Masters in Management (MiM)

MASTER´S FINAL WORK

PROJECT

STUDY SPACES AT ISEG:
ADAPTING THE LIBRARY FOR GROUPWORK

AUTHOR:
BEATRIZ ALEXANDRA DA ROSA FERREIRA DE OLIVEIRA

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Abstract

This project focuses on the growing importance of cooperative learning and how this needs to be reflected in ISEG's infrastructures, more specifically in the library.

The main objective of this project is to propose an alteration plan of the library's first floor to turn it into a floor dedicated to group study and cooperative learning. For this purpose, a survey was developed to understand student's needs and expectations from the library, and then a proposal was made based on the results.

The survey results showed that, regarding a groupwork space, there are three aspects to take in consideration: design, utility, and social environment. From neutral colors to a good number of electrical outlets and even privacy and soundproof walls, all these elements were considered very important to students.

Finally, the proposal suggests the creation of groupwork booths to allow students to have a private space to work in groups in the library. The elements included in these booths are based on the survey results, and thus reflect students' preferences.

Keywords: Cooperative Learning; Groupwork; Library; Group Study Spaces, ISEG.

Resumo

Este projeto está focado na crescente importância da aprendizagem cooperativa e como esta necessita ser refletida nas infraestruturas do ISEG, mais especificamente na biblioteca.

O objetivo principal deste projeto é propor um plano de alteração do primeiro piso da biblioteca, transformando-o num piso inteiramente dedicado ao estudo em grupo e à aprendizagem cooperativa. Com este propósito foi desenvolvido um questionário, para entender as necessidades e expectativas dos alunos relativamente à biblioteca, e com base nos resultados foi desenvolvida a proposta.

Relativamente ao espaço de trabalho de grupo, os resultados do questionário mostraram que existem três aspetos a ter em consideração: design, utilidade e ambiente social. Desde cores neutras, a um número considerável de tomadas elétricas e até privacidade e paredes com isolamento acústico, todos estes elementos foram considerados como muito importantes para os alunos.

Por fim, a proposta de alteração sugere a criação de cabines que permitam aos alunos ter um espaço privado para trabalhar em grupo, dentro da biblioteca. Os elementos incluídos nas cabines foram baseados nos resultados do questionário e, como tal, refletem as preferências dos alunos relativamente a espaços de trabalho em grupo.

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1 Introduction

1.1 Theoretical Context

The subject of cooperative learning and cooperative learning dedicated spaces has tremendous importance today, since it is so rare to work individually today. Moreover, the skills needed to perform in a groupwork are considered very important in the working world today. In fact, being able to perform in a team or group is considered by many as important as having great technical skills (Johnson & Johnson, 2014).

The increase of importance of cooperative learning in the learning process should be reflected in schools and universities, both in the lectures and the infrastructures. Since teachers from all different courses are increasingly asking for more group projects from their students, the existence of spaces where they can work and study as groups is a must. This means having a space where students can have conversations, brainstorm, discuss topics and ideas among each other (Staines, 2012).

The adequate conditions for groupwork are not the same as the ones for individual work, therefore the spaces to develop these activities need to have different characteristics. A space dedicated to group studying and group projects must allow speaking, interacting, moving around, making noise (Staines, 2012)...On the other hand, an individual workspace should be a quieter place, where students do not have the need to move around or communicate as much with each other. Libraries tend to be traditional spaces, only considering individual and silent activities as ways of studying. The characteristics and rules of these spaces often do not allow activities that involve a lot of interaction among students (Cha & Kim, 2015).

However, modern libraries are changing the traditional model, which makes sense considering the changes that came with the 21st century, the technological evolution, as well as the evolution that concepts like work and study have made. Looking back at what work and study used to mean 50 years ago, it is fascinating how far things have come. Today people can work together while being on opposite sides of the world and students can access and share information at a click of a button. Studying today does not mean being surrounded by silence and bookshelves. Of course, sitting alone reading and practicing exercises is still very important, but other needs have arisen, and libraries need to answer these new needs. Seeing how easy it is for information to travel, and for people and companies to contact each other, knowing how to work with other people has never

been so important (Johnson & Johnson, 2014). Libraries now can not only be adequate for individual studying, but also for working in groups. The division of a library in different zones, with different purposes, allows cooperative learning to be developed in an area where students can be focused in what they are doing but can also interact with each other (Cha & Kim, 2015).

Learning is constantly evolving, and doing it cooperatively seems like the next step. In response, universities need to keep up with this evolution to form the best students and citizens.

1.2 Relevance of the Study

In Portugal, the library "Francisco Pereira de Moura", also known as ISEG's library has the widest collection of works in the areas of economic and business sciences, as well as bibliographic bases and statistical information that students can access for free (ISEG, n.d.). Therefore, this library has become very important, useful, and appealing to ISEG's community, as well as others interested in the economy and business areas of study. However, despite holding more information than any other academic library in economy and business sciences, there are still ISEG's students that choose to study in other places, including other academic libraries. This preference for other libraries is most likely due to a not so modern look that ISEG's library still has, which does not match the rest of the school, nor its' way of teaching.

Creating a groupwork floor with a modern design in ISEG's library will make it a more dynamic, aesthetically pleasing, and attractive space, while allowing students to develop skills and projects that reflect what the working world and society need. This means ISEG's students will want to frequent the library more often and improve the way they work not only individually, but also cooperatively.

Based on the 4th SDG "Quality Education" and the 10th SDG "Reduced Inequalities", this project purposes a more modern library, accessible to all students, that encourages the focus on education and offers high quality and equal studying conditions to students coming various financial backgrounds. Changing one floor of the library may be a small alteration, but it means another step towards becoming a highly ranked, modern and student focused university.

1.3 Problem and Objectives of the Study

The main objective of this project is to propose a renovation plan for the first floor of ISEG's library and turn it into a floor dedicated to cooperative learning. This alteration plan will be based on students' needs and expectations.

To achieve this goal, empirical data will be collected from current ISEG students from all types of study programs (Bachelors, Master's, PhDs and Executive Education) through an online survey. After collecting and analyzing the data, it will be possible to understand the interests and needs students have regarding a groupwork room, as well as what elements they find important to have in this room.

To summarize, the problem pointed out in this project is the fact that ISEG's library does not have a groupwork dedicated room. To solve this problem research must answer why should ISEG have a groupwork room and what elements should this room include.

2 Literature Review

2.1 What is Cooperative Learning?

Cooperative learning is not new in education, it is actually an old concept that has been renewed in the last years. Cooperative learning is a structured, systematic instructional technique (Felder & Brent, 2007) that consists in putting small groups of students working together to achieve shared goals and to maximize their own and each other's learning (Johnson & Johnson, 1999).

Assigning students to groups and telling them to work together does not result in cooperative learning. This sort of arrangement can lead to competition or individualism. However, whenever two parties interact, there is a potential for cooperation (Bergamin et al., 2019).

Cooperative learning will only happen if these five basic concepts are present: Positive Interdependence, Individual Accountability, Face-to-Face Promotive Interaction, Interpersonal and Small Group Skills and Group Processing (Johnson & Johnson, 1999).

- **Positive Interdependence** is based on the idea that one cannot succeed without the other's success. This concept can be implemented by teachers through the establishment of mutual goals, joint rewards, shared resources and assigned roles.

- **Individual Accountability** means that everyone in the group is held accountable to complete their share of the work. The performance of each member of the groups is assessed and the result is then provided to the individual and the group.
- **Face-to-Face Promotive Interaction** happens when team members help each other, share information, and encourage everyone's productivity.
- **Interpersonal and Small Group Skills** such as decision-making, conflict management, communication, instructorship, and trust- building are essential for any work group to function and need to be promoted.
- **Group Processing** involves having group sessions, so the members reflect on what actions were and were not helpful, which actions need to be continued and which need to be changed.

2.2 Importance of Cooperative Learning

A few years ago, it was believed that to learn students needed to be quiet. Nowadays, even though quiet classes where the teacher is the center of attention are still very important, cooperative learning has become a major part of education (Felder & Brent, 2007). In a world where people are connected all the time, having a high number of different perspectives is essential to solve social and organizational problems (Caruso & Woolley, 2008).

Working cooperatively is not always easy due to personality differences and various working rhythms and methods, but it is beneficial for the learning process. In the working world people do not always get to work how, when and with who they want, therefore preparing students to preform and solve issues in a work group will make them ready to face challenges outside of the academic reality (Taylor, 2011).

Groupwork is an extremely important and effective technique for achieving certain kinds of intellectual and social learning goals. This technique helps develop academic language and, socially helps build trust and improve communication. Groupwork also helps in classroom management, by keeping all students involved in their work. Keeping everyone involved means that all students, with all kinds of skills and forms of understanding information, have access to learning tasks. Through groupwork and cooperative learning, the classroom becomes a more equitable and productive place for everyone (Cohen & Lotan, 2014).

In the 21st century, learning in the traditional way is becoming increasingly unrealistic, because of all the technology and information that can be accessed in seconds. Cooperative learning offers a social and engaging way to help students obtain skills and knowledge in the classroom, as well as developing their creative and social skills, which are essential in today's society (Dumont et al., 2010).

