Analysis of signage language and its relationship with the spatial orientation of a university center

Análisis del lenguaje señalético y su relación con la orientación espacial de un Centro Universitario

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◈ Abstract

The purpose of this research was to analyze the various aspects of the signage language and the architectonic space where it is situated to examine its efficiency in connection with users' mobility and orientation It was carried out through the situational analysis method, with a qualitative and quantitative approach, considering the current signs in use, the architectural work and the areas of the entire system. We found that the system is inadequate: it fails to apply the principles and premises that are considered as the basis of all the signage system, signs are not adapted to the environment, individuals are not prioritized as the center of signage programs and we identified a huge significant disconnect between the architectural environment, the use of spaces and services, as well as the signage system used. We concluded that it is necessary to implement an intervention that prioritizes the primary and secondary functions of the system, as well as the identification and application of identity principles and of the institutional image to design an efficient wayfinding language and to improve the use and interaction of the general environment of the University Center.

◈ Resumen

La presente investigación tuvo como objetivo analizar las distintas dimensiones del lenguaje señalético y los espacios arquitectónicos donde éste se sitúa para examinar su eficiencia en relación con la movilidad y orientación de los usuarios. Se realizó a través del método de análisis situacional, con un enfoque cualitativo y cuantitativo, considerando las señales actuales en uso, la obra arquitectónica y las áreas de todo el sistema. Se observó que el sistema es deficiente, no aplica los principios y premisas considerados como la base de todo sistema señalético, las señales no están adaptadas al medio, no se prioriza al individuo como el centro de programas señaléticos e identificamos una enorme discordancia entre el entorno arquitectónico, el uso de los espacios y servicios, así como el sistema de signos utilizado. Concluimos que es necesaria una intervención que priorice las funciones primarias y las secundarias del sistema, así como la identificación y aplicación de los principios identitarios y de la imagen institucional para diseñar un lenguaje guía eficiente y mejorar el uso y la interacción del entorno general del Centro Universitario.

◈ Introduction

This university campus, known as Centro Universitario de Arte Arquitectura y Diseño, is composed of three sites: one in the Barranca de Huentitán, and the other two in downtown Guadalajara. For this analysis only the first was taken into account.

Since its beginnings, the architectural complex was recognized as one of the most meaningful modernist buildings of the country. The architect Ignacio Díaz Morales founded the building on November 1, 1948. Nowadays it is one of the thematic university centers of the Red Universitaria. It offers more than 15 undergraduate programs and has a university population of more than seven thousand members.

This educational campus is part of the Red Universitaria of the University of Guadalajara. It is considered the university complex with a "personality" completely different from others due to its geographical and topographical characteristics: the singularity of the complex and its functions turn it into an architectonic model; however, due to the same characteristics, it requires an efficient and reliable signage system for orientation, wayfinding, and decision making by users in order to access different areas and services.

From the beginning, a graphic design strategy that was appropriate to the environment was not considered and, although some pieces or signage element were subsequently created to guide users, they are considered insufficient both in number and design. Moreover, they are perceived as isolated efforts, which demonstrates the absence of an articulated and efficient system for mobility, orientation and spatial awareness of the university's community that will enable efficient navigation and improve accessibility.

The main problem is that the diversity of levels, stairs, accesses and corridors makes it essential to provide clear and accessible information about locations, routes, and directions, but the university center has deficiencies in all areas related to signage. As a result, users experience lost time in transfers, stress on people and a lack of identification of areas and services from a systems perspective, i.e., there is no interaction of the signs with the architecture, the particularities of the space or the environment, nor are ergonomic factors considered in general.

For this analysis the principles of Joan Costa (1987, 2022) in his two works were taken as theoretical references: one focused on the history of signs and has a strong focus on the design of signage programs with a focus on the development of the phases of the process, and the other from which the methodology is drawn, which is more structured and with a tendency towards the consideration of the corporate image in the systems. With regard to Arthur and Passini (1992), it was considered important to draw from his contributions to the field of *spatial orientation* in terms of the psychology of perception and his multiple approaches to the principles, parts and components of Wayfinding. García (2012) adopts some of these fundamentals and makes more current contributions within the practice of guidance system design. These were deemed particularly valuable from a methodological standpoint, but the methodological principles of Jorge Frascara (2000) and Joan Costa (2022) were considered the basis for determining each of the stages of the analysis in question. García's (2012) insights were also incorporated to enrich this perspective.

◈ Theoretical foundation

Environment signage

Costa's work (1987, p.9) is a reference to the principles, guidelines, considerations and criteria both theoretical and practical in the design of signage systems, which refers to signage as "part of the science of visual communication that studies the functional relationships between orientation signs in space and the behaviors of individuals. At the same time, it is the technique that organizes and regulates this set of directions". His work undertakes the study of environments and the interaction of individuals and signs. He defines it as a system that determines users' decision making and behavior. Costa (2022) also points out its importance as a guiding language by describing it as the articulation of a bi-media message, that is, a language composed of words and images, here he includes pictograms and arrows on images, in addition to a code that could be considered in a second level of meaning, which is color, all this from the point of view of systems theory.

