Signage Design for (Re)Occupied Buildings: The case of study of Royal College of Art of University Coimbra

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▶ Signage and Wayfinding Design are key components of the city's social infrastructure. Although signage is not the only spatial orientation resource — quite the contrary —, its function in the contemporary built environment is vital to compensate the buildings' wayfinding weaknesses. A typical example of this is the buildings that, due to changes in their functions or poorly designed rehabilitation works, lost their native wayfinding design. The Real Colégio das Artes (trans. Royal College of Arts) of University of Coimbra, is a typical case in the point. The college built by Companhia de Jesus, in 1569, on the centre of Coimbra's Alta, over the time, endured several distinct functions and rehabilitation interventions that created the actual confusion. Even though it was built initially to be a Jesuit College, it also performed the functions of High School, Military Headquarters during the Peninsular War, University Teaching Hospital and National Museum. Furthermore, the building was one of the few buildings that survived Alta's demolition towards the creation of the new university campus, during the first half of the twentieth century. After the construction of the new University of Coimbra Teaching Hospital, in 1986, the building returned to its role of University College accommodating several faculties of the University of Coimbra. Today, the college is home of the Departments of Architecture and Biochemistry, of some of the administrative services and research unities of the University of Coimbra, and of the unity of postgraduate studies in Contemporary Art Colégio das Artes. The college is also classified by UNESCO such as a world heritage site.

Nowadays, the building presents a confuse and "difficult to understand" logic. For instance, the classrooms are scattered by the building without a sequence. Moreover, it does not exist a direct door to enter some classrooms. We need to go through corridors surrounded by professors offices and storerooms. This created an atypical organisational system whereby, most of the times, the space identification is made using improvised signage (e.g. A4 paper sheets). To solve this problem, we developed a modular, open-ended and dynamic signage system that enables: (1) to distinguish and to unify the entities held by the building; (2) to include/exclude entities easily without the system losing its integrity; (3) to change the name and sequence of the classrooms; and (4) to include temporary signage. Apart from that, the system considers a set of proposes and techniques to respect the college historical and aesthetical legacy. In this paper, we present the outcomes and the process behind their development.

Design de sinalização para edifícios (re)ocupados: O caso de estudo do Real Colégio das Artes da Universidade de Coimbra

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▶ O Design de Sinalização e Orientação é fundamental para as infraestruturas socias de hoje. Embora a sinalética não seja o único recurso de organização espacial — muito pelo contrário —, a sua função é essencial para compensar lacunas na orientação dos espaços. Frequentemente isto é resultado de múltiplas mudanças de funções do espaço e/ou obras de reabitação mal executadas perderam a sua orientação. O edifício do Real Colégio das Artes da Universidade de Coimbra, encaixa neste perfil. O colégio foi contruído pela Companhia de Jesus, em 1569, no centro da Alta de Coimbra e desde daí tem assegurando várias funções. Foi colégio jesuíta, liceu nacional, quartel militar durante das invasões francesas, hospital universitário e museu nacional. Além disso, o edifício é um dos poucos sobreviventes à demolição da Alta de Coimbra em prol da construção do actual campus universitário, na primeira metade do século XX. Após a construção dos novos hospitais da Universidade de Coimbra, em 1986, o edifício retorna a sua função inicial de colégio universitário alojando várias faculdades, departamentos e serviços da Universidade de Coimbra. Hoje, é a casa dos Departamentos de Arquitectura e Bioquímica, de serviços administrativos, de unidades de investigação e da unidade de estudos avançados em arte contemporânea Colégio das Artes. É também classificado, pela UNESCO, como património da Humanidade.

Hoje-em-dia, o edifício apresenta uma lógica espacial confusa e difícil de entender. Por exemplo, as salas de aulas estão dispersas pelo edifício, sem sequencia, e em algumas para chegar a sala de aula tem de se percorrer corredores cercados por portas não identificadas (como gabinetes de professores e salas de arrumo). Isto cria um atípico sistema de organização onde muitas vezes os espaços são identificados recorrendo a sinalética improvisada (p. ex. folhas de papel A4).
Para resolver estes problemas, nós desenvolvemos um sistema de sinalização e orientação modular, aberto e dinâmico que permite: (1) distinguir e unificar as entidades presentes no edifício; (2) incluir/excluir entidades facilmente sem que o sistema perca a integridade; (3) mudar o nome e a sequencia dos espaços de forma rápida e fácil; (4) incluir sinalética temporária (p. ex. sinalética de eventos). Além disso, o sistema foi projectado de forma a respeitar o património histórico e estético do edifício. Neste artigo, vamos apresentar e discutir os resultados deste projecto.