To conclude on the importance of this form of learning, cooperative learning can bring value into the world. In fact, in the first twenty-five years of Nobel Prize awards only 41% of the cited research methods were cooperative, whereas in the last twenty-five years the percentage of cooperative research methods used rose to 75%. This means the "best and brightest" in the world are applying cooperative strategies to their research, so these methods need to be taught in schools and in higher education (Adams, 2013).

2.3 Cooperative Learning in today's Education

Cooperation will play an important role in many circumstances of the 21st century, and four of these were highlighted. The first one is a growing global interdependence that will result in local diversity, as well as more frequent and intense conflicts. The second circumstance is the increasing number of democracies in the world, and the third one is the need for creative entrepreneurs. Finally, the fourth circumstance highlighted is the growing importance of interpersonal relationships. It is essential for cooperative learning methods to be included in today's education system, so individuals can understand and develop the necessary competences to meet these challenges. (Johnson & Johnson, 2014).

Continuously growing research confirms cooperative learning's effectiveness in higher education. In fact, in comparison with traditionally taught students with teacher-centered lectures and competitive grading, cooperatively taught students tend to show higher academic achievement, higher-level reasoning and critical thinking skills, more persistency, deeper understanding of learned material and less disruptive behavior in class. On a more personal level, cooperatively taught students also show lower anxiety and stress, higher self-motivation to learn and achieve goals, a more positive and supportive relationship with colleagues, a greater ability to stand in the other's shoes, a more positive attitude towards subject areas and, finally, a higher self-esteem (Felder & Brent, 2007).

Cooperative learning methods are among the most extensively evaluated in use today and can improve effective outcomes. Students normally like to work in groups, they

feel more successful and prefer subjects taught cooperatively. Cooperative learning is also a great tool to promote union, since different ethnic groups work with each other, and people need to be more accepting of other´s differences (Slavin, 2008).

The progress that education makes in this century must be evidence-based. However, this reform in education does not come easy, and for it to happen three conditions need to exist (Slavin, 2008):

Firstly, a broad range of proven programs must exist. An evidence-based reform will not happen if educators can only use one or two proven programs, or if no programs have strong evidence.

Secondly, educators and policymakers need to have access to impartial and reliable reviews of research, so they can rigorously evaluate which specific programs and practices have been proven to work.

Finally, the government must provide incentives to education institutions to adopt cooperative learning proven programs.

2.4 Cooperative Learning Skills

There are both interpersonal and process management skills that are essential to be able to work in a team. These essential skills are communication, negotiation, adaptability, coordination, and leadership (de Prada Creo et al., 2021).

Communication is essential to work in a group in a variety of ways. If students communicate clearly with each other the group becomes more productive and effective, and it is easier to maintain a positive work environment. Members need to get to know one another and build a comfortable and trustful relationship. This means members need to voice their opinions and listen to the others', and make sure everyone is participating and agreeing with the work that is being produced (de Prada Creo et al., 2021). Communication is believed by employers in developed economies to be one of the most important skills to have in new graduates, which is understandable as business today requires them to communicate virtually, face-to-face, informally, and formally on a national and international basis with a multi-cultural and multi-generational audience (Jackson, 2014).

Negotiation skills are also highlighted when it comes to groupwork and negotiating can be defined as a process through which two or more parties interact to create potential agreements intended to provide guidance and regulation to their future

behavior. Knowing how to negotiate tasks, deadlines, the content of the work, and many other issues with the other members is crucial to achieve the group's goals. Negotiation is also very important to resolve any conflicts that might arise during the work (Martin-Raugh et al., 2020).

Adaptability is also one of the essential skills to work in a group, and it has a lot of relevance when there are members of the group with various cultural backgrounds and work habits and rhythms. Adaptability means that all group members should mold to each other, respect all the differences that might exist and understand that these differences, when used correctly, can enrich, and improve the groupwork (de Prada Creo et al., 2021).

In groupwork knowing how to coordinate is essential, since without organization achieving goals as a group becomes very difficult. Process management starts when groups are formed and only ends after the goals are achieved, therefore coordination is needed all throughout the work (de Prada Creo et al., 2021).

To begin, a group must know how to set their goals, so they know the exact reason why they are working in the first place. Setting goals helps create motivation for the group members and clarifies what the group and the work is supposed to achieve. Dividing the work is also in the list of first things that need to be done, this means understanding which part of the work fits each member better (de Prada Creo et al., 2021).

Coordination and time management is one of the most important parts of any groupwork, both to each member and to the group itself. Planning deadlines for each part of the work, scheduling meetings, and managing the work that gets done by each member are all different ways that the group and its members need to coordinate their time and work. This skill is also extremely important to acquire because it will be useful for the rest of the members' professional and personal lives (de Prada Creo et al., 2021).

Finally, having leadership skills to monitor group process means being able to overlook the entire work in all its different perspectives. Checking if the deadlines will be met by the group and all the members, making sure all members understand the work, checking if there are any doubts and correct any problems that need solving are some of the points that need monitoring. Without control over the group process, the work tends to become messy, unorganized and it becomes very difficult to achieve the previously settled goals (de Prada Creo et al., 2021).

2.5 How can a Group Study Room improve Cooperative Learning Skills?

A physical environment can affect the frequency and quality of social interactions. Physical barriers to nonverbal cues may interfere with the establishment of trust and, therefore, difficult an effective communication. This means an adequate physical space for social interaction will increase and improve the communication skills of the people in it (Brand, 2009).

Having digital skills like knowing how to use information and digital resources and building systems that follow and get updates on relevant information is very important today. However, in a networked knowledge-based society, knowing how to interact with people and being able to benefit from social skills is increasingly important. Students can acquire both social and digital or technical skills in cooperative learning spaces, and at the same time the acquired skills improve their experiences in these spaces (Ala-Mutka & Punie, 2008).

It is becoming more necessary to pursue learning goals such as critical thinking, knowledge- sharing, and cooperation techniques. This means learning spaces are supposed to offer learning as a social process through communication, interaction, and a community that encourages learning and experience-sharing and improves students' social skills. Finally, learning spaces should support organized learning and managed connections inside and between study groups, but also informal learning, by providing possibilities for students to create connections and learn in a more practical way (Ala-Mutka & Punie, 2008).

2.6 Cooperative Learning in Libraries

One of the most significant elements to achieve a successful connection between students and library spaces is adapting the architecture and design of the school library to meet the architectural study needs of the students. According to a study conducted by Abowardah and Khalil in 2019 one of the main zones required for the architecture of the school library to encourage the students' engagement with library spaces is the group workspace (Lotfy et al., 2022). However, designing group study spaces can be very challenging, because it is not easy to meet today's needs as well as the future needs of students in higher education (Staines, 2012). Even so, the demand for these spaces in libraries is exceeding the existent capacity (Gardner & Eng, 2005). There is not a precise

model defined for group study rooms, but there are some essential elements to these spaces:

- **Sound Proofing**

The installation of sound barriers in group study rooms is very important, so that the sound does not float among various groups. Listening to other groups while trying to maintain focus in a project can be very confusing and even annoying, so the creation of the correct acoustics needs consideration (Staines, 2012).

- **Flexible Furniture**

Pieces of furniture like tables and chairs that can be moved easily are a better fit for group study rooms, since these enable students to reconfigure the room the way they find most effective. Depending on number of members and the type of project, the room configuration can make the work process easier (Staines, 2012).

- **Wall-writing Surfaces**

Easily erasable surfaces like white boards can be very useful while working in groups and having easy access to these boards is seen as an important feature in adapting to new learning methods (Lotfy et al., 2022). These objects turn processes like sketching, brainstorming, and working on problems much easier and effective, and facilitate the participation of all members, since everyone can see and give opinions on what is being written (Staines, 2012).

- **Good Lighting, Color and Comfort**

Factors like comfort, noise level, amount of people present, cleanliness and space are considered focal points in students' spatial choices for places in a library (Lotfy et al., 2022). Well lighten rooms, where students can work in a pleasant environment, with both natural and artificial lights are the best option for group study rooms. This means creating spaces entirely or partially walled-in with glass, that allow the light to pass through, enable students to see and be seen without disruption, and help control the temperature for comfort (Staines, 2012).

Still on the same topic, a very important element that needs to be considered is color. The selection of wall colors is essential when designing efficient learning spaces since colors have the power to influence emotions. In fact, studies have shown that when

presented with warm colors, people's emotions tend to be aggressiveness, anger, tension, excitement, happiness and dynamism. On the other hand, when surrounded by cool colors emotions lean more to relaxation, peacefulness, spaciousness, comfort, security, peace and tranquility. A study developed by Kemal Yildirim, Kubulay Cagatay and Nur Ayalp shows that the use of different colors on classroom walls has a statistically significant effect on the performance of students. This study concluded that cool and light neutral colors will create a better learning environment for students (Yildirim et al., 2015).

- **Appropriate Technology**

The technological requirements for group study rooms include wireless connection, video projectors, enough electrical outlets to plug in laptops, phones, tablets and other devices, and a monitor that allows all group members to share their work with the group (Staines, 2012). Having presentation technology, power, and wireless networking, is very important to adapt libraries to changes in technology and learning methods (Lotfy et al., 2022).

- **Straightforward Reservation Process**

As the number of students doing group projects is so high and tends to get higher, it is very important that students can see easily which study rooms are available and reserve these for the time needed, via an electronic system (Staines, 2012).