In this regard, it should be said that, for the design of pictograms, it will be necessary to consider, according to the ONCE Foundation (2011), some basic elements, such as the referent, graphic items, comprehension and legibility. These four elements first make reference to the object or the thing to represent, that is to say, what it represents on a semantic level; secondly, the particularity of signs is made explicit so they can be articulated one after another, that property that some refer to as syntax; thirdly, the conclusive and unequivocal particularity of the graphic sign and, finally, the property of pictograms to be understood and recognized in different environmental conditions. These systems are conceived with a single purpose: to help people so they can locate themselves in an environment and then know where to go.

Environments, users and directions

On the other hand, Arthur and Passini (1992, p. 23) add a concept called *spatial orientation*. In this respect they note that "Spatial orientation has been defined in various terms, but all refer in one way or another to a person's ability to determine his or her location in an environment". Moreover, they mention that people could be considered spatially located if they are capable of creating a mental map of their location with respect to the environment. It is worth noting that these authors consider three related processes:

◈ Decision making and development of an action plan.

◈ Decision execution, which transforms the plan into an appropriate behavior in the right place in space.

◈ Information processing understood in its generic sense as including environmental perception and cognition, which in turn are responsible for the information base of the two decision-related processes. (Arthur and Passini, 1992, p. 25)

These authors have been prominent in the field of environmental design and environmental psychology, and are especially known for their contributions to wayfinding theory. They have conducted significant research on how people orient themselves and navigate in complex environments, such as hospitals, shopping malls and airports, and have proposed strategies to improve the legibility and accessibility of these spaces.

Arthur and Passini (1992) also point out that spatial cognition is a concept worth considering, since it determines the way in which people perceive, process and use spatial information to orient themselves in their environment. This includes aspects such as spatial memory, visual perception and navigational decision making.

Visual perception plays a crucial role in spatial cognition, as it allows us to capture visual information from the environment, such as shapes, colors, textures and distances. Arthur and Passini (1992) emphasize the importance of understanding how people visually perceive and organize their surroundings to orient themselves effectively; they emphasize that spatial memory allow us to remember the location and disposition of objects or places in the space; they study how people store and recover spatial information in their memories to guide their movements and decisions during navigation, in the course of which it is fundamentally necessary to determine one's relative position with respect to objects and landmarks in the environment, and examine how people use visual signs, such as landmarks or nodes, to orient and move successfully in a given space through spatial orientation. In these situations, it is therefore essential to consider adaptation to the environment.

Arthur and Passini (1992) consider that spatial cognition is flexible and adaptable, which means that people can adjust their behavior and navigation strategies according to the changing characteristics of the environment.

To resume, Arthur and Passini (1992) emphasize the importance of understanding and enhancing the user experience in built environments through design strategies that focus on stimulating the senses, facilitating navigation, promoting positive emotions, fostering meaningful social interactions, and enabling individualized customization. Their research has significantly contributed to the creation of more inclusive, welcoming and satisfactory places for everyone, thus improving their quality of life and overall well-being. It brings a comprehensive perspective to the study of wayfinding, combining cognitive, environmental and social aspects to improve navigation and orientation in urban and architectural environments. Their approach is based on creating accessible, legible and inclusive spaces that promote a positive experience for all users.

As we have seen, highly complex interrelated cognitive and conceptual processes are required. In this regard, García (2012, p. 7) points out "The orientation process is defined by various procedures that shape it and give it meaning: perceptual, cognitive and interaction procedures". The first one is related to each person's senses and their capacity to assimilate information, the second one is related with information processing, which will result in the representation of the contrast between what is perceived and previous experiences of people to finally deduce the routes from start to finish, relying on the route scheme, and the third corresponds to the experiences of people as they move, when an update of the environment and its spatial location for decision making is made.

Nowadays, a term that is frequently and naturally used is wayfinding. Although Arthur and Passini (1992, p. 22) remark that it is a new term for old problems, it "reflects a new approach to studying the movements of people and their relationships to space. Even more importantly, this new approach opens up new ways to design for people's space."

In the 1970s, the concept in question brought with it a more comprehensive approach to the different areas of influence, which allows for a better understanding and clearer focus. For his part, García (2012, p. 7) defines "Design intervention in orientation processes as the development of resources and spatial information systems, with communicative intent, to guide and direct people in architectural, urban and natural environments".

Signage systems

Signage systems are studied from different approaches, Costa (2022) first defines them as systems based on the interrelationship between individuals, spaces and messages, in the manner of the functioning of the interface. This makes explicit the importance of taking into account,

first and foremost, that spaces are determined by the built environment, which has, in turn, certain indispensable conditions. They are as follows:

◈ A spatial condition

◈ A morphological condition

◈ A stylistic condition

◈ A service condition

These four conditions define the structural dimension of the environment which, in turn, is related to services. These are structured considering the functional dimension of the environment. This system also includes another system that relates spaces with users, which the same author calls the guide language as a mode of expression and describes as a bi-media sign system. In this regard, Moles and Janisewsky (2009) point out that these messages are composed of complementary signs, among which the first are graphic signs, which they define as informational, since they have an expressive dimension and their own entity. Here we are faced with variations of signs: iconic, linguistic and conventional signs; these, in turn, are considered subsystems of the graphic system.

On the other hand, Shakespear (2003) conceives, like Moles and Janisewsky (2009), that typographic, pictographic and chromatic elements are subsystems that individually and jointly define the efficiency of the signage system. Moreover, this author also considers the chromatic, placement and technological subsystems. In view of this, Shakespear (2003, p. 58):

> The graphic subsystem tends to establish the visual power of the instruments; the typographic subsystem, the legibility of the messages; the chromatic subsystem, the capacity to pragmatically encode the lines and services; the technological subsystem, the strength and quality of life of the signals. The placement subsystem defines the most efficient location of the stimuli in terms of perception and in terms of self-protection to avoid signal predation.

