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Study of the impact of an
interactive solution on a university
campus: ISCTE-IUL case

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Abstract

Every year, universities welcome new students, teachers, researchers and visitors that are unfamiliar with numerous aspects regarding the campus. Kiosks have proved to be a useful tool to solve numerous aspects, from finding specific information, performing transactions or even discovering a location. This study aims to determine whether or not a kiosk would influence the experience lived by visitors and the community of ISCTE-IUL on campus. In other words, what impact does an interactive and informative system has on the campus of a university? An online survey was distributed to the community, former students and potential visitors of ISCTE-IUL, to gather requirements for the system. A prototype was developed, and a usability test was performed with random participants that, at the time, were either students or visitors of ISCTE-IUL. At the end of the test, the users answered a feedback questionnaire, that allowed a better understanding of the impact and possible improvements to the system. The analysis of the initial survey revealed the need for this type of system on campus. The usability test and feedback questionnaire proved the usability and utility of the prototype and the main conclusions are in accordance with the proposed goals. This type of system proved to have a positive impact on the campus and on this basis, it is recommended the implementation of a similar system on campus. Future versions of this system should consider the recommendations provided by test users and also the enhancements to the functionalities.

Keywords: *Interactivity; Usability; Human-Computer Interaction; Kiosk; University.*

Resumo

As universidades recebem todos os anos alunos, professores, investigadores e visitantes que não estão familiarizados com vários aspetos relativamente ao campus. Os quiosques são uma ferramenta útil para a resolução de vários aspetos, desde encontrar uma informação específica, realizar transações ou até descobrir um local. Este estudo tem como objetivo determinar se um quiosque pode influenciar a experiência vivida no campus pela comunidade e visitantes do ISCTE-IUL. Isto é, que impacto tem um sistema interativo e informativo no campus de uma universidade? Foi distribuído um inquérito online de forma a recolher requisitos para o sistema. O mesmo foi realizado por membros da comunidade, antigos estudantes e potenciais visitantes do ISCTE-IUL. Foi desenvolvido um protótipo e foi realizado um teste de usabilidade por participantes aleatórios, que naquele momento, eram estudantes ou visitantes do ISCTE-IUL. No final do teste, os utilizadores responderam a um questionário de *feedback*, que permitiu uma melhor compreensão do impacto de possíveis melhorias do sistema. A análise do inquérito inicial revelou a necessidade deste tipo de sistema. O teste de usabilidade e o questionário de *feedback* provaram a usabilidade e utilidade do protótipo e, as principais conclusões, estão de acordo com os objetivos propostos. Este tipo de sistema provou ter um impacto positivo no campus e nesta base, é recomendada a implementação de um sistema semelhante no campus. Versões futuras deste sistema devem considerar as recomendações fornecidas pelos utilizadores e também melhorias às funcionalidades.

Palavras-chave: *Interatividade; Usabilidade; Interação Humano-Computador; Quiosque; Universidade.*

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Terms and Abbreviations

QR Code: Quick Response Code

HCI: Human-Computer Interaction

FAQ: Frequently Asked Questions

IT: Information Technology

Chapter 1

Introduction

1.1 Motivation

User-friendly, natural and intuitive information systems are more and more present in our everyday, and kiosks are no exception [16]. In an extremely evolved world, and mostly in an educational and innovative environment as a university, it is necessary that the campus evolves as well. This project focuses on this subject, in particular, the study of the implementation of a kiosk at ISCTE-IUL University.

Every year, universities welcome new students, teachers, researchers and visitors that don't know the campus, and their integration could be more efficient with the use of an interactive system to help them regarding numerous aspects of the university [9]. Currently, ISCTE-IUL has a community of 9600 students, 390 teachers, 390 researchers and 270 members of the technical staff [1]. Besides that, it has more than 550 corporation agreements with foreign universities, welcoming every year several students from different countries that are not familiarized with the college where they will be studying for at least one semester. This is one of the crucial factors by which is intended to study the impact that an interactive solution would have on the integration and the experience that will be lived by the new students. Currently, to obtain directions to specific locations inside ISCTE-IUL, students, teachers, researchers or visitors, have to reach out to other persons for help.

Another extremely important reason for this study, is the creation of a system that helps students from under-graduate and post-graduate programs of ISCTE-IUL, with day-round availability of information, enabling the access to different functionalities and improving several recurring activities in the daily life of the students.

And finally, another relevant focus are visitors that go to the campus every day, ranging from suppliers, event participants to ISCTE-IUL candidates. Visitors will be able to obtain specific and prompt information and possibly perform a number of actions in the solution.

Although the focus of this project is the ISCTE-IUL case, this problem is felt by other educational establishments. Universities are usually very different from one another and are constituted by complex campus, which present a few barriers and obstacles for new students and visitors. There are successful experiments that prove that a kiosk can mitigate some of those barriers and also provide an interactive and efficient way of obtaining information on campus [5] [6]. This can be seen as an important step of digital transformation, that must take place not only in corporate structures, but also, in an important environment of knowledge production, such as universities.

1.2 Research Goals

This dissertation is intended to demonstrate the impact and utility of an interactive system, more precisely a self-service kiosk for navigation, information gathering and with functionalities to support the visitors and the ISCTE-IUL community, improving and innovating the student's daily life and promoting the potential of the campus.

It is necessary to evaluate how the community and visitors of a university interact with a system that facilitates the exploration of numerous aspects in the campus. For this evaluation, it will be necessary to plan, design and implement a prototype of the system in question. That will allow to draw conclusions on the impact and evaluate if it represents an appropriate solution to support the navigation on campus, as well as inform and provide functionalities to support the students and visitors. To reach the expected results, the following research goals were defined:

- Understand which elements are crucial to improve the experience on ISCTE-IUL's campus by students and visitors;
- Evaluate the users' feedback regarding the usability of the interactive system, and understand if the prototype meets the defined purpose in the initial phase of the project;
- Validate that an interactive and informative prototype version of the kiosk has a positive impact on the experience lived on campus by its users.

1.3 Methodology

In this project it is intended to create an interactive and informative solution that can be tested independently by potential users, and for that reason, the research mainly focuses on descriptive studies. The aim is to learn how users interact with a self-service kiosk solution, as well as what is required to plan, design and implement such a solution. After the implementation of a prototype, studies are conducted to understand and verify the impact of this type of system.

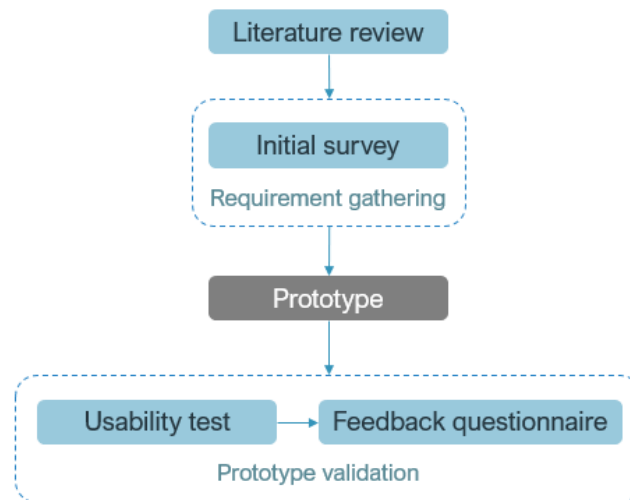


FIGURE 1: Diagram of techniques used in the investigation.

As illustrated in Figure 1, first, a literature review was performed and after that research, it was necessary to resort to techniques such as a survey, a usability test and a feedback questionnaire, to perform the evaluation.

The literature review was carried out with the following purposes:

- Understand the current knowledge on the topic of interactive systems, the benefits, limitations, and applications of this technology;
- Research the topics of interactivity, human-computer interaction and usability, and relate them with interactive systems;
- Analyse current applications of interactive systems as well as identify their limitations.

The criteria for considering studies for this review was:

- Types of studies: the articles must present empirical data or theoretical concepts;
- Types of participants: studies from students and professionals, on the topics mentioned before will be considered;
- Types of publications: articles, cases studies and conference proceedings will be included;
- Publication dates: inclusion of studies written between 2000 and 2019;
- Language: only studies written in English will be considered.

The following databases were examined: IEEE Xplore, Science Direct – Elsevier and Springer, ResearchGate, Scopus and ACM Digital Library.

The title, abstract, and keywords of the articles in the electronic databases mentioned were explored according to the following search strategy:

1. “kiosk” AND “interactive”
2. “kiosk” AND “information”
3. “interactive kiosk” AND “university”
4. “interactive displays” AND “applications”
5. “interactivity” AND “human-computer interaction”
6. “human-computer interaction” AND “kiosk”
7. “usability” AND “kiosks”
8. “usability” AND “interactivity”

The search strategy identified relevant articles, that were reviewed. Studies were excluded if: the focus, or main focus, was not any of these topics, interactive and/or information systems, interactivity, human-computer interaction or usability; the study did not present empirical data or theoretical concepts.

The quantitative method, in methodological terms, is the one that proves to be best fitted to the subject in question, since it focuses on the connection between the study variables and its cause-effect relation.

The initial survey was performed before building the prototype and, therefore, prior to the system's usability test and feedback questionnaire. It was performed by different groups of people, ranging from elements of the ISCTE-IUL community, to previous visitors or even respondents that have never been on campus. The usability test, once the prototype was available, was performed by several campus users. The feedback questionnaire was only for test users that performed the usability test and therefore the sample used in the test and in the questionnaire is exactly the same.

The initial survey focused mainly in gathering responses from potential users of the solution, regarding unexplored aspects of ISCTE-IUL campus, acceptance to the usage of an interactive and informative system and, understanding who can benefit the most from this type of solution. The respondents were either students, previous visitors or potential visitors, with a high, medium and low degree of familiarization with the campus, respectively. This survey provided insight on which requirements should be part of the system.

A prototype was built with several functionalities that correspond to the requirements gathered in the initial survey. After developing the prototype, it was performed a usability test that presented different scenarios to the test users. These scenarios allowed them to explore all the main functionalities of the system, as well as, perform a few of the most relevant actions identified as necessary by the respondents of the initial survey.

The feedback questionnaire was performed at the end of the usability test, to gather opinions regarding the implemented system. The feedback obtained was used to validate the viability of the prototype and the level of acceptance of this type of solution on campus.

Chapter 2

Literature Review

The context and current knowledge framework for the relevant areas of study in this dissertation are presented in this chapter and it begins with an historical review of the main elements of this work.

In section 2.1, the history and a few of the most important concepts regarding interactive kiosks are presented. Subsequently, in sections 2.2 and 2.3 the theoretical concepts related to human-computer interaction and usability, are respectively exposed. In section 2.4, several real cases are presented, which relate to the previously described concepts, focusing on the analysis of results and limitations of each one of the presented approaches.

Finally, in section 2.5, a conclusive analysis is performed, in which the actual framework in the area of interactive kiosks is described. It is also provided a visual comparison between the real cases mentioned in the previous section and the proposed system.

2.1 The Interactive Kiosk

2.1.1 Concept and history

Public displays differ between large-scale public displays, that can be interacted with from a distance, to interactive kiosks in public spaces with information

of local interest, such as shopping centers, museums, hospitals, libraries, universities [16], airports, retail establishments [9] and subway stations [15].

A kiosk can be defined as "a computer-assisted medium that can be placed in specific locations to provide electronic information and services to the public" [6].

The first self-service kiosk was developed and implemented in 1977 by Murray Lappe, a student from the University of Illinois, and allowed students and visitors to search for movies, bus schedules, course's information and extracurricular activities and maps. Since that moment, the development of kiosks was massively increased. However, these were considered uninteresting, with simple interfaces and with a very limited number of screens available, only allowing consumers to perform a simple transaction, for example, place an order or look for specific information.

Current kiosks, in contrast to the first implementations, support numerous features, ranging from information storage, interactivity and multiple transactions, such as, the purchase of tickets [10].

Consequently, these gather the four functions that should be present in kiosks, proposed by Rowley e Slack (2002) [12]:

- Inform: provide/promote information;
- Interact: exchange of information between users and the kiosk;
- Transaction: commerce and sales;
- Relate: create and reinforce relationships between the consumer and the retailers.

2.1.2 Types and characteristics of interactive kiosks

There are three general types of kiosks [19]:

- Kiosks for dissemination of information and advertisement of products and services in a unilateral communication environment. Mostly used in touristic locations and conferences;

- Interactive kiosks that automate the access to information and data retrieval, allowing users to insert data through a touch screen or a keyboard. This type can be found in shopping centers and airports;
- Transaction kiosks enable exchange of information and more complex transactions than the previously presented types. These are more robust, there is a bilateral communication between the user and the system and can have functions such as user authentication or cash withdrawal. It can be designed to accept money and debit or credit cards, and can be found, for example, in parking lots to allow payments, or in retail and restaurants, to optimize the process of buying a product or a meal.

A very common characteristic of kiosks is the combination of the rigid interaction style with an accessible graphic interface through a touch screen. Kiosks are used commercially as industrial applications, as a way to eliminate paper and improve the efficiency of services [14]. Due to its popularity as a mean to access public information, there is a great interest in improving its interaction flexibility allowing the user to perform more complex tasks [8]. It should be placed in high visibility locations, where the potential users can see it more frequently [12].

2.1.3 Advantages associated with kiosks

There are several advantages in implementing kiosks, such as: simple and intuitive design, availability of the information at any moment, allowing transactions to be performed rapidly using visual and textual instructions, and the information can be presented in more than one language [4]. Besides that, kiosks have considerably larger screens than mobile devices and straightforward interfaces, that may possibly make kiosks more interesting technologies to obtain punctual information, since these consist in intuitive and simple systems [12].

2.1.4 Disadvantages associated with kiosks

Interactive kiosks present information of local interest and improve experiences in a visual and interactive way. However, it is necessary to take into consideration the different types of people that can interact with this type of display,

since they can differ in ages, interests and relation to technology [16]. There is a risk associated with the fact that some social groups are not adequately represented in the process to access information in public spaces, namely, the ones that do not have IT knowledge or are not familiarized with the kiosk technology [18]. Nevertheless, these factors are conditions that should not influence the utilization of a kiosk, since it must have a simple, intuitive and accessible interface for any user [15].

2.2 Interactivity and Human-Computer Interaction

The concept of interactivity has been considered an open term. Even though there is not an agreed definition of interactivity, most of the known definitions emphasise on the process as a two-way communication with focus on the user sense of control, modifying content in a mediated environment in real time. In the beginning of the Web, web pages contained mostly static information and interaction was mainly based on navigation through web pages, clicking on links and filling forms. As computers turned into a normal presence in households and workplaces, interaction evolved extremely. An example of this factor was the introduction of e-commerce, allowing a two-way communication between merchant and consumer [7].

Interactivity has numerous benefits, mainly the improvement of the relation that people have with a specific technology and the possibility to offer a personalized user experience. It can even be applied in combination between the usage of mobile devices, such as smartphones, as a way to interact with informative kiosks [9].

Human-computer interaction was the focus of the first interactive definitions, in which the emphasis was on the interaction of people with computers. For a system to be interactive, it has to respond to the user actions. The process of interactivity can be considered as a repetitive cycle of decision sequences, user action and reaction of the environment [13].

Reciprocal communication and control are two important aspects of interactivity. The reciprocity implies that the interaction should allow a two-way stream of information and the information shared in the sequence must be slightly related.

Additionally, the exchange of information should occur in real time. The control dimension implies that the participants should have control over the information that is sent and exchanged, as well as in the means used for the communication. The control ensures reciprocal information exchange that meets the needs of the parts involved in the communication, while the reciprocal communication provides an efficient channel to execute control [13].

Three dimensions of interactivity were proposed [13]:

- Active control, which describes the capacity of a user to voluntarily participate and influence a communication;
- Two-way communication, that captures the bidirectional stream of information;
- Synchronization, that relates to the speed of the interaction.

The concept of human-computer interaction emerged with the creation of the computer, for the reason that any machine, as sophisticated as it may be, is useless unless it can be adequately used by people. This way, there are two essential terms that should be considered in the design of a human-computer interaction: functionality and usability. The functionality of a system can be defined as a set of actions and services that the system provides to a user. However, the value of the functionality is only visible when it becomes possible to be used in an efficient way by the user. The usability is the degree to which the system can be used in an efficient and adequate way to reach certain goals for specific users.

The HCI is a design that should produce a fit between the user, the computer and the services required to reach a specific performance, such as quality as in-service optimization [3]. The HCI is characterized by a tendency in production, design, and establishment of interaction ways more oriented to humans, natural and intelligent, gradually meeting the needs and the requirements of a larger and less experienced group of users [13].

The design of a human-computer interaction should take into account numerous aspects of human behaviours and needs to be useful. The user activity has three levels: physical, cognitive and affective. The physical aspect determines the interaction mechanisms between the user and the computer. The cognitive handles the part where users can understand and interact with the system. Finally,

the affective aspect tries to make the interaction experience pleasant for the user and allowing him to continue using the machine through a change in attitudes and emotions [3].

2.3 Usability

Usability is generally defined as the user-friendliness and acceptability of a system by a specified class of users that perform specific tasks in a certain environment. The user-friendliness affects the performance and satisfaction of the users, while the acceptability affects the product usage.

In the HCI is stated that usability should be considered before the development of a prototype, for the reason that if the inspections and usability tests are only performed at the end of the design cycle and if it is necessary to change the interface, they could be difficult and expensive to implement [2].

There are numerous studies regarding kiosk usability which indicate that users consider this type of systems useful, fun and smart [15].

It is generally accepted that the following characteristics of usability are part of any software project:

- Learning: users can begin to use the system rapidly;
- Efficiency: enables the user, with the understanding on how the system works, to accomplish a high productive level;
- Memory: allows the occasional user, that has not used the system for some time, to function with it, without having to learn how to use it;
- Low error rate: allows the users to perform fewer errors, and in case of occurrence they can be easily corrected;
- Satisfaction: the system is pleasant to use.

As a way to ensure that a solution has the usability characteristics mentioned before, there are methods that can be divided in inspection methods (without final users) and test methods (with final users) [2].

2.3.1 Test methods for usability

End user testing is the fundamental usability evaluation method and may even be indispensable. The test methods provide direct information on the way that people use systems and the exact problem they face with a specific interface. From the methods for testing usability, the most standard ones are thinking out loud, observations and questionnaires [2].

Thinking out loud

It involves that an end-user constantly verbalizes his thoughts out loud, while using the system. This way, it allows to understand how the user perceives the system, identifying the main misconceptions from the end-user.

A variant of this method is the constructive interaction that involves placing two end users using the system together. The main advantage is that the test situation becomes more natural, since people are used to verbalize their thoughts while working together.