To conclude, the literature mentioned in this chapter has made clear how important cooperative learning is in education. Furthermore, certain articles presented very helpful information regarding study spaces and what elements are important to have in these spaces. However, this project is still missing ISEG's students' point of view in what is important to have in a groupwork space. This direct contact with students and their opinions is essential for this project, and the next chapters are dedicated to the analysis of students' perspectives regarding groupwork spaces and the library.

3 Methodology

3.1 Introduction

The following chapter aims to describe the methodology used in the development of this project, explain how it was developed and in what context it was used. The structure of this chapter starts with a research context, followed by the purpose and type of study, sampling and data collection method and, finally, the development of the survey script.

3.2 Research Context

This project was conducted at the Lisbon School of Economics and Management, also known as ISEG and, as previously mentioned leans on the topic of the alteration of this university's library. With over 110 years of history, more than 5000 students and a great reputation to maintain, ISEG is in a constant battle to be up-to-date and compete with other business schools while answering both the market and students' needs. In 2022 ISEG integrated the Financial Times European Business Schools ranking, occupying the 65th position among the 95 schools listed, which makes it one of the best business schools in Europe and, of course, in Portugal.

ISEG is located in the heart of Lisbon, something that attracts many students from all over the country and other countries as well. Most of the students coming from outside of Lisbon rent small bedrooms in residences that can be very messy and noisy due to the amount of people living in the same place. For these reasons, students' bedrooms in residences are not usually an ideal place to study. Furthermore, a lot of students that are originally from Lisbon prefer to study among their colleagues in a more silent and academic environment, outside of their own house. Therefore, a lot of students rely every day on ISEG's study spaces, particularly the library, to study and develop projects during the whole academic year.

ISEG's library has tremendous value to its community, due to the amount of very valuable, diverse, and updated information that it holds, in all different forms. In fact, in Portugal this library is considered the most important university library, in the fields of economic and business sciences. This library encompasses the European Documentation Center and is the depositary library of the World Bank. Furthermore, ISEG's library

information system is based on an internally produced database and access to various online information systems.

On the topic of design, ISEG's library has not changed much over the years, it is a very simple space where students can find big wooden tables and many bookshelves filled with books. However, other business schools in Portugal like Nova SBE have modernized the library, by turning it into a more dynamic, social and aesthetically pleasing space. While these modern libraries might not possess as much valuable information as ISEG's library, their design and modern hedge is attracting many students from various universities and turning them into more socially active and culturally diverse spaces.

ISEG is a wonderful school with great infrastructures, a great community union and a modern way of teaching, or its motto would not be "Open Minds. Grab the future". ISEG's library needs to match the rest of the university and become as modern and up to date as the information kept inside it.

3.3 Purpose and Type of Study

This project was developed using a quantitative and cross-sectional method along with a non-probabilistic sampling technique. The method used in the project was an online survey, based on the literature review, and targeting ISEG's students from all different programs. The purpose of this survey was to understand students' needs regarding their study spaces, and to understand how often they use these spaces, for what purposes and what new features and characteristics could improve them.

3.4 Sampling and Data Collection

The present study targets the student population of ISEG from all different programs (Bachelors, Masters, PhDs, and Executive Education) which accounts for around 5400 students.

An online survey was used as the primary data collection instrument. This survey was created and spread to students using Qualtrics, an online software platform focused on collecting, organizing, and understanding data. After its creation, this survey was shared with ISEG's students through social media, specifically Instagram and WhatsApp,

from the 26th of January to the 9th of February. This survey collected a total of 114 responses, of which 76 were usable.

3.5 Development of the Survey Script

The survey used in this project includes a total of 22 questions, distributed in 8 sections, each section dedicated to a different study space. These sections include "General Questions", "Reading Space", "Groupwork Space", "Individual Study Space", "Performative Space" and "Multipurpose Room" (excluding the first section and the demographic section). The survey was developed with two students working on other projects, and therefore only two sections of the survey ("General Questions" and "Groupwork Space") will be useful in this project. The questions were inspired by the literature review, specifically the part that refers what is important to include a groupwork space, as well as a benchmarking process that analyzed other universities with modern libraries, such as the Birmingham University and Nova SBE.

The first section of the survey is meant to filter the sample, by only allowing ISEG students to answer questions from the other sections, as well as asking students which program they study, for statistical purposes.

The second section of the survey, named "General Questions", starts by asking students how often they use ISEG's study spaces for various purposes, and then which areas of ISEG they prefer to study in. This section of the survey still asks how students feel about ISEG's study spaces, meaning if they find these spaces modern and pleasant. Finally, this section ends by asking students how much they value certain study spaces in a university, and certain elements and modern features regarding these spaces.

Moving on to the fourth section of this survey, named "Groupwork Space", which is the only section directly related to this project. This section starts by asking students how much they value certain environment characteristics, like privacy, when developing group projects. The second question of this section is directly inspired by benchmark and asks if groupwork booths were to exist inside ISEG's library, which elements would be important to have in these booths. Through these questions it is possible to understand students' interest in a space dedicated to groupwork.

Finally, this survey finishes with a demographic section, solely for statistical purposes. The parts of the survey analyzed in this project can be seen in Appendix A.

4 Empirical Analysis

4.1 Introduction

The following chapter will present an analysis of the data collected from the Qualtrics online survey. A total of 114 ISEG students participated in this survey, however 8 people were not ISEG students and only the answers of 76 ISEG students, around 71,70%, were usable. The unusable answers belong to students who started the survey but did not finish it.

The empirical analysis, which includes data processing and statistical analysis, was done using IBM SPSS Statistics software. The analysis only focuses on two blocks of the survey, these being "General Questions" and "Groupwork Spaces", since these groups are the only ones relevant to this project.

4.2 Sample Profile

The sample of this study consists of 76 ISEG students, of which 46 are female and represent the majority of the participant students, around 60.53%. Participants of the male gender represent 39.47% of the total, with 30 students participating. The most representative age group is 18-24, accounting for 85.53%, which means a total of 65 students in this group. From the other age groups, the only with representation in the sample is 25-34, with a total of 11 answers, which translates into a representation of 14.47%.

Regarding the programs that the students from the sample are in, the majority of the answers were obtained from students in Master's degrees, with a total of 50 students in this type of program, representing 65.79% of the sample. The second most represented program was the Undergraduate degree, with a total of 25 students, accounting for 32.89% of the sample. Finally, the only other program with representation in the sample is the Executive Education, with answers from 1 student and representing 1.32% of the sample.

Table 1- Sociodemographic Characterization of the Sample

Characteristics of the sample (N=76)	Options	N	%
Gender	Female	46	60.53%
	Male	30	39.47%
Age	18-24	65	85.53%
	25-34	11	14.47%
Current Study Program	Undergraduate	25	32.89%
	Masters	50	65.79%
	Executive Education	1	1.32%

Source: Author

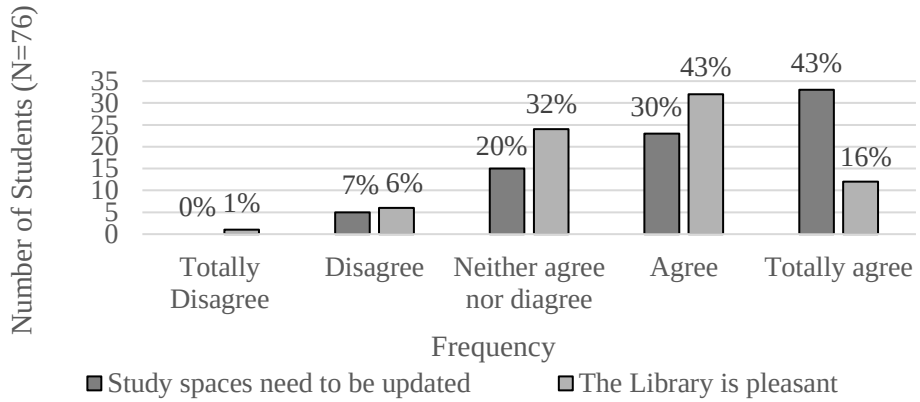
4.3 Students' relationship with ISEG's Study Spaces

To initiate this analysis, it is important to understand the general feeling students have towards ISEG's Study Spaces. To understand this general opinion, it is important to look at the results of the sixth question of the survey. This question asked students how much they agreed that ISEG's study spaces needed to be updated, and if the library was a pleasant space to be in. Looking at Graph 1, it is possible to see that, regarding the first affirmation, most students (73%) agree that the study spaces need to be updated. Furthermore, only 7% of the students do not feel like the study spaces need to be updated.

Regarding the second affirmation, most students (43%) agree that the library is a pleasant space to be in, and only 6% think the library is not. Adding to this information, 32% of students do not think the library is a pleasant place to be in, but do not find it unpleasant either.

To understand if there were any differences between males and females, undergraduates and master's students and the two different age groups, three t-tests were performed using SPSS. Differences were considered significant when $p<0.05$ (Marôco, 2007), and the results showed that there were no differences when any of these groups were compared.

Graph 1- Students' opinions regarding the Library and the Study Spaces



Source: Author

Proceeding to the first question of the "General Questions" block, students were asked to answer how often they used ISEG's study spaces for seven different purposes, these being: "Individual Studying", "Individual Work", "Group Studying", "Group Projects", "Reading", "Book/Articles consultation", "Computer Access" and "Using Data Providers". As the focus of this project is cooperative learning, the analysis of results of "Group Studying" and "Group Projects" will be deeper, while the approach for the other individual purposes will me more generic.