Design methods

Costa (2022) also proposes a series of steps for signage systems design. They are the following:

1. CONTACT

1.1 Functional typology

1.2 Personality

1.3 Brand image

2. INFORMATION GATHERING

2.1 Plan and territory

2.2 Keywords

2.3 Photographic documents

2.4 Architectural constraints

2.5 Environmental constraints

2.6 Pre-existing graphic standards

3. ORGANIZATION

3.1 Keywords and iconic equivalence

3.2 Information verification

3.3 Signal types

3.4 Program conceptualization

The last part proposed by the author is what we can properly call the intervention and solution to the problem posed. This phase is the Graphic Design phase.

◈ Methodology

To carry out the analysis some principles of systems theory were taken into account, as well as the design method of Joan Costa (2022) and the theoretical references of Arthur and Passini (1992), with a focus on spatial orientation, emphasizing the observation stage, which is when one can perceive, identify its components, its characteristics and the functionality of the signals in general. It is a qualitative and quantitative study in which the following steps were carried out:

The first step was to identify the issues or problems encountered in mobility, location, orientation and decision-making of people in the environment and to define which ones could be influenced. For this purpose, we proceeded to randomly observe the different mobility flows of the users, as well as to try to identify the *itineraries* in order of frequency and use within the university center. Subsequently, spatial situations were identified, as well as those attributes that confer a certain personality to the environment.

The second stage consisted of organizing the information by groups and describing each of the parts that make up the architectural complex. Then their characteristics and functions were identified, as well as

how the different sections integrate with each other, which allowed to understand the environment and to determine the areas and modules that comprise the entire architectural complex.

In addition, the primary and secondary functions were identified in order to subsequently define the functional typology, as Costa (1987) comments. In this regard, it should be said that this university center has a rather peculiar "personality", not only because of its functional conditions, but also because its spatial and environmental particularities also have a significant impact. The plans and conditions of the territory were compiled, observing its topographic and architectural conditions to locate conflict zones and nodal points, service zones and specific areas.

On the other hand, observations were made of the mobility of people on four days of greatest affluence during three random weeks, one at the beginning of the semester, another in the second month and the third a week before the end of the school year, with the purpose of recording itineraries and routes, conflict zones and decision making.

Finally, the total number of signals and their function were located. At the same time, the support variants were identified. This information was assumed to be essential for the conclusion of the analysis. This last phase began with the collection of information and the analysis of quantitative data.

◈ Results

This section will highlight some of the most important findings. It should be clarified that, although fundamental aspects of spatial orientation and signal localization were considered, many of the data collected in the information were not included in this text, as it was not part of the objective. For example, some interviews and a photographic collection, as a memory of the processes that, although considered valuable, could be taken as a reference for a later stage in the decision making process and possible design proposal.

The architectural environment

Here we will describe the components of all the complex that integrates the architectural environment, as well as some functions and activities that take place in it, which will help to their analysis and comprehension in terms of user's interactions both in a sense of mobility and location in the different areas.

The university is located in a space that has the Barranca de Huentitán as territorial limit, so it is located on a land that is resolved in the form of platforms that facilitate the identification of the different areas in which the complex is developed. The first platform is the one that keeps the same level as the street, which is the parking area and links to the workshop areas, the Technology building and the Audiovisual Arts course.

It was necessary to design platforms that would allow each of the buildings to be deployed at different heights as they were developed on a terrain with large slopes. Thus, the linking of these volumes at different levels is developed by means of bridges or corridors. For example, the first floor of Tower 2 is linked from the south to the north area by a series of staircases that are flanked by the areas or gardens known as the Central Courtyard. To the left and right side is a corridor that links the research library volume to the teachers' lounge and cafeterias. The north and south wings are linked through a series of platforms, which are located on each of their levels. The north wing is located on a lower level. The only way in which a vertical route can be developed is through the stairs.

The university is formed by areas that have a pedestrian and a vehicular entry. The pedestrian entry is followed by an esplanade that makes it easy to access the first module of buildings that is composed by the north and south wings. The first consists of a nucleus of classrooms or classroom spaces and administrative areas, these areas are divided into a tower in volume that develops in a vertical direction, and in a module in a horizontal direction, which includes various areas of the school control coordination. The access to these spaces is developed through a staircase, which leads to a main lobby, which is a double height space and links the north and south wings on a first level or first floor, with sections with the sign-in and attendance registration area for both teaching and administrative staff. This space, in turn, is linked to a corridor that leads directly to the library area and the bookstore.

The main lobby is a triple-height space with access to the research area on the right hand side and a vertical circulation core on the left. The latter includes the elevator and stairs to access the different levels that make up the administrative structure of the tower.

The north and south areas are linked to a space in which we can find work areas made up of small islands with benches, tables and umbrellas. This is an area with consolidated trees that provide shade to the facades or south-facing windows.

This volume has the shape of a circumferential arch and is made up of four levels. Its direct connection is to the back garden of the university center, whose equipment is intended for sports. It is a roofed area with a light structure and walkways on one side.

