George ADÎR, Nicoleta-Elisabeta PASCU,Victor ADÎR, Gabriel George GEAMBAŞU

THE GRAPHIC LANGUAGE OF SIGNS, SYMBOLS, PICTOGRAMS IN A GLOBAL WORLD

Abstract: *This paper has tried to answer to a question: Is it important to use signs, symbols and pictograms to create a graphic and visual language, to communicate between people all over the world? And the answer is YES and will be explained in this paper. These graphic representations can be found in universities and schools, hospitals, airports, museums, libraries, network communication, business centres etc. But why are they so important? Because they inform, guide, allow, prohibit or warn depending on the situation. In our actual world visual communication without written language has become necessary. The main direction of the study was to present/design signage maps, as training models using signs, symbols, colours and pictograms.*

Key words: *sign, symbol, pictogram, signage map, wayfinding, wayshowing*

1. INTRODUCTION

From the beginning we wanted to express our interest in signage, that means signs, symbols, pictograms, having as direction the words of the ancient Chinese sage Confucius: "*Signs and symbols rule the world, not words or laws*" [1]. It is necessary to define all the aspects bounded to the importance and the role of graphic elements in the visual communication. Without clarifying these directions, it will be difficult for people to perceive, understand, translate and acquire visual information.

2. SIGNIFICANCES

2.1 Signs and symbols

As we know, the message is an important element in communication which could be assure by using words, figures, letters, images, colours, signs, symbols, message can be conveyed as: objective (rational) or subjective (symbolic). In communication is possible to use linguistic elements (words and letters to build a text) and iconic elements (signs, symbols, pictures, illustrations etc.). The study and the meaning of signs were developed as a science, named *semiology* (Europe) and *semiotics* (USA). The founding fathers of this science were the Swiss linguist Ferdinand de Saussure (1857-1913) and the American philosopher Charles Sanders Peirce (1839-1914). Ferdinand de Saussure was focused on language, examining it as a structure to develop a system of making meanings. His model was centred on words as signs. He has identified two important parts of a sign:" *the signifier*" and "*the signified*". For him this science was involved to define the role of signs as part of social life. "A linguistic sign is not a link between a thing and a name, but between a concept (*signified*) and a sound pattern (*signifier*) [2]. For the Italian semiotician Umberto Eco, the signified is something between "a mental image, a concept and a psychological reality" [2].

For Charles Sanders Peirce there are three types of signs, namely: *icon signs* (called sign vehicle, by some theorists) - represent the objects they depict; *indexical signs* (it is about a concept related to a sign); *symbolic signs* (it is about a convention to present something, without a resemblance with the object) [1]. The culture is different all over the world and people have a personal and cultural experience and that is why a sign may have different meaning. The three types of signs are translated like this in [2]: "The sign is a unity of what is represented (the object), how it is represented (the form what the sign takes) and how it is interpreted". Pierce has created a theory which presents the reading of signs as part of a creative process.

David Crow in [6] has shown that the goal of the signs into a message is to convey "something to be understood by the people". And Roland Barthes who was a follower of Saussure`s work has identified two levels of significations in [3], [6]:

- *denotation*, which answer to the question: What is represented?
- *connotation*, which give the answer to the question: How is it represented?

About *connotation* Roland Barthes has specified the culture of the people and the degree of understanding about the representation. That is why is important to create a clear connection between what is communicated and the way to do it.

A symbol is a word derived from the ancient Greek *symballein* or *sumbolon* with a meaning *"*to get together". A sign is understood as what it is, as something that stands for. A symbol is creating perceptions, beliefs, emotional responses. Of course, in our daily life signs and symbols have become part of the community, for a social and active life, with a multicultural identity. It is a perpetual changing process all over the world. The levels of operating are from spiritual to material, individual to universal, rational to emotional, as vehicles for information and meaning. Signs and symbols have played an important role "to picture" or to design the world to be understood by us.

In his book [7] Henry Dreyfuss has identified three main types of symbols, as follows:

- *representative symbols* (is a representation of the object);
- *abstract symbols* (it is a stylized representation of the object, but clear);
- *arbitrary symbols* (it is about something new, it has to be learned).

Also, he has presented a lot of symbols/pictograms about many domains of activity. We have presented from his book only a few representative and suggestive graphic representations, as follows:

- fast displacement (a rabbit);
- slow displacement (a turtle);
- time (sand glass);
- light (bulb -switch on);
- dark (bulb-switch off);
- direction (continue arrow);
- moving in a direction (interrupted arrow);
- keep dry (umbrella);
- fragile (glass);
- lock/unlock (padlock).