Starting with the analysis of results of the individual activities, it is possible to observe in Table 2 that the activity students practice least frequently in ISEG's Study Spaces is reading, with this activity's mean being the lowest. On the other hand, the activity practiced most frequently is "Individual Study" with a mean of 2.67, and the average answer being "2-3 times a month". Furthermore, it is interesting to look at "Book/ Article Consultation", which has the second lowest mean of all the activities. This value proofs that traditional libraries filled with bookshelves do not fulfill students' needs anymore.

Table 2- Means results of Purposes to use Study Spaces

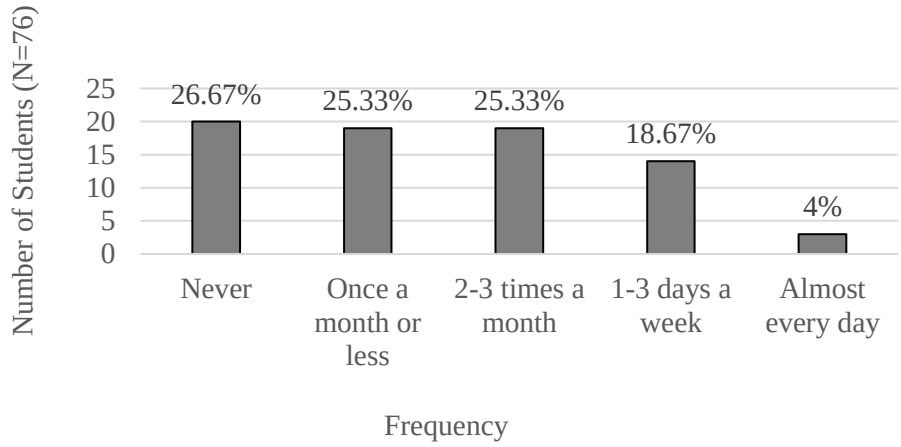
Purpose to use Study Spaces	Mean	Standard Deviation
Individual Studying	2.67	1.29
Individual Work	2.37	1.11
Group Studying	2.48	1.18
Group Projects	2.49	0.97
Reading	1.21	0.52
Book/Articles consultation	1.23	0.53
Computer Access	1.25	0.82
Using Data Providers	1.36	0.66

Source: Author

Moving on to the analysis of cooperative activities developed by students in ISEG's study spaces, it is possible to observe the results for "Group Studying" activities in Graph 2. The average frequency of group studying practice is found in the "Once a month or less" category, with a mean of 2.48 (Table 2).

Looking at Graph 2, it can be concluded that even though the most common answer was "Never", around 73% of students claim to study in groups at least one time. With close values in all frequencies, apart from "Almost every day", many students rely on ISEG's study spaces to study in groups.

Graph 2- Students' frequency of Group Studying in ISEG

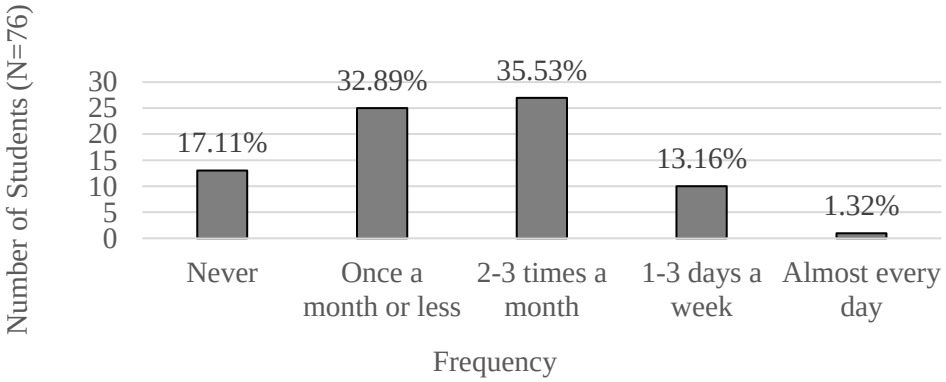


Source: Author

Still regarding the "Group Studying" category, three t-tests were performed to understand if there were any differences between the two genders, the different age groups, and the different study programs. Differences were considered significant when $p<0.05$ (Marôco, 2007), and all the results showed there were no significant differences.

The next and final cooperative category to be analyzed is "Group Projects/ Work", and these category's values can be seen in Graph 3. Starting with the analysis of the highest and lowest values, it is possible to see that accounting for 35.53% of the responses, "2-3 times a month" is the most common answer among students. On the other hand, the least common answer is "Almost every day", and accounts for 1.32% of the responses. Finally, the average answer from students is "Once a month or less", the mean value being 2.49 (Table 2), which makes this activity the second most practiced by students.

Graph 3- Students' frequency of Group Projects development in ISEG



Source: Author

Once again, the t-tests performed in the previous category were done for this category as well, the differences were considered significant when $p<0.05$ (Marôco, 2007), and the results were the same. There are no significant differences in the answers of the different groups.

To finish the analysis of this topic, and by looking at Table 2, it is possible to conclude that cooperative learning activities are both part of the top 3 most frequent activities practiced by students in ISEG's study spaces. This highlights the relevance cooperative activities have in higher education.

Moving to the analysis of results of the second and third questions of the "General Questions" block, students were asked which areas they preferred to study in, inside ISEG. On the second question students were asked to choose between "Library", "Cafeteria", "Rooftop" or "Other". In the third question students answered which areas they preferred to study in, inside ISEG's library, and were given the choice between "Aquarium", "Library floors", "Masters' Room" or "Classrooms".

Looking at Table 3, in which the "Classrooms" space was included in, it is possible to observe that ISEG students chose the library as their preferred space to study. The library has the highest mean out of all the spaces (3.20), with the average answer being "2-3 times a month". Apart from "Other", the Rooftop is the space students use the least to study in with a mean of 1.64.

Table 3- Means results of Study Spaces' frequency of use

Study Spaces	Mean	Standard Deviation
Library	3.20	1.36
Cafeteria	2.36	1.26
Rooftop	1.64	0.93
Classrooms	2.03	1.08
Other	1.38	0.96

Source: Author

Still regarding the Library, t-tests were conducted to understand if there were significant differences between the demographic groups (age, gender, and study program). Differences were considered significant when $p<0.05$ (Marôco, 2007). The t-tests performed did not show any significant differences for any of the demographic groups regarding the library.

Seeing that the library is by far the space students use the most frequently to study in, it is interesting to see which spaces they choose inside the library building. When looking Table 4, it can be concluded that students opt for the library's floors more frequently than any other space in the library building. The average answer regarding the library's floors fell into the "2-3 times a month" category, with a mean of 2.83, the highest mean of all.

Table 4- Means results of Library's Study Spaces' frequency of Use

Library's Study Spaces	Mean	Standard Deviation
Library' s floors	2.83	1.40
Aquarium	2.12	1.08
Master's Room	2.08	1.35

Source: Author

Once again, t-tests were conducted to search for significant differences between males and females, undergraduates and master's students, and the age groups "18-24" and "25-34", regarding the library's floors. Differences were considered significant when $p<0.05$ (Marôco, 2007).

Starting with the study program test, results showed a significant difference between these groups, with the undergraduates having a mean of 3.32 and the master's a

mean of 2.62 (Appendix B, Test 1). This shows that undergraduates opt for studying in the library more often than master's students, probably because undergraduates spend more time in ISEG, normally have a stronger connection with their colleagues and have more exams to study for as well.

Proceeding to the t-test that searched for differences between the age groups, results showed there were no significant differences between the groups "18-24" and "25-34".

Finally, the results for the t-test between males and females showed there were no significant differences.

To finish the analysis of students' relationship with study spaces, students were asked how important it was for them to have five different spaces (Groupwork space, Individual study space, Reading space, Individual Workspace and Multipurpose space) in a university, and the results are shown in Table 5. As the focus of this project is cooperative learning spaces, it is very important to point out that the "Groupwork space" was considered the most important to have, with a mean of 4.53 and the average answer being "Extremely Important".

Table 5- Means results of Importance of Study Spaces

Study Spaces	Mean	Standard Deviation
Groupwork Space	4.53	0.73
Individual Study Space	4.49	0.73
Reading Space	3.36	1.12
Individual Workspace	4.12	0.87
Multipurpose Room	3.92	0.99

Source: Author

Three t-tests were conducted to find any significant differences according to gender, age group and study program, for the "Groupwork Space" variable. Differences were considered significant when $p<0.05$ (Marôco, 2007) .

The results for all the t-tests according showed that there were no significant differences for any of the demographic groups.

4.4 Important elements in a Study Space

To finalize the analysis of the "General Questions" block, it is not only important to understand what spaces students value, but also what elements and features these spaces should have. To understand what these elements and features should be, the eighth and tenth questions were developed.

The eighth question asked what elements were important to have in a study space and the results are shown in Table 6. It is possible to conclude that the technological aspect has the highest value to students, followed by good lighting and then comfort. Students also highly valued an extended working period.

Table 6- Means results of Importance of Elements in a Study Space

Elements	Mean	Standard Deviation
Peaceful/ Neutral Colors	3.61	1.17
Dynamic/ Warm Colors	2.74	1.21
Comfortable Furniture	4.51	0.73
Natural Light	4.76	0.48
Illumination	4.72	0.53
Electrical Outlets	4.86	0.39
Good Wi-fi Connection	4.88	0.36
Extended Hours	4.63	0.69

Source: Author

With the help of SPSS, the three t-tests performed before for the previous questions were performed for all the elements in Table 6 to search for significant differences, which were considered significant when $p<0.05$ (Marôco, 2007).