The advantages of this method include: reveal why users perform specific functions; provide an approximation of the way that individuals use the system; gather a large quantity of data that is obtained by a reduced number of users; and simultaneously obtain information of preferences and performance.

The disadvantages include the different learning styles, that sometimes, can be perceived by users as not natural and exhausting, and also time-consuming, since it is necessary to perform a session of contextualization to the end users, as a way to prepare them for the test [2].

Observations

Considered to be the most straightforward method, involves observing the interaction between users and the system, either in person or through videos. The focus of the observation is to identify obvious usability problems in the first interaction with the system [2].

Questionnaires

The usability aspects can also be studied through a set of questions to users, being especially useful when it is desired to know the level of satisfaction of users

and possible concerns that they might have, something that cannot be measure with the previous test methods.

The questionnaires allow to study the way that end users use the system and which are their favourite functionalities. It is an indirect method, since this technique does not properly study the interface, but rather the users' opinions about it.

The advantages include the fact that preferences, satisfaction and possible concerns of the user can be easily detected, and the questionnaires can also be used to gather statistics.

The disadvantages include the need to obtain enough answers for this method to be significant and it identifies less problems than the other methods mentioned before [2].

2.4 Application of interactive systems

2.4.1 In shopping centers

Public Display – Advertising of Events and Publicity [9]

In the work described in [9], an interactive public display was developed to announce events and publicity, more specifically to show movies on theatres at that moment as illustrated in Figure 2. An interactive method was used, resorting to smartphones and limiting the usage of the kiosk to the person standing in front of it.

Three mechanisms were considered and evaluated to perform the connection between the smartphone and the system: insert of a specific URL, read a QR Code or connect through a Wi-Fi access point. After performing the connection, the user can observe the informative content of the kiosk in the smartphone and perform specific actions [9].

The kiosk can operate in two different modes [9]:

- Non-interactive (by default), only informative, where the system changes the content presented and the user can observe it without interaction;
- Interactive mode, where the user can control and interact with the system.

The smartphone can also function in two different modes, as shown in Figure 3 [9]:

- Control mode, the user performs gestures in the mobile device to navigate the contents available in the kiosk;
- Action mode, the user can obtain information, buy tickets to movie sessions or share contents.



FIGURE 2: Prototype of the interactive public display system [9].

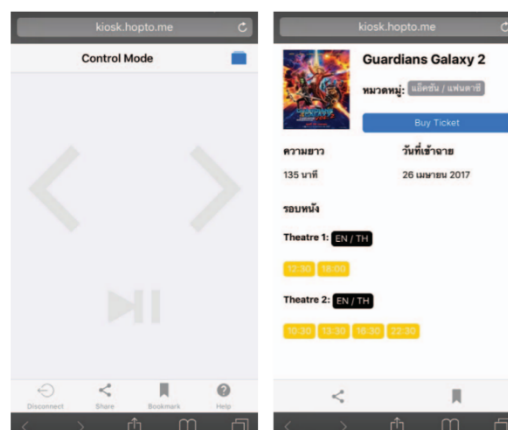


FIGURE 3: Screenshot of a mobile web client, in Control Mode and in Action Mode [9].

Results achieved

The participants were given the possibility of choosing from the available methods to connect with the public display, with the possibility of using one in a first experience and select other (or the same) in a second experience.

After the analysis of a brief questionnaire given to the participants, it was concluded that the QR Code was considered to be the most practical connection method, being more convenient and effortless than the URL.

The URL method was chosen only once by a participant, due to the lack of an application to scan the QR Code presented, and the Wi-Fi connection method was also selected only once by a participant, that considered to be more familiarized with this method than with the QR Code scanning [9].

Limitations

The connection to a specific Wi-Fi access point to enable the communication between the kiosk and the smartphone was considered to be the most promising method, however, it implies that the user changes the current Wi-Fi connection for the access point, and at the end of the usage he has to change back to the original connection. This is possibly one of the reasons why this method was one of the least chosen.

The QR Code, although it was the most chosen method by the participants, is not viable for every user if they do not possess a way to scan the QR Code in their smartphones, so an alternative connection method should be present [9].

Interactive Kiosk - MUSE [8]

The work performed in [8] focused on the study of intermodal interactions referring to an interactive kiosk that provides information about a shopping center, through images and natural language, and allows the interpretation through a smartphone.

A study was performed in shopping centers to understand the limitations of the current kiosks installed: specific information, that is not related with stores, is difficult to find; in rush hours there are waiting lines to use the kiosks; noticeable difficulty to understand the locations of stores in the map; the users show the

need to photograph the map presented in the kiosk as a way to take with them the location of the place they intend to find.

To mitigate the problems of the previous kiosks, mentioned above, the developed solution resorts to a combination of images and natural language to exchange information and its interface is shown in Figure 4. The users can ask questions and receive answers regarding topics that the kiosk does not present explicitly.

To avoid waiting lines, the users may perform a connection to the screen simultaneously through the scanning of a QR Code. This connection allows users to transfer maps, promotion coupons or other kiosk information. The intent is to enable faster and more efficient information exchange, similar as asking another person for information [8].



FIGURE 4: Screenshot of the initial screen, menu screen, alphabetic search and search by category, respectively [8].

Results achieved

The kiosk was not tested in real context, so it is not possible to obtain conclusions of the interaction means proposed by the authors. [8].

Limitations

The kiosk is only presented in English, that is not one of the official languages of the country where it was implemented, Singapore. This can present a disadvantage for people that do not have the knowledge of this language.

To interact with the kiosk is necessary that users possess a smartphone with internet connection, an application or a scanning program for QR Codes and a web

browser, not allowing people that do not possess a smartphone to fully interact with the kiosk [8].

Interactive Kiosk - 3D Navigation [15]

The main goal of the study performed in [15] was to test the usability of a system that possesses a tactile screen and also offers directions resorting to 3D visualizations.

The kiosk allows three different ways to find a path to a specific destination, as illustrated in Figure 5. One of the ways is through a shortcut menu that presents directions to standard locations, such as the parking lot, restrooms, ATM or pharmacies. There is also a category menu where stores in the shopping center are categorized and, lastly, as shown in Figure 6, a search menu that allows users to insert text and the stores that correspond to that text, show up on the screen. This way, the user chooses the location where he intends to go and directions are provided through panoramic 3D images [15].



FIGURE 5: User Interface (UI) of the system, with the three menu options [15].

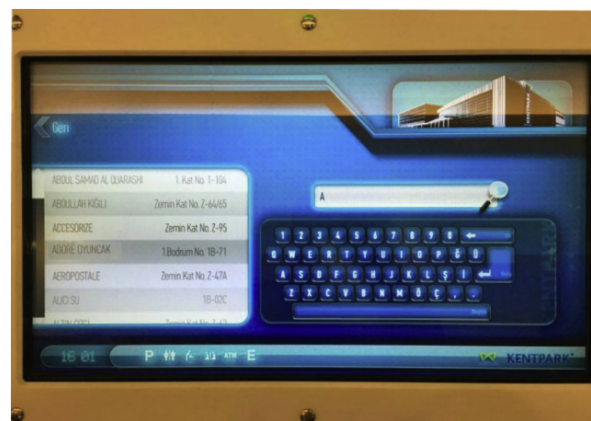


FIGURE 6: The search menu [15].

Results achieved

To test the kiosk, the participants were given numerous tasks that included, locating different points of interest and choosing one of the available menus to perform each task.

The characteristic that users preferred were the instructions through the 3D visualizations, and the way they preferred to obtain directions was through the category menu.

The total time that users took to find a location was significantly low, showing that a navigation kiosk overcomes difficulties in finding locations on shopping centers [15].

Limitations

Due to the constant changes in the shopping center, the status of the stores that just closed or open should be updated, which does not happen in this kiosk. If the system possesses an internet connection, its contents could be remotely updated.

It is necessary to satisfy the need of users with different characteristics and levels of experience and, for that reason, the kiosk should be designed taking these aspects in consideration. A few tasks assigned to the participants were performed in a larger period of time due to the lack of experience of some users with this type of system. The placement of the help menu on the kiosk could facilitate the experience of certain users that are not familiarized with this type of system.

The participants demonstrated some difficulty with the 3D functionality. Such constraint could be eliminated if the system offered directions and the user had the option to control the display speed for the 3D instructions describing how to go from one location to another.

A few age groups showed some difficulty with the usage of the tactile screen, that could be eliminated if some functionalities of the kiosk resembled more to the ones present in a smartphone, with swipe gestures instead of a scroll bar [15].

2.4.2 In libraries

Informative Kiosk – Library [6]

The main objective of the project referred in [6], was the creation and implementation of a public informative kiosk.

The kiosk allows to reduce doubts and uncertainties about the campus and obtain answers to frequently asked questions, the diagram is shown in Figure 7, decreasing the necessity to resort to library staff. The usage of a tactile screen allows the user to navigate to the information that he intends to obtain and also allowing the navigation in the library, resorting to videos, as illustrated in Figure 8. [6].



FIGURE 7: Diagram of the frequently asked questions page [6].



FIGURE 8: Diagram of the videos that show how to navigate in the different areas of the Library [6].

Results achieved

The kiosk was considered as efficient, having an average of utilization of nine times a day, being mostly used to obtain directions to specific locations of the library, given its dimension. The second most used functionality was the one that gather the six most frequent questions asked by visitors of the library, that could be either students of the university or external individuals [6].

Limitations

A Smart Board was used, that consists in an interactive board, instead of a screen, which generated some frustrations by the users, since the Smart Board does

not always respond in the correct way to tactile activity. So, a tactile technology should be more appropriate to improve the service provided by the kiosk [6].

2.4.3 In university campus

Navigation System – QUT Nav [17]

In [17], a study was developed to define a recommendation to design a portable navigation pedestrian system for a university campus. The gathering of user requirements was performed, identifying the main information that should be present in a portable navigation pedestrian system: location of the destination and the buildings of the university that are in its surroundings; indoor and outdoor available pedestrian routes; estimate information in terms of time and distance of the route; routes that have in consideration climacteric conditions.

The QUT Nav application was developed, and contains three different components:

- Map: contains a digital map that presents the current location of the user and the buildings that belong to the university, resorting to GPS, as it is possibly to see in Figure 9;
- Route: contains information regarding pedestrian routes in the campus, inside and outside of buildings, as shown in Figure 10;
- Direction: allows to connect the map component to the route. Obtains the location of the building where the user is and every possible route to reach the destination building.

The test users filled a questionnaire at the end of the experience regarding the navigation and usability of the system [17].

Results achieved

Through the performed experience and the interviews made to participants, it was possible to understand which information should be present in a portable navigation system:

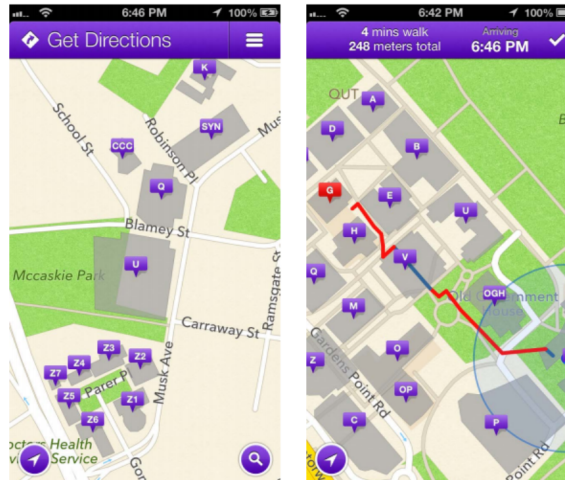


FIGURE 9: Interface of the Map component and Direction engine, respectively [17].

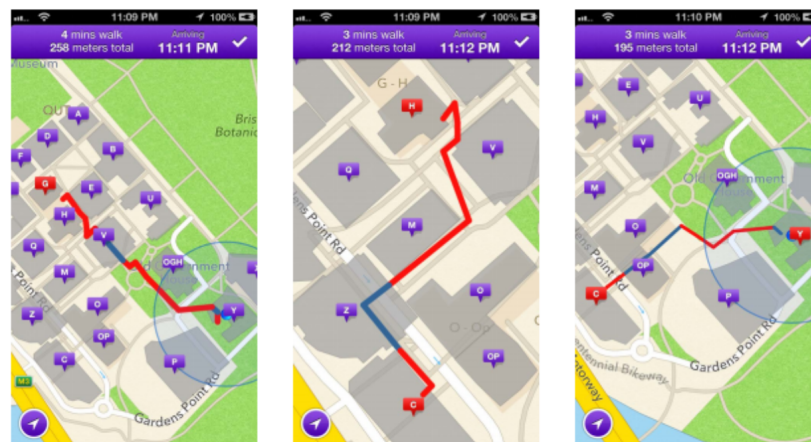


FIGURE 10: Screenshot of three different routes that correspond to three tasks [17].

- Entrances of the buildings: the buildings can contain more than one entrance, making the distance between one place to another minor or superior. The participants considered relevant to mention in the route if the entry has stairs or lifts;
- Representation of the buildings through icons: through their names or alphabetical letters that are represented in the buildings;
- Colourful routes: routes distinction, one colour for indoor routes and another for outdoor routes;
- Itinerary forecast information: prediction of distance, duration time and hour of arrival to the destiny. There was no significant evidence of which of the estimates was more helpful for the participants during their trajectory;

- Correct location inside the buildings: usage of GPS and Wi-Fi sensors present in the smartphone;
- Possibility to choose routes: there might exist several paths to reach the same destination, and the smaller and most sheltered routes (inside buildings) are considered to be more useful by the participants [17].

Limitations

In the interview performed to the participants at the end of the navigation system usage, was mentioned that the buildings considered important should be highlighted in the map, for example the library, or represented with a different icon, to be easily located.

The participants had the goal to complete numerous tasks and, for that reason, they reported that it was not possible for them to understand which estimates (distance, travel time or arrival hour) were more helpful.

By multiple times, participants had referred that their location was inconsistent or was not represented in the correct way, mostly when they walk inside buildings [17].

Intelligent Kiosk – MIKI [5]

The study performed in [5] had the purpose to test the usability of an interactive kiosk located at the entrance of the Institute of Memphis University. It provides, through a tactile screen, information and the location of specific persons and research centers, events occurring and directions to building rooms, this last functionality is exemplified in Figure 11. As a way to test the usability of the system, the participants had to perform three tasks: finding a person, a location and an event [5].

Results achieved

Through the result of the usability tests it was possible to conclude that the interface design, the graphic quality and the content presented in the kiosk were adequate and almost all the participants managed to complete every task. However, the study also had the goal to understand how the specific characteristics



FIGURE 11: Directions screen. The floor plan continually rotates while the directions screen is visible [5].

of the individuals, such as gender and previous experience with this type of technology had influenced the interaction with the system, but a significant statistical difference in these factors was not found [5].

Limitations

The system contains a 3D plan of the building, however, possibly due to lack of visual orientation of this plan, the participants required more time to perform a task of finding a location and found more problems with it. In the plant, the starting point and the desired destination should be marked, becoming more accessible to contextualize the user. Although the 3D image is more interesting, the same did not allow the user to control it, in other words, zoom it, move it or visualize it according to its preference, since the image was constantly moving. Besides that, it was concluded that if textual directions were provided, it could be easier to find a location [5].

2.4.4 In clinical services/hospitals

Interactive Kiosk – Health Kiosk [11]

In the work described in [11], it was developed and tested a system that allows combining a few medical devices and a control application, as a way to create a health kiosk that helps gathering vital signs, providing useful feedback for the users. The system allows obtaining data from three medical devices, since they are totally connected and communicate via Bluetooth. There are two more devices, a printer to print the exams results and a card reader to extract the data of

the citizenship cards of the users. The exam results can also be obtained through scanning of a QR Code on the screen [11].



FIGURE 12: Screen with the exams to be performed. Blue dots correspond to the clicks made on screen [11].



FIGURE 13: Example of grouping clicks on a screen [11].

Results achieved

A usability test was performed that determined that there were not any problems associated with interactive attempts by users in sections of the screen that did not possess any type of interaction implemented. In terms of time, the difference between the utilization of the citizenship card and the manual insertion of personal data was evaluated, and users that authenticate themselves by reading the citizenship card finished the process of authentication slightly faster.

The observation of participants interactions with the kiosk allowed the understanding that a few doubts emerged, mainly in the way that some exams should be done. Even though there were videos and audio instructions to support performing the exams, these were mainly ignored. Figures 12 and 13 illustrated the exams screen and an example of grouping clicks, respectively, and this last one, allowed to understand if users interacted with parts of the screen that were not interactive.

The questionnaires revealed that the citizenship card was demonstrated to be a good mean of authentication in the system [11].

Limitations

The instructions provided to support the usage of the available medical devices were sometimes ignored or were not paid attention to, possibly because they were too extensive and, for that reason, needed to be simplified to retain the users' attention. The QR Code was not used by almost any participant, several affirmed that they did not know that was necessary to perform the code scanning when it appeared on the screen. The QR Code should be more visible on the screen, and there should be instructions on how to scan it [11].

2.5 Conclusions

This chapter gathered the majority of relevant information regarding kiosks, interactivity, usability and, at the end of this section, a comparison between the interactive systems analysed in section 2.4 with the proposed prototype, through Table 1.

The kiosk is a system that can be placed in specific locations to provide information and services to users. It should possess a simple and intuitive interface, accessible to any type of user, either the most experienced with the technology or the least familiarized with this type of system.

The interactivity is a powerful instrument that allows the improvement of the relationship that people have with a certain technology and even provides a personalized user experience.

The human-computer interaction has the focus to create and establish more natural, intelligent and oriented-to-people interactive ways. The goal is to progressively meet the necessities and requirements of a larger and less experienced user base, mitigating difficulties in the usage of certain technologies.

The usability is the possibility of a user to interact with a product in a quick and accessible way. For a certain system to be considered usable, it should integrate the five characteristics of usability: learning, efficiency, memory, low error

rate and satisfaction.

There are several methods to test the usability of a system, which are divided into two categories: inspection methods and test methods. The inspection methods are a set of methods that allow the identification of problems and improvements in an interface usability design, using the verification of the present components, with the established norms. The test methods provide direct information about the way that people use the systems and allow to identify which are the real problems that users find with the tested interface.