The north wing garden is one of the largest. It can be considered that this space is divided into three large areas: the first is the central one, where activities of coexistence take place; it is made up of walkways, benches and light roofs such as umbrellas. On the right side is the multipurpose court with a light roof, while on the west side is a large volume comprising three levels: the first floor is intended for the planning and finance area, while the first and second levels are for research and Graduate studies.

This last element of the university complex (research and Graduate area) is located on the perimeter limit of the ravine and consists of four levels, where the computer classrooms and the Fashion Design course are located. It is united by a series of sloping walkways that are deployed according to the natural slope of the curves of the ravine, in a direction from higher to lower, where the highest height is intended as a garden area and the lowest is directly connected to the aforementioned area.

As we can see, the entire architectural environment is of a very high complexity both for its displacement and for the spatial location of the users. Its particularities determine that the access to each area should be clear and timely, with the intention of having a more efficient accessibility to the various services and areas, taking into account the safety in the displacements and actions of people.

All these characteristics and spatial particularities are determining factors that affect mobility in the environment. Some of them we will describe below, taking into account the categorization of wayfinding areas described by García (2012).

1. Visual access in some areas is good, as the architectural plan, as described above, allows for side-to-side viewing, but there are areas that are highly difficult, as they lack open spaces and adequate lighting, as can be seen in Figure 1.

Figure 1. *Visual access, differentiation and spatial complexity of the environment. In red the areas with the greatest problems are indicated and in green those with the least difficulty.*
Source: Compiled by authors.

These areas did not make it easy to decide which route or path to choose and can even make it difficult for users to relate spatially to the space in general.

The degree of figure-background differentiation is also affected by the different blocks or intermediate levels of the areas marked in red and the spatial complexity ends up being very high due to the different planes and slopes.

2. An exhaustive observation was made of some factors that hinder or favor spatial orientation and people's routes in the different most important areas of the university environment. Ninety percent of the users make use of these areas and all of them face the same adverse situations of the architectural environment. Table 1 shows the results obtained.

Table 1. Architectural and environmental factors that influence the spatial location and movement of people in the environment represented with degrees of difficulty.

Module or area	Accessibility	Spatial orientation	Lightness	Environmental conditions
South wing	Low	Medium	Medium	Medium
Norht wing	Medium	High	High	Medium
Graduates	Low	Medium	High	Medium
Zona Talleres	Alta	Media	Alta	Baja

Source: Compiled by authors.

Routes, Conflict Zones, and Decision Points

Through observation, a wide range of circulation patterns continuously used by individuals was identified. Notably, the main starting point for most routes is located on the lower ground level situated beneath the main lobby. Approximately 20 distinct routes were mapped, representing the habitual paths followed by users, as well as several key decision-making points, which in this context function as conflict nodes, since only two of them currently provide directional signage to certain areas.

The previously mentioned high-traffic area (see Figures 2 and 3) houses the key signing station used by faculty members to check in and collect classroom keys. This spot is the main point of departure for most users. In addition, two screens are located here to display real-time updates on classroom assignments and faculty arrivals.
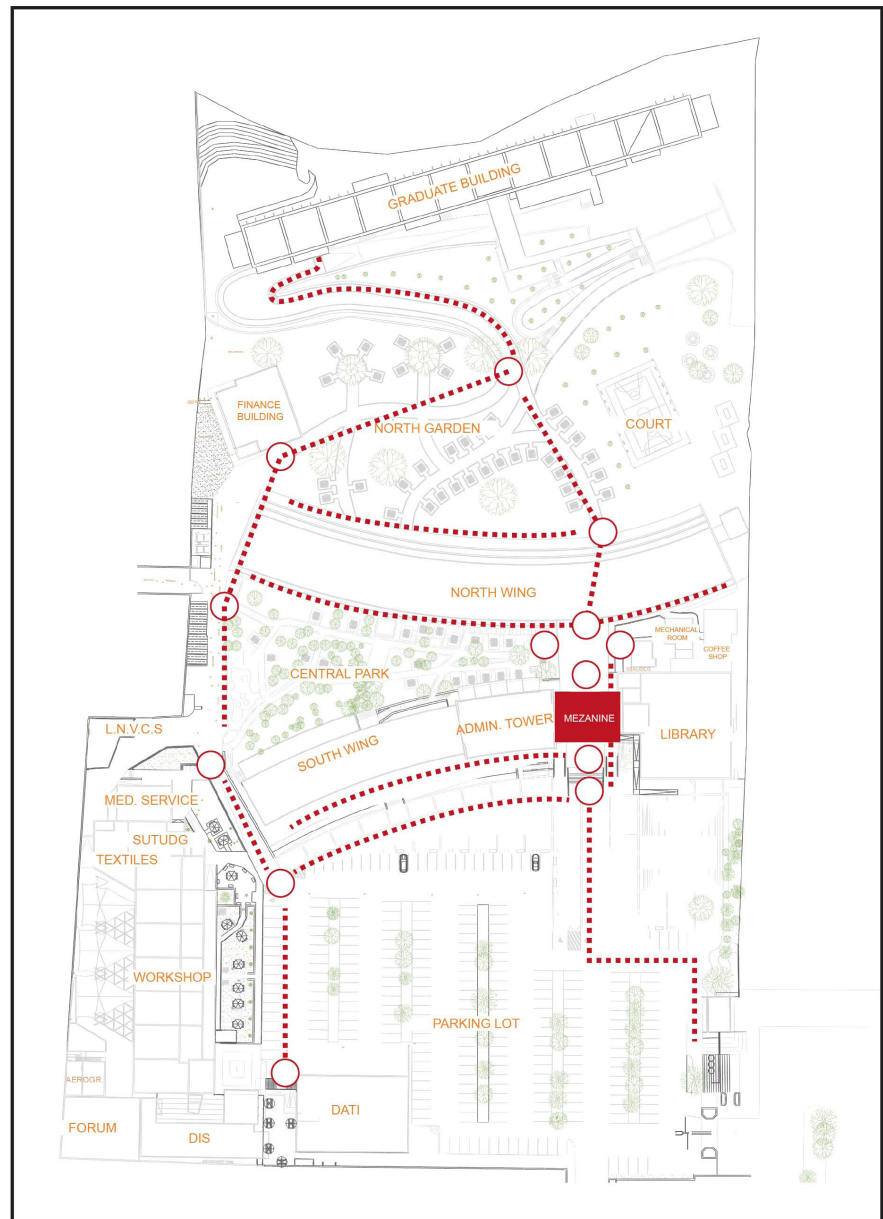
Figure 2. *Identification of the primary circulation routes used by the university population. The area marked with a box indicates the zone with the highest density of overlapping paths.*
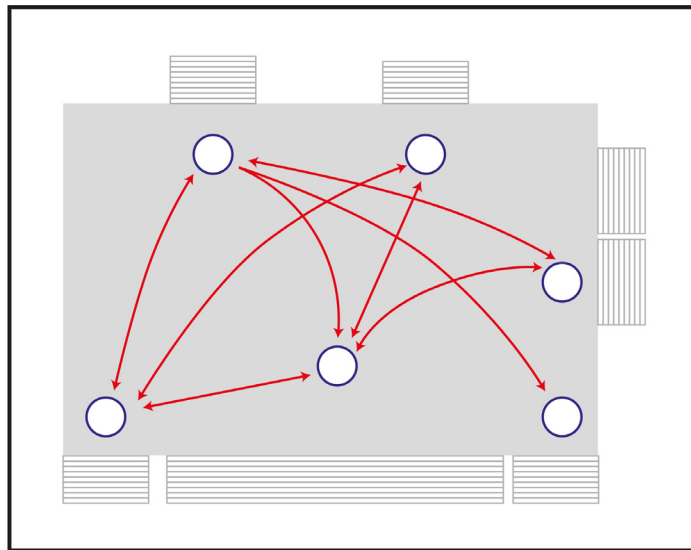*Source: Compiled by authors.*