Introduction

The signage and wayfinding design play a fundamental role in nowadays buildings. When one navigates for the first time in a built environment, these disciplines help everyone to find their own route. However, signs not are compulsory for navigation. In most cases, they are only required because the building is failing in the transition of its organisation. This is mainly because either the buildings are designed without consideration to the "building user experience" or, over the times, the buildings changed their functions and/or suffered poorly designed rehabilitation works losing, therefore, their native wayfinding designs (Mollerup, 2005; Waller, 2011).

Each signage and wayfinding design project is therefore unique. Each one has its own features, its goals and its users. In this sense, the designer should understand the users and hidden logics beforehand to develop an effective design that exploits the building's characteristics (Gibson, 2009). Accordingly, these project always should be centred on the user. Nevertheless, issues related to the user are commonly undervalued in the specialised literature and/or during the process.

The *Real Colégio das Artes* is a clear example of how the successive changes of functions (and the consequents rehabilitation/adaptation works) disfigure the spatial organisation of a building. The building displays how natural wayfinding shape of a building can be ruined to give way a confuse and meaningless organisation. Nowadays, when a visitor arrives in the building, for the first time, always needs some kind of further assistance to find his/her destination.

The *Real Colégio das Artes* was built by *Companhia de Jesus*, in 1569, in the centre of Coimbra's *Alta* to be a pre-university Arts School and it passed through several functions over the time (Lobo, 1999). It was High School, Military Headquarters during the Peninsular War, University Teaching Hospital and National Museum. It was also survived to the Alta demolition towards the built of Coimbra university campus, dictated by Portuguese dictatorial regime, in the first half of the twentieth century (Figueira, 2011; Lobo, 1999; Providência, 2000). Since the opening of the new University of Coimbra (UC) teaching hospital, in 1986, the building returned to its original role of teaching site, hosting several faculties of the Faculty of Science and Technologies of UC (FCTUC). The building was suffered upgrading/adaptation works every time that its function changed to fit the new responsibilities (Bandeirinha, 2013; Providência, 2000). The college is also classified by UNESCO such as a world heritage site.

Today, the building hosts the Departments of Architecture (DArq) and the biochemistry classrooms of the Department of Life Sciences of FCTUC, some of the administrative services and research unities of the UC (e.g. the Centre for Social Studies or the Building, Security and Environment Management Services) and the unity of postgraduate studies in Contemporary Art *Colégio das Artes*. This complexity of entities and functions created an atypical environment where the location of project classrooms change quite often (to fit all the enrolled students) and the theoretical classrooms/professors' offices do not unveil any rational order. Beyond, all classrooms are hard to access and find. An environment that although confusing stimulated the affection on its users (e.g. staff, students or professors).

In this paper, we present one tentative signage and wayfinding design to solve this problem. Our proposal aims to the development of modular, open-ended and dynamic signage system that enables the maintenance of the current environment of the building. This way, the system unifies all entities in the building and has the capability to react to changes without losing its coherence. Besides that, the system also includes technological solutions that explore the potential of new digital technologies in a signage design scenario. This work is aligned with the wayfinding research presented in (Rebelo, Fonseca and Bicker, 2016).

The remainder of this paper is organised as follows: Section 2 summarises the current state of the building; Section 3 presents related work focusing in modular and open-ended signage systems; Section 4 unveil the design process behind the development of the signage system ad presents its final shape; and finally, Section 5 presents conclusions and directions for future work.

The Building Current Condition

Today, the building presents a confusing and hard to perceive space planning. Consequently, users do not find effortlessly unknown spaces. This planning is the fruit of the space requalification from teaching hospital to the university college.