Table 1 compares the real cases addressed before, according to the following aspects:




































	Navigation/ Orien- tation system	Interaction with mobile devices	Obtaining specific in- formation	Usability tested in real context
Public Display – Advertising of Events and Publicity [9]				
Interactive Kiosk – MUSE [8]				
Interactive Kiosk – 3D Navigation [15]				
Informative Kiosk – Library [6]				
Navigation Sys- tem – QUT Nav [17]				
Intelligent Kiosk – MIKI [5]				
Interactive Kiosk – Health Kiosk [11]				
Prototype to be developed				

TABLE 1: Comparison of the systems analysed

 Implemented / perceived in the referred system
  Not evident if it was implemented / perceived in the referred system
  Not implemented / perceived in the referred system

Chapter 3

Requirement analysis and system design

This chapter contains the analysis and conception of the interactive and informative prototype developed. This prototype will be used to study the subject of this dissertation - Impact of an interactive solution on a university campus. Through this it will be possible to verify if the proposed objectives were achieved or not.

The main requirements were gathered through an initial survey to the student community of ISCTE-IUL and potential visitors of this institution. The retrieved information allowed to understand which elements could satisfy the needs identified by the survey respondents. In this chapter, we define which functionalities should be a part of the solution and the architecture that guided the development of this prototype.

3.1 Survey on the major issues on campus

A survey was applied to the students, visitors and potential visitors of the university, to assess and understand which were the main issues they faced while exploring the ISCTE-IUL campus. The structure of this survey is in Appendix A. The responses allowed to gather the requirements to design the prototype.

The survey is divided in five sections:

- Section 1 - Participant characterization: this section is common for either students or visitors of ISCTE-IUL and it is composed of six questions, five of them are multiple-choice questions with only one answer and one open answer question;
- Section 2 - Student or former student of ISCTE-IUL: this section is only for the student or former student's community of the university and it is composed of five questions, four of them are multiple-choice questions with the possibility of multiple responses and one question with Likert scale response from 1 to 5;
- Section 3 - Visitor or potential visitor of ISCTE-IUL: this section has only one multiple choice question with only one answer for non-students of the university;
- Section 4 - Potential visitor of ISCTE-IUL: this section is only for respondents that have never visited ISCTE-IUL and it is formed by three questions, two of them are multiple choice questions with only one answer and one multiple choice question with various answers;
- Section 5 - Visitor of ISCTE-IUL: this section is for respondents that have visited ISCTE IUL at least one time and it is composed of three questions, one is a question with Likert scale response from 1 to 5, the other one is a multiple choice question with only one answer and the last one is a multiple choice question with various answers.

The survey was made available through the Google Drive forms platform and was mostly disseminated in social media networks and through "word-of-mouth". The sample is composed of 101 people, and answers are analysed in the following sections.

3.1.1 Analysis of the responses from the initial questionnaire

1. Participant characterization

(a) Age.

From the respondents, 81,19% had ages between 18 and 25 years old, as shown in Figure 14. The respondents with ages between 26 and 39 years old were 9,90%, from 50 to 65 were 7,92% and with more than 65 years old were 0,99%. The rest of the age groups did not present any respondent.

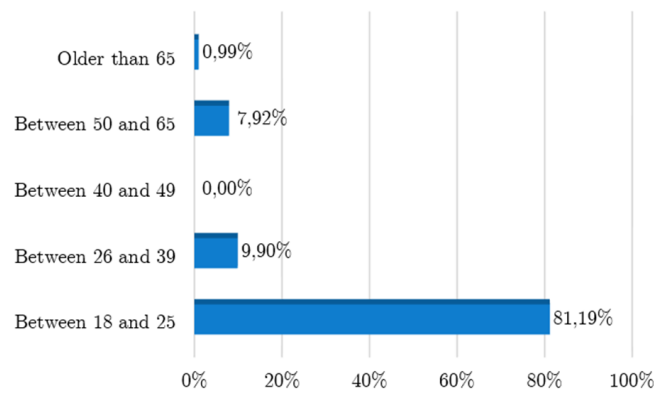


FIGURE 14: Age distribution of the respondents.

(b) Gender.

In terms of gender, 60% of the respondents were female and 40% were male, equivalent to 61 and 40 respondents, respectively, as shown in Figure 15.

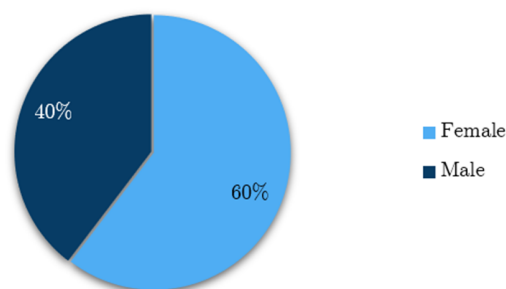


FIGURE 15: Gender of the respondents.

(c) *Nationality.*

As shown in Figure 16, 97,03% of respondents have Portuguese nationality, and only 2,97% have other nationalities, corresponding to 98 Portuguese and 3 non-Portuguese respondents.

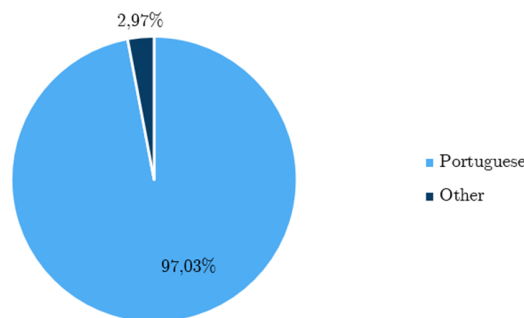


FIGURE 16: Nationality of the respondents.

(d) *Academic qualifications.*

The majority of respondents were either enrolled in a bachelors degree or already had one at the time or were enrolled in a masters degree or already had one, with 54,46% and 17,82%, respectively.

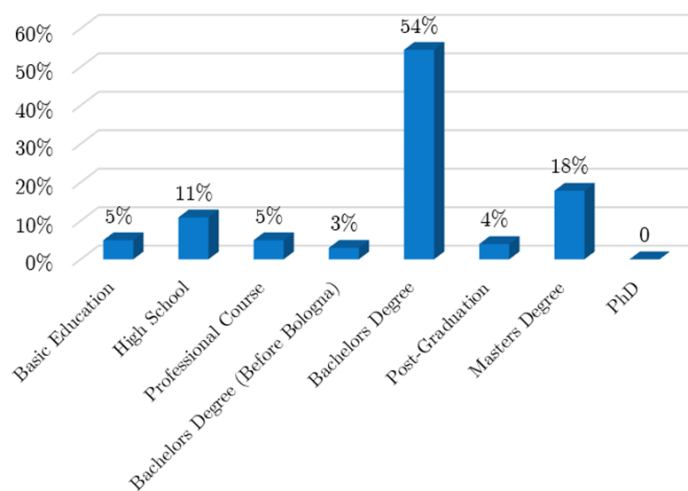


FIGURE 17: Academic qualifications of the respondents.

(e) *Professional situation.*

From the respondents, 61,39%, were students and 20,79% were working-students. Following, with 15,84%, were employees and with 0,99% each, were self-employees and retired.

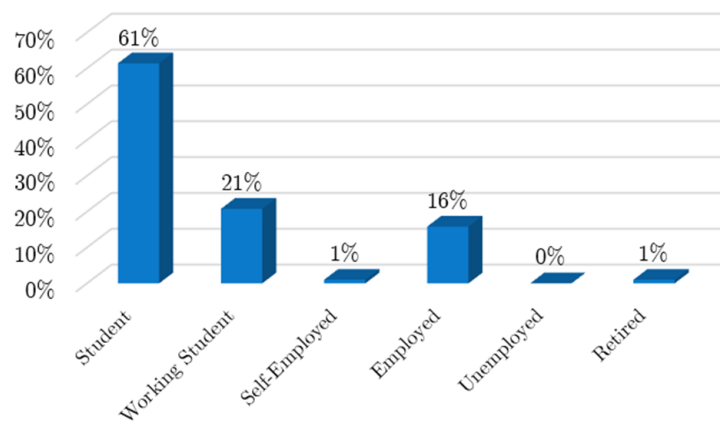


FIGURE 18: Professional situation of the respondents.

(f) *Are you or have you ever been a student of ISCTE-IUL?*

Figure 19 represents the percentage of respondents that have been or were students of ISCTE-IUL at the time. The 69,31% that responded “Yes” to this question were directed to Section 2 (“Student or former student of ISCTE-IUL”) of the survey. And the 30,69% that responded “No” were directed to Section 3 (“Visitor or potential visitor of ISCTE-IUL”) of the survey.

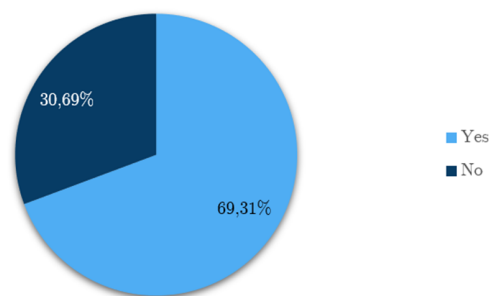


FIGURE 19: Percentage of ISCTE-IUL students or former students and visitors.

2. Student or former student of ISCTE-IUL

All the results presented in this section correspond only to respondents that were students or former students of ISCTE-IUL.

(a) *Indicate the type of course in which you are enrolled and/or have already been enrolled in ISCTE-IUL.*

To this question was possible to choose more than one answer, since there was the possibility that the respondent have already been enrolled in more than one degree in ISCTE-IUL.

From the respondents, 80,00% were enrolled or already have been enrolled in a bachelors degree. Following was the masters degree and bachelors degree and only masters degree, each with 7,14%.

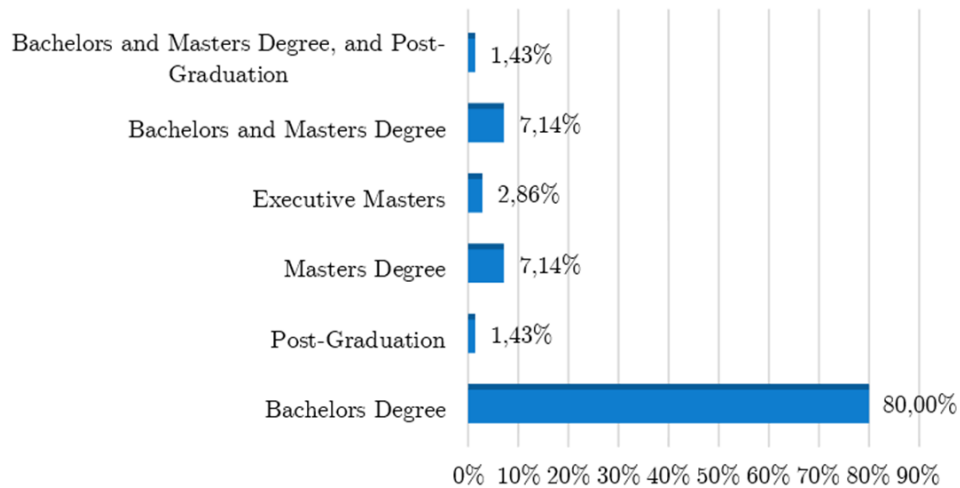


FIGURE 20: Type of course of the respondents from ISCTE-IUL.

- (b) *Select which school(s) from ISCTE-IUL that you belong to or had belonged to.*

To this question was possible to choose more than one answer.

As shown in Figure 21, the majority of respondents were from ISTA – School of Technology and Architecture with 72,86%, followed by IBS – ISCTE Business School with 10,00%, 8,57% were from ECSH - School of Social Sciences and 7,14% from ESPP - School of Sociology and Public Policy. Only 1,43% had been enrolled in more than one school.

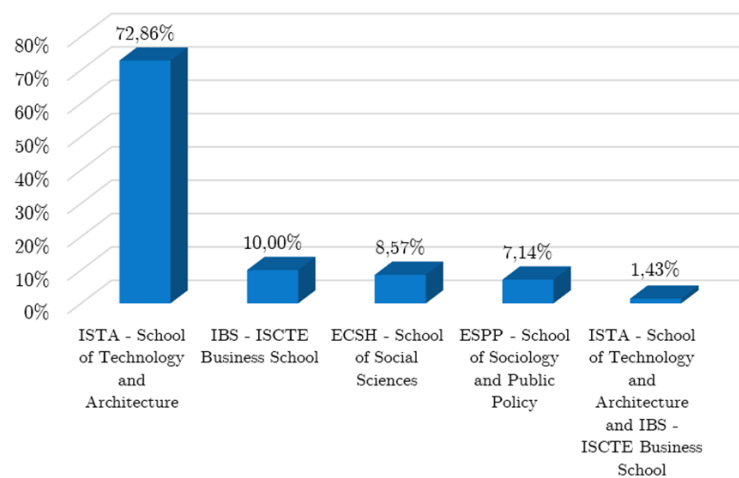


FIGURE 21: Students or former students of ISCTE-IUL by school(s).

- (c) *Which of these aspects are not explored currently on ISCTE-IUL campus?*

To this question was possible to choose more than one answer.

The three most chosen options, in decreasing order, were: “System to support campus navigation”, with 74,29%, “Assistance in looking for information about events that are occurring on ISCTE-IUL” with 57,14% and “System where visitors, candidates and suppliers can obtain information” with 55,71%. The two least chosen options were, both with 34,29%, “System to obtain information about student union, student association from different schools and place of interest” and “Assistance in finding information on teachers and academic services”, as illustrated in Figure 22.

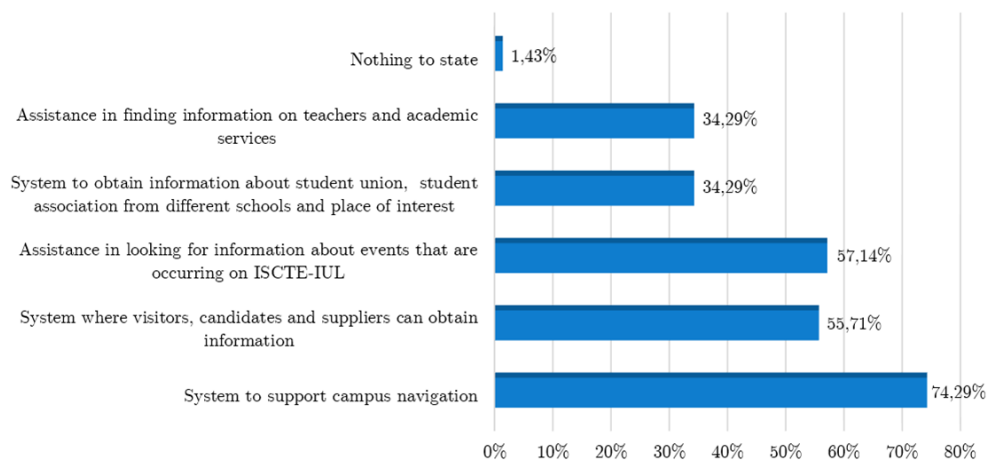


FIGURE 22: Aspects considered to be more useful by the community of ISCTE-IUL.

- (d) *Do you agree with the implementation of an interactive kiosk to solve unexplored aspects of the ISCTE-IUL campus?*

Considering Likert scale where 1 is “Strongly disagree” and 5 is “Strongly agree”, is to possible to verify that 60% of the respondents answered “5” and 31,43% answered “4”, agreeing with the implementation of an interactive kiosk to solve the unexplored aspects presented previously.

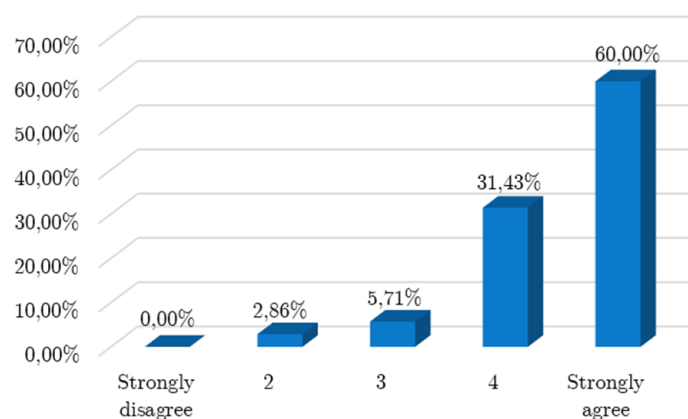


FIGURE 23: Level of agreement in the implementation of an interactive kiosk.

- (e) *Who can benefit the most from implementing this kind of interactive kiosk?*

To this question was possible to choose more than one answer.

In terms of who could benefit from the implementation of an interactive kiosk, the four most chosen options were students with 92,86%, visitors with 84,29%, event participants with 81,43% and candidates with 72,86%, as shown in Figure 24.

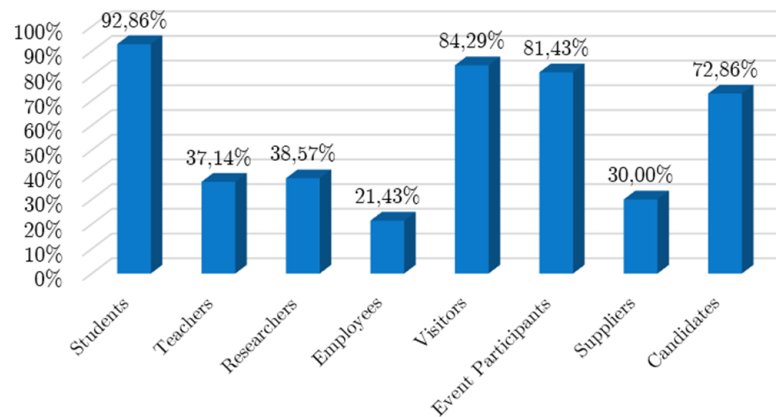


FIGURE 24: Potential beneficiaries of an interactive kiosk.

After this question, the survey ended for the students or former students of ISCTE-IUL.

3. Visitor or Potential Visitor of ISCTE-IUL

For the respondents that were not students or former students of ISCTE-IUL, it was necessary to determine if they ever visited ISCTE-IUL, in order to direct them to the appropriate section according to the knowledge they have of the campus.

(a) *How many times have you visited ISCTE-IUL?*

As illustrated in Figure 25, 58,06% of the respondents have never visited ISCTE-IUL and, after responding to this question, were directed to Section 4 (“Potential visitor of ISCTE-IUL”). From the respondents that have been on ISCTE-IUL, 29,03% visited at least 1 to 2 times, and 6,45% visited 2 to 5 times and 6,45% have visited more than 5 times. Respondents that have answered one of the last three answers were directed to Section 5 (“Visitor of ISCTE-IUL”).

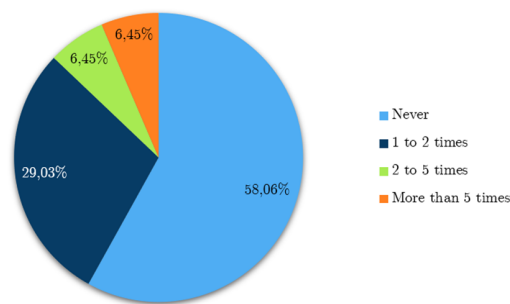


FIGURE 25: Number of visits to ISCTE-IUL.

