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ERGONOMICS AND SIGNAGE SYSTEM

Nicoleta-Elisabeta PASCU, Nicoleta Luminiţa CARUTASU, Victor ADIR, George CARUTASU

Abstract: *In a signage system ergonomics has a special task, to assure three important things to be done very well: information, direction, destination. The signage systems aim is to achieve such a connection to be safe and secure for the people when they work, travel, navigate etc. Ergonomics and signage system may work to design the best flow or things which may create an easier life for someone involved in an activity. In this paper we analyzed these three actors-ergonomics, humans and a signage system- which have to work together to solve the problems which may appear in our daily life in different domains of activity and we presented the cases studies for several fields.*
Key words: *Ergonomics, humans, design, signage system, eye-level, signs.*

1. INTRODUCTION

From the beginning we have had to answer to a few questions? Why is necessary ergonomics in a signage system? And, what may be the contribution of it for such a process of special communication using letters, figures, colors, geometric forms, illustrations, symbols and pictograms. A signage system is realized to satisfy people in their working/travelling etc. process accomplishing some essential characteristics: to inform, to guide, to assure a final destination, to allow, to forbid, to warn about its purpose. Using ergonomics is a special way to adjust working/traveling etc. conditions according to the physical and mental needs of humans. The link between design, signage and ergonomics is the subject of many papers and books [1], [2] and [3]. For example, [1] presents the basics of design principles for industrial production, including materials, digital design, ergonomics and significance of the design. Related to [2], the author presented a comprehensive study of pictograms and traffic signs as early signage elements. The work is also presenting a significant number of case studies, regarding the signage system design in various building types, such as airports, waste disposal facilities or parks. The human-systems interaction is debated in [3] with high regard over existing state-of-the-art of current ergonomic influence in design.

In this paper it is analyzed the signage system and how ergonomics may help it to signage system improvement.

2. ABOUT A SIGNAGE SYSTEM

A signage system is closely linked to the security of persons and goods. To design a signage system is not an easy work. The designer has to know graphics, ergonomics, communication, aesthetics, the language of colors, signs and symbols. We are living now in a complex world and a signage system is very important for it.

The more we shall be movable the more will be a necessary system in our daily life. To read and to understand a signage system means to travel efficiently, to avoid the dangers in the way, to reach the desired destination and to satisfy human needs. For such a system is necessary to design the components and the traffic flows in connection with the people. It is about wayfinding that means a „coordinated basket of aids" to help people navigate.

A wayfinding process has six main characteristics [4], namely: the intention to move, searching information, verifying information, analyzing the different ways to join

a desired destination, choosing a route using clear criteria, and the final decision. Otl Aicher, a great German designer, said [5]: “Finding the way is not a gift or an innate ability that one either has or does not have. It is a precondition for life itself. Our approach to environments of whatever kind is part of our existence. Living with our respective ways of navigating is a basic premise for our liberty and our self-confidence. Knowing where I am, my location, is the precondition for knowing where I have to go, wherever it may be”. There are some principles to realize a wayfinding design. These principles are about: necessity, usability, universality, simplicity, normativity, safety, uniformity and perceptibility. It is important to fit the signage system to the people rather the people to the system. Because the designer has to create such a system to be ergonomic, friendly and safety.

To achieve a signage system, the designer is compelled to answer to some important questions, such as [6]:

- What are the navigation flows into the signage system?
- What kind of graphic representations will be used?
- What is the necessary typology of signs, symbols and pictograms for the system?
- What will be the size of information panels?
- Where will be placed the panels?
- What is the coding language for colors?
- What kind of information is necessary on panels?
- What are the materials for these panels?
- What quantity of each panel, pictogram, symbol has to be assured?
- How many times the signs have to be repeated along a signage flow towards the desired destination?

The graphic language is the bedrock of every signage system. In the specialized literature is an example which speaks about the combination of words and graphics: The London Underground Map, which was conceived by Harry Beck in 1933. The designer of a signage system has to think in: images, signs, words, shapes, proportions and colors.

A signage system must inform large crowds and that is why is very important „to build” it very carefully do not disturb the flow of navigation. It is known that in an airport, or trade fair, shopping mall or hospital the people want to get to the right area as quickly as possible. It is very important where are the placements of information panels and at what height to be accessible to the humans. The height at which information is displayed depends on the environment. The font design is one of main rules to be well known when someone is starting to create a signage system. The letters have to be legible and attractive. The panels for information may be fixed to the floor, on suspended supports, fixed to the walls or doors.