Nowadays, the places' nomenclature still reveals how the departments grew in the building. When the old wards became unoccupied project classrooms are established on the wider rooms and the remaining spaces were adapted to other functions (e.g. theoretical classrooms or professors' offices) (Lobo, 11/2015, *oral communication*). Now the spaces are spread in the building, showing a senseless enumeration; therefore, to find a classroom is a complex task. For instance, a classroom named "Theoretic 3" might not be between the "Theoretic 2" and the "Theoretic 4." Another troublesome situation is that the access to the classroom not always is made by a direct door; consequently, the user needs to walk across corridors surrounded by professors' offices and storage compartments until entering in the classroom.

Moreover, the places do are not identified. Paper sheets of any, PVC plates and writing in the walls are commonly used to communicate all kind of information — since classrooms' name to warnings (see figure 1).

Figure 1. Paper sheet identifying the Theoretical 2 (T2) classroom (2016).

Related Work

Although the wayfinding design is existing in our society since cavemen age, it only solidified (as a field of study) during the 20th century. Nowadays, the overwhelming majority of public spaces need a wayfinding project and the process of these systems is increasingly richer and complex (Gibson, 2009; Smitshuijzen, 2007; Uebele, 2007). However, these projects often are not designed to support changes; consequently, a mistake may overthrow an entire project. Modular and flexible systems appear to be a good solution to this problem. Indeed, over the 20th century, several modular systems have developed to handle with large signage proposals. For instance, the design of *British motorway network road signs* (John Kinneir and Margaret Calvert, 1957), the signage from *British railways stations* (John Kinneir and Margaret Calvert, 1964), the *New York subway signage* (Unimark, 1966) or the signage points of 1978's *Mexico City Summer Olympic Games* (Lance Wyman, 1978). Nevertheless, the modularity was only explored as a graphic design tool.

Presenting a notable and distinct approach, the Dutch trio *Experimental JetSet* designed the signage to the temporary venue of *Stedelijk CS Museum* in Amsterdam, (Netherlands) in 2004 (Experimental Jetset, 2004). This work, they explored modular principles not only during the sign design process but also in the system's materialisation. Therefore, the Dutch trio presented a system where A4 plastic document holders are the basic construction modules. This also enabled the museum staff to change and replace, whenever required, the signage content. This system displayed how the standard sizes and materials might not be an obstacle to the development of effective projects (Armstrong and Stojmirovic, 2011).

In 2012, the German studio *L2M3* designed the signage to *SimTech research centre of the University of Stuttgart* based on the same principles (Victionary, 2013). The SimTech research centre hosts offices, classrooms, interdisciplinary research facilities and teaching laboratories. Due to the instability of its functions, designers develop a module-based system. This system allows to compose all kind of information using the same grid and customise each piece of information whenever necessary. The system also supports the integration of external pieces of information (e.g. events posters or warmings). Furthermore, *L2M3* also explored the same principles in the development of the signage system to *Ruhr Museum* at Essen, in Germany (2010). Here, the system is designed according to a modular and flexible grid, based on the mines railways (Slanted *et al.*, 2012: 38).

The German studio *Büro Uebele* developed a similar design to *Vitra Campus* (2011) (Büro Uebele, 2011). In this project, the design team developed a modular typographic system that used a monospaced typeface, allowing combine and reorganise the signs, letter by letter. The system design is, therefore, extremely flexible, allowing its use in every type of situations and places, even in the design of stationery designs to the park.

The British design studio *Cartlidge Levene* developed a signage system, to *Royal College of Arts* (2015), that handles with regular reorganisations, typical of colleges (Cartlidge Levene, [n.d.]). The system was designed through two layers. The first layer presents constant

elements (e.g. classroom names or floor numbers) composed using wall-painted typography. The second layer is an aluminium path designed to upgrade the first layer. This path enables (at any time) new pieces of information (e.g. posters, warnings or even digital signage) be combined with permanent information.

Domenic Lippa and Jeremy Kunze, explored a different approach to handle the typical reorganizations of university colleges when they designed the signage system to *London College of Communication* (2014) (Pentagram, 2014). This signage system was designed to be "reprogrammed" as appropriate. Former systems failed, and communication was done using alternative signs (e.g. paper sheets). This way, the new system was designed using a perforated aluminium sheet as a platform for affixation and construction of the signs. Besides that, a colour code was developed to represent all college areas.