4. Potential visitor of ISCTE-IUL

All the results presented in this section correspond only to respondents that have never visited ISCTE-IUL.

(a) *If you decided to visit ISCTE-IUL, do you consider that an informative and interactive kiosk on campus would be beneficial on your visit?*

From the respondents, 88,89% answered “Yes”, 11,11% answered “Maybe” and none of the respondents answered “No”.

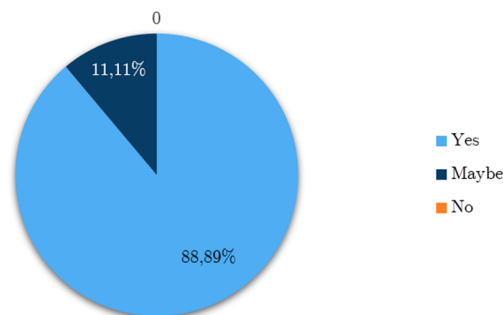


FIGURE 26: Level of agreement on the benefits of using an interactive and informative system.

(b) *Would you use an informative and interactive kiosk if you knew that it could help you in your visit?*

As shown in Figure 27, 72,22% state that they would use an informative and interactive kiosk answering “Yes”, 27,78% answered “Maybe” and there were 0 “No” responses.

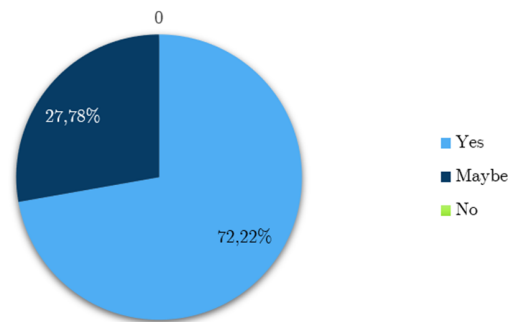


FIGURE 27: Percentage of potential visitors that would use an interactive and informative system.

(c) *Which of these aspects do you considered to be useful to explore on ISCTE-IUL campus?*

To this question was possible to choose more than one answer.

As illustrated on Figure 28, a “System to support campus navigation” was the most chosen one, with 66,67%, followed by a “System where visitors, candidates and suppliers can obtain information” and “Assistance in looking for information about events that are occurring on ISCTE-IUL”, both with 50,00%. The two least chosen options were “System to obtain information about student union, student association from different schools and place of interest” with 27,78% and “Assistance in finding information on teachers and academic services” with 22,22%.

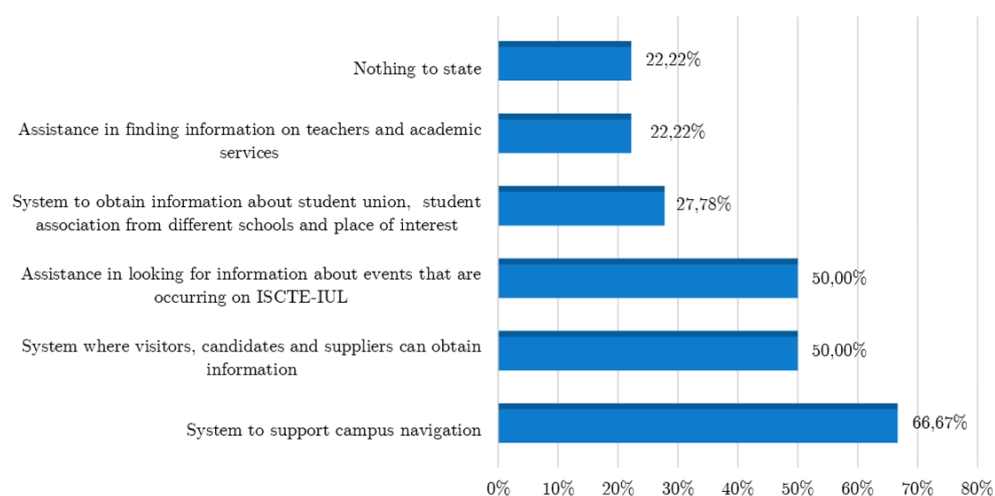


FIGURE 28: Aspects considered to be more useful by potential visitors of ISCTE-IUL.

After this question, the survey ended for the potential visitors of ISCTE-IUL.

5. Visitor of ISCTE-IUL

All the results presented in this section correspond only to respondents that have visited ISCTE-IUL at least one time.

- (a) *Considering your visit(s) to ISCTE-IUL, do you think an informative and interactive kiosk, could have been useful to improve your experience in the campus?*

Considering Likert scale where 1 is “Not useful” and 5 is “Very useful”, it is possible to verify that 61,54% of the respondents answered “4” and 23,08% answered “5”, agreeing to the usefulness of an interactive kiosk to improve their experience in the campus. The rest of the responses were “3” with 15,38%.

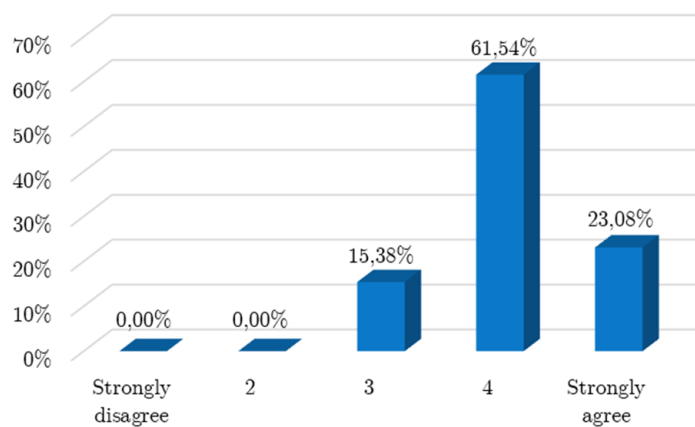


FIGURE 29: Usefulness that a kiosk could had in the experience on campus.

- (b) *Would you use an informative and interactive kiosk if you knew that it could help you in your visit?*

To this question, 84,6% of the respondents answered “Yes”, 15,4% answered “Maybe” and none of the respondents answered “No”, as illustrated in Figure 30.

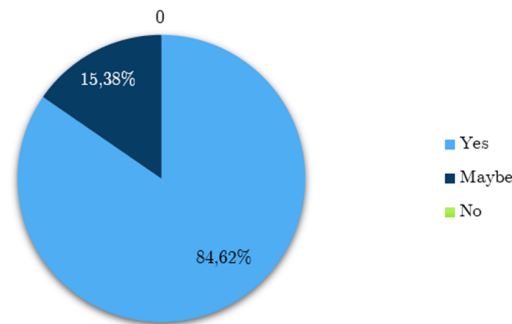


FIGURE 30: Percentage of visitors that would use an interactive and informative system.

(c) *What aspects are not explored currently on ISCTE-IUL campus?*

To this response was possible to choose more than one answer.

As shown in Figure 31, the most chosen aspect was “System to support campus navigation” with 76,92%, followed by “System where visitors, candidates and suppliers can obtain information” with 61,54%, “Assistance in looking for information about events that are occurring on ISCTE-IUL” with 53,85%. The two least chosen options were, with 15,38%, “System to obtain information about student union, student association from different schools and place of interest” and with 7,69% “Assistance in finding information on teachers and academic services”.

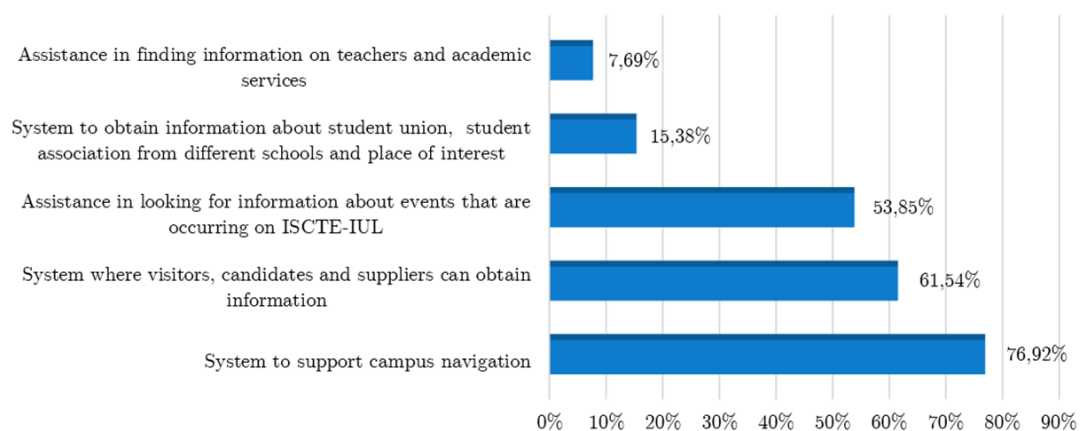


FIGURE 31: Aspects considered to be more useful by visitors.

After this question, the survey ended for the visitors of ISCTE-IUL.

3.1.1.1 Conclusions

Through the initial survey it is possible to conclude that an informative and interactive kiosk would improve the experience on the ISCTE-IUL campus, as well as be useful to either the students community or the visitors.

The three sets of participants from the sample, students of ISCTE-IUL, visitors and potential visitors, agree with the implementation of this type of system on campus, considering that the three most important unexplored aspects are a system to support campus navigation, a system where visitors, candidates and suppliers can obtain prompt information and assistance when looking for information about events that are occurring at ISCTE-IUL.

The analysis above allowed the conclusion that students, visitors, participants of events and candidates are the groups that could benefit the most from the implementation of an informative and interactive kiosk, which correspond to the unexplored aspects on the university campus.

3.1.2 The system design

The architecture proposed for the solution, aims to integrate the requirements mentioned in the previous chapter.

Two types of stakeholders were identified. First, the users of the system that can either be members of the university community or visitors, which means they are the ultimate beneficiaries of the system. The other stakeholder that was identified is the manager of the system, that has the responsibility to maintain, update and monitor the system, ensuring its integrity.

Considering the use-case diagram present in Figure 32, it is necessary to explain a few topics regarding the actions of the stakeholders.

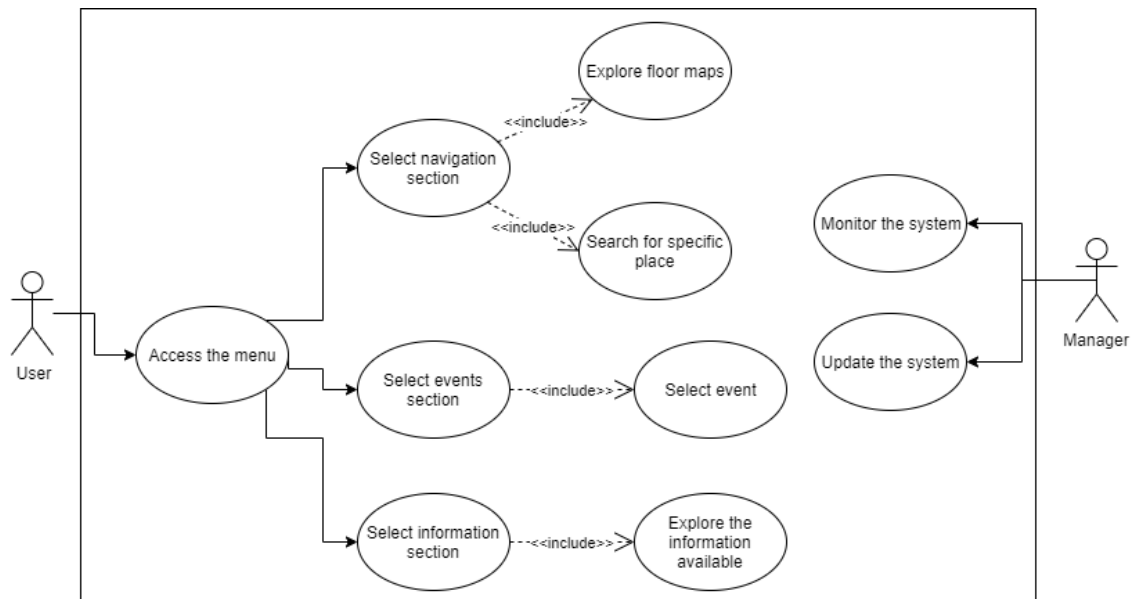


FIGURE 32: Use-case diagram of the solution

The user of the system:

- The use-cases represent the user interaction with the system, and its respective available functionalities;
- The use-cases “Select Navigation”, “Select Events” and “Select Information” all include other use-cases that correspond to different actions in each section of the system.

The manager of the system:

- The use-case “Monitor the system” refers to actions such as, validate content or verify the availability of the system;
- The use-case “Update the system” refers to ensuring that the information presented in the kiosk is up to date and is relevant for the users.

3.1.2.1 Design of the prototype

To understand the viability and usability of an interactive and informative system on a university campus, a prototype was developed. The design and development of the prototype was done according to the research presented in Chapter 2.

The functionalities of this prototype were developed taking into account the requirements proposed by the respondents of the initial survey, meeting the defined goals and allowing the test users (users that tested the prototype) to draw conclusions regarding the usability and viability.

The development of the prototype had the following purposes:

- Develop a system that mitigates the issues mentioned by the respondents of the initial survey;
- Integrate intuitive and relevant functionalities;
- Gather a real evaluation of the developed work in the scope of this project, through a usability test, followed by an evaluation questionnaire.

The implementation follows a prototyping approach, enabling the creation of some key functionalities that demonstrate the potentialities of an interactive and informative system in the ISCTE-IUL campus. This is the university where the prototype was tested, and the system is tailored to this specific campus. The functionalities that were developed and presented in this prototype are the following:

- Access to a navigation system that provides visual and textual directions to numerous locations in the *Sedas Nunes* Building;
 - Usage of a QR Code to interact with mobile devices.
- Display of events information that are relevant and occurring on campus at the moment or in the future;
- Access to relevant information related to the university.

Initially, an authentication functionality was considered to be implemented, which would allow students to have a reserved area with more personalized information. However, after discussing with several students, the need for such area was not found, since the university already provides a website with relevant information for students, using authentication features, and that is easily accessed on any device.

The prototype was developed in Bootstrap that includes HTML5, CSS and Javascript and Visual Studio Code was chosen for the system development. The

solution is in Portuguese and was developed to work in a tablet of 10.5" (2560x1600 pixels) and 6.0 Android OS version, with access to the internet and Google Chrome browser.

3.1.3 Prototype view

To better understand the operation of the prototype, each screen was described by order of appearance.

1. Initial Screen

The initial screen as shown in Figure 33, is the first screen seen by the user, prior to the usage of the system. The screen has a dynamic transition of words that match the main functionalities of the system: Navigation (“Navegação”), Information (“Informações”) and Events (“Eventos”), to allow the user to understand which is the purpose of the kiosk. If the user does not touch the button “Obter ajuda!” (get help!), the screen will only display the words mentioned before, but if the user interacts with the button, he will be directed to the menu screen (Figure 34).



FIGURE 33: Initial screens

2. Menu Screen

The menu screen, displayed in Figure 34, shows the three most voted functionalities by the respondents of the initial survey. Each functionality provided by the system has a brief description associated to help users understand which is the main purpose of each section and if it corresponds to what they are looking for.

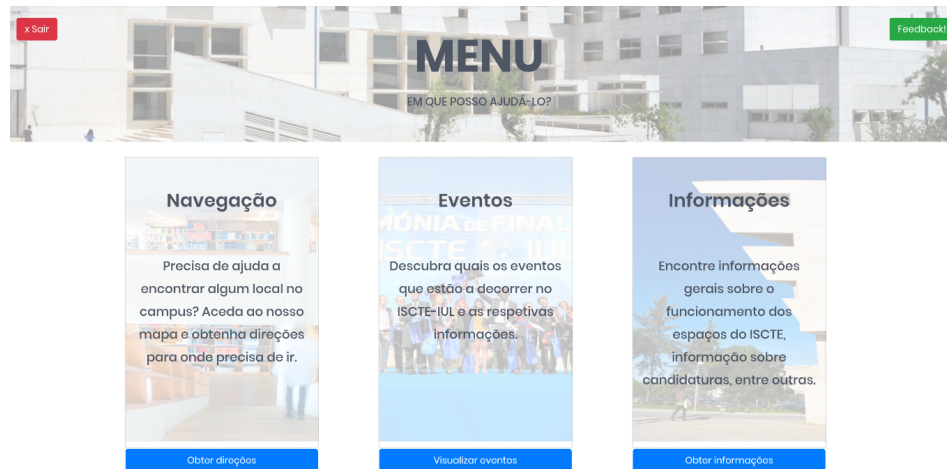


FIGURE 34: Menu screen

The first section is Navigation with a brief description that states the following: “Do you need help finding a location on campus? Access our map and obtain directions to where you need to go.”. This description allows the user to know before they touch the button “Obter direções” (Obtain directions), that this section will have a map with directions associated.

The second section is Events, where the user can read the following without entering the section: “Find out which events are taking place at ISCTE-IUL and their respective information.”. This section has a button associated “Visualizar eventos” (View events), that directs to a page of events and the corresponding details.

The third and final section is Information. Since the title of this section is quite general, in the description some examples of the information provided are given, allowing the user to know what type of information is displayed on this section: “Find general operating information about ISCTE spaces, about applications, and others.” The button “Obter informações” (Obtain information) will take the user to a section, with a set of different types of information.

Still on the menu screen, there are two different buttons. The red one, “Sair” (Exit) takes the user to the initial screen and the green one “Feedback!”, has been inserted only for testing purposes and directs the user to the final questionnaire in the usability testing.

3. Navigation Screen

To facilitate the way that people move through campus and eliminate possible problems in finding the numerous places that are located in the institute, it was designed a navigation system composed with 2D images of each of the three floors that are part of *Sedas Nunes* building. The system also contains textual directions, as well as QR Codes for a few routes, to allow the user to take the directions himself.

If the user selects the navigation section, it appears the screen shown in Figure 35. The screen is composed by a map of the first floor, that corresponds to the location where the kiosk prototype will be placed, next to the main entrance of *Sedas Nunes* building. There is a mark that says "Local Atual" (Current Location), for the user to know where he is standing in the map. It is also possible to change the map to floors 0 and 2, to see the several points of interest on each floor, as illustrated in Figures 36 and 37.



