of the workshops above interest me
- I would be interested in a workshop about the following topic *(please specify in the following text-box):*
- 4.Please specify the *workshop topic* here:

5.Which of the following benefits would be the most important reason for you to attend one of the above-mentioned Maker Space workshops? Please select at most 2 options.

- To learn new skills or improve existing ones
- To meet people with similar interests
- To use specialized tools and equipment not available at home
- Having fun by trying something new
- Have a break from routine as stress relief
- To support the Non-Profit Project **Change Makers** *(an innovative educational project that empowers the community to develop critical skills through hands-on workshops)*

6.If all conditions were ideal (e.g., you have the time, availability, and believe the workshop offers good value), how likely would you be to attend one of the above-mentioned workshops?

- Very Unlikely
- Unlikely
- Neutral (not likely or unlikely)
- Likely
- Very Likely

7.Let's imagine you were to attend a workshop. Which of the following time option would be most convenient for you?

- Weekday mornings
- Weekday afternoons
- Weekend mornings
- Weekend afternoons
- Other *(please specify in the following text box):*
  *8. Please specify the other *time option* here:

9.Let's imagine you were to attend a workshop. How much would you consider a reasonable price to pay for each workshop?

- 0€-5€
- 6€-10€
- 11€-15€
- 16€-20€
- 21€-25€
- Other *(please specify in the following text-box):*
  * 10. Please specify other *reasonable price* here:

Section 2 - Respondent Characterization

11. To what extent do you agree with the statement: *"Personally, I see lifelong learning as an important part of my personal and career progress.*"

- (1) Strongly Disagree
- (2) Disagree
- (3) Neutral (Neither Agree nor Disagree)
- (4) Agree
- (5) Strongly Agree

12.To which of the following age groups do you belong to?

- Young Adult (18-29)
- Adult (30-55)
- Pre-Senior (56-65)
- Senior (65+)

13.What is your occupation?

- Student
- Employed (full or part time)
- Self-employed
- Retired
- Unemployed
- Other *(please specify in the following text-box)*

*14.Please specify other occupation here:

15.Where do you live most of your time?

- Lisbon Municipality
- Oeiras Municipality
- Cascais Municipality
- Sintra Municipality
- Amadora Municipality
- Other (please specify in the following text-box):
- *16.Please specify the other *living location* here:

Appendix 12 – Current Change Makers' Workshop Portfolio

CHANGE MAKERS' WORKSHOP PORTFOLIO

Electronics and Programming Workshops

Introduction to Electronics and Programming

Currently, we have access to computers, tablets, and smartphones. Knowing that the future is synonymous with technology, it is important that everyone who uses these technologies can understand and apply them intelligently.
The proposed activities guide participants step by step through the world of electronics and programming, and as they engage with the materials, they will naturally learn:

- The 3 pillars of electronics: voltage, current, and resistance;
- What electronic circuits are;
- What analog and digital signals are and how to control them;
- Types of actuators (with a detailed look at electric actuators);
- What sensors are and how they work;
- Introduction to programmable boards (Arduino and Microbit) and how to explore sensors and actuators in circuits.

Circuit Simulation in Tinkercad

Electronics is a technological field that plays a fundamental role in society. It enables us to communicate, work, learn, and have fun. Learning to simulate and test electronic circuits before building them is essential to detect issues and design errors that could lead to wasted time and resources.
Tinkercad is a free online tool that allows users to simulate electronic circuits and test them virtually before constructing them. During this workshop, participants will learn:

- How to use Tinkercad to create simple circuits;
- How to perform simulation tests;
- How to troubleshoot problems;

This knowledge will help participants design electronic projects with more confidence and safety, avoiding common mistakes that can damage equipment and materials.

Soldering for Electronics

Learning to solder is a valuable skill for those seeking careers in fields related to electronics, such as electronic engineering, information and communication technology, robotics, automation, and many others.
This workshop provides participants with a unique opportunity to acquire these skills, better preparing them for the job market.
In this workshop, participants will learn:

- How to solder with precision and efficiency by identifying and properly using soldering tools and materials;
- How to master soldering techniques;
- How to understand workplace safety.

Introduction to 3D Modeling and Printing

3D modeling and the corresponding printing of parts have applications in various fields of knowledge, from prototyping components for the automotive industry to construction, as well as teaching subjects like mathematics or geography, and even the medical industry.
The goal of this workshop is for participants to:

- Understand the basics of 3D modeling and printing and its potential.
- Learn about the different types of printers and their suitability for various purposes.
- Understand how a 3D printer works.
- Get familiar with 3D modeling and printing technologies (modeling software, slicing, and printing rules).
- Discover different applications of what they have learned for their day-to-day activities
- Take home a self-made 3D object.