Future directions of signage and wayfinding design point to the development of open-ended projects aided by the new technologies (Armstrong and Stojmirovic, 2011; Smitshuijzen, 2007). In this sense, future signage designers will create resilient frameworks that will simplify the wayfinding in the complex-built environment of nowadays.

The System

The process of wayfinding and signage design, regardless of the adopted design methodology, can always be divided into two distinguishable stages. In the first stage, the built environment is studied and documented (e.g. its navigation patterns, its users, its distinguishing characteristics, etc.). This initial stage is fundamental because define the foundations where the project will settle. In the second stage, the visual concepts and features (e.g. sizes, colours, positions) are defined and, then, the system designed (Smitshuijzen, 2007).

For the first stage of this project, we adjust the design process proposed in (Gibson, 2009:34) to include the user participation. This way, we combine Gibson's methodology together with the *Informance Design* method (Burns *et al.*, 1994). Bruns et al.'s method is developed to design interactive scenarios and may be summarised as follows. The designer iteratively develops low-resolution prototypes and assess them, in a performance fashion, with users, in order to find inconsistencies and failures. In our project, we design prototypes (wayfinding plans and signs) and we carried out meetings with users to examine the prototypes strengths and weaknesses.

As the outcome of this process, we define three main objectives that the new system should resolve: (1) to standardise and to identify all the spaces, in the building, maintaining the differentiation between the entities hosted by the building; (2) to develop a system that supports the regular changes in the spaces designation; and (3) to design the system with a visual identity that respect the building's history and heritage. This way, we proposed a modular and flexible system built over a dynamic set of visual and composition rules. This proposal, therefore, can handle with the inclusion, exclusion and change of all kind of information, at any time. (Rebelo, Fonseca and Bicker, 2016) gives a more comprehensive report of the first stage of this project.

In the next sections of this chapter, we will present: how we developed the graphical language to the signs; how we designed the pictograms and the maps; and, finally, how we design each type of sign.

Graphic Norms Development

Although UC has its graphics standards, the diversity and heterogeneity of its places make difficult to regulate the signage in every space. Furthermore, some entities already have its own signage system (see figure 2). Accordingly, we choose to design one solution from scratch.

Figure 2. Signage at Faculty of Arts and Humanities of UC (2016).

Since the expulsion of the *Companhia de Jesus* from Portugal (c. 1759), the building hosted a set of ephemeral and temporary functions. For instance, it was temporary military headquarters during the Peninsular War (Figueira, 2011), its cloister held "tent hospitals" to isolate contagious diseases (Providência, 2000) and it was filled by prefabs when the university was no space to all the student, in the 1990s (Lobo, 1999). With this in mind, we transposed the concept of ephemerality as the main visual thematic to the signage design.

This way, we define a set of rules to design a dynamic grid system whereby signage system will anchor. The result is a grid based on the resulting shape of the intersection of two squares. We were inspired by the architectural shape of the building, one square (the building's delimitation) intercepted by another square (the cloister). The grid is extremally dynamic and behaves as follows. While the grid outer shape is fixed, the inner shape changes its position and it can even extrapolate the outer edges (see figure 3).

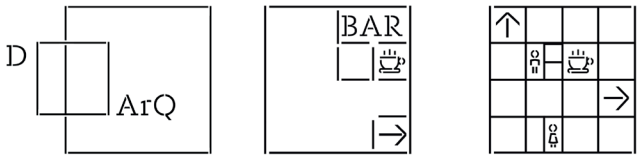

Figure 3. Preliminary signs design testing grid system.

We decided to identify entities using colour variations; therefore, the definition of a proper colour palette was an essential task. The basis of this decision was the relation between DArq and *Colégio das Artes* (contemporary art studies unity). These two institutions have an interesting symbiotic relationship sharing professors, events, students and, of course, the space. (In a metaphorical meaning, one completes the

another and vice-versa.) We use the black to identify the *Colégio das Artes*'s classrooms and the negative colour (white) to DArq. Other institutions in the building are defined using grey colours. Furthermore, the system allows the inclusion of temporary signage in the system (see figure 4). Although the staff of building should be responsible by the definition of the colour of these signs (e.g. use event colour), we defined yellow as default colour to these temporary pieces of information (see figure 4).