FIGURE 35: First floor of *Sedas Nunes* Building and where the entrance and location of the prototype is



FIGURE 36: Ground floor of *Sedas Nunes* Building



FIGURE 37: Second floor of *Sedas Nunes* Building

If the user intends to obtain directions to a specific place, the search bar, placed in the middle of the screen, can be used for that purpose. The user only needs to start typing the name of the place that he is looking for, and suggestions will be proposed, according to what is being written. If the button "Procurar" (Search) is pressed and there is a valid suggestion in the search bar, visual and textual directions to the specific location will be displayed, as it is possible to see in the examples of Figures 38, 39 and 40. The visual directions are colour coded, according to the colours of the building where the kiosk is installed. There are four different colours for each section of the building: north aisles are blue, east aisles are yellow, south aisles are green and west aisles are red. These colours can be seen on the outside of the building, at the end of every corridor, and, in the signals placed in each corridor.

The images of the floors contain some icons that correspond to the lift, canteen and cafeteria, bathrooms, points of information and security, ATM and, areas adapted to reduced mobility and parking.

In figure 38, directions to the treasury services are shown, which are on the floor where the user of the prototype is located. Besides the directions, there is a note that indicates that, for this type of service, it is necessary to take a service ticket and where this may be taken.

The screens with directions all have a button "Voltar à visão geral" (Back to general vision) which takes the user to the initial screen of navigation.



FIGURE 38: Screen of directions to the treasury services

In figures 39 and 40, directions to an auditorium in the ground floor are shown. Since the user needs to go through two floors, two buttons were added to the end of the image, “Piso atual” (Current floor) and “Piso seguinte” (Next floor), to help the user visualize where he needs to go through in each floor. This location has a QR Code associated, that allows the user to take the directions in his mobile device, as it is possible to observe in Figure 41.



FIGURE 39: Screen of directions to Auditorium Caiano Pereira - First floor



FIGURE 40: Screen of directions to Auditorium Caiano Pereira - Ground floor

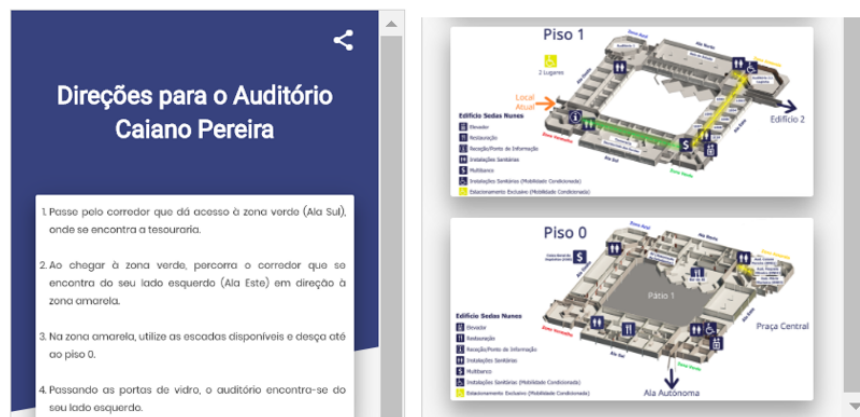


FIGURE 41: Contents of the QR Code placed in Auditorium Caiano Pereira directions page

4. Events Screen

The events screen, displayed in Figure 42, corresponds to the second section of the menu screen. It lists every event that is occurring or will happen on ISCTE-IUL campus, for the next two weeks. Each event has a brief description so the user can understand the purpose of the event. In case the user intends to know more, he may select the event of his interest and will be directed to a page, provided by the ISCTE-IUL website, where the main details are described, such as exact location on campus, dates, time and speakers, if applicable. This information can be seen in Figure 43, with an example of the event EURAM.

EVENTOS ISCTE-IUL
PRÓXIMOS EVENTOS A DECORRER NO CAMPUS

Programa Erasmus+ Estágios
04 JUN - 30 JUN
Mobilidade Outgoing
Encontram-se abertas, até dia 30 de Junho, as candidaturas para bolsas de estágio, ao abrigo do Programa Erasmus+, para estudantes e recém-diplomados do ISCTE-IUL.

Conferência Bienal ERGOMAS
17 JUN - 21 JUN
Conferência Internacional
The European Research Group on Military and Society (ERGOMAS) is organizing its biennial conference on military and society hosted by the ISCTE.

IoT for Smart Cities
24 JUN - 28 JUN
Escola de verão
Every year, ISTAR hosts a Summer School Program dedicated to the central themes of the ongoing multidisciplinary research which involve the areas of Science and Information Technology, Architecture, Mathematics and the recently created IoT laboratory.

Programa Erasmus+ Estudos
01 JUN - 30 JUN
Mobilidade Outgoing
Estão abertas as candidaturas para o Programa de Erasmus+ (estudos) para o 2º semestre, do ano letivo 2019/2020. Junto com a candidatura os interessados devem anexar o Curriculum Vitae e documentação comprovativa dos requisitos específicos exigidos pelas Universidades às quais se candidata.

EURAM 2019
26 JUN - 28 JUN
Conferência Internacional
A 19ª conferência EURAM - European Academy of Management - realizar-se-á no ISCTE de 26 a 28 de Junho. O tema da EURAM 2019 será "Exploring the Future of Management: Facts, Fashion and Fado".

IASIA Conference 2019
22 JUL - 26 JUL
Conferência
The International Association of Schools and Institutes of Administration will hold its 2019 Conference at the ISCTE-Instituto Universitário de Lisboa (ISCTE-IUL) on July 22-26, in Lisbon, Portugal. The main conference theme will be "Public Administration's Missions and Goals for the Achievement of the SDGs."

FIGURE 42: Events screen

EVENTOS
CONFERÊNCIA INTERNACIONAL

EURAM 2019

Exploring the Future of Management

26-28 Jun
Lisboa, Por

A 19ª conferência EURAM - European Academy of Management - realizar-se-á no ISCTE de 26 a 28 de Junho.
O tema do EURAM 2019 será "Exploring the Future of Management: Facts, Fashion and Fado". O programa da conferência será divulgado na aplicação do EURAM no final de Maio.
Mais informações [aqui](#).

Publicado por Gabinete de Comunicação e Multimédia

26 JUNHO
28 JUNHO

← Together or Apart? European Integration from a Sociological Standpoint Conferência Conferência Reconstrução de sistemas de saúde em situação de pós-catástrofe →

FIGURE 43: Detail of the EURAM event, as provided by the ISCTE-IUL website

5. Information Screen

The last section of the menu screen is the information. The information screen contains some frequently asked questions as well as some helpful content for candidates, students and visitors, as it can be seen in Figure 44.



FIGURE 44: Information screen

One example of information that can be obtained in this section is the opening hours of the schools' secretariat and conditions. Displayed on Figure 45 is the response, with the schedules for service attendance on normal school terms and for terms of interruptions due to breaks, as well as the service conditions.



FIGURE 45: Attendance hours and conditions of schools' secretariat

Another example, that is shown in Figure 46, corresponds to the information of applications for graduate and post-graduate programs, that can be very helpful for potential or actual candidates.

It is displayed the application phase, dates of application, result disclosure and enrolment.

atendimento o indicar a sua situação para que possa ser atendido logo que terminado o atendimento em curso.
 † Dispensador de senhas: a disponibilização de senhas termina 15 minutos antes do encerramento dos serviços.

Informações sobre candidaturas

Ano Letivo 2019/2020
 Licenciaturas | Estudante Internacional

Fases	Candidaturas	Divulgação dos resultados	Matriculas e inscrições
1ª	03-12-2018 a 11-02-2019	04-03-2019	04-03-2019 a 25-03-2019
2ª	12-02-2019 a 25-03-2019	08-04-2019	08-04-2019 a 15-04-2019
3ª	26-03-2019 a 29-04-2019	13-05-2019	13-05-2019 a 20-05-2019
4ª	30-04-2019 a 03-06-2019	17-06-2019	17-06-2019 a 24-06-2019
5ª	04-06-2019 a 15-07-2019	29-07-2019	29-07-2019 a 05-08-2019

Formação Pós-Graduada (Mestrados, Pós-Graduações ou Doutoramentos)

Fases	Candidaturas	Divulgação dos resultados	Matriculas e inscrições
1ª	15-01-2019 a 25-02-2019	18-03-2019	18-03-2019 a 25-03-2019
2ª	26-03-2019 a 06-05-2019	20-05-2019	20-05-2019 a 27-05-2019
3ª	28-05-2019 a 17-07-2019	29-07-2019	29-07-2019 a 05-08-2019
4ª	08-08-2019 a 02-09-2019	18-09-2019	18-09-2019 a 23-09-2019

Estatutos que podem ser requeridos e como requerê-los

Onde obter esclarecimentos adicionais, após a inscrição/matricula?

FIGURE 46: Information of applications from graduate and post-graduate programs

Chapter 4

Validation and evaluation of the developed work

To validate and evaluate the proposed solution, developed in the scope of this dissertation, it was necessary to understand the perception of users to this type of systems, how they interact and their acceptance to a solution that allows them to view the campus and the university in general, in a different way. This study serves as an instrument of validation and data gathering, as well as to understand if the proposed goals were met and reach conclusions.

For that, an initial survey, a usability test, and a feedback questionnaire were performed.

The first survey, analysed in the previous chapter, had the main purpose to understand which the key concerns of the community and visitors of ISCTE-IUL were. It was also intended to evaluate their receptivity for a solution that involved an implementation of an interactive and informative system and, with that, gather possible requirements for the system.

In this chapter, the usability test and the feedback questionnaire are described. The usability test was performed to understand how users react and interact with the proposed prototype that includes the most chosen functionalities by the respondents of the initial survey. The feedback questionnaire was requested at the end of the usability test and answered by the test users. The respective responses were analysed to understand the level of acceptance and to draw conclusions.

4.1 Usability test

4.1.1 Description of the usability test

The controlled usability test was performed by twenty-two people, using a tablet to test the prototype, simulating a kiosk. The usability test sample is described in the analysis of the feedback questionnaire, since both were performed by the same sample.

The script of the test involved, as shown in Appendix B, has seven tasks that allowed the participants to test every functionality presented in the prototype. The participants had to perform the following tasks:

1. Navigation task - Search for directions to the Treasury Services. After reading and observing the directions presented, go through the proposed path;
2. Navigation task - Search for directions to Classroom 2E05. After reading and observing the directions presented, go through the proposed path;
3. Navigation task - Search for directions to Auditorium Caiano Pereira. After reading and observing the directions presented, scan the QR Code that appears on the page, taking directions in the smartphone and go through the proposed path;
4. Information task - Find the disclosure date of the third phase applications results regarding the post-graduation program;
5. Information task - Find the attendance hours (in the period of academic interruption) of the school secretariats;
6. Event task - Find the event that occurs between the 26th and 28th of June;
7. Event task - Access the detail information of the previous event.

The navigation tasks are focused in students and visitors, allowing them to find a specific service, classroom and auditorium. The users needed to find directions to these specific locations and go through the proposed routes.

The information tasks were mostly focused on candidates, potential students of the university, and consisted in finding the release date of applications results

and the attendance hours for the school secretariats, which can also be helpful for current students. These tasks involved locating a set of information in the system and, after finding it, the participants should inform which where the date and attendance hours, to confirm if the correct information was found.

The event tasks were mainly focused on potential visitors, finding a specific event and its respective information. The participants need to locate the event that occurred in the referred dates on the script of the usability test, confirm if they found the correct event and then proceed to view the corresponding details.

The tasks mentioned above were timed to better understand if the previous knowledge of the campus was important to obtain the information. Or if, even without familiarization with the university, the user was still able to find locations and information.

At the end of the test, to determine the utility and acceptance of the system, it was given a feedback questionnaire to the participants, allowing to gather their opinions as potential users of the system.

4.1.2 Analysis of the usability test results

4.1.2.1 Time records to perform the tasks

The sampling was composed by students of the ISCTE-IUL, as well as visitors that had either none or little knowledge of the campus, or the way to obtain information in there. Therefore, the tasks were timed, to differentiate the time between students and visitors to find a specific location, information or event. The participants identified themselves as students of ISCTE-IUL or visitors before the beginning of the usability test. If they were students of ISCTE-IUL, it was asked which was their field of study, to differentiate the students of technologies, that are usually more comfortable with different types of technology and students of non-technology areas.

The duration of navigation tasks was timed as the following:

1. The timer began when the participant started to interact with the system to perform the task;

2. The timer finished only when the participant completed the path to the specific location and arrived at the kiosk again.

The duration of the information and event tasks was timed according to the following steps:

1. The timer began when the participant started to interact with the system to perform the task;
2. The timer finished when the participant confirmed the information found was correct.

Task Number	Type of Participant		
	Students of ISCTE-IUL		Visitors
	Technology Students	Other Students	
1	1,51	1,30	2,30
2	3,27	3,66	5,34
3	4,03	4,35	6,15
4	0,36	0,48	0,76
5	0,28	0,42	0,27
6	0,24	0,27	0,31
7	0,06	0,05	0,05

TABLE 2: Average of duration, in minutes, for each task by type of participant.

Every test had the approximate duration of 15 minutes, including the briefing given before starting the test, performing the tasks, answering the feedback questionnaire and suggestions at the end.

Regarding the navigation tasks, it was thought that these could be the ones that had time records that differentiate the most between the three types of participants. Students of the university, independently of their field of study, are more familiarized with the campus, which could be a factor that would help to perform the orientation tasks in a quicker and easier way. However, it is possible to understand that there was not a significant difference in the times of the tasks, mostly in the navigation tasks, which could be a conclusion that even though the students have more knowledge of the campus and its locations, with the directions proposed for the three specific locations, the visitors could just as easily find them. The other tasks, information and events, were timed as well, to understand the usability and if the functionalities were implemented to be easily found and navigated.

An important point to mention is that the participants did not know previously which of the functionalities they should use for each task, this information was not mentioned in the test script. Therefore, the users needed to read the tasks and understand where they could find the information that was asked and consider which section of the kiosk would make more sense to contain the information.

4.1.2.2 Observations and usability limitations of the prototype

The utilization of the prototype was supervised, and observation notes were taken, as a way to better understand usability issues and difficulties.

The usability limitations focused mostly on the navigation section.

The navigation section, as shown previously in Figures 35, 36 and 37, has a general vision, that allows the users to view the three floors that constitute the *Sedas Nunes* Building. A few participants did not see the search bar and tried to interact with the 2D image of the floor, touching in the name of the location that they were asked to find, hoping to be redirected to the page of directions. That functionality was not implemented, and when they understood that it did not work, after observing the page again, they managed to find the search bar to locate the specific place.

In the first navigation task, after accessing the page that gathers the visual and textual directions to the treasury service, seven participants had trouble to understand their current location, even though it appeared written in a different colour “Local Atual” (Current Location), it was possible to understand that it should appear in a different way, more prominently.

The third task also raised a few doubts. The purpose of the third navigation task was to understand if a QR Code that included the visual and textual directions to a location, could help in the navigation through the campus to that specific place. Five of the participants took some time to find the QR Code on the page, since it was not highlighted enough, according to them. The second problem raised in this task was that eight participants did not had installed, in their smartphone, a software to scan QR Codes. For these participants, it was given the option to take the tablet with them, to assist in the navigation, since the information that appeared in the QR Code is the same to the one shown in the page of directions to

the Auditorium Caiano Pereira. Some opinions, that were mentioned informally at the end of the test, referred to the QR Code, that even though it was helpful and useful, could easily be replaced by a photograph of the screen. The participants that mentioned this, considered that either way, the photograph or the scanning of the QR Code would take approximately the same time, so it was not problematic.

4.2 Feedback questionnaire of the usability test and usage of the prototype

Every participant was asked to answer a brief questionnaire to assess how the experience of the prototype usage was and, if the participants considered useful an implementation of this type of system. The structure of this questionnaire is in Appendix C. The responses allowed to gather helpful feedback to conclude whether or not the proposed prototype could be useful for the community of ISCTE-IUL and visitors.

The questionnaire is defined by five sections:

- Section 1 - Participant characterization: this section is common for either students or visitors of ISCTE-IUL and it is composed by six questions, five of them are multiple-choice questions with only one answer and one open answer question;
- Section 2 - Student of ISCTE-IUL: this section is only for the student community of the university and it is constituted by two multiple-choice questions with the possibility of multiple responses;
- Section 3 - Visitor of ISCTE-IUL: this section has only one multiple choice question with only one answer for non-students of the university;
- Section 4 – Feedback of the system functionalities: this section is common for either students or visitors of ISCTE-IUL and it is composed by three subsections, the first with five statements regarding navigation, the second with four statements referring the events and the third with four statements on the functionality of information. All these statements are evaluated with Likert response scale from 1 to 5.

Still in this section, there are four questions, two multiple-choice questions with only one answer, one multiple choice question with the possibility of multiple responses and one is a question with Likert scale response from 1 to 5;

- Section 5 – Suggestions, comments and/or observations: this section is for every participant of the usability test and corresponds to an optional open answer question.

The questionnaire was inserted in the kiosk prototype, in the menu and was referred in the script of the usability test, as a final task that should be performed at the end of the experiment. The sample is composed of twenty-two people, that correspond to every participant of the usability test, and the answers are analysed in the next sections.

4.2.1 Analysis of the responses from the feedback questionnaire

1. Participant characterization

(a) Age.

As shown in Figure 47, 72,73% of the respondents had ages between 18 and 25 years old. The respondents with ages between 26 and 39 years old were 22,73% and from 40 to 49 were 4,55%. The rest of the age groups did not present any respondent.

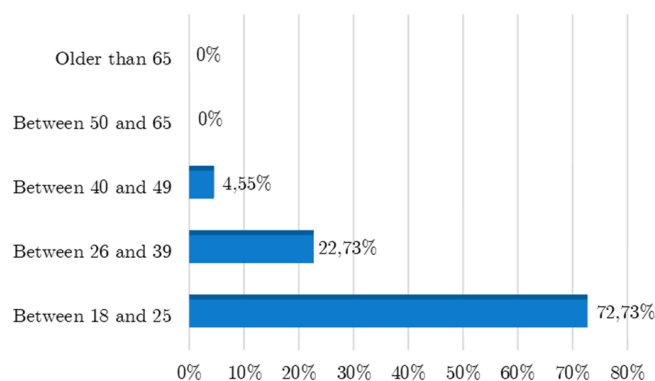


FIGURE 47: Age distribution of the respondents.

(b) *Gender.*

From the respondents, 68% were female and 32% were male, equivalent to 15 and 7 respondents, respectively, as shown in Figure 48.

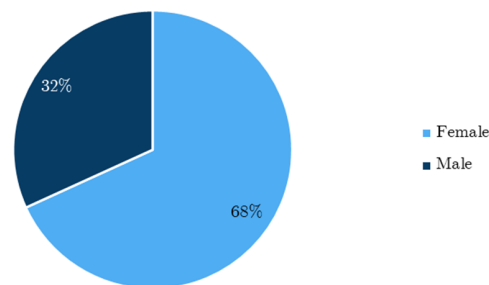


FIGURE 48: Gender of the respondents.