The results of the test that compared undergraduates and master's students showed no significant differences for any of the elements.

The results of the t-test comparing males and females showed a significant difference in the importance of natural light. Females give more importance to the presence of natural light in study spaces than males, and the means were 4.89 and 4.57 respectively (Appendix B - Test 2). From this we can interpret that females tend to give more importance to a pleasant and comfortable environment than males.

The results for the age groups "18-24" and "25-34" showed significant differences for three variables: Illumination, Good Wi-fi connection and Extended hours (Appendix

B – Test 2). Firstly, the age group "25-34" gives more importance to illumination than the younger age group, with means of 5.00 and 4.68 respectively. Secondly, a good wi-fi connection has more importance to the age group "25-34" than to the group "18-24", the means being 5.00 and 4.86 respectively. Finally, the older age group values more extended working hours than the younger group, the means being 4.91 and 4.58 respectively. These differences allow the conclusion that older students give more importance to having good conditions to study, they probably use more internet to study than undergraduates, and finally older students prefer to study during later hours.

The tenth question of the survey asked students how important four technological features would be, if implemented. The results of this question can be seen in Table 7, and trough these it can be concluded that the most valued features are related to the library occupation. Having access to printers also has high importance to students.

Table 7- Means results of Importance of Features in a Study Space

Library's Study Spaces	Mean	Standard Deviation
Being able to book a spot for you/ your group in the library via ISEG's app	4.09	1.05
Being able to see the library's seat occupation online/ via ISEG's app	4.45	0.85
Having access to a second monitor for your PC	3.21	1.28
Having access to printers	3.95	1.11

Source: Author

Once again, t-tests were conducted to analyze if there were significant differences according to student's gender, age group and study program. These differences were considered significant when $p<0.05$ (Marôco, 2007). The results of all the tests conducted showed that there were no significant differences for any of the groups.

To finalize the analysis of the important elements to include in a study space a factor analysis was conducted using SPSS and the Varimax rotation method (Table 8). This dimension reduction included all the elements in tables 6 and 7, and three different groups were found. The first group can be associated with technology and includes being

able to see the library's occupation and being able to book a spot in the library, all via ISEG's app, having access to printers and to a second monitor as well. The second group can be associated with comfort and design and includes peaceful colors, dynamic colors, comfortable furniture, and natural light. The third group is associated with utility and includes illumination, electrical outlets, good Wi-fi connection and extended working hours. Finally, the percentage of the variance explained by the first group is 20.6%, the second group explains 17.3%, and the third group 16.6% (Appendix C).

Table 8- Factor Analysis Results

	Componente		
	1	2	3
Peaceful/ neutral colors	,060	,799	,033
Dynamic/ warm colors	,168	,769	-,164
Comfortable Furniture	,110	,594	,342
Natural light	,001	,629	,283
Ilumitation	-,122	,015	,733
Electric outlets	,082	,127	,668
Good Wi-fi connection	,112	,061	,782
Extend hours (24/7 spaces)	,327	,196	,357
Being able to see the library's seat occupation online/ via ISEG's app	,774	,159	,171
Having access to a second monitor for your PC	,697	,082	,096
Having access to printers	,743	,000	-,087
Being able to book a spot for you/ your group in the library via ISEG's app	,809	,059	-,017

Source: SPSS

4.5 Groupwork Space

Since the objective of this project is to create a cooperative learning/ groupwork space on the first floor of the library, it is important to understand what characteristics students are looking for in this type of space. To understand this the "Groupwork Space" block of the survey was created, with two matrix table questions.

The first question asked students how important it was to have certain elements in a groupwork space, and the results can be seen in Table 9. Trough the results it is possible to see that when it comes to groupwork students value the group's privacy and being able

to communicate freely above anything else and comfort, while still important, is not as valued.

Table 9- Means results of Importance of Elements in a Groupwork Space

Elements	Mean	Standard Deviation
Privacy to develop ideas and discuss topics with group members	4.47	0.66
Being able to make noise	4.38	0.76
Groupwork Booths	4.32	0.84
Flexible Furniture	3.92	1.01

Source: Author

To finish the analysis of this question t-tests were conducted to understand if there were significant differences according to the demographic groups (age, gender, and study program) for any of the elements in Table 9. These differences were considered significant when $p<0.05$ (Marôco, 2007).

Starting with the tests' results of the age groups and study programs, no significant differences were found in either of the tests for any of the variables.

Moving to the results of the gender test, there were differences found in the privacy variable, the groupwork booths variable and the flexible furniture variable (Appendix B – Test 3). Firstly, the significant difference found in the privacy variable shows females give more importance to privacy, the means being 4.65 for females and 4.20 for males. Secondly, the difference found in the groupwork booths shows that females give more value to the existence of booths than males, with means of 4.51 and 4.03 respectively. Finally, the difference found between genders in the flexible furniture variable shows again a higher importance given by females to this variable than males, with the means being 4.20 and 3.50 respectively. These differences lead again to the conclusion that females give much more importance to their study environment, comfort and privacy than males do.

The second question of the "Groupwork Space" block has a direct connection to the previously analyzed question, since it asks students which elements they found important to have inside groupwork booths if these were to exist. The results of this question can be seen in Table 10 and show that all elements were considered important,

with soundproof walls being highly valued, as well as the ability to seat many people and having natural light.

Table 10- Means results of Importance of Elements in a Groupwork Booth

Elements	Mean	Standard Deviation
Glass walls for natural light	4.16	0.97
Wall writing surfaces	4.08	0.96
Big table to sit at least six people	4.43	0.64
Big monitor with webcam (for teams' meetings and training presentations)	3.93	0.98
Soundproof walls	4.46	0.73

Source: Author

Once again, to see if there were significant differences according to student's age groups, gender, and study programs in any of the elements of Table 10, t-tests were conducted using SPSS. Differences were considered significant when $p<0.05$ (Marôco, 2007).

Starting with the age groups, results showed a significant difference in the variable "Wall writing surfaces", with the age group "25-34" giving more importance to this element than the group "18-24" with means of 4.64 and 3.98 respectively (Appendix B – Test 4). This difference makes clear that older students value more written references in their study than younger students, probably because of the technological evolution and differences in education between these two generations.

The results of test that looked for differences between undergraduates and master's students showed a significant difference in the big table variable. According to the results, undergraduates give more importance to being able to seat many group members in one table than master's students, with means of 4.64 and 4.33 respectively (Appendix B – Test 4). This difference can have the following interpretation: Undergraduates prefer to study and work collectively with their colleagues, while master's students opt for a more individual and quiet study.

Finally, the results of the t-test between males and females did not show any significant differences for any of the variables in Table 10.

5 Space Alteration Proposal

5.1 Introduction

The present chapter intends to present a proposal for the alteration of the first floor of ISEG's library, by making it a space dedicated to groupwork. This proposal will be based on the empirical analysis's results, as well as the literature review.

5.2 Summary of Survey Results

The Empirical Analysis chapter was essential to collect information that clarifies what ISEG's students find important to have in a groupwork space, from design and comfort elements to technological features and even the social conditions. This information will serve as a base for the alteration of the first floor of the library, because it is essential that the alteration project is based on students' needs and opinions.

Starting with the design aspect of the room, students valued the presence of natural light, good artificial illumination, and having comfortable and flexible furniture was also considered very important. When asked about color preferences for the library, most students chose peaceful and neutral colors over warm and dynamic colors.

When it comes to elements that improve and facilitate the groupwork, students highly valued having privacy to work, and consequently highlighted the importance of soundproof walls that enable groups to communicate freely. Extended working hours of the library were also an important element to students. Additionally, the analysis revealed that having a good number of electrical outlets was also extremely important, as well as tables that could fit well a group of at least 6 members and surfaces to write on.

From a technological perspective, the ability to book a spot in the library and see the library occupation all via ISEG's app was very appealing to students. Furthermore, a good wi-fi connection was considered extremely important and having access to printers was also considered important.

To finalize, from the preference of neutral and cooler colors (Yildirim et al., 2015), to flexible furniture and good illumination (Staines, 2012), and even the importance of soundproof walls, the reservation process and good wi-fi (Staines, 2012) (Lotfy et al., 2022), all the empirical data collected is in accordance with the literature review.

5.3 Groupwork Floor Proposal

The proposal for the first floor of the library is to create a space that allows students to develop group projects and study in groups. The goal of this project is to provide students with a modern and dynamic space that gives high quality and equal study conditions. In this project there are four focus points: design, comfort, utility, and technology.

Starting with the general operation of the space, and to answer students' needs regarding extended working hours of the library, the room would be accessible to students from 9.30h to 00.00h. This schedule adds one hour to the current working hours of the library and gives students with different timetables the flexibility to have meetings in the space almost the entire day. Regarding room organization and security, an ISEG staff member responsible for the control of the space would be present in this floor during working hours, to avoid any misconduct or disruptive behavior, as well as contribute to the organization of the floor.