2.2 Pictograms

For a signage system a graphic representation is an important element in a visual-graphic communication. To design pictograms is not an easy work, because the designer has to draw clear and easy to be understood as a known graphic. Many times, there are no words to explain the representation. Nakagawa Kenzo, a Japanese designer, said that pictograms "are an intelligent invention of the 20th century".

A pictogram has to accomplish a few essential functions: to inform, to guide, to allow, to forbidden, to warn, to reach the final destination, all these connected to a necessity.

We have seen a good definition for pictogram in [8]: "*A pictogram is an image created by people for the purpose of quick and clear communication without language or words, in order to draw attention to something*".

We have translated like this: it is not a natural graphic representation because it is created, it has to be a clear drawing for an easy reception and mental translation, it is beyond the boundaries of a language and wants to pay attention to something. It is about a pictorial symbol which may have a degree of abstraction.

A pictogram has to satisfy important characteristics: to contain a message, to have a clear design, to realize the connection to the people and to assure its target.

The context for using a pictogram is important because it is available only if there are surroundings. The context gives to a pictogram "a power" to improve something, to convey a concrete message.

The graphic representation may be real or abstract/stylized. But what is important is the clearness of it.

In his book [7] Henry Dreyfuss has given a wonderful example about the using of a graphic representation as symbol/pictogram.

For him is a huge difference between two bottles: one is labelled with the well-known drawing of *a skull and crossed bones* only and the other without this drawing, only an inscription POISON in four foreign languages (in Greek, in Japanese, in Russian, in Hebrew). If someone do not know one of these languages it is possible to use it with bad consequences, even deadly. But the graphic inscription of *a skull and crossed bones* warns the people about the danger. Henry Dreyfuss has given this example to show the importance of a graphic representation (the skull and crossed bones) beyond a written language. This example is eloquent and is an argument to use symbols, pictograms and other representations in our daily life. Like Dreyfuss we have seen many examples in our researches which uphold his arguments. For example, a high voltage pillar labelled with the words DANGER! HIGH VOLTAGE! DEATH! written in English language and another pillar with only the famous drawing *skull and crossed bones*. For a person who do not know the English language it will be difficult to understand the danger but when will see the drawing it will be clear about it. That means a difference between life and death related to a pictogram. As we have noticed the context of using a pictogram is important. In [8] the authors have presented a pictogram in different situations to see when is forbidden.

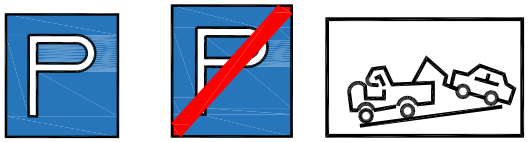
The pictogram is hanging in a tree, is drawing in a book and is fixed on the wall in a room (Figure 1). They have explained that only the third situation is clear NO SMOKING. The first has an unclear message and the second is only a picture in a book. The third situation has the right effect of the pictogram, is a concrete and usable message.

About the context we have noticed three types of pictograms:

- *indicative* (informative to the public without constraints or obligations);
- *imperative* (only obligations for the public to do/or do not do something); they are called authoritative;
- *suggestive* (it is about the consequences of a situation).

In Figure 2 we have presented the types of pictograms.

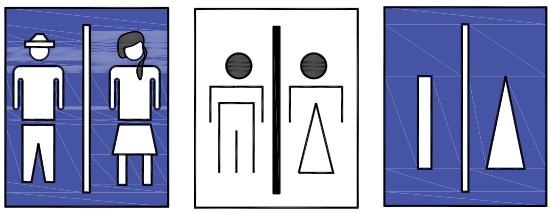
Figure 1 Pictogram NO SMOKING.



a) b) c)

Figure 2 The three types of pictograms.
a) indicative; b) imperative; c) suggestive.

A pictogram has to be neutral, as culture. The below example (Figure 3) presents a pictogram for men/women toilet. There are three types of graphic representation for a pictogram: *representative* (it is a real representation); *arbitrary* (it is a stylized concept, but the drawing keeps the essential features of the represented object); *abstract* (is a new concept for representation, unknown, and it has to be learned).



a) b) c)

Figure 3 The types of pictograms.
a) representative; b) abstract; c) arbitrary.

In our researches we have identified different shapes for pictograms in various field of activity. In Figure 4 we have presented some of them [9], [10].