Figure 3. *Diagram of the space beneath the lobby, showing the various possible routes for initiating movement through the building.*
Source: Compiled by authors.

This area experiences extremely high foot traffic and mobility. Over 70% of students pass through it at least once a day, while faculty members may do so between one and six times daily, depending on their teaching schedule. This leads to a high volume of decision-making moments. Due to the architectural layout, users are faced with multiple route options that require ascending or descending between levels. However, there is a clear lack of signage to guide and orient members of the university community, which compromises the efficiency and safety of navigation. This makes the area both the most complex and the most critical in terms of wayfinding needs.

Figure 4. *Photograph of the high-traffic zones and starting points for several main circulation routes. Note the absence of signage at key decision points.*
Source: Compiled by authors.

Figure 5. *Photograph of the high-traffic zones and starting points for several main circulation routes Note the absence of signage at key decision points.*
Source: Compiled by authors.

Areas and services Definition of keywords

The site map revealed several areas and services (see Tables 2 and 3). These areas correspond to th keywords commonly used by users and their nomenclature. We can say that it is official, since it corresponds to the database of the information system of the university center, but something different happens in the services, since some perform primary functions and others secondary functions; both are integrated in the different areas of the complex, that is, they do not follow an apparent order and their randomness is the result of a possible lack of planning. This classification will be instrumental in determining the terminology to be used in the signage system, as well as in its potential pictographic translation.

Table 3. Different areas or modules identified within the architectural environment, for potential iconic translation

Areas and modules
• Technology building
• Dis building (Department of Image and Sound)
• Workshop building
• Administrative tower
• School control counters (All courses, ground floor)
• Library (Huentitan between mezzanine and the first floor)
• Area of research
• (Huentitan between the mezzanine floor and the first floor)
• South wing
• North wing

Source: Compiled by authors.

Table 4. Services of primary and secondary functions for their possible iconic translation

Services of primary functions	
Dati classrooms	5th floor Personnel Coordination
Dis classrooms	- Administrative Unit
North wing classrooms	- Academic Unit
South wing classrooms	6th floor Extension Coordination
Graduate classrooms	-Comptroller's Office
Library	Spreading Unit
Administrative tower	Liaison Unit
2nd floor General Services Coordination	Social Services Unit
- Procurement Unit	Incorporated Teaching Unit
- Patrimony Unit	7th floor Technology and Processes Division
- Maintenance Unit	-Department of Construction Techniques
3rd floor Academic Coordinations	-Department of Representation
- Planning Coordination	-Department of Production and Development
- Academic Services Coordination	8th floor Design and Projects Division
- Research and Graduate programs Coordination	-Division of Technology and Processes
Master's in Cultural Management and Development	-Department of Design Projects
Master's in Architectural Sciences	-Department of Urban Projects
4th floor Career Coordinations	-Department of Architectural Projects
-Graphic Communication Design	9th floor Rectorate Offices
-Interior and Environmental Design	- Academic secretaryship
-Fashion Design	- Administrative secretaryship
-Industrial Design	Language Lab
-Architecture	Student Services Window
-Urbanism and Environment	Finance Building (Cyber Garden)
Department of Theory and History	Ignacio Díaz Auditorium (Postgrades Building)
	Graduates Building (Classrooms and Workshops)
	Alberti Video Classroom (North Wing, First Floor)
Secondary Services	
Stationery	Water Fountains
Café-Ole cafe	Courts
La Roja cafe	Gym
Garden cafe	Medical office
La terraza cafe	Faculty Check-In Stand Huentitán
	Faculty Check-In Stand Graduates

Source: Compiled by authors.