From a design perspective, this project aims to create a modern and aesthetically pleasing space, with a clean look and as much natural light as possible. According to the empirical data, students prefer neutral and light tones to warm colors, therefore the proposal is to paint the walls white or with very light tones of grey. Using light and neutral tones on the walls will also increase the reflection of natural light and will create a brighter space. The use of stronger colors is saved for decoration details, like small pieces of furniture, which also makes the room more flexible to decoration changes.

The focal point of the project is the creation of eight groupwork booths in the main hall of the first floor, four on each side, as it is illustrated in the blueprint displayed in Appendix D. The walls of the booths are made of a transparent material to let natural light pass and create a less obstructed room. Furthermore, these booths are planned to be soundproof, which had tremendous importance to students because that way they can have privacy and communicate freely without disrupting other groups or be disrupted by them. Inside each booth there is a table that fits 6 students comfortably placed in the middle, as illustrated in Appendix E. The chairs used should be ergonomic, comfortable, and easy to move, preferable with wheels, so that groups can easily adapt the booths to their needs. It is important to refer that the blueprint in Appendix D and the illustrations in Appendix E were both developed in collaboration with an architecture student, to

whom it was explained how the blueprint of the floor and the groupwork booths should look like.

From a utility perspective, these booths will be equipped with at least six electrical outlets (one for each student), which was considered very important in the data analysis, and a big writing board for brainstorming and laying down ideas and strategies. Students also found important to have access to printers, so the project includes at least one printer for groups to use, controlled by the room responsible.

On the topic of illumination, the floor has ceiling lights for the common areas, and each booth has its own adjustable ceiling light. This way groups can adapt the light to what fits their work better and makes them more comfortable, since illumination needs vary depending on the activities. All the lights in the project are LED for sustainability purposes, since these lights last longer, have low maintenance and low energy costs as well.

Finally, on the topic of technology, quality wi-fi connection was one of the most important elements to students and therefore should be ensured for the entire groupwork floor. Additionally, this project includes the implementation of two new technological features through ISEG's App. Firstly, for organization purposes students would have to book the groupwork booths for the time needed, and there would be two ways to do that, by using ISEG's App, or with the staff member responsible for the floor. Secondly, ISEG's App would also enable students to see the current occupation of the groupwork floor and help them decide if they want to make use of the floor depending on its occupation.

6 Conclusion

6.1 Project Implications

The implications of this project reflect the consequences that the project has, and these can be divided in two groups, theoretical implications and practical implications. Starting with the theoretical implications, this project, particularly the "Empirical Analysis" chapter, confirms the importance that cooperative learning has in higher education and society. The empirical data collected showed that students find extremely important to have cooperative learning dedicated spaces, where group projects can be developed.

Moreover, this project adds to the existing literature on cooperative learning and university libraries, while helping universities understand what students need in their libraries today. It was made clear that the overall environment of a library is very important to students, from design elements to technological features and social factors, all these play an essential role in making the library a place that students want to attend.

Finally, this project helps understand how much higher education has changed, and how traditional teaching methods and traditional libraries are not responding to students' needs anymore. A library filled with bookshelves is no longer what students need in their schools. With the evolution of technology, a library today needs to be a dynamic, social, flexible, and aesthetically pleasing space since learning methods now incorporate so many different techniques and ways that students can work.

Moving to the practical implications, this project directly affects ISEG's library, and the use students make of it. The empirical data collected showed that students find ISEG's study spaces outdated, and the space they valued the most was the Groupwork Space. The execution of this project would respond to the needs found during the analysis of the collected data, and allow students to have a space where they can work in groups and communicate with each other while being in a focused and academic environment.

Additionally, the data analysis also showed that undergraduates use the library more often than master's students. A groupwork floor would increase the affluence of students from all study programs to the library outside of exams season and facilitate the planning and development of group projects.

Furthermore, the utilization of ISEG's app to book a spot in the library and see its occupation would facilitate the library's organization, as well as help students organize their study schedule. The development of ISEG's App and the addition of these features to it would also be another step towards having a modern and dynamic library.

Finally, redesigning the library and creating a space dedicated to more modern ways of learning aligns perfectly with ISEG's new image and new motto "OPEN MINDS. GRAB THE FUTURE.".

6.2 Limitations and Future Research

The limitations found during the development of this project came from both the theoretical part associated with the literature review, as well as the practical part associated with the data collection.

Starting with the literature review limitations, there is a multitude of articles that explain the concept of cooperative learning, why this form of learning is so important today, and how it reflects on students grades and acquired skills. However, most articles approach cooperative learning from a very theoretical perspective, and do not approach the practical perspective of cooperative learning. There were few articles that mentioned what a cooperative learning space should look like, what elements are essential to have in it, and what a cooperative learning environment should look like.

Moving on to the practical limitations found during the empirical research, these were mostly related to the short number of responses to the survey. In a university with over 5000 students, under 100 answered the survey, probably because of the extension of it and the release timing, which was during exams season, when most students are not available. The extension of the survey was extremely difficult to control, because this was a project with various topics being approached by different group members, with each member needing specific answers to develop their part of the project.

Considering the obstacles previously mentioned, further studies with a higher number of respondents, related to university libraries should be conducted. These studies should approach cooperative learning from a practical perspective, and help understand what an efficient university library, that responds do students' needs looks like today.

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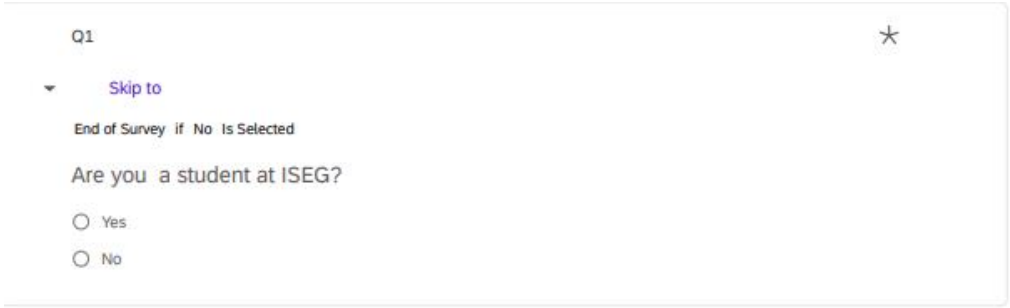
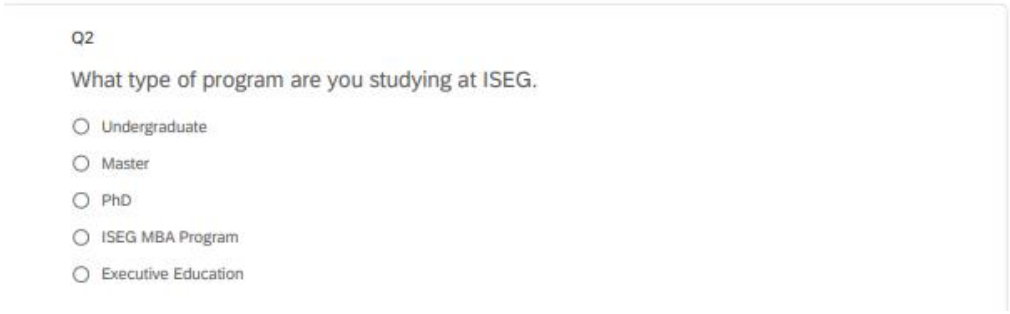
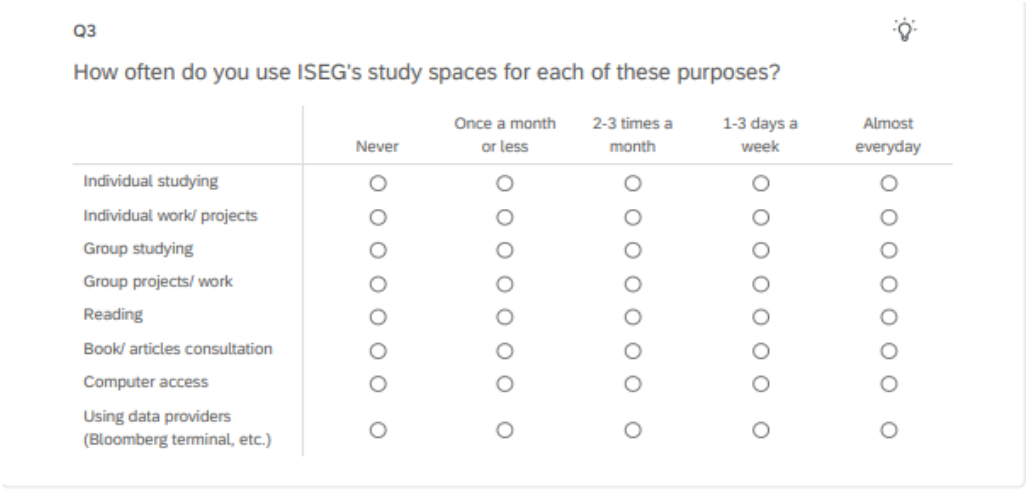
Appendices

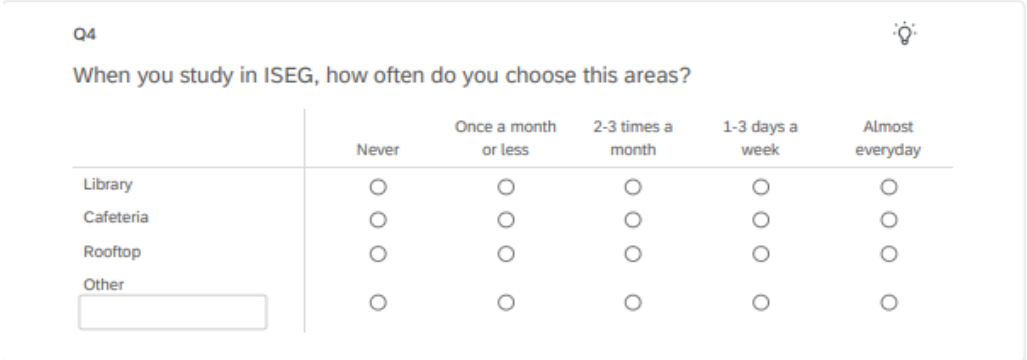
Appendix A- Survey





General Questions Block





Q5

When studying at ISEG's Library, how often do you use these areas?