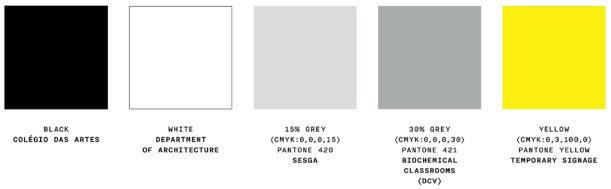

Figure 4. Signage colour palette.

Looking at the evolution of signage designs, typography has become one signage important part. Nowadays, to design signage, designers should have strong typographic knowledge (Gibson, 2009). To pick a typeface was become, then, one fundamental assignment. For this system, we take into consideration multiple factors related with the nature of signage projects (e.g. legibility and flexibility) and related with specific features of this project (e.g. appropriateness to the aforementioned visual concept and safeguard the building's heritage). Since the initial experiments, stencil typefaces seemed to the proper choice. Nowadays, everyone is acquainted with the nature and aesthetical of these typefaces. Besides that, these typefaces have always had an ephemeral nature being used to fast create warning or/and identify temporary spaces. These kinds of typefaces are also keeping a close relationship with architectural projects. For instance, we can see stencil letterforms in the designs of architects such as Le Corbusier, James Stirling and/or Alison and Peter Smithson (Kindel, 2013).

Although we have experimented with several typefaces (see figures 5–7), we adopted the typeface *Karbon Slab Stencil Regular* (see figure 8), designed by Kris Sowersby and released by the *Klim Type Foundry* (2010). This typeface fulfils the requirements for a good signage typeface: (1) it is legible at long distances, due to its proper x-height and generous negative spaces; beyond, its decedents and ascendants does not have an exaggerated size; (2) it is designed with a stroke predominantly uniform enabling, therefore, an effortlessly design of the pictograms; and (3) it fits in the recommendations of the *Americans with Disabilities Act* (i.e. having a width-height ratio between 3:5 and 1:1 and a line-weight ratio between 1:10 and 1:5) permitting someone with visual impairments read comfortably the signs (Gibson, 2009).

Figure 5. Typographic posters designed to assess the typefaces' legibility. Left: Poster designed with *User Stencil font family* (Medium and Medium Cameo weights) designed by Pedro Leal and released by DSType (2012). Right: Poster composed with *Monosten Stencil bold*, designed by The Entente and released by Colophon foundry (2011).

Figure 6. Sign's prototype developed to assess the typeface legibility and the potential style of the pictograms. Designed using the typeface Danmark Medium, designed by Henrik Kubel and released by A2-Type (2010)

Figure 7. Set of modular glyphs designed by the authors for the project.

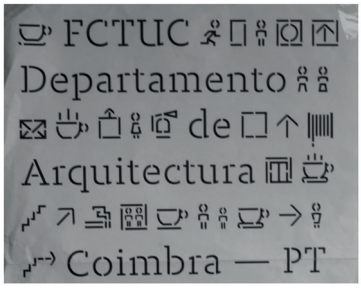

Figure 8. prototype sign designed to assess the graphic style of the pictograms. Developed using *Karbon Slab Stencil Regular*, designed by Kris Sowersby and released by the *Klim Type Foundry* (2010).

Pictograms and Maps Design

Pictograms and maps design — just like typography — have a key role in signage systems. These visual artefacts help people that prefer (or natural handle better with) visual languages, providing alternative representations of the spaces and actions (Gibson, 2009).
For pictograms, as already referred, we concerned with their design already during the typeface selection stage, in order to design pictograms that are fully integrated with typeface — as if they are special characters (see figure 6 and 8). The chosen typeface *(Karbon Slab Stencil)* enabled this integration. In this sense, the pictograms were designed employing always the same stroke weight (i.e. the weight of the typeface's stems) and the same height (i.e. the typeface's cap-height). This way, the graphic coherence between pictograms and characters is ensured (see figure 8). The outcome of this stage is displayed in figure 9.

Pictograms are generally static. In this project, we also designed a set of "reactive pictograms" that transmit extra information in their reading (for instance, if a service is opened/closed). These pictograms can have two stages (active and inactive) and may be implemented in the space in two ways: (1) through the application of "interactive signs" that have the capability of gather real-time information; and/or (2) through the manual replacement of the module. Figure 10 displays the pictograms of cafeteria and reprography in their two states.