Location or siting of signs

On the architectural plans, the different types of signage were marked according to their function and support structure. This information proved useful, as it allowed us to cross-reference with the variable of user pathways. The signs were classified as follows:

By function

◈ Orientation: Designed to situate individuals within the environment, for example, location maps or campus plans.

◈ Directional: Indicate a specific direction or route. These usually involve arrow systems placed at decision points where users must choose a path.

◈ Identification: They are used to indicate specific places, spaces, or objects. These are typically found at the beginning or end of a route (offices, malls, institutions, universities,etc.). They often include pictograms or text.

◈ Informational: They provide specific and detailed information such as schedules, routes, instructions, etc. These are generally text-based.

◈ Regulatory: They indicate danger or restricted areas. They convey rules or prohibitions and typically include pictograms and warning text.

By their support

◈ Attached: Meaning the same as glued, most of the sign will be leaning against a wall.

◈ Band type: Signs tied between two walls, columns, or posts, typically extending perpendicularly.

◈ Flag type: Signs attached perpendicularly to one side of a wall or column.

◈ Hanging: Signs suspended from above, typically from the ceiling.

◈ Totem: Freestanding volumetric signs anchored to the floor, usually with a base that separates the information surface from the ground.
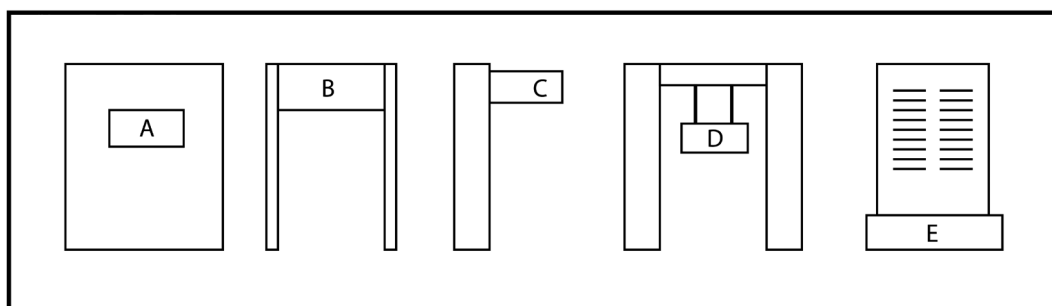
Figure 6. *Classification of signals according to their support.*
Source: Compiled by authors.

This location analysis yielded the following results:

◈ In the category of orienting signs totaled 23, these are arranged in three types of supports: attached, banded and flag. Variants of six sizes, different colors and located in all areas, except for the Graduate building.

◈ There are a total of seven directional signs with three supports: attached, hanging and totem. There were two different sizes and they are located in only two areas.

◈ As for the identification signs, 207 signs were found in all areas and with 18 different sizes, 12 colors, with flag supports and attached in all areas or zones of the university center.

◈ There were only two informative signs, both attached and with different sizes.

◈ Finally, the regulatory signs located were 82, with six different size variants, three different colors and in all areas of the environment (see Figure 7).
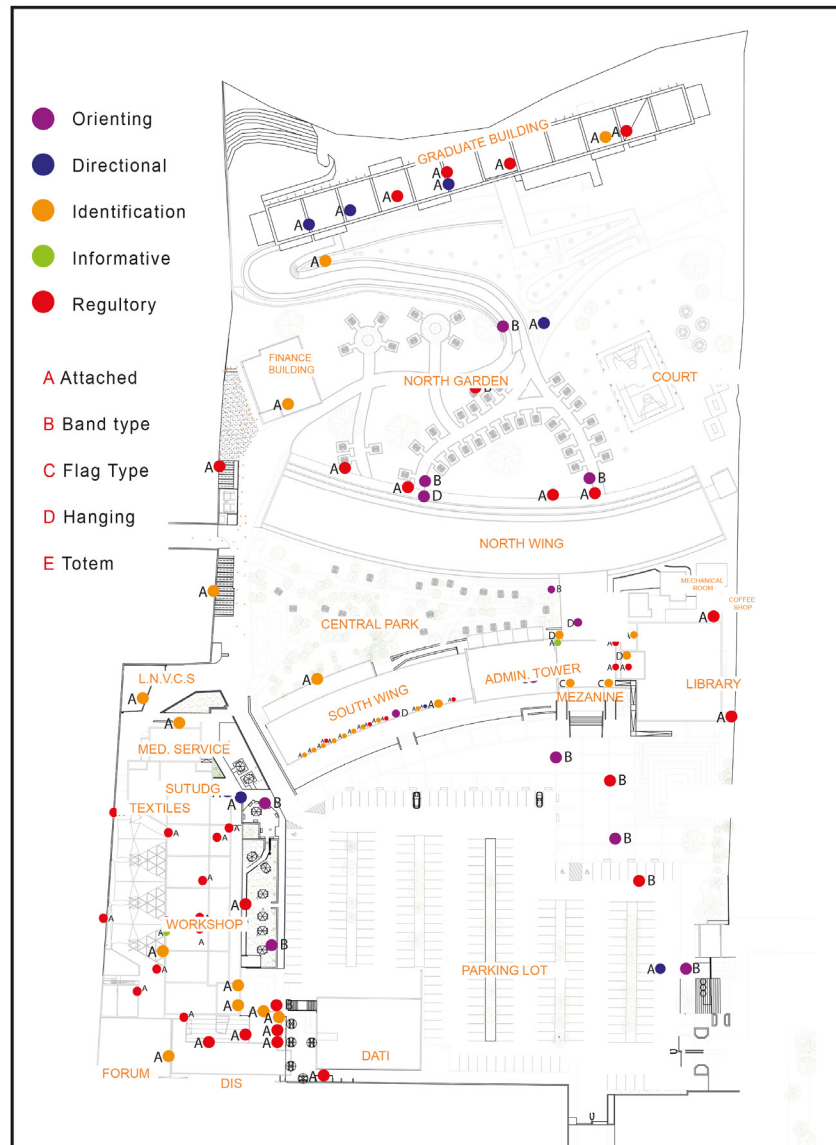
Figure 7. *General location of signal types.*
Source: Compiled by authors.