	Never	Once a month or less	2-3 times a month	1-3 days a week	Almost everyday
Ground Floor / Aquarium	○	○	○	○	○
Library floors	○	○	○	○	○
Masters' Room	○	○	○	○	○
Classrooms	○	○	○	○	○

Q6

On the scale presented, how much do you agree with the following affirmations?

	Totally disagree	Disagree	Neither agree nor disagree	Agree	Totally agree
ISEG's Study Spaces need to be updated.	○	○	○	○	○
The Library is a pleasent place to be in	○	○	○	○	○

Q7

How important do you think having these spaces in a universty is?

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Groupwork/ group projects dedicated space	○	○	○	○	○
Individual study space	○	○	○	○	○
Reading Space	○	○	○	○	○
Individual work space	○	○	○	○	○
Multipurpose space	○	○	○	○	○

Q8

How important do you think these elements are in a study space?

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Peaceful/ neutral colors	○	○	○	○	○
Dynamic/ warm colors	○	○	○	○	○
Comfortable Furniture	○	○	○	○	○
Natural light	○	○	○	○	○
Ilumitation	○	○	○	○	○
Electric outlets	○	○	○	○	○
Good Wi-fi connection	○	○	○	○	○
Extend hours (24/7 spaces)	○	○	○	○	○

How much do you agree that ISEG's study spaces might be improved by adding green features like those in the image?

- ○ Totally disagree
- ○ Disagree
- ○ Neither agree nor disagree
- ○ Agree
- ○ Totally agree

Q10

How important do you think these features would be in a study space?

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Being able to book a spot for you/ your group in the library via ISEG's app	○	○	○	○	○
Being able to see the library's seat occupation online/ via ISEG's app	○	○	○	○	○
Having access to a second monitor for your PC	○	○	○	○	○
Having access to printers	○	○	○	○	○

Groupwork Space Block

Q13

Group Work Space

This block of the survey is dedicated to a part of the Library to develop group projects.

Q14

On the scale presented, how important are the following elements regarding group projects/ groupwork?

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Privacy to develop ideias and discuss topics with group members	○	○	○	○	○
Being able to make noise	○	○	○	○	○
Groupwork booths	○	○	○	○	○
Flexible furniture	○	○	○	○	○
Boards to write on/ wall wirting surfaces	○	○	○	○	○

Q15

If Groupwork booths (like the one in the image) were to exist in the Library, how important would these elements be?

	Not at all important	Slightly important	Moderately important	Very important	Extremly important
Glass walls for natural light	○	○	○	○	○
Wall writing surfaces	○	○	○	○	○
Big table to sit at least six people	○	○	○	○	○
Big monitor with webcam (for teams meetings and training presentations)	○	○	○	○	○
Sound proof walls	○	○	○	○	○

Appendix B – "t- tests" Results

Test 1 – Library's Floors

- Undergraduates and Master's

Estatísticas de grupo

	What type of program are you studying at ISEG.	N	Média	Desvio Padrão	Erro de média padrão
Library floors	Undergraduate	25	3,32	1,249	,250
	Master	50	2,62	1,427	,202

Teste de amostras independentes

		Teste de Levene para igualdade de variâncias		teste-t para Igualdade de Médias							
						Significância		Diferença média	Erro de diferença padrão	95% Intervalo de Confiança da Diferença	
		Z	Sig.	t	df	Unilateral p	Bilateral p			Inferior	Superior
Library floors	Variâncias iguais assumidas	,939	,336	2,084	73	,020	,041	,700	,336	,031	1,369
	Variâncias iguais não assumidas			2,180	54,236	,017	,034	,700	,321	,056	1,344

Test 2 – Elements in a Study Space

- Gender

Estatísticas de grupo

	What is your gender?	N	Média	Desvio Padrão	Erro de média padrão
Natural light	Male	30	4,57	,626	,114
	Female	46	4,89	,315	,046

Teste de amostras independentes

		Teste de Levene para igualdade de variâncias		teste-t para Igualdade de Médias							
						Significância		Diferença média	Erro de diferença padrão	95% Intervalo de Confiança da Diferença	
		Z	Sig.	t	df	Unilateral p	Bilateral p			Inferior	Superior
Natural light	Variâncias iguais assumidas	33,504	<,001	-2,992	74	,002	,004	-,325	,109	-,541	-,108
	Variâncias iguais não assumidas			-2,632	38,668	,006	,012	-,325	,123	-,574	-,075

- Age Groups

Estatísticas de grupo

	What is your age?	N	Média	Desvio Padrão	Erro de média padrão
Ilumitation	18 - 24	65	4,68	,562	,070
	25 - 34	11	5,00	,000	,000
Good Wi-fi connection	18 - 24	65	4,86	,390	,048
	25 - 34	11	5,00	,000	,000
Extend hours (24/7 spaces)	18 - 24	65	4,58	,727	,090
	25 - 34	11	4,91	,302	,091

Teste de amostras independentes

		Teste de Levene para igualdade de variâncias		teste-t para Igualdade de Médias							
						Significância		Diferença média	Erro de diferença padrão	95% Intervalo de Confiança da Diferença	
		Z	Sig.	t	df	Unilateral p	Bilateral p			Inferior	Superior
Ilumitation	Variâncias iguais assumidas	25,218	<,001	-1,896	74	,031	,062	-,323	,170	-,663	,016
	Variâncias iguais não assumidas			-4,635	64,000	<,001	<,001	-,323	,070	-,462	-,184
Good Wi-fi connection	Variâncias iguais assumidas	6,934	,010	-1,170	74	,123	,246	-,138	,118	-,374	,097
	Variâncias iguais não assumidas			-2,859	64,000	,003	,006	-,138	,048	-,235	-,042
Extend hours (24/7 spaces)	Variâncias iguais assumidas	10,428	,002	-1,454	74	,075	,150	-,324	,223	-,769	,120
	Variâncias iguais não assumidas			-2,535	34,156	,008	,016	-,324	,128	-,585	-,064

Test 3 – Elements in a Groupwork Space

- Gender

Estatísticas de grupo

	What is your gender?	N	Média	Desvio Padrão	Erro de média padrão
Privacy to develop ideias and discuss topics with group members	Male	30	4,20	,714	,130
	Female	46	4,65	,566	,084
Groupwork booths	Male	30	4,03	,999	,182
	Female	45	4,51	,661	,099
Flexible furniture	Male	30	3,50	1,042	,190
	Female	46	4,20	,910	,134

Teste de amostras independentes

		Teste de Levene para igualdade de variâncias		teste-t para Igualdade de Médias							
						Significância		Diferença média	Erro de diferença padrão	95% Intervalo de Confiança da Diferença	
		Z	Sig.	t	df	Unilateral p	Bilateral p			Inferior	Superior
Privacy to develop ideias and discuss topics with group members	Variâncias iguais assumidas	1,743	,191	-3,066	74	,002	,003	-,452	,148	-,746	-,158
	Variâncias iguais não assumidas			-2,920	52,016	,003	,005	-,452	,155	-,763	-,141
Groupwork booths	Variâncias iguais assumidas	1,112	,295	-2,494	73	,007	,015	-,478	,192	-,860	-,096
	Variâncias iguais não assumidas			-2,304	45,829	,013	,026	-,478	,207	-,895	-,060
Flexible furniture	Variâncias iguais assumidas	,670	,416	-3,076	74	,001	,003	-,696	,226	-1,146	-,245
	Variâncias iguais não assumidas			-2,988	56,059	,002	,004	-,696	,233	-1,162	-,229

Test 4 – Elements in a Groupwork Booth

- Age Groups

Estatísticas de grupo

	What is your age?	N	Média	Desvio Padrão	Erro de média padrão
Wall writing surfaces	18 - 24	65	3,98	1,008	,125
	25 - 34	11	4,64	,505	,152

Teste de amostras independentes

		Teste de Levene para igualdade de variâncias		teste-t para Igualdade de Médias							
						Significância				95% Intervalo de Confiança da Diferença	
		Z	Sig.	t	df	Unilateral p	Bilateral p	Diferença média	Erro de diferença padrão	Inferior	Superior
Wall writing surfaces	Variâncias iguais assumidas	4,153	,045	-2,093	74	,020	,040	-,652	,311	-1,272	-,031
	Variâncias iguais não assumidas			-3,310	26,193	,001	,003	-,652	,197	-1,056	-,247

- Undergraduates and Master's

Estatísticas de grupo

	What type of program are you studying at ISEG.	N	Média	Desvio Padrão	Erro de média padrão
Big table to sit at least six people	Undergraduate	25	4,64	,490	,098
	Master	49	4,33	,689	,098