Figure 4 Different shapes for pictograms.

The colours and shapes are elements which made difference between pictograms. In addition, about the typology and colour together we have noticed the way to action for them, as follows:

- red colour & circle shape is a message of interdiction;
- red colour & triangle shape is translated as compulsory;
- yellow colour & triangle shape is a message of warning, caution, concern;
- green colour & rectangle shape talks about emergency exit, rescue, fire exit;
- blue colour & square shape is translated as indicative (give an information about something);
- blue colour & circle shape is indicative (it is possible to be an obligation like for traffic sign-only to the right road, for example);
- blue colour & rectangle shape is indicative, also (it is possible to be an obligation, as traffic sign-only one way, for example).

To create a pictogram is as an equation to put together, by addition, a few elements. In Figure 5 we have represented an example for emergency exit or exit fire and in Figure 6 a pictogram for escalator.

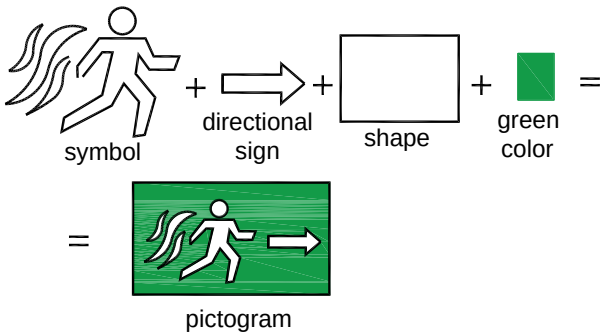


Figure 5 The addition of elements to make the exit fire pictogram.

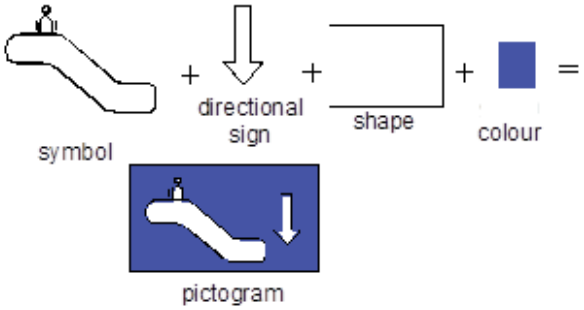


Figure 6 How to create an escalator pictogram.

There are basic criteria for a pictogram into a signage system:

- To be visible (a place to be easy seen);
- To be legible and available;
- To be clear related to the graphic message;
- To straighten to a right direction;
- To be informative.

We have restrained the necessity of a grid on which it is designed the pictogram. It is important for the overall visual coherence of the system. In [8], [13] there are examples about it.

3. WHAT ABOUT A SIGNAGE SYSTEM

3.1 Wayshowing and wayfinding concepts

We are living into a complex world and a signage system is necessary now more than ever.

We are mobile humans and for us is very important to have a comfort of displacement. In our study we have analysed a lot of signage systems with many signs and pictograms.

All these elements are used to create “a map” for a safety navigation.

To create a signage system is necessary to understand and to apply two essential terms: *wayshowing* and *wayfinding*.

Wayshowing means the whole activity of planning and implementation of a signage system and *wayfinding* is about how to find a safety road from a location to another. *Wayshowing*, as a planning activity allows *the wayfinding* to do all the best for navigate.

In [11] it is specified: “*wayshowing* deals with sending, *wayfinding* with receiving”.

The process of *wayfinding* has the follows stages:
1. To take the decision of displacement
2. To search the information
3. To verify the information
4. To establish some criteria about ways
4. To analyse different ways
5. To choose the right way using criteria
6. To take a final decision

For a signage system are necessary: *directional signs*- show the way to something; *descriptive signs*- assure information; *regulation signs* – rules about navigation, security. The designer of a signage system has to realize a balance between information and the" simplicity" of the system. Even in this universe of pictograms there are special graphic languages (using peculiar pictograms) for different activities. For example, in the car industry the pictograms on the dashboard help to drive a car, or for Olympic Games, special pictograms created for a lot of sport disciplines. And, of course, the traffic signs which represent, in our opinion, a global graphic language.