Structural elements of signage design

Several variations were observed in the structural elements of the signage design on site. The most relevant aspects identified were: typography, pictograms, and color. The following was identified in the signage language used in this environment:

◈ Typography. There is a wide range of typefaces used, which undermines consistency and system uniformity. While most type families are generally appropriate for signage, others exist with better legibility and are purpose-built for this function.

The use of clear criteria in its different variables of weight, inclination and width was not identified, as its application lacks consistency in this language. The typography was grouped into two general styles, but their application does not seem to follow any fundamental design principles.

It must be taken into account that typography is a translation of the linguistic into the visual and it is imperative to consider this design element as the main piece of the signs. Due to its characteristics, most of them respect the conditions of balance, thickness and stroke, but due to the composition used, they denote low quality in the cleanliness and proportions of the texts.

From the point of view of the linguistic function, there are some key statements or words that should be considered for modification. About 80% of the signs are concise and clear in wording, and their morphological structure is appropriate for the context. The primary flaw in this design element is the excessive variety of typefaces, which disrupts system coherence and creates a generalized sense of disorder, far from what would be expected in a unified system. In addition to this, there are no clear or evident criteria for the use of typographic variables and in some signs the use of condensed capital letters is not justified and hinders the readability of the words.

Regarding the application in the environment, more than half of the signs were difficult to read at a distance, since the size does not take into account viewing angles and height.

Finally, in three areas of the university center there are problems of environmental luminosity, a condition that was not taken into account and hinders the visibility and reading of the texts.

◈ Pictograms. Only a few pictogram designs were found, most of which correspond to those of a prohibitive and normative nature, such as those related to emergency exits, fire extinguishers, meeting points, among others; they all follow pre-established designs and were not adapted to the stylistic conditions of the other signs or the environment; they adequately use the conventional and current forms recognized by the collective imaginary.

Most pictograms are reduced to their minimal form, which improves clarity by removing unnecessary information. On the other hand, the representation of the referents maintains a logical and coherent form, avoiding false interpretations and double meanings and preserving the monosemic character of the signs. It was also observed that the statements are accurate and meaningful to the users.

The main issue with pictograms is the lack of formal coherence, since they do not maintain a uniform structure, resulting in an absence of a unified graphic vocabulary.

◆ Color code In the colors used in this environment, it was observed that some criteria were not considered to ensure accessibility to the environment. While three campus areas use color to differentiate zones, this distinction is not perceived clearly by users. The main issue is the lack of continuity and reinforcement in the pre-informational signs to remind people where and how the colors are arranged by area and thus facilitate movement. Consequently, the chromatic code does not help to establish a previous movement through the environment or to plan itineraries in advance before making decisions, because the configuration of the space and how to move safely in it is not understood.

In terms of contrast, i.e., the difference in reflection of one surface on another, for the most part an adequate use of colors was observed; however, the architectural and environmental conditions of some areas prevent the signals from being effective. In such cases, it should be considered to change shades of the same color range. There are some signs with poor color contrast, such as white text on yellow backgrounds.

Regarding the use of the colors indicated for safety and aspects stipulated by some standard, all those used comply with this criterion and their function is adequate.