Teste de amostras independentes

		Teste de Levene para igualdade de variâncias		teste-t para Igualdade de Médias							
						Significância				95% Intervalo de Confiança da Diferença	
		Z	Sig.	t	df	Unilateral p	Bilateral p	Diferença média	Erro de diferença padrão	Inferior	Superior
Big table to sit at least six people	Variâncias iguais assumidas	2,343	,130	2,026	72	,023	,046	,313	,155	,005	,622
	Variâncias iguais não assumidas			2,257	64,184	,014	,027	,313	,139	,036	,591

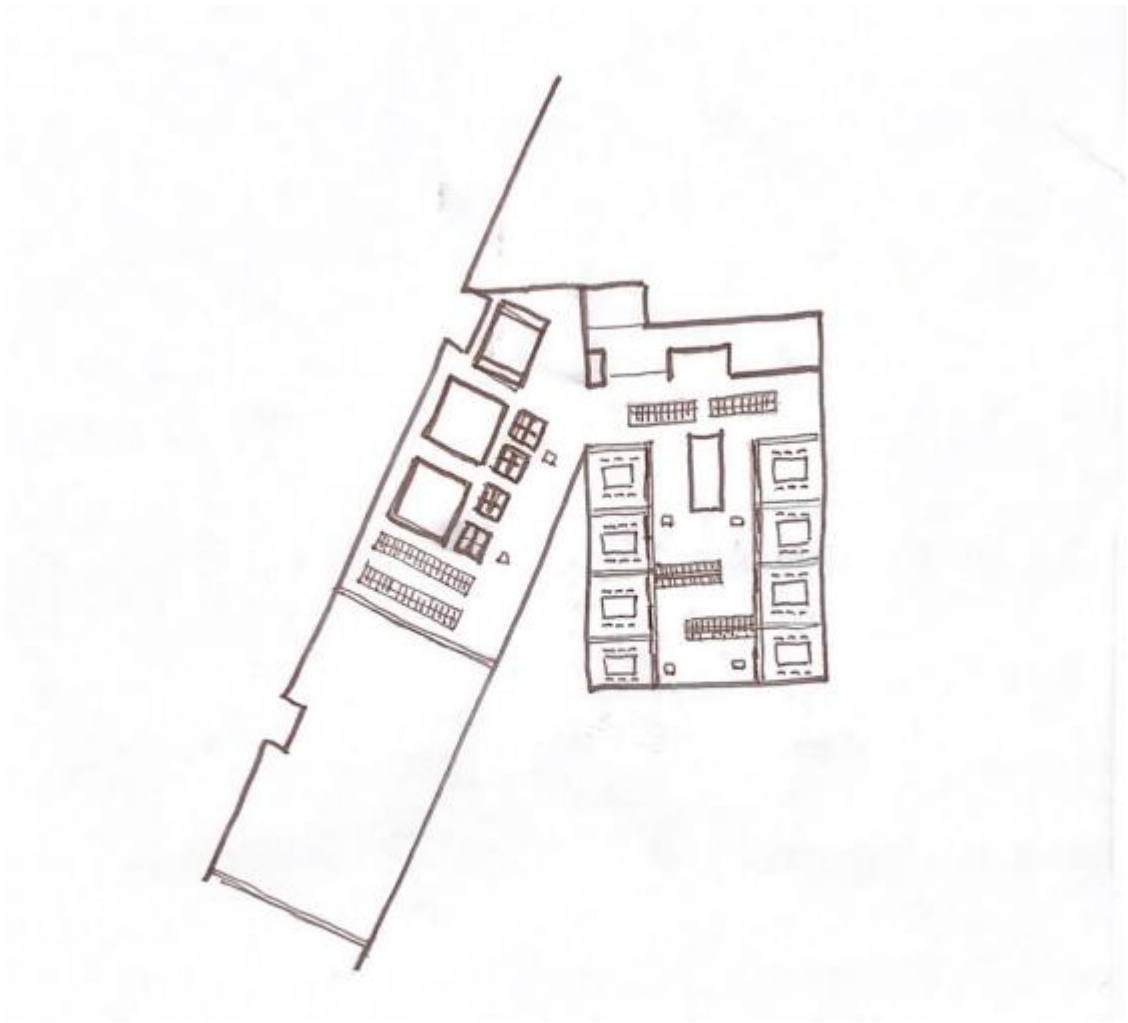
Appendix C – Factor Analysis Results

Variância total explicada

Componente	Autovalores iniciais			Somas de extração de carregamentos ao quadrado			Somas de rotação de carregamentos ao quadrado		
	Total	% de variância	% cumulativa	Total	% de variância	% cumulativa	Total	% de variância	% cumulativa
1	3,137	26,146	26,146	3,137	26,146	26,146	2,478	20,646	20,646
2	1,937	16,144	42,290	1,937	16,144	42,290	2,072	17,268	37,915
3	1,468	12,233	54,523	1,468	12,233	54,523	1,993	16,608	54,523
4	,991	8,258	62,781						
5	,916	7,633	70,414						
6	,857	7,138	77,552						
7	,740	6,168	83,720						
8	,554	4,614	88,334						
9	,504	4,197	92,531						
10	,383	3,196	95,726						
11	,301	2,508	98,235						
12	,212	1,765	100,000						

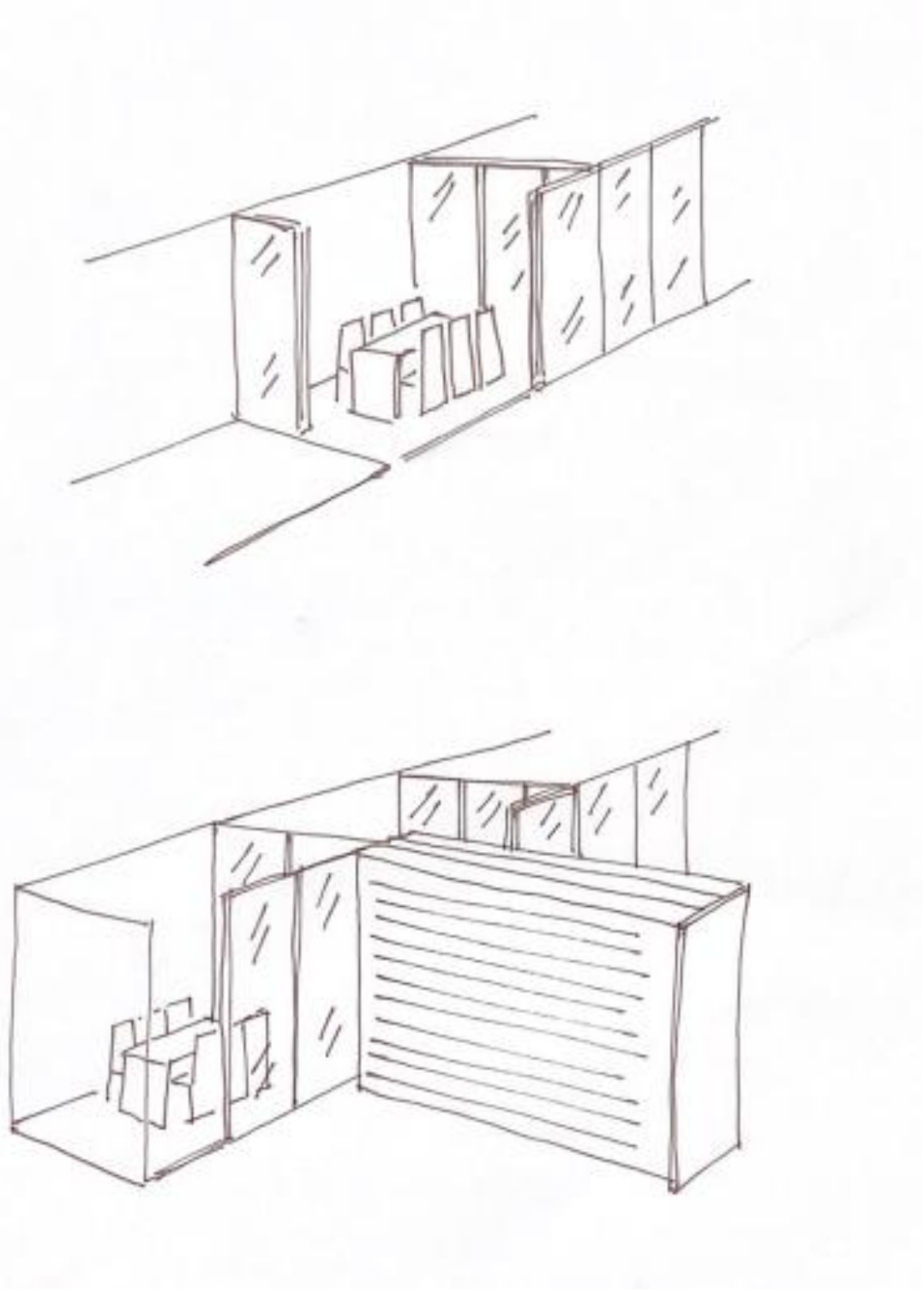
Método de Extração: análise de Componente Principal.

Appendix D – Groupwork Floor Blueprint



Author: Carlos Nora

Appendix E - Group Booths Design



Author: Carlos Nora