3.2 The challenges for a signage designer

To begin the development of a signage system is important to make a complete analysis of the theme, that means a map which may include all demanded aspects. Studying this information the designer may create a graphic and visual language for the system, to be able to accomplish what is necessary to function „at maximum speed". A designer creates a set of pictograms, not only one, because it is necessary to realize a flow of signage into a representation (university, business center, hospital, museum, airport etc.). There are a few questions about the signage system and the designer has to answer to all these. The questions are [12]:
1.What are the displacement flows in a signage map?
2.What kind of graphic representations will be used?
3.How many signs, symbols, pictograms will be necessary?
4.Where are the locations of these signage elements?
5.What kind of informations are necessary to be specified?
6.What colours are for signage elements?
7.What size is necessary to be clearly seen?
8.What kind of materials are used to realize them (to prevent their devastation)?
9.What kind of supporting systems are used and what quantity?
10.What kind of coding system will be conceyved (colours, letters, figures or a combination etc.)?

Before the beginning of the design process it is important to have or to create a library of signs, symbols, pictograms, colours, letters and figures to be a support in this special work. That is why the designer has to analyze books, to be well/very well informed about what he intends to realize.

4. CASE STUDY

We have tried in this paper to present only a fundamental part about terms, concepts and graphic elements which may be involved in a signage system. In our research work we have analysed many signage systems in airports, museums, universities, business centres etc.

We have seen a typology of pictograms related to the field of activity, using real or abstract drawing. And we have noticed that pictograms of our daily life (e.g. toilet, stairs, escalator, lift, meeting point, departures, arrivals etc.) are, more or less, the same all over the world.

Because a good drawing of a pictogram may be acknowledged from a lot of people. Books as [9], [10], [11], [14] have many examples of signage systems.

Our desire was to design a signage system for a virtual hospital and in this paper, we have presented our work, which is from our book [5].

We have tried to satisfy the requirements of such work and the result is here.

There were three important steps for us to draw this signage system.

First, we have established how many departments and of what kind will be for this hospital.

After that, for each department to set what kind of graphic representations (arrows, pictograms, maybe letters and figures, colours etc.) are needed.

Then, we have presented during a visual storming the sketches about this project concerning the pictograms, signs and colours and the design structure of the signage in this virtual hospital.

And the result was a lot of pictograms for each department. The flow of navigation in hospital is using colours.

This project is presented in Figures 7 (pictograms) and 8 (the signage system).

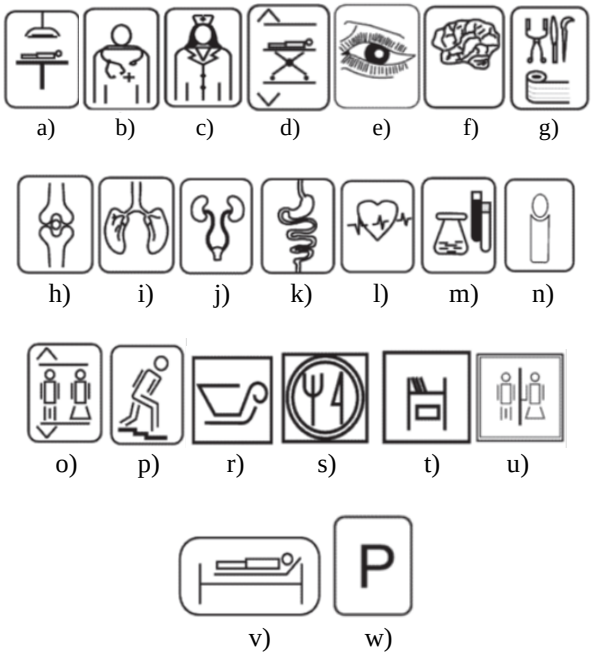


Figure 7 Pictograms for hospital.
a) operator block; b) doctors cabinet; c) nurses cabinet; d) stretcher elevator; e) ophthalmology; f) neurology; g) surgery; h) orthopaedics; i) pulmonology; j) urology; k) gastroenterology; l) cardiology; m) medical tests laboratory; n) information desk; o) elevator; p) stairs; r) coffeeshop; s) restaurant; t) book shop; u) men/women toilet; v) salon patients; w) parking.