According to the aesthetics of the pictograms and of the typeface, we also developed a set of simplified floors map designs to be placed in the floors directories (see figure 11).

Figure 9. Some of the pictograms designed to the *Real Colégio das Artes*' signage.

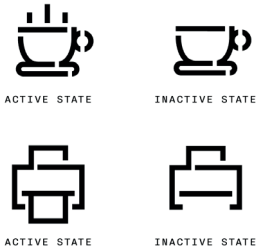

Figure 10. Cafeteria's and reprography's "reactive pictograms." Left: Pictograms when the service is open (active stage). Right: Pictograms when the service is closed (inactive stage).

Figure 11. Low-resolution scheme of the map in the directory of floor 0.

Signage Design and System Physical Materialisation

We developed a wall-mounted proposal were each sign have a similar width and it is the height that varies. Each sign is conceived in a modular way to combine with other signs. Accordingly, the pieces of information, in each sign, can be changed where required. The height of the modules was standardised in 7 cm. However, we also designed signs with 1/2 height to be used when the sign's content is too long or to identify the type of space (always upwards of the main sign). We define such as initial baseline height (i.e. where the first row of signs will be placed) in 1.80 m, although this measure can change due to the particularities of the affixation site. Each module will be made using composite aluminium with content opened in the upper side.

In the initial proposal, we designed small and recursive modules wherein the composition was made letter by letter. However, during the meetings with users, we reach the conclusion that most of the words recur. In this sense, we only made textual modules with complete words.

The signs are designed with typeface at 144 pts. Each row can contain two kind of information: (1) textual (i.e. numbers, text and punctuation) and (2) pictorial (i.e. pictograms and arrows). The two types of information (visual and textual) are not directly joined. They always need a space between them to create a buffer zone and therefore facilitate the read by the viewer (see figure 12). Indents may be used to define the hierarchy of contents (see figure 13).

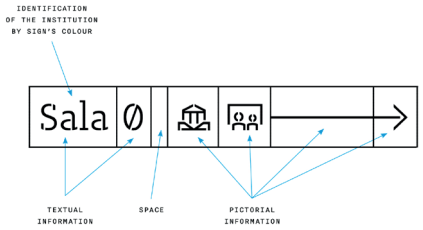

Figure 12. Signage schema with two types of information (textual and pictorial)

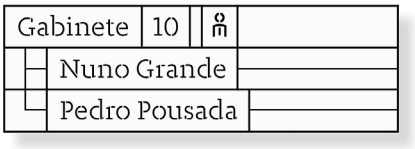

Figure 13. Prototype sign, for professors' office, using idents to define the hierarchy of the information.

According to (Gibson, 2009), we can subdivide all signs into four large groups: (1) identification signs, i.e. visual marks that identify the spaces and its function; (2) directional signs, i.e. visual marks that provide navigation information; (3) orientation signs, i.e. visual marks that, generally, presents the space around itself; and (4) regulatory signs, i.e. visual marks that describe what user should/should not do.

To identify the spaces (i.e. identification signs), we developed two distinct approaches. One is a sequential, static and unchanging approach, only employed for administrative purposes. This consists in enumerating the doors sequentially, using stencil. Another approach is based on space's functions and the signs can be reorganised where necessary. These signs have distinct properties depending on the type of place that it identifies. All the identification signs have a fixed width of 45 cm. For identify classrooms, a ½ height sign (3.5 cm) is placed upper the main sign to indicate the type of classroom. These signs can have multiples widths albeit it not exceeds the width of the main sign (see figure 14). For the services, this type of identification sign disappears because there is not necessary (see figure 15). Signs for secondary spaces (e.g. professors' offices, storage rooms and workshops rooms) are always composed using ½ height rows (see figure 16).

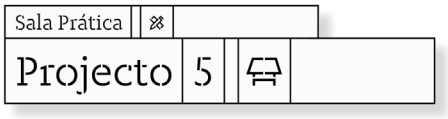

Figure 14. Identification sign for the practical classroom Project 5.

Figure 15. Identification sign for cafeteria space.