(c) *Nationality.*

In terms of nationality, all of the respondents have Portuguese nationality, corresponding to 100%.

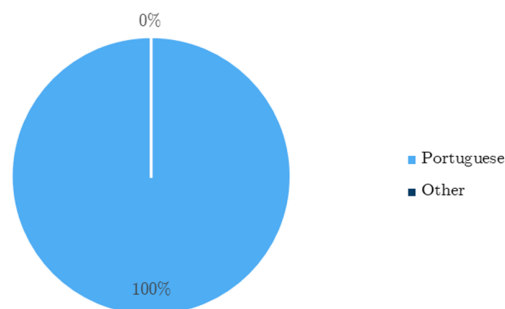


FIGURE 49: Nationality of the respondents.

(d) *Academic qualifications.*

From the respondents mostly were enrolled in a bachelors degree (or already had one) or were enrolled in a masters degree (or already had one), with 60,87% and 18,18%, respectively.

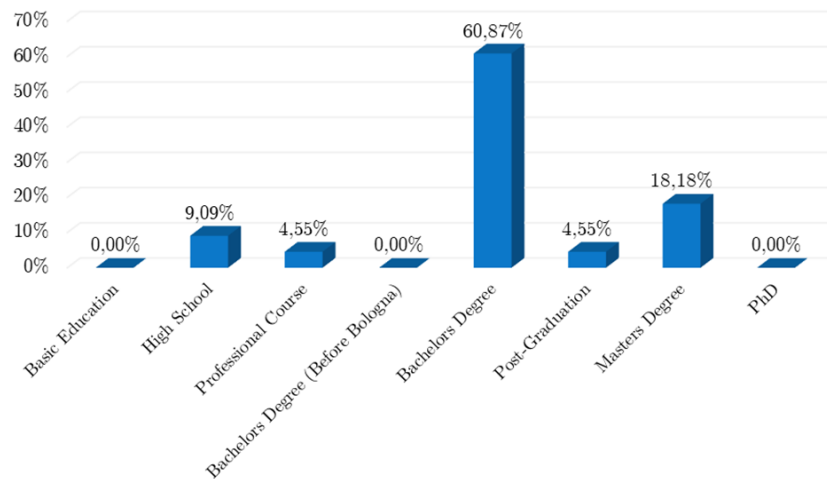


FIGURE 50: Academic qualifications of the respondents.

(e) *Professional situation.*

The Figure 51 represents the different professional situations of the participants of the test. 54,55% were students, 22,73% were working-students and, also with 22,73%, were employees.

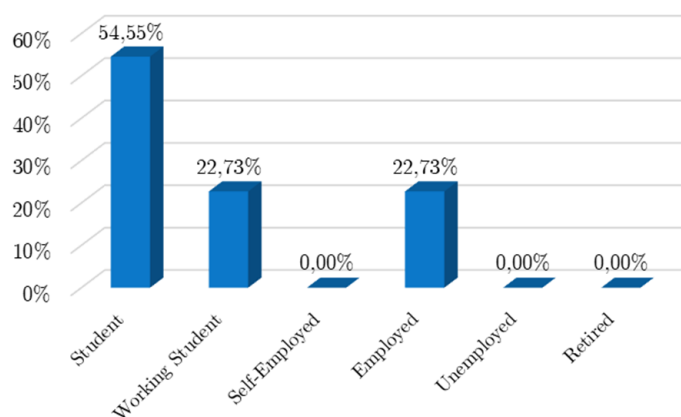


FIGURE 51: Professional situation of the respondents.

(f) *Are you a student of ISCTE-IUL?*

As shown in Figure 52, 63,64% responded “Yes” to this question, confirming that were students of ISCTE-IUL at the time and were directed

to Section 2 (“Student of ISCTE-IUL”) of the questionnaire. With 36,36% were the respondents that answered “No” and were directed to Section 3 (“Visitor of ISCTE-IUL”) of the questionnaire.

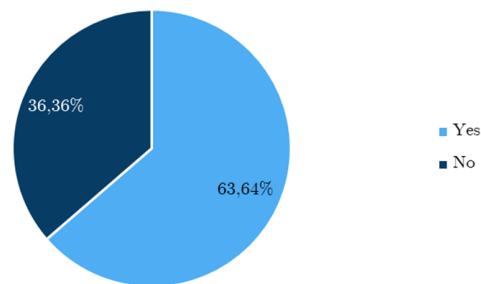


FIGURE 52: Percentage of ISCTE-IUL students and visitors.

2. Student or former student of ISCTE-IUL

All the results presented in this section correspond only to respondents that were students or former students of ISCTE-IUL.

- (a) *Indicate the type of course in which you are enrolled and/or have already been enrolled in ISCTE-IUL.*

To this question was possible to choose more than one answer, as it is possible the respondent has already been enrolled in more than one degree in ISCTE-IUL.

The majority of respondents, with 64,29% were enrolled or already have been enrolled in a bachelors degree. Following was the masters degree and bachelors degree with 14,29%, and only masters degree, post-graduation and post-graduation and masters degree, presented 7,14% each.

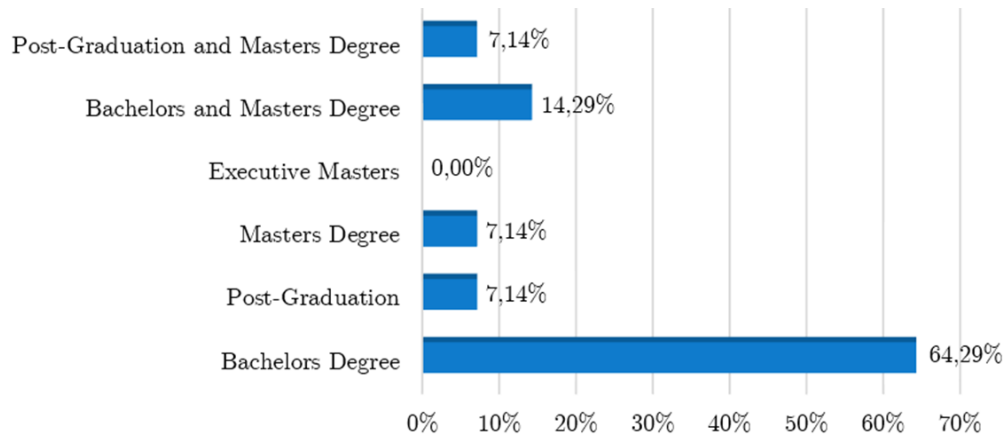


FIGURE 53: Type of course of the respondents from ISCTE-IUL.

- (b) *Select which school(s) from ISCTE-IUL that you belong to or had belonged to.*

To this question was possible to choose more than one answer.

As shown in Figure 54, 57,14% were respondents from ISTA – School of Technology and Architecture, followed by ECSH - School of Social Sciences and ESPP - School of Sociology and Public Policy, both with 14,29%. IBS – ISCTE Business School and participants enrolled in more than one school correspond to 7,14% each.

After this question, the respondents were directed to Section 4 (“Feedback of the system functionalities”).

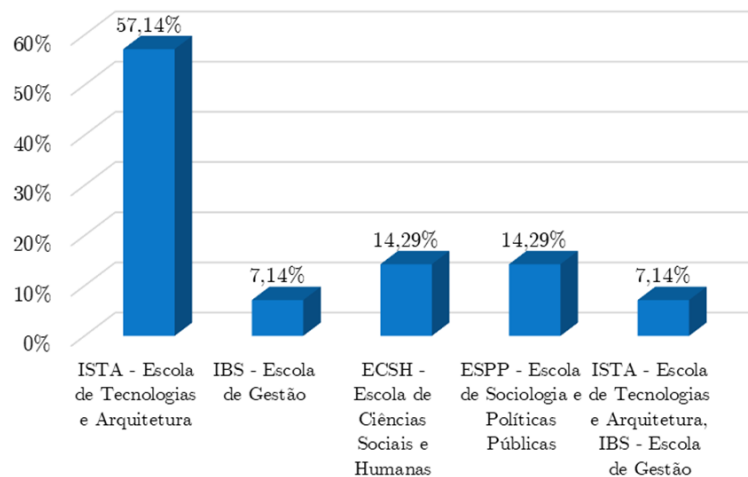


FIGURE 54: Students of ISCTE-IUL by school(s).

3. Visitor or Potential Visitor of ISCTE-IUL

For the respondents that were not students of ISCTE-IUL, it was necessary to determine if they ever visited ISCTE-IUL, to understand if they had previous knowledge of the campus before the experiment.

(a) *How many times have you visited ISCTE-IUL?*

As illustrated in Figure , 62,50% of the respondents visited at least 1 to 2 times ISCTE-IUL prior to this experiment, 12,50% had never visited ISCTE-IUL and also 12,50% had visited more than 5 times.

After this question, the respondents were directed to Section 4 (“Feedback of the system functionalities”).

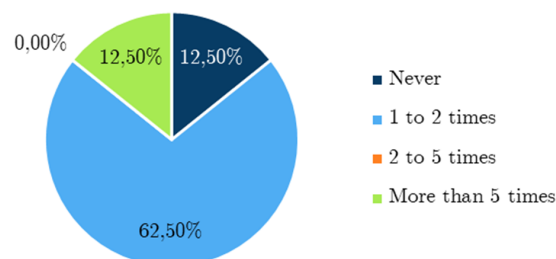


FIGURE 55: Number of visits to ISCTE-IUL.

4. Feedback of the system functionalities

Student of ISCTE-IUL

(a) Navigation functionality

The Likert scale where 1 is “Strongly disagree” and 5 is “Strongly agree” was applied to the answers of the statements presented in this subsection.

- *The 2D floor plan models of the Sedas Nunes Building are useful in the comprehension of a path.*
- *The visual indications complemented by the textual directions are enough to understand the path to a specific location.*
- *The QR Code is an accessible way to take the directions with the user.*
- *It is an important functionality for ISCTE-IUL students.*
- *It is an important functionality for ISCTE-IUL visitors.*

Figure 56 gathers the responses of students of ISCTE-IUL regarding the five statements mentioned before. From the participants 85,71% strongly agree with “The 2D floor plan models of the *Sedas Nunes Building* are useful in the comprehension of a path”, “The visual indications complemented by the textual directions are enough to understand the path to a specific location” and “It is an important functionality for ISCTE-IUL students”. All of the students strongly agreed that navigation “It is an important functionality for ISCTE-IUL visitors” and 71,43% also strongly agreed that “The QR Code is an accessible way to take the directions with the user”. The rest of the participants agreed with the affirmations.

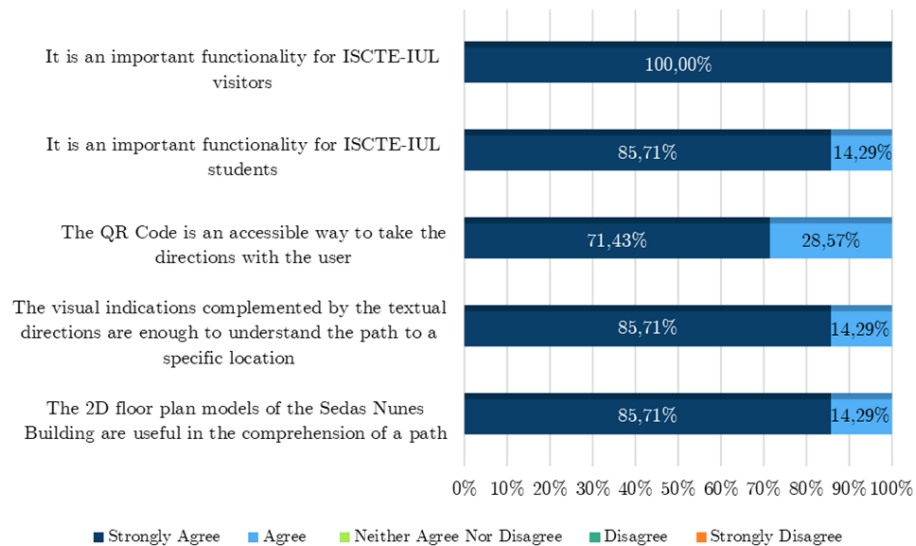


FIGURE 56: Students evaluation of the Navigation functionality.

(b) Events functionality

The Likert scale where 1 is “Strongly disagree” and 5 is “Strongly agree” is applied to the answers of the statements presented in this subsection.

- *It is relevant to present the next events occurring on campus.*
- *I find it accessible to obtain information of an event through this functionality.*
- *It is an important functionality for ISCTE-IUL students.*
- *It is an important functionality for ISCTE-IUL visitors.*

As shown in Figure 57, to the statements “It is relevant to present the next events occurring on campus”, “I find it accessible to obtain information of an event through this functionality” and “It is an important functionality for ISCTE-IUL students” the percentage of participants that strongly agreed was 85,71%, 78,57% and 64,29%, respectively and the remaining agreed. To “It is an important functionality for ISCTE-IUL visitors” 85,71% strongly agreed, 7,14% agreed and the same percentage, chose neither agree nor disagree.

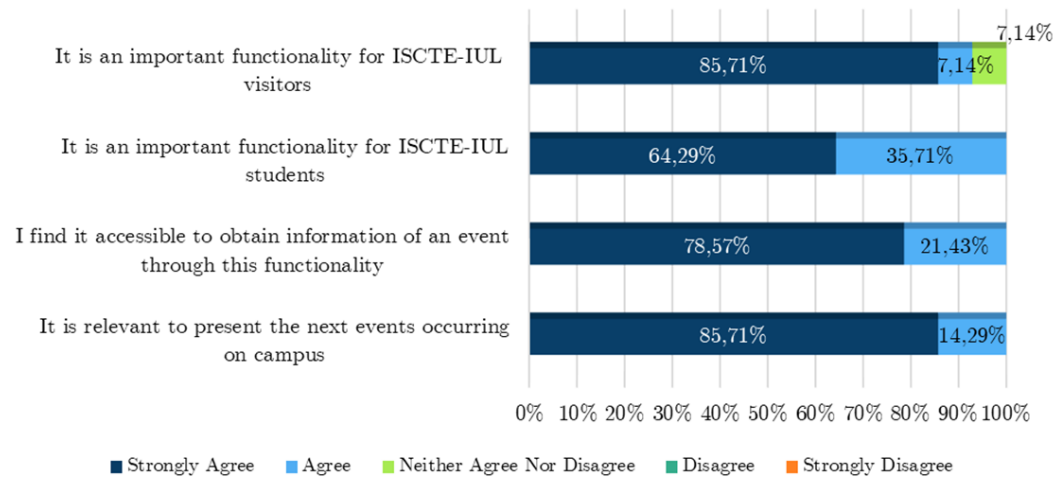


FIGURE 57: Students evaluation of the Event functionality.

(c) Information functionality

The Likert scale where 1 is “Strongly disagree” and 5 is “Strongly agree” is applied to the answers of the statements presented in this subsection.

- *Presenting the frequently asked information is relevant in this section.*
- *I considered that this functionality allows to obtain rapidly punctual information.*
- *It is an important functionality for ISCTE-IUL students.*
- *It is an important functionality for ISCTE-IUL visitors.*

The Figure 58, illustrates the responses to four statements related to the information functionality of the system. To the affirmations “I considered that this functionality allows to obtain rapidly punctual information” and “It is an important functionality for ISCTE-IUL visitors”, 92,86% and 85,71%, respectively, strongly agreed, and the remaining agreed. “Presenting the frequently asked information is relevant in this section” was strongly agreed by 71,43% of the participants, 21,43% agreed and 7,14% neither agreed nor disagreed and to “It is an important functionality for ISCTE-IUL students”, 78,57% strongly agreed, 14,29% agreed and 7,14% neither agreed or disagreed.

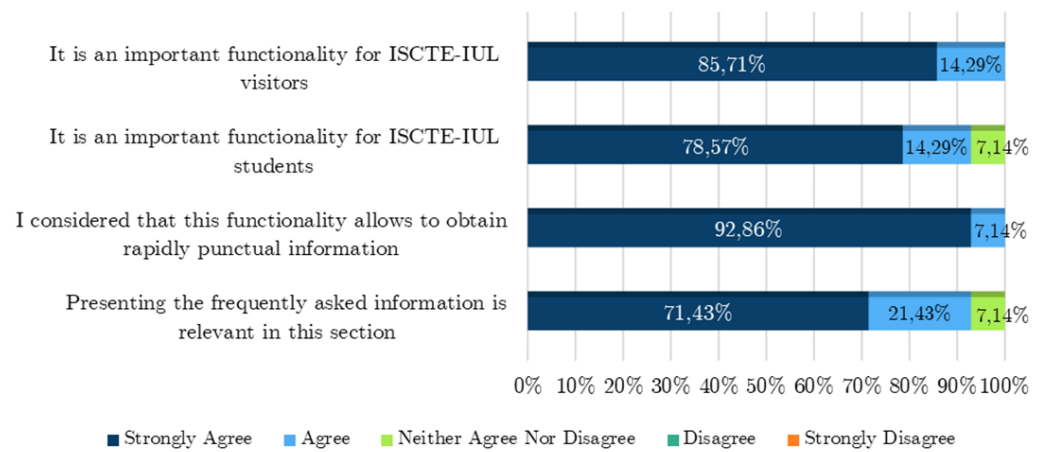


FIGURE 58: Students evaluation of the Information functionality.

(d) Regarding the general system

- i. *Do you consider to be beneficial the implementation of a system similar to the one that you tested on ISCTE-IUL campus?*

In Figure 59 it possible to observe that every respondent considered to be beneficial the implementation on ISCTE-IUL campus of a similar solution to the one tested in the usability test.

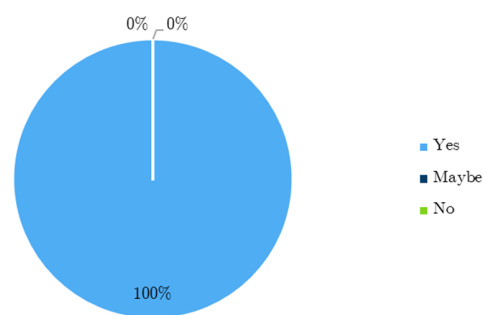


FIGURE 59: Students level of agreement with the implementation of kiosk on campus.

- ii. *Do you consider this type of system may improve the experience on the ISCTE-IUL campus?*

To this question, 100% of the participants answered “Yes”, as shown in Figure 60.