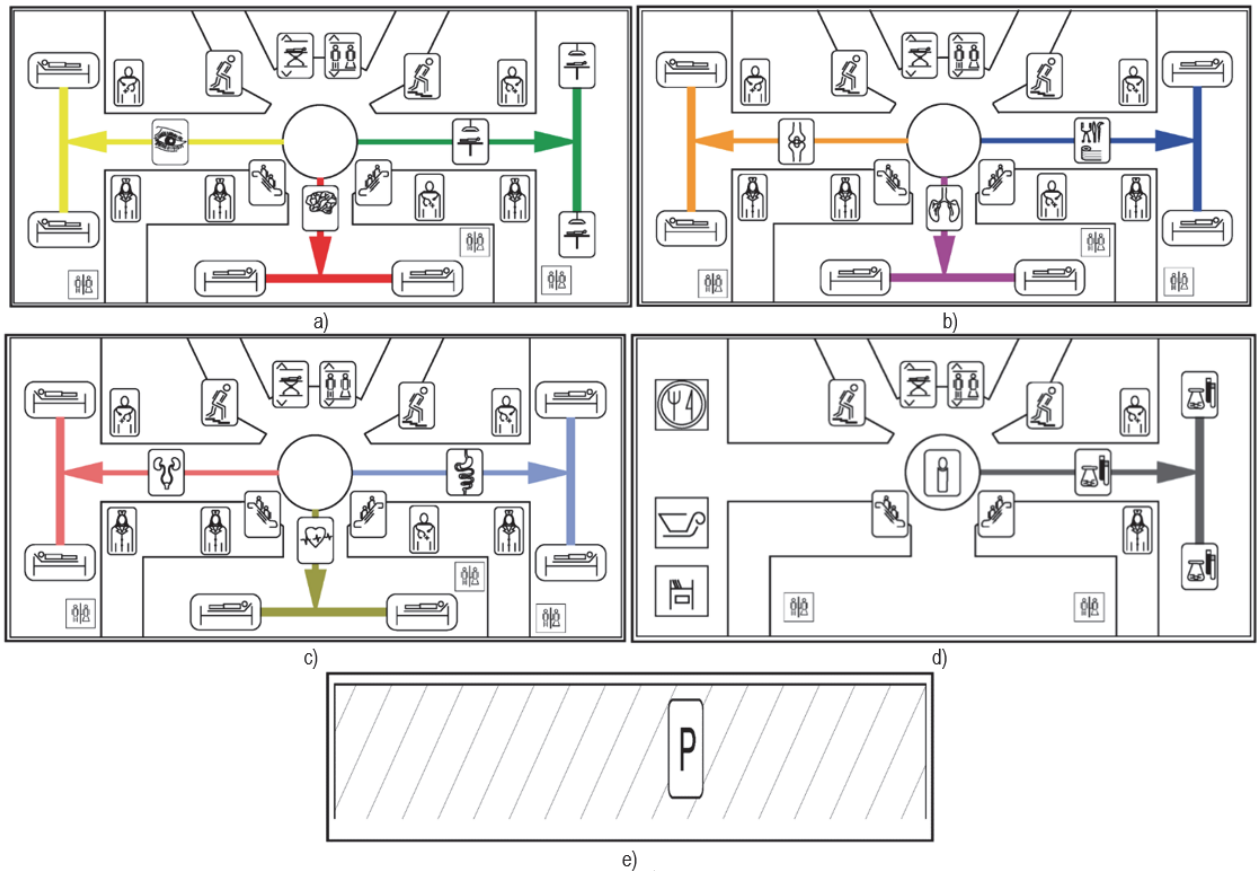


Figure 8 Distribution of pictograms and travel routes in a hospital:a) Level 3: yellow line (Ophthalmology), green line (Operator block), red (Neurology); b) Level 2: brown line (Orthopaedics), blue (Surgery), purple line (Pulmonology); c) Level 1: pink line (Urology), light blue line (Gastroenterology), dark green line (Cardiology); d) Ground Level: grey (Medical tests laboratory); e) Parking Area.

In this example we have used pictograms and colours to realize a signage system. It is possible to use letters/figures to identify departments, salon patients, administration rooms etc. What was so important for us was to show a navigation system for people in a hospital.

To achieve a signage system for this kind of activity is necessary to learn special knowledges about "the job" developed in it. And very carefully with the colours (to avoid black and red colours in a hospital).

We have followed the steps of design to finish our work and we have tried to answer to a lot of questions related to this special system. Of course, in our research work, we have met signage systems about hospitals and their pictograms. Every designer had his own vision concerning the pictograms related to medical investigations. In Figure 9 we have presented a few pictograms for hospital that we have noticed during our study [9].

We have seen other graphic representations for the same activity and signage systems using these pictograms. In this field of representation is important to have a clear and good graphics to be understood by the people.

That is why in our research we have found pictograms which were more or less close as design. In Figure 10 from [9] we have presented another part of our study.