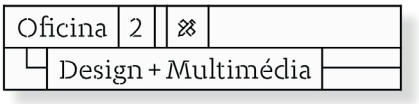

Figure 16. Identification sign for workshop 2 room (a workshop room for design and multimedia students).

Directional signs are similar to identification signs (see figure 17). However, they are slightly longer (56 cm). If the directional pieces of information are associated with identification information, the signs keep the width of the identification signs (see figure 18). Arrows are used in a continuous way.

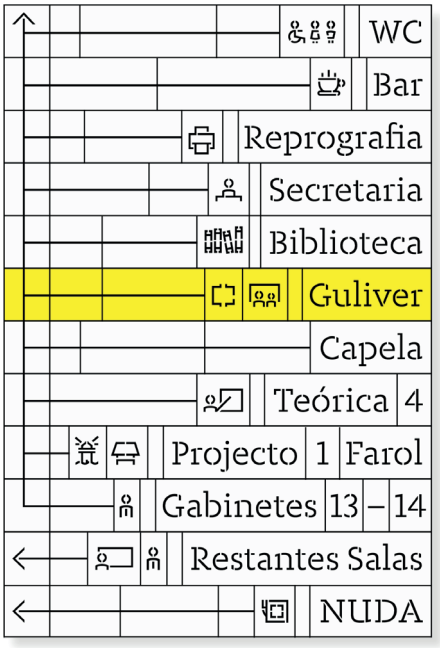

Figure 17. Directional signage

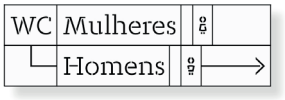

Figure 18. Directional sign associated with an identification sign.

Orientation signs, by their nature, generally are a bit distinctive in relation to the others. In our design, each sign is composed of two not connected parts: one with the map; and another with the caption (see figure 11).

We also design other types of signs' implementations in sites where the main rules could not be employed and/or to increase the visibility of certain type of spaces, e.g. toilets (see figure 19).

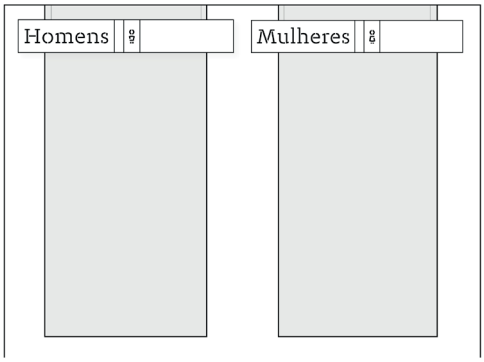

Figure 19. Signs implemented in a site wherein main rules could not be employed, in this case, in toilets.

Furthermore, we outlined prototypes for a "smart signage" system. These signs add one new layer of information, displaying, for instance, if a service is open or close or if the professor is in his/her offices' hours. The system also may be used to display warnings or the classrooms occupation timetables. We developed two types of "smart modules:" (1) "smart signs," that are similar to the main components of signage but have the capacity to change its state (e.g. illuminate itself or change its content); and (2) "digital signs," that are alike a monitor but can be attached in the main signage system as a module. To this type of digital signage, we developed software that enables ever-changing information to be added to the system (e.g. warnings or notices).

(Rebelo, Fonseca and Bicker, 2016) gives a more comprehensive description of the system.

4. Conclusion and Future Work

In this paper, we presented a wayfinding and signage system to the *Real Colégio das Artes* of UC and outlined its development process. This system was designed in a modular way, ensuring that signs are dynamic and open-ended. In this sense, it can handle the variations in space's

designations. Beyond, the system also unifies the entities hosted in the building through the application of a dynamic visual approach.

To design the system, it was required the building space analysis and historical contextualisation. This way, we conduct one historical survey about the building and the entities hosted by itself. Moreover, we also iteratively conduct meetings with users in order to gather data to understand their routines and assess tentative designs. Accordingly, we believe that we design a stable outcome.

Besides that, we outlined an experimental approach to develop "smart signage." These prototypes unveil how novel digital technologies can be used to increase the information capabilities of the system. For instance, to display the availability of a service, warnings or notices.

Future work will be focused on making the necessary revisions for installation of the system and documenting the system performance after installation. Furthermore, we will continue to explore and to improve the "smart signage," in order to allow this approach to be transposed to other built environments and functions.

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