Create your LED Lamp

LED lamps are becoming increasingly popular not only because of their low cost and energy efficiency but also due to the numerous applications that this technology enables.
The main goal of this workshop is to teach the community the skills necessary for creating LED lamps, which have a wide range of applications. Participants will learn how to:

- Use vector drawing software to create and manipulate the image they wish to engrave and cut.
- Understand the different types of laser machines and how they work.
- Use the laser cutting and engraving machine to cut and engrave the image created or manipulated in the vector drawing software onto acrylic.

Engraving and Laser Cutting for Crafts

Laser cutting and engraving is a technique that uses a laser beam to cut or engrave materials like wood, acrylic, and metal. It's widely used in industry for creating precise objects quickly, such as in automotive parts, jewelry, and labels. It also has small-scale applications in art, rapid prototyping, and object customization.
With this workshop, participants will:

- Master basic vector drawing techniques;
- Master basic laser cutting and engraving techniques;
- Design and by produce unique handicrafts;
- Take home a self-made item.

Introduction to Vector Drawing in Inkscape

Vector drawing is widely used in a wide range of professions (eg designer, illustrator, web designer, etc) and activities (eg marketing, branding, etc) for example to create business cards, posters, billboards, web pages, etc. Thus, the acquisition of this type of competence is increasingly relevant in the professional, academic and labor market world.
Accordingly, the goal of this workshop is for Change Makers to provide tools and introductory knowledge of vector drawing in Inkscape for:

- Freehand drawing (particularly for logo creation);
- Basic vector manipulation of pixelated images.

Creative Engineering Workshops

Painting Robots

In this innovative and fun workshop, participants will have the opportunity to build their own Painting Robot using simple, recycled materials. Using a DC motor, recycled items like cups, toilet paper rolls, bottles, corks, pens, and batteries, participants will assemble a mobile robot capable of creating moving art. Once built, the Painting Robot will come to life through the DC motor, making the entire structure move across a table. The robot's "legs," made of colorful pens, will draw unique patterns on a sheet of paper as it moves.
This will be an enjoyable workshop where participants will:

- Learn how to build a simple robot, combining concepts of mechanics, engineering, art, and sustainability;
- Take home their own Painting Robot and a unique work of art, sparking the artist and engineer within them.

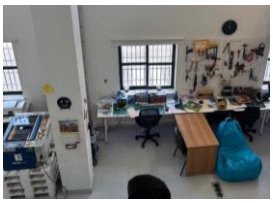
Electric Car

In this hands-on workshop, participants will become engineers by designing and building their own cars using recycled materials, encouraging creative freedom in construction.
They'll explore mechanical concepts by making their cars move using an electric motor powered by batteries.
This interactive workshop allows participants to:

- Gain practical experience with mechanics, electricity, and design thinking through an eco-friendly and sustainable activity;
- Take home their own electric car.