Finally, it is necessary to comment that most of the usual colors used are adequate, which helps users to easily recognize and understand them (see figures 8 and 9).
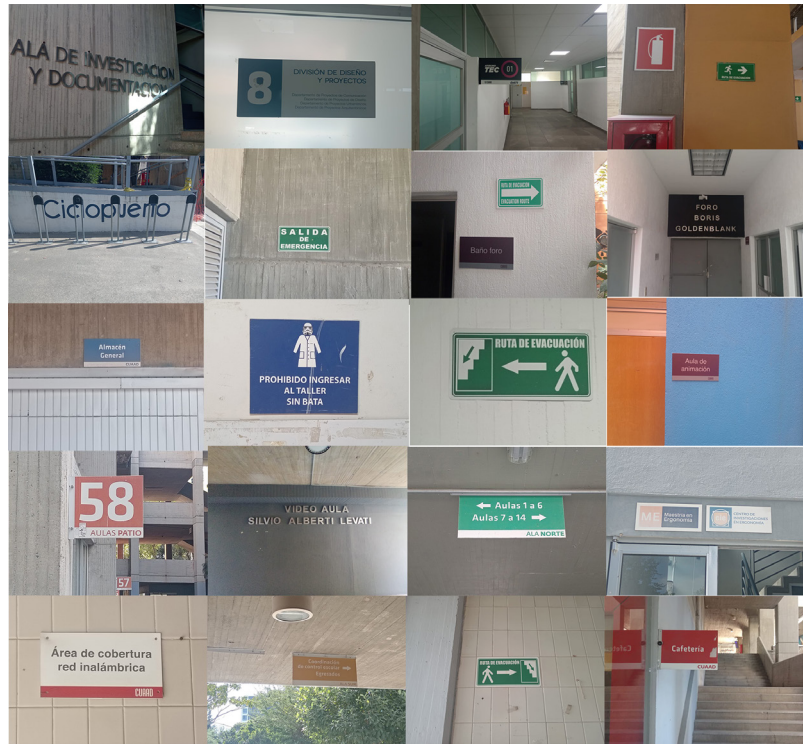
Figure 8. *Main examples of the use of typography, pictograms and colors on university center signs.*
Source: Compiled by authors.

Figure 9. *Main examples of the use of typography, pictograms and colors on university center signs.*
Source: Compiled by authors.

The following is the evaluation of the use of typography, pictograms and colors in the signs of the university center (see table 5).

Table 5. Evaluation of the use of typography, pictograms and colors on university center signs.

Number of typographic styles	Legibility Typographic	Linguistic legibility	Contrast	Use of variables
Serif (1)	Regular	Good	Good	Good
Sans Serif (9)	Regular	Regular	Regular	Regular
Number of pictogram styles	**Synthesis**	**Semantic function**	**Shape style**	**Formal synthesis**
Standardized regulatory designs(3)	Good	Good	Good	Good
Designed for the system (4)	Bad	Regular	Regular	Bad
Number of colors	**Contrast**	**Follows the established code**	**Takes into account institutional colors**	**Helps with orientation or location**
Blue with 6 different identified shades	Regular	Partially	No	Partially
Red (2)	Good	Yes	Partially	Partially
Green (2)	Good	Yes	No	No

Source: Compiled by authors.

Recommendations for improvement

Visibility and legibility improvement

◈ Sign relocation: Place signs in more visible and accessible locations, ensuring they are not obstructed by objects or structures.

◈ Design and contrast: Use high-contrast colors and legible fonts, following best practices for inclusive design.

◈ Typography review: Adopt typefaces specifically designed for signage environments, preferably using only one type family and selecting appropriate sizes to ensure readability from various distances.

Updating and Standardization

◈ Information updates: Periodically review and update signage to reflect changes on campus and ensure all information is accurate and relevant.

◈ Design standards: Implement a consistent design and comply with signage regulations to ensure coherence throughout the campus.

Improving Accessibility

◈Implementation of tactile and braille signage: Ensure that all important signs include braille and tactile elements for individuals with visual impairments.

◈ Height adjustments: Install signs at a suitable height for individuals with reduced mobility, ensuring they are accessible from wheelchairs.

Enhancing Safety

◈ Improvement of emergency signage: Increase the visibility and clarity of emergency signs and evacuation routes, ensuring they are well-lit and properly maintained.

◈ Regular maintenance: Establish a regular maintenance program to inspect and repair damaged or worn-out signage.

◈ **Conclusions** Considering environmental graphics or, more specifically, signage, which explores the relationship between individuals and architectural space as well as the complexity of the factors involved in these interactions, we can assert that its design, analysis, and understanding as a highly complex system is essential in any context.

In this approach of its study and understanding in an educational environment with multiple topographic and spatial variants, the need for its effectiveness is evident, starting from its morphological, stylistic conditions of regulation and service.

We found that the low quantitative and qualitative effectiveness of the signage system turns this environment into an experience of disorientation and confusion. The wide variety of sizes, shapes, colors, and supports highlights the lack of planning and effectiveness. Moreover, the absence of continuity and sequence in the signs disperses the information and contradicts their primary function.

The analysis reveals several significant deficiencies in the university's signage system, which affect user orientation, accessibility, and safety. Implementing the proposed recommendations will help improve the functionality and effectiveness of the signage, making the campus experience safer and more accessible for all members.

In addition to this, we add the high complexity of spatial positioning and mental mapping of the location where people are located. Therefore, we recognize the urgent need for intervention.

It is necessary and fair to point out that the results obtained in this analysis are far from sufficient to carry out an integral intervention and in its multiple dimensions to give an effective response to the problem, for example, in this research the university identity and its graphic representation factors were not taken into account, which should, as far as possible, influence the system; neither the conditions of efficiency for people with disabilities, the pre-existing rules for the coexistence of different signs, etc. Given this reality, it can be concluded that, for the timely and comprehensive intervention of the problem of this university center, the multiple variants should be taken into account and studied by various experts in different disciplines, since an approach in the generality of the conditions addressed is not enough, but, on the contrary, the exhaustive and meticulous analysis in this regard will be necessary to offer a better solution. ◉

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