About color is important do not be alone because that situation does not help in wayfinding. The color has to be combined with numbers, letters or pictograms/signs to accomplish its purpose. Color coding in this manner facilities wayfinding and is practical for airport signs. For example, in Germany yellow is the background color for signage in airports.

The wayfinding in navigational systems is presented in presented in [7] and also [8], the covering case studies regarding the specific aspects of various situations. The first book [7] details the signage system designed for public areas, including blueprints and manufacturing details for the signage systems and the second [8] envisages the specifications for tourism industry.

Examples of how to design a signage systems, is presented in [9], in case of the packaging line. The study presents a step-by-step design for the signage system taking into consideration the interaction between human and machines disposed on the packaging line.

In another study [10], the authors presented collected data regarding users’ perception over the signage system efficiency in Portuguese hospitals. However, the study includes also, improvements suggested by respondents regarding the signage systems.

Another case study regarding the design of the signage system is presented in [11], where the authors debated the aid of waste disposal in crowd meetings, the study having as base one festival with thousands of attendees.

The buildings evacuation in case of emergency is presented in [12] where the authors proposed a decision support systems, that can be used for the route evacuation, starting from the

signage systems. Another study [13] presented the analyzed the signage detection and acceptance for large groups in stress conditions in building evacuation process.

3. ERGONOMICS - HUMANS - SIGNAGE SYSTEM

The first step to design a signage system is to create a map including all important traffic flows. From this step are going further the other steps concerning the design of identification, directional, regulatory and description signs which will complete this map. Ergonomics has its role to make the connection between humans and map. Because every panel must have a proper height to be understood by people, to have legible and clear writing of information and colors to be friendly for eye. The eye-level for different positions of humans is an important element of ergonomics. The perception of objects was debated in [14] where four experiments were conducted to establish the affordance and the apparent size. The Figure 1 presents three different postures and the average eye-level for them.

There are difference between the average eye-level in the specialized literature, as follows;

- About 160 cm (163 or 165) the average eye-level while standing up;
- About 125 cm (123 or 128) the average eye-level while sitting on chair or in a wheel-chair;
- About cars, the eye-level is depending on the type of vehicle.

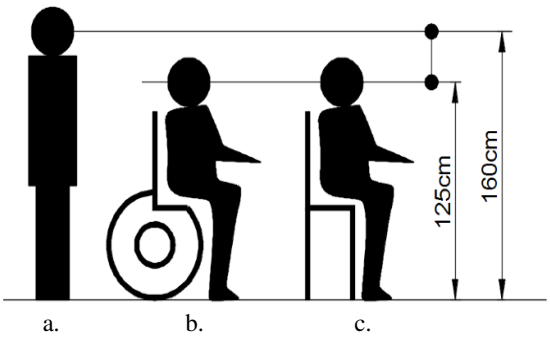

Fig. 1. Eye-level for different human positions:
a. standing up; b. in a wheel-chair; c. sitting on chair.

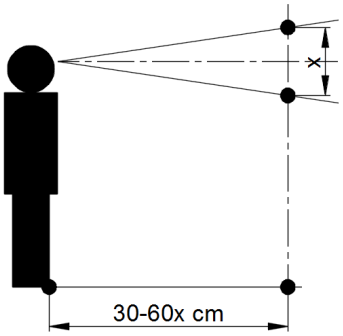

Fig. 2. Maximum reading distance related to the height of a letter

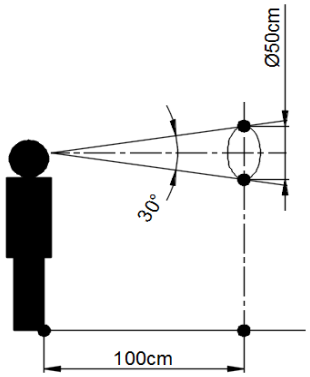

Fig. 3. The angle of vision related to the distance.

The field of vision is different for a wheel-chair user compared with standing-up users. That is why to realize a signage system which has to be friendly with all the participants. Maximum reading distance is between 30 and 60 times the x-height of a letter, as is presented in Figure 2 [6]. The generation of visual fields for design purpose is presented also in [15], including version for three fields: stationary, eye and head vision fields.

In Figure 3 is pointed the angle of vision essential for reading in accordance to the distance. A distinct approach is needed when the signs are seen indirectly, by mirroring, a detailed study regarding traffic signs is presented in [16] about lateral vision.