Appendix 13 – Change Makers' Maker Space Photographs

Ground Floor



Left- Side – Storage Area, Laser Cutter and Pegboard Wall Organizer

Main Working Area – White Table and Display Screen

Right-Side – Space-Themed Mural and Displayed Projects

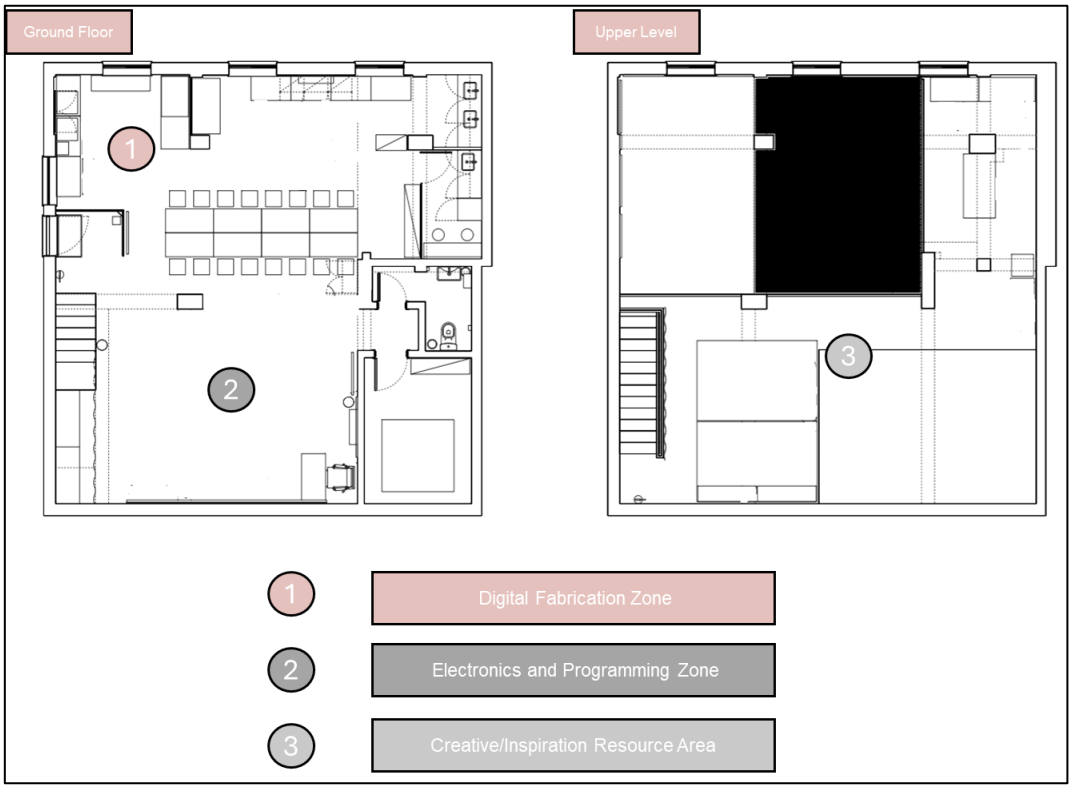
Upper Level

Open Concept Design

3D Printing Machines & Display Screen

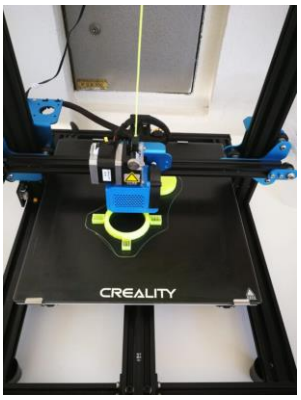
Legend: These images show the Change Makers' maker space, with a ground floor and an upper level.

Appendix 14 – Change Makers' Space Plan

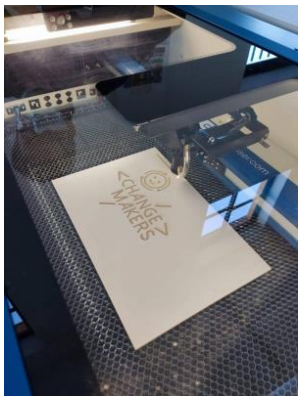


Legend: This image shows the Change Makers' Maker space blueprint with the recommended division into three different areas.

Appendix 15 – Change Makers' Equipment

<table>
<tr><th colspan="2">Change Makers' Equipment</th></tr>
<tr><th>3D Printers</th><th>CNC Machine</th></tr>
<tr>
<td> 

Allow the transformation of any 3D digital design into real objects.
Specificities:
30 x 30 x 40 cm
3 Machines</td>
<td> 

Digital manufacturing machine that works through mechanical wear.
Specificities:
CNC Optima 80
3D Cutting / Engraving
1000 x 800 x 100 mm</td>
</tr>
<tr><th>Laser Cutting and Engraving Machine</th><th>Vinyl Plotter</th></tr>
<tr>
<td> 

Digital manufacturing machine that works through wear, allowing the creation of physical pieces through vector drawing.
Specificities:
Epilog Laser Fusion Edge
High Precision Cutting / Engraving
610 x 305 x 178 mm
40 watts</td>
<td> 

Allows transforming vector drawings into vinyl stickers.
Specificities:
Skycut V24 Vinyl Cutting Plotter
2D High Precision Cutting
Max cutting width 610 mm
Cutting speed 700 mm/s</td>
</tr>
</table>

Legend: These images show current Change Makers equipment that can be used by the Maker Community.

Appendix 16- Social Impact for the Baseline Scenario

	SOCIAL IMPACT - BASELINE SCENARIO					
	1	**2**	**3**	**4**	**5**	**TOTAL (over the 5-year period)**
Number of school workshops	35	40	43	47	50	215
Students reached	**731**	**840**	**908**	**980**	**1050**	**4509**
Number of community workshops	24	28	30	32	35	148
Participants reached	**359**	**413**	**446**	**481**	**525**	**2224**
Makers reached*	**101**	**116**	**126**	**136**	**147**	**626**

**calculated by dividing the number of usages by the average usages of 1,6 per user annually*