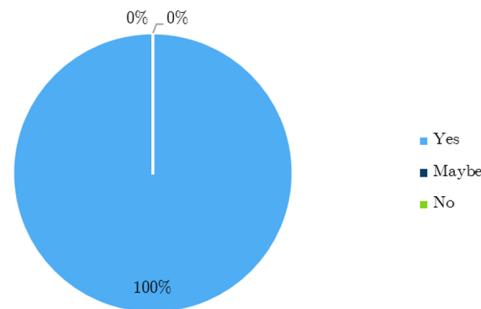


FIGURE 60: Percentage of students that agree the system may improve the experience on campus.

iii. *Who do you consider that may benefit the most from this type of system?*

To this question was possible to choose more than one answer. In terms of who could benefit from this type of system, the four most chosen options were visitors, event participants and candidates with 92,86% each and students with 78,57%, as shown in Figure 61.

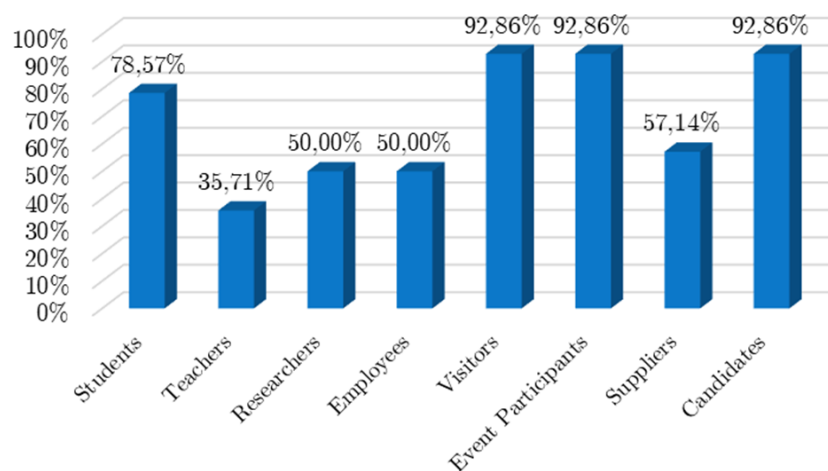


FIGURE 61: Potential beneficiaries of this type of system from the students point of view.

iv. *What is your overall satisfaction with the presented system?*

As illustrated in Figure 62, 92,86% of the students considered they were strongly satisfied by the presented system, and 7,14% were satisfied.

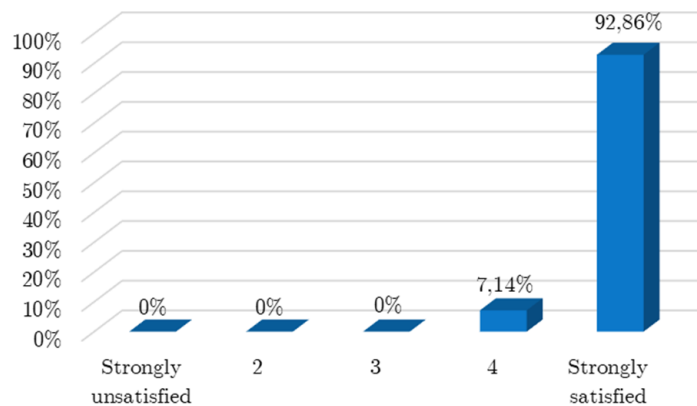


FIGURE 62: Students overall level of satisfaction with the system.

Visitors of ISCTE-IUL

(a) Navigation functionality

The Likert scale where 1 is “Strongly disagree” and 5 is “Strongly agree” was applied to the answers of the statements presented in this subsection.

- *The 2D floor plan models of the Sedas Nunes Building are useful in the comprehension of a path.*
- *The visual indications complemented by the textual directions are enough to understand the path to a specific location.*
- *The QR Code is an accessible way to take the directions with the user.*
- *It is an important functionality for ISCTE-IUL students.*
- *It is an important functionality for ISCTE-IUL visitors.*

Figure 63 gathers the responses of visitors regarding the five statements mentioned before. From the participants, 62,50% strongly agree with “The visual indications complemented by the textual directions are enough to understand the path to a specific location” and “The QR

Code is an accessible way to take the directions with the user” and the remaining agreed. 87,50% strongly agreed with “It is an important functionality for ISCTE-IUL students” and the remaining agreed. All of the visitors strongly agreed that navigation “It is an important functionality for ISCTE-IUL visitors” and half of the respondents strongly agreed with “The 2D floor plan models of the *Sedas Nunes* Building are useful in the comprehension of a path”, 37,50% agreed and 12,50% neither agreed nor disagreed.

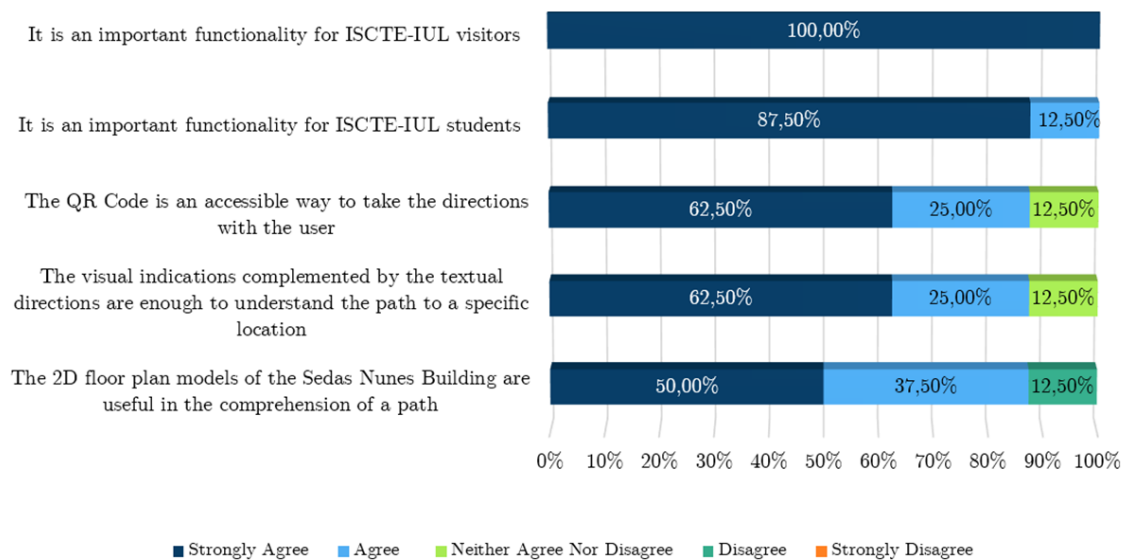


FIGURE 63: Visitors evaluation of the Navigation functionality.

(b) Events functionality

The Likert scale where 1 is “Strongly disagree” and 5 is “Strongly agree” is applied to the answers of the statements presented in this subsection.

- *It is relevant to present the next events occurring on campus.*
- *I find it accessible to obtain information of an event through this functionality.*
- *It is an important functionality for ISCTE-IUL students.*
- *It is an important functionality for ISCTE-IUL visitors.*

As shown in Figure 64, to the statements “It is relevant to present the next events occurring on campus”, “I find it accessible to obtain information of an event through this functionality” and “It is an important

functionality for ISCTE-IUL students” the percentage of participants that strongly agreed was 62,50%, 87,50% and 75,00%, respectively and the remaining agreed. To “It is an important functionality for ISCTE-IUL visitors” all visitors strongly agreed.

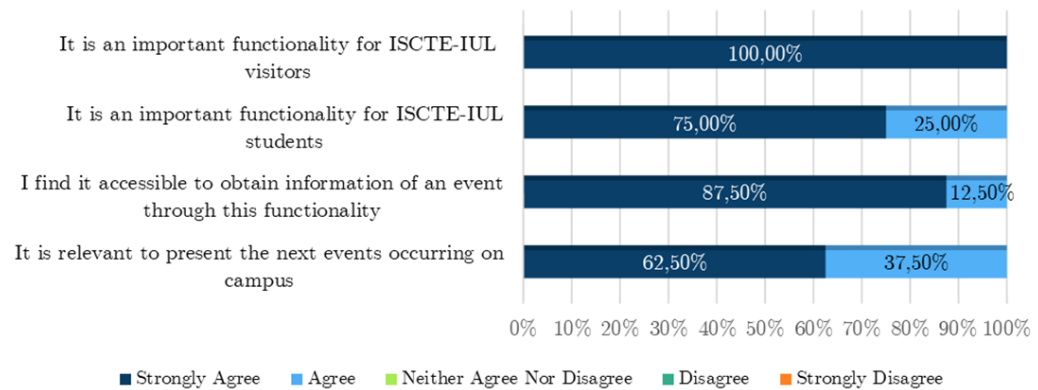


FIGURE 64: Visitors evaluation of the Event functionality.

(c) Information functionality

The Likert scale where 1 is “Strongly disagree” and 5 is “Strongly agree” is applied to the answers of the statements presented in this subsection.

- *Presenting the frequently asked information is relevant in this section.*
- *I considered that this functionality allows to obtain rapidly punctual information.*
- *It is an important functionality for ISCTE-IUL students.*
- *It is an important functionality for ISCTE-IUL visitors.*

The Figure 65, illustrates the responses to four questions related to the information functionality of the system. To the statements “I considered that this functionality allows to obtain rapidly punctual information” and “It is an important functionality for ISCTE-IUL students” 87,50%, each, strongly agreed, and the remaining agreed. “Presenting the frequently asked information is relevant in this section” and “It is

an important functionality for ISCTE-IUL visitors”, all the respondents strongly agreed.

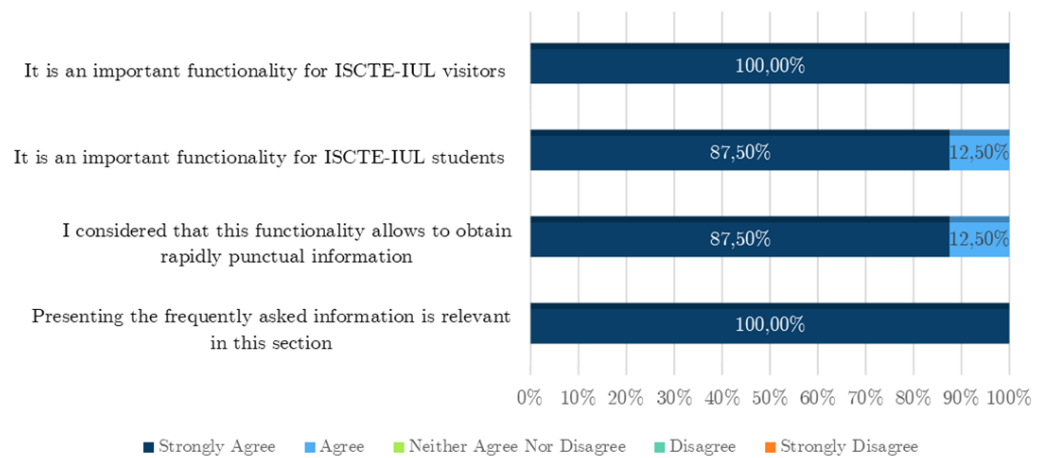


FIGURE 65: Visitors evaluation of the Information functionality.

(d) Regarding the general system

i. *Do you consider to be beneficial the implementation of a system similar to the one that you tested on ISCTE-IUL campus?*

In Figure 66 it possible to observe that every visitor considered to be beneficial the implementation on ISCTE-IUL campus of a similar solution to the one tested in the usability test.

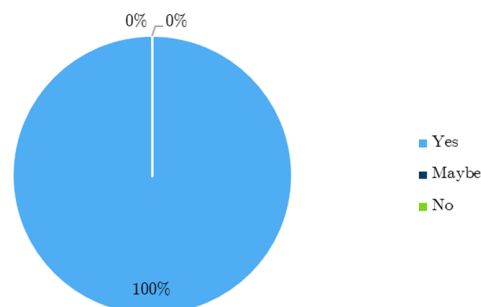


FIGURE 66: Visitors level of agreement with the implementation of kiosk on campus.

- ii. *Do you consider this type of system may improve the experience on the ISCTE-IUL campus?*

To this question, 100% of the respondent answered “Yes”, as shown in Figure 67.

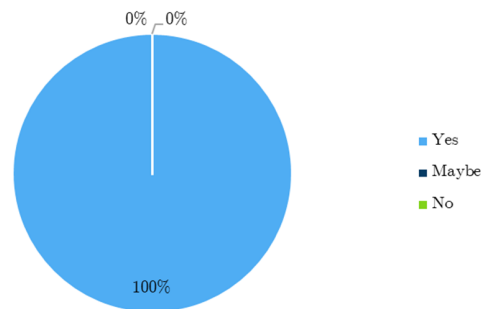


FIGURE 67: Percentage of visitors that agree the system may improve the experience on campus.

- iii. *Who do you consider that may benefit the most from this type of system?*

To this question was possible to choose more than one answer. In terms of who could benefit from this type of system, the three most chosen options were students, visitors and event participants with 100,00% each, as shown in Figure 68.

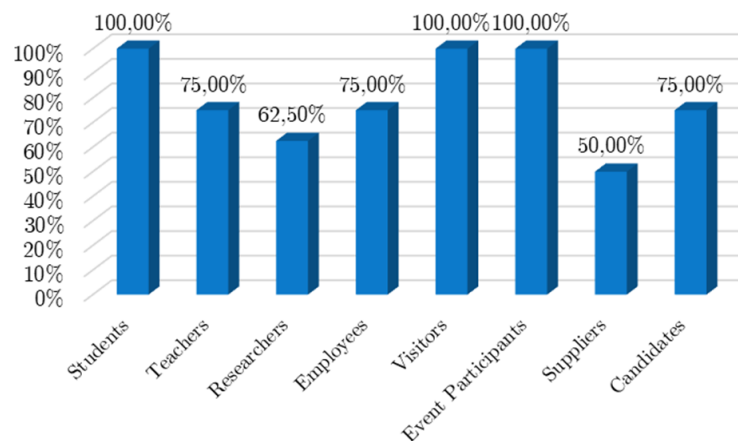


FIGURE 68: Potential beneficiaries of this type of system from the visitors point of view.

iv. *What is your overall satisfaction with the presented system?*

As illustrated in Figure 69, 75,00% of the visitors considered they were strongly satisfied by the presented system, and 25,00% were satisfied.

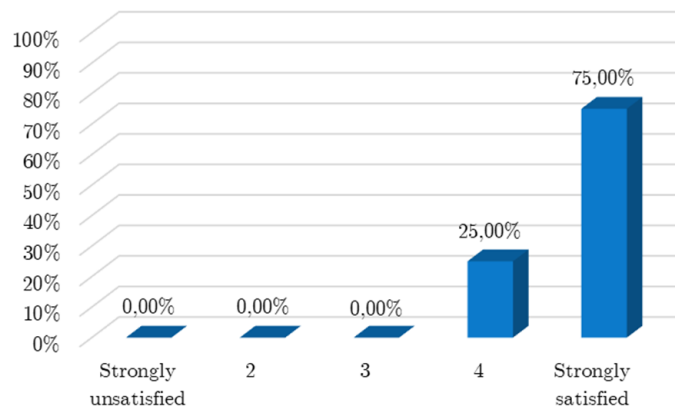


FIGURE 69: Visitors overall level of satisfaction with the system.

5. Suggestions, comments and/or observations

This question consisted of an open answer and it was optional to respond. The overall responses to this question confirmed the observations of the usability test and a few suggested the upgrade of some functionalities to improve the system.

Five participants referred that the QR Code should be more visible, confirming what was observed during the usability tests. It was also mentioned that the icons that correspond to accesses, such as stairs, ramps or lifts, should be more highlighted. Also, in this note, it was suggested an upgrade to the system, to support users with reduced mobility.

If a path to a location involves going through more than one floor, it was suggested that when the user explores the indications given in the visual directions, to be mentioned, in the floor of the destination, that it is where the desired location is.

Other suggestion that was coincident with what was observed during the usability test, was highlighting the start point, in other words, the user should be able to observe the map without questioning where its current

location is. The map should also be movable, allowing the user to view it according to its preference.

In the questionnaire it was also commented that the type of system tested should be present in every university, since it was considered to be extremely helpful, mostly for visitors that are unaware of several matters regarding the university, but as well as people familiarized with the campus.

Chapter 5

Conclusions

5.1 Main conclusions

The main goals of this dissertation were defined according to the purpose of studying the impact of an interactive and informative system on the campus of ISCTE-IUL. More precisely, studying the impact of providing several sets of information, regarding the most diverse aspects of the university, such as:

- Obtain and follow directions to navigate to different locations on campus, proposing a navigation system that, due to the architecture of the buildings, could be helpful for either elements of ISCTE-IUL community and visitors;
- Discover, find and obtain information regarding events occurring on campus, as these gather several visitors every day;
- Explore information respective to numerous aspects of the campus: disclosure calendar of application results, opening and closing hours of the buildings, conditions of services, and others.

The aspects mentioned before, were the most voted ones by the respondents of the initial survey.

The system was tested by a sample of students and visitors of ISCTE-IUL that evaluated the utility and usability of the proposed prototype, confirming that it should be implemented. The participants of the usability test also mentioned

valuable and interesting improvements for possible variants of the system, that should be considered in the design of future prototypes of a similar system in ISCTE-IUL or a campus of any other university.

The project showed that this type of solution could be very beneficial for students and visitors of the university. It is possible to understand, using the results of the test and the responses from the questionnaire, that there is receptivity in using a similar system and implementing one on ISCTE-IUL campus and, such system, could have a large impact in the overall environment of the university.

5.2 Study limitations

Even considering the efforts to minimize the limitations of the study as much as possible, a few limitations were found, that prevented to reach the study goals in the best way possible.

It was revealed the need for more usability and feedback data from visitors. Even though the prototype showed to be useful and usable by the test users, and the number of participants was enough to understand usability problems and possible improvements, it would be interesting to test it with more visitors. During the usability test, visitors proved to be very useful in finding improvements on the prototype, especially in the navigation functionality, since they do not have as much knowledge, as students have, regarding the campus.

Another important point was the reduced knowledge of a few technologies. The time constraint did not allow the apprehension of more knowledge regarding a few programs that could have been useful in making the functionalities more interesting. For example, architects of ISCTE-IUL provided a 3D model of the *Sedas Nunes* Building, but due to the platform where it was built, it was found to be extremely difficult to combine that model with prototype technologies. A considerable amount of time was spent studying and implementing strategies to integrate the model in the navigation functionality, but ultimately, the 2D images were chosen, due to being more accessible to integrate and turned out to be a very important feature in the navigation system.