Regarding the peripheral vison, some authors suggested for driving [17] that the limitations considered and determined to be implemented in further designs of traffic signals. In addition, in [18] the authors presented recommendations related to highway construction starting from peripheral and skewed vision.

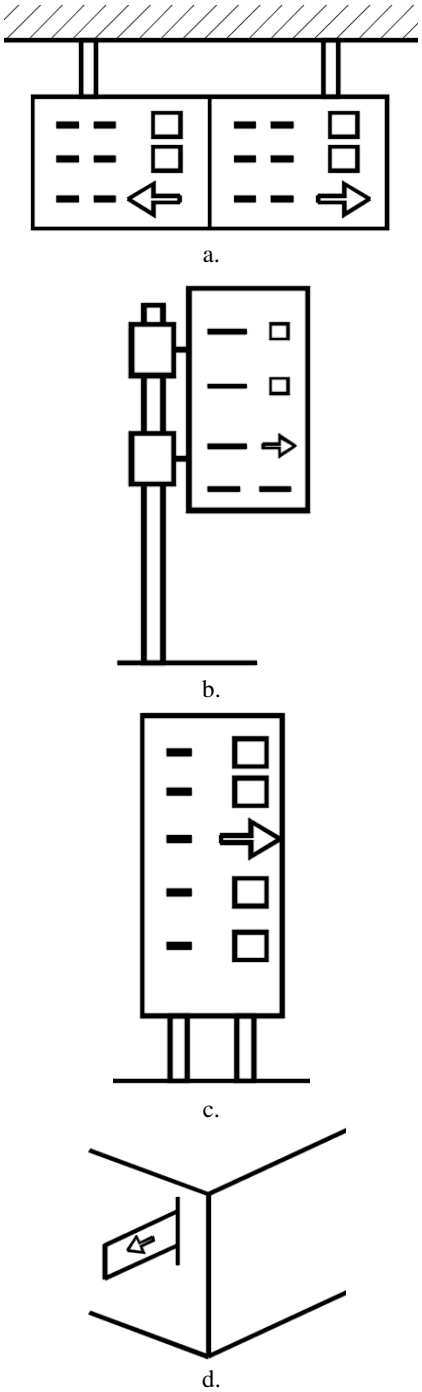

Fig. 4. Some positions of information or directional panels in a building: a. suspended signs; b. fixed on a stick; c. fixed to the floor;
d. fixed to the wall, at a right angle.

The most signs, in a building, will be read while standing up. The most convenient reading angle is a plane perpendicular to our eyes. Signs panels may be positioned to meet this demand [6]. In Figure 4 are presented directional/ information panels in different positions.

When there is an intersection of different traffic flows in a building it is possible to realize signage as in Figure 5.

An one-way road does not exist in buildings, so is important to use directional signs positioned to be useful for people coming from all directions. The Figure 5 is suggestive in this way.

In a building there are many information and directional panels which have to be positioned related to eye-level. That is why when the designer „builds the ergonomic map", selects the symbols and signs, the size and the location of panels, has to thinking at what height these panels may be fixed.

Of course, there are different signage systems for various buildings (exhibition spaces, conference centers, museums, universities, colleges, schools, shopping malls, theatres, cinemas, office buildings etc.) having general signs and special signs.

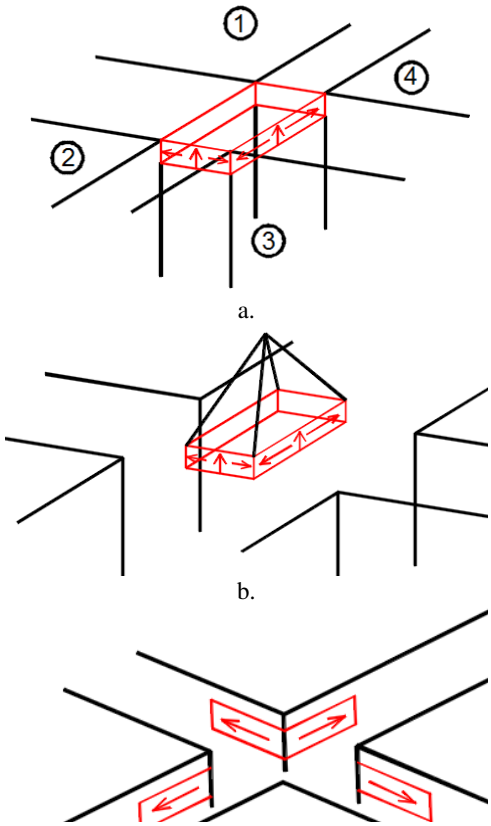

Fig. 5. How to rule the traffic flows using signs at intersection: a. as portals; b.as a sign bloc in the center of the intersection; c. on all corners of the intersection

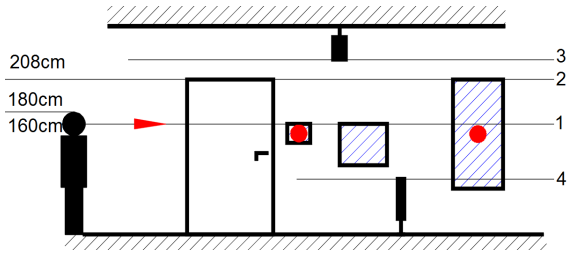

Fig. 6. Placement of signs related to the standard height in building: small and medium sized signs (eye-level); 2. large signs (level- alignment with door frames); 3. suspended signs (level – above the door frames); 4. freestanding signs (level- the door handles).

The Figure 6 is about the placement of signs related to different building elements and people. It is noticed that signs are fixed concerning a well thinking pattern.

4. CONCLUSION

This paper has presented only a part of our research study which is focused on a signage system related to ergonomics in our university. We have noticed the importance of ergonomics and signage working together to fit the connection between humans and system. We were interested to understand in which way the designer may „build an ergonomic map".

We have pursued to see the connection between the eye-level, the height of signs, letters and colors. In future papers we shall develop an ergonomic map for our university, using specific signs for an educational process.

The design process supposes the use of various knowledge from various field. However, starting from this point, the paper presented the link between design, ergonomics, and signage.

The signage becomes relevant in the context of globalization, with more travelling in foreign countries or in stress situation, The large meetings are also another example of how signage might be used to proper deliver basic information regarding the site facilities, without human intervention.

If the benefit in case of airport and public areas in normal situations is given by time shortage in finding points of interest for the public, in case of emergency situations, the signage system can make the difference by saving lives, by shortening the escape time of resident or finding the save route of rescue.

However, in the future work, the co-existence and interaction between humans and robots in the same working environment will be analyzed, starting from the idea that the humans and the robots as well, should identify and use the information from the same signage systems. Furthermore, the virtualization of existing workplace, using augmented reality or virtual reality will impose significant changes where the signage system should be adapted

In addition, we plan that environmental issues, air pollution should be considered for the design of a safety and healthy workplaces [19].

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Ergonomia sistemului de semnalizare

Rezumat: Într-un sistem de semnalizare, ergonomia are o sarcină specială, de a delimita trei aspecte importante: informații, direcție și destinație. Scopul sistemelor de semnalizare este de a realiza un canal de informare, pentru diverse activități, cum ar fi cele de tip lucrativ, de transport, navigație etc. În acest articol, au fost analizați factorii implicați (ergonomia, oamenii/utilizatorii și sistemul de semnalizare) ce trebuie să colaboreze pentru a rezolva problemele care pot apărea în viața cotidiană în diferite domenii de activitate și au fost prezentate diverse studii de caz aferent unor domenii de aplicare practică.

Nicoleta Elisabeta PASCU, Assoc. Prof., PhD., University Politehnica of Bucharest, Engineering Graphics and Industrial Design, 313 Splaiul Independentei, Sector 6, 060042 Bucharest, Romania, nicoleta.pascu@upb.ro, Office Phone: +40214023812
Nicoleta Luminita CARUTASU, Assoc. Prof., PhD.habil., University Politehnica of Bucharest, Engineering Robots and Production Systems, 313 Splaiul Independentei, Sector 6, 060042 Buchareast, Romania, nicoleta.carutasu@upb.ro, Office Phone: +40214029759
Victor ADIR, Assoc. Prof., PhD., University Politehnica of Bucharest, Engineering Graphics and Industrial Design, 313 Splaiul Independentei, Sector 6, 060042 Buchareast, Romania, victor.adir@upb.ro, Office Phone: +40214023812
George CARUTASU, Prof. PhD. habil., Romanian-American University, Informatics, Statistics, Mathematics Department, 1B Bulevard Expozitiei, 012101 Buchareast, Romania, carutasu.george@profesor.rau.ro, Office Phone: +403721201139, PhD Supervisor, University Politehnica Timisoara, Doctoral School, Piaţa Victoriei Nr. 2, 300006 Timişoara, jud. Timiş, România E-mail: carutasu.george@upt.ro, Timisoara, Romania, Office Phone: +40256403180