5.3 Proposals for future work

During the conception of the prototype and, mostly, on the usability tests, a few proposals emerged to improve the functionalities presented:

- The system should be developed in two languages, Portuguese and English, due to the fact that there is a large community of foreign students and visitors and, in this way, make the system more accessible to a greater wider of users;
- Regarding the navigation functionality, it should be possible to adapt routes to a reduced mobility option, avoiding stairs, and resorting to ramps and lifts instead. It could be interesting to integrate some of the work presented in [17], having the possibility to choose between an indoor route, that goes only through buildings, or an outdoor route, that goes through the outside of the building;
- Another improvement to the navigation functionality was suggested by a visitor and corresponds to the possibility of selecting a starting point and a destiny point, so users can view directions from a different location than the one where the kiosk will be placed. The current prototype offers directions from the place where the kiosk was tested.
- Considering the information system, if the amount of frequently asked questions and other types of information needs to be larger, these should be categorized and grouped by type of information.

Chapter 6

Appendices

Appendix A

Survey for requirements gather



Impacto de um Sistema Informativo e Interativo no Campus do ISCTE-IUL // Impact of an Informative and Interactive System on ISCTE-IUL Campus

Este estudo insere-se na investigação que suporta a dissertação do Mestrado em Informática e Gestão do ISCTE-IUL. Tem como objetivo compreender quais os problemas presentes no campus do ISCTE-IUL, que poderão ser solucionados através da implementação de um sistema informativo e interativo.

Estima-se que o tempo de resposta seja aproximadamente 1/2 minutos.
A participação neste estudo é completamente voluntária.

Os seus dados são anónimos e as respostas serão tratadas de forma confidencial. Será efetuado tratamento estatístico da informação recolhida apenas para fins académicos.

Obrigada desde já pela participação.

--/--

This study is part of a research for a Masters dissertation in Computer Science and Management from ISCTE-IUL.

It has the purpose to understand which are the problems present on ISCTE-IUL campus, that can be solved by implementing an informative and interactive system.

It is estimated that the response time is approximately 1/2 minutes.
The participation in this study is completely voluntary.

Your data is anonymous and the answers will be treated confidentially. Statistical treatment of the collected information will be carried out for academic purposes only.

Thank you in advance for your participation.

SEGUINTE

Nunca envie palavras-passe através dos Google Forms.

Caracterização do Participante // Participant Characterization**Idade // Age ***

A sua resposta

Género // Gender *

- Mulher / Woman
- Homem / Man
- Outro / Other

Nacionalidade // Nationality *

- Portuguesa / Portuguese
- Outra: _____

Habilitações Literárias (finalizadas ou em curso) // Educational Qualifications (completed or in progress) *

- Ensino Básico / Basic Education
- Ensino Secundário / High School
- Curso Profissional / Professional Course
- Bacharelato / Bachelors Degree (Before Bologna Process)
- Licenciatura / Bachelors Degree
- Pós-Graduação / Post-Graduation
- Mestrado / Masters Degree
- Doutoramento / PhD

Habilitações Literárias (finalizadas ou em curso) // Educational Qualifications (completed or in progress) *

- Ensino Básico / Basic Education
- Ensino Secundário / High School
- Curso Profissional / Professional Course
- Bacharelato / Bachelors Degree (Before Bologna Process)
- Licenciatura / Bachelors Degree
- Pós-Graduação / Post-Graduation
- Mestrado / Masters Degree
- Doutoramento / PhD

Situação Profissional // Professional Situation *

- Estudante / Student
- Trabalhador-Estudante / Working student
- Trabalhador por conta própria / Self-Employed
- Trabalhador por conta de outrem / Employed
- Desempregado / Unemployed
- Reformado / Retired

É ou já foi aluno do ISCTE-IUL? // Are you or have you ever been a student of ISCTE-IUL? *

- Sim / Yes
- Não / No

[ANTERIOR](#)[SEGUINTE](#)

Nunca envie palavras-passe através dos Google Forms.

Aluno ou Ex-Aluno do ISCTE-IUL // Student or Former Student of ISCTE-IUL

Indique qual o tipo de curso em que se encontra inscrito e/ou que já esteve inscrito no ISCTE-IUL. // Indicate the type of course in which you are enrolled and/or have already been enrolled in ISCTE-IUL. *

Caso tenha completado mais do que um tipo de curso no ISCTE-IUL, seleccione as opções que se adequam. // If you have completed more than one type of course in ISCTE-IUL, select the appropriate options.

- Licenciatura / Bachelors Degree
- Pós-Graduação / Post-Graduation
- Mestrado / Masters Degree
- Doutoramento / PhD
- Mestrado Executivo / Executive Masters
- Curso de Curta Duração / Short-Term Programmes

Refira qual ou quais as escolas do ISCTE-IUL a que pertence ou já pertenceu. // Select which school(s) from ISCTE-IUL that you belong to or had belonged to *

- ISTA - Escola de Tecnologias e Arquitetura / ISTA - School of Technology and Architecture
- IBS - Escola de Gestão / IBS - ISCTE Business School
- ECSH - Escola de Ciências Sociais e Humanas / ECSH - School of Social Sciences
- ESPP - Escola de Sociologia e Políticas Públicas / ESPP - School of Sociology and Public Policy
- INDEG-ISCTE

Quais destes aspetos considera que não se encontram explorados no campus do ISCTE-IUL? // Which of these aspects are not explored currently on ISCTE-IUL campus? *

Pode seleccionar uma ou mais opções. // You can select one or more options.

- Sistema de apoio à navegação pelo campus / System to support campus navigation
- Suporte para obtenção de informações pontuais para visitantes, candidatos e fornecedores / System where visitors, candidates and suppliers can obtain information
- Auxílio na procura de informação sobre eventos que se encontram a ser realizados no ISCTE-IUL / Assistance in looking for information about events that are occurring on ISCTE-IUL
- Suporte para obtenção de informações sobre a associação de estudantes, núcleos das diferentes escolas e locais de interesse / System to obtain information about student union, student association from different schools and place of interest
- Auxílio no encontro de informação sobre docentes e serviços académicos / Assistance in finding information on teachers and academic services
- Outra: _____

Concorda com a implementação de um quiosque interativo para colmatar aspetos não explorados no campus do ISCTE-IUL? // Do you agree with the implementation of an interactive kiosk to solve unexplored aspects of the ISCTE-IUL campus? *

1 2 3 4 5

Discordo totalmente / Strongly disagree Concordo totalmente / Strongly agree

Quem acha que pode beneficiar mais da implementação deste tipo de quiosque interativo? // Who can benefit the most from implementing this kind of interactive kiosk? *

Pode seleccionar uma ou mais opções. // You can select one or more options.

- Alunos / Students
- Docentes / Teachers
- Investigadores / Researchers
- Funcionários / Employees
- Visitantes pontuais / Visitors
- Participantes de eventos / Event participants
- Fornecedores / Suppliers
- Candidatos / Candidates
- Outra: _____

ANTERIOR

SUBMETER

Nunca envie palavras-passe através dos Google Forms.

Visitante ou Potencial Visitante do ISCTE-IUL // Visitor or Potential Visitor of ISCTE-IUL

Quantas vezes já visitou o ISCTE-IUL? // How many times have you visited ISCTE-IUL? *

- Nunca / Never
- 1 a 2 vezes / 1 to 2 times
- 2 a 5 vezes / 2 to 5 times
- Mais que 5 vezes / More than 5 times

ANTERIOR

SEGUINTE

Nunca envie palavras-passe através dos Google Forms.

Potencial Visitante do ISCTE-IUL // Potential Visitor of ISCTE-IUL

Na eventualidade de uma visita ao ISCTE-IUL, considera que um quiosque informativo e interativo no campus seria benéfico na sua visita? // If you decided to visit ISCTE-IUL, do you consider that an informative and interactive kiosk on campus would be beneficial on your visit? *

- Sim / Yes
- Não / No
- Talvez / Maybe

Utilizaria um quiosque informativo e interativo, caso soubesse que o mesmo poderia auxiliar a sua visita? // Would you use an informative and interactive kiosk if you knew that it could help you in your visit? *

- Sim / Yes
- Não / No
- Talvez / Maybe

Quais destes aspetos considera que seja útil explorar no campus do ISCTE-IUL? // Which of these aspects do you considered to be useful to explore on ISCTE-IUL campus? *

Pode seleccionar uma ou mais opções. // You can select one or more options.

- Sistema de apoio à navegação pelo campus / System to support campus navigation
- Suporte para obtenção de informações pontuais para visitantes, candidatos e fornecedores / System where visitors, candidates and suppliers can obtain information
- Auxílio na procura de informação sobre eventos que se encontram a ser realizados no ISCTE-IUL / Assistance in looking for information about events that are occurring on ISCTE-IUL
- Suporte para obtenção de informações sobre a associação de estudantes, núcleos das diferentes escolas e locais de interesse / System to obtain information about student union, student association from different schools and place of interest
- Auxílio no encontro de informação sobre docentes e serviços académicos / Assistance in finding information on teachers and academic services
- Outra: _____

[ANTERIOR](#)[SUBMETER](#)

Visitante do ISCTE-IUL // Visitor of ISCTE-IUL

Considerando a(s) sua(s) visita(s) ao ISCTE-IUL, qual teria sido a utilidade de um quiosque informativo e interativo na sua experiência no campus? // Considering your visit(s) to ISCTE-IUL, do you think an informative and interactive kiosk, could have been useful to improve your experience in the campus? *

1 2 3 4 5

Baixa utilidade / Not useful Elevada utilidade / Very useful

Utilizaria um quiosque informativo e interativo, caso soubesse que o mesmo poderia auxiliar a sua visita? // Would you use an informative and interactive kiosk if you knew that it could help you in your visit? *

- Sim / Yes
- Não / No
- Talvez / Maybe

Quais destes aspetos considera que não se encontram explorados no campus do ISCTE-IUL? // What aspects are not explored currently on ISCTE-IUL campus? *

Pode seleccionar uma ou mais opções. // You can select one or more options.

- Sistema de apoio à navegação pelo campus / System to support campus navigation
- Suporte para obtenção de informações pontuais para visitantes, candidatos e fornecedores / System where visitors, candidates and suppliers can obtain information
- Auxílio na procura de informação sobre eventos que se encontram a ser realizados no ISCTE-IUL / Assistance in looking for information about events that are occurring on ISCTE-IUL
- Suporte para obtenção de informações sobre a associação de estudantes, núcleos das diferentes escolas e locais de interesse / System to obtain information about student union, student association from different schools and place of interest
- Auxílio no encontro de informação sobre docentes e serviços académicos / Assistance in finding information on teachers and academic services
- Outra: _____

ANTERIOR

SUBMETTER

Appendix B

Usability test script (in Portuguese)

Guião – Teste de Usabilidade de um Sistema Informativo e Interativo no Campus do ISCTE-IUL

O seguinte teste tem como objetivo principal averiguar a usabilidade de um sistema informativo e interativo no campus do ISCTE-IUL. Este sistema foi desenvolvido para funcionar como um quiosque fixo que estará situado na entrada principal do Edifício *Sedas Nunes*, junto ao segurança (zona vermelha).

Após a concretização deste teste, é solicitado que responda a um breve questionário de feedback sobre o sistema testado.

Cada vez que terminar uma tarefa, avise que a concluiu à pessoa responsável pelo teste, antes de proceder à realização da próxima tarefa.

De forma autónoma, pretende-se que realize as seguintes tarefas: Nota: Caso não tenha conseguido concretizar uma ou mais tarefas, por favor, quando efetuar a resposta ao questionário final, mencione o(s) número(s) da(s) tarefa(s) que não realizou e o motivo (erro de funcionamento do sistema, impossibilidade de encontrar o que foi solicitado, etc. . .).

1. Recorrendo às funcionalidades apresentadas, procure indicações para:

(a) A Tesouraria.

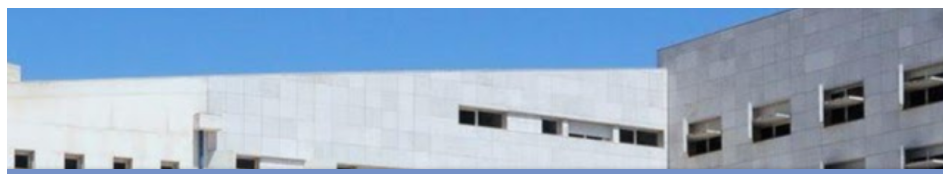
i. Após ler as indicações e observar as direções apresentadas na imagem, faça o caminho apresentado.

- (b) A sala 2E05.
 - i. Após ler as indicações e observar as direções apresentadas na imagem, faça o caminho apresentado.
 - (c) O Auditório Caiano Pereira.
 - i. Após ler as indicações e observar as direções apresentadas na imagem, faça scan do QR Code apresentado na página e levando as direções consigo, faça o caminho apresentado.
2. Recorrendo às funcionalidades apresentadas, encontre as seguintes informações:
 - (a) Data de divulgação dos resultados das candidaturas de 3^a fase da formação Pós-Graduada.
 - (b) Horário de atendimento presencial (em período de interrupção letiva) dos secretariados das escolas.
 3. Recorrendo às funcionalidades apresentadas, encontre o evento:
 - (a) Que decorre nos dias 26 a 28 de junho.
 - i. Aceda à informação detalhada deste evento.
 4. Aceda ao menu do sistema, e responda ao questionário de feedback (botão verde “Feedback”).

Agradeço desde já a participação neste teste. Qualquer sugestão ou dúvida não hesite em comunicar à responsável pelo sistema, que se encontrará consigo durante o teste.

Appendix C

Feedback questionnaire



Feedback do Impacto de um Sistema Informativo e Interativo no Campus do ISCTE-IUL

Este estudo insere-se na investigação que suporta a dissertação do Mestrado em Informática e Gestão do ISCTE-IUL. Tem como objetivo avaliar a usabilidade de um sistema informativo e interativo para colmatar alguns problemas presentes no campus do ISCTE-IUL, que poderão ser solucionados através da sua implementação.

Estima-se que o tempo de resposta seja aproximadamente 2/3 minutos.
A participação neste estudo é completamente voluntária.

Os seus dados são anónimos e as respostas serão tratadas de forma confidencial. Será efetuado tratamento estatístico da informação recolhida apenas para fins académicos.

Obrigada desde já pela participação.

SEGUINTE

Nunca envie palavras-passe através dos Google Forms.



Feedback do Impacto de um Sistema Informativo e Interativo no Campus do ISCTE-IUL

*Obrigatório

Caracterização do Participante

Idade *

A sua resposta

Género *

- Mulher
- Homem
- Outro

Nacionalidade *

- Portuguesa
- Outra: _____

Habilitações Literárias (finalizadas ou em curso) *

- Ensino Básico
- Ensino Secundário
- Curso Profissional
- Bacharelato
- Licenciatura
- Pós-Graduação
- Mestrado
- Doutoramento

Situação Profissional *

- Estudante
- Trabalhador-Estudante
- Trabalhador por conta própria
- Trabalhador por conta de outrem
- Desempregado
- Reformado

É aluno do ISCTE-IUL? *

- Sim
- Não

ANTERIOR

SEGUINTE

Nunca envie palavras-passe através dos Google Forms.

Aluno do ISCTE-IUL

Indique qual o tipo de curso em que se encontra inscrito e/ou que já esteve inscrito no ISCTE-IUL *

Caso tenha completado mais do que um tipo de curso no ISCTE-IUL, seleccione as opções que se adequam.

- Licenciatura
- Pós-Graduação
- Mestrado
- Doutoramento
- Mestrado Executivo
- Curso de Curta Duração

Refira qual ou quais as escolas do ISCTE-IUL a que pertence ou já pertenceu *

- ISTA - Escola de Tecnologias e Arquitetura
- IBS - Escola de Gestão
- ECSH - Escola de Ciências Sociais e Humanas
- ESPP - Escola de Sociologia e Políticas Públicas
- INDEG-ISCTE

ANTERIOR

SEGUINTE

Nunca envie palavras-passe através dos Google Forms.

Visitante ISCTE-IUL

Quantas vezes já tinha visitado o ISCTE-IUL? *

- Nunca
- 1 a 2 vezes
- 2 a 4 vezes
- Mais do que 5 vezes

ANTERIOR

SEGUINTE

Nunca envie palavras-passe através dos Google Forms.

Feedback das Funcionalidades do Sistema

Funcionalidade de Navegação *

	Discordo completamente	Discordo	Não concordo nem discordo	Concordo	Concordo completamente
Os modelos 2D das plantas dos pisos do Edifício Sedas Nunes são úteis na compreensão de um caminho	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
As indicações visuais complementadas com as indicações em texto são suficientes para compreender o caminho para um determinado local	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
O QR Code é uma forma acessível de levar as indicações	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
É uma funcionalidade importante para alunos do ISCTE-IUL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
É uma funcionalidade importante para visitantes do ISCTE-IUL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Funcionalidade de Eventos *

	Discordo completamente	Discordo	Não concordo nem discordo	Concordo	Concordo completamente
É relevante a apresentação dos próximos eventos a decorrer no campus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Considero acessível obter as informações de um evento através desta funcionalidade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
É uma funcionalidade importante para alunos do ISCTE-IUL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
É uma funcionalidade importante para visitantes do ISCTE-IUL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Funcionalidade de Informações *

	Discordo completamente	Discordo	Não concordo nem discordo	Concordo	Concordo completamente
A apresentação de questões frequentes nesta secção é relevante	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Considero que esta funcionalidade permite a obtenção rápida de informações pontuais	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
É uma funcionalidade importante para alunos do ISCTE-IUL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
É uma funcionalidade importante para visitantes do ISCTE-IUL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Relativamente ao sistema em geral:

Considera benéfico a implementação de um sistema semelhante ao que testou no campus do ISCTE-IUL? *

- Sim
- Não
- Talvez

Considera que este tipo de sistema permite melhorar a experiência no campus do ISCTE-IUL? *

- Sim
- Não
- Talvez

Quem considera que pode beneficiar mais deste tipo de sistema? *

Podem seleccionar uma ou mais opções.

- Alunos
- Funcionários
- Investigadores
- Docentes
- Candidatos
- Visitantes Pontuais
- Fornecedores
- Participantes de Eventos

Qual é a sua satisfação geral com o sistema apresentado? *

- 1 2 3 4 5
- Muito insatisfeito Muito satisfeito

ANTERIOR

SEGUINTE

Sugestões, Comentários e/ou Observações

Mencione sugestões, comentários e/ou observações sobre o sistema testado. Caso não tenha conseguido completar 1 ou mais tarefas do guião de teste, por favor, mencione aqui as mesmas e o motivo pelo qual não conseguiu realizá-las (exemplos de motivos: erro de funcionamento do sistema, impossibilidade de encontrar o que foi solicitado, etc...).

A sua resposta

ANTERIOR

SUBMETER

Nunca envie palavras-passe através dos Google Forms.

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