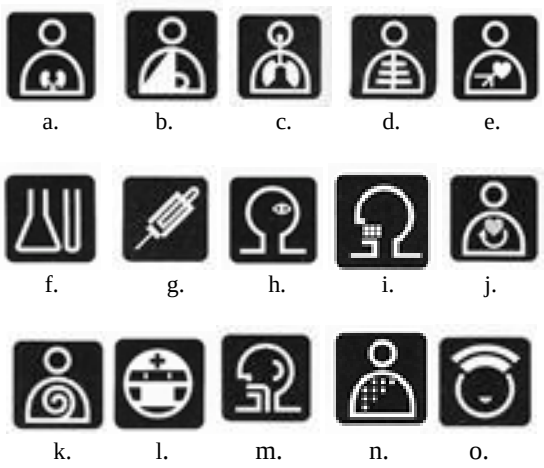


Figure 9 Pictograms for a hospital (in Japan).
a) Urology; b) Orthopaedic surgery; c) Respiratory organs; d) Radiology; e) Cardiovascular medicine; f) Examination room; g) Blood testing; h) Ophthalmology; i) Dentistry; j) Circulatory organs; k) Internal medicine; l) Operating room; m) Ear, nose and throat; n) Dermatology; o) Nurses station.

In [10] we have seen pictograms from Hochgebirsklinik Davos, and we have presented a few in Figure 11.

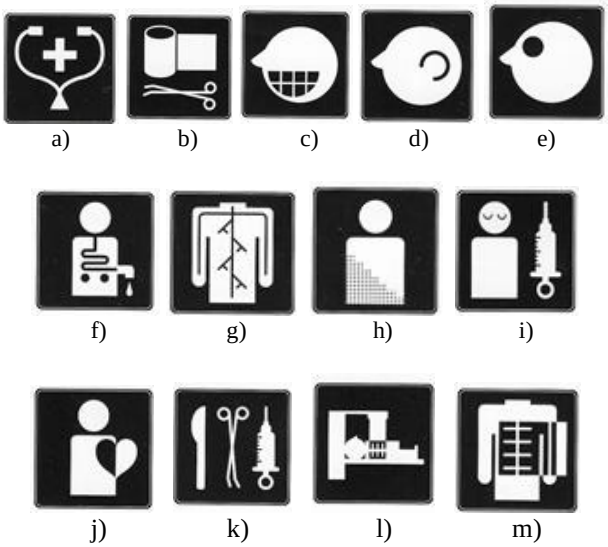


Figure 10 Pictograms for a hospital (in Japan).
a) Internal medicine; b) Surgery; c) Dentistry and oral surgery; d) Ears, nose and throat; e) Ophthalmology; f) Urology; g) Neurology; h) Dermatology; i) Anesthesiology; j) Cardiac surgery; k) Operating room; l) Radiological examination; m) Radiology.

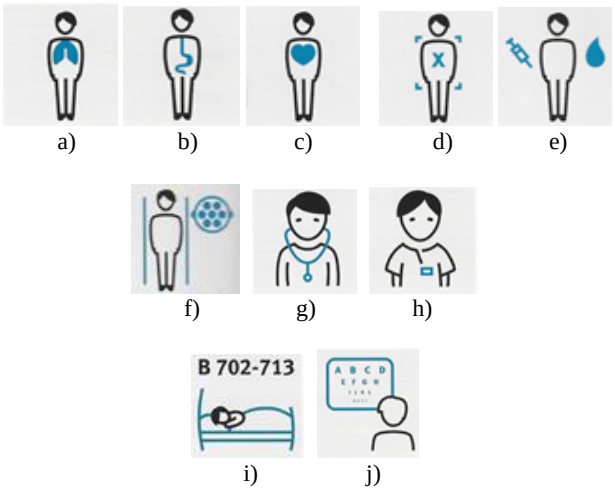


Fig.11 Pictograms for a hospital.
a) Respiratory organs; b) Endoscopy; c) Electrocardiogram; d) X-ray; e) Blood withdrawal; f) Operation room; g) Doctor; h) Nurse; i) Patient room; j) Ophtalmic clinic.

These were three examples in medical field and, as we have noticed, it exists an analogy between graphic representations.

Different designers have created pictograms about a domain of activity and they have drawn internationally understandable pictograms, without a single word. Just graphics.

It is one example from many others which shows the power of pictograms beyond the boundaries of a language.

Another example of our work was related to a signage system for a natural park [5].

For this purpose we have first created pictograms (Figure 12) which were well included in the signage system (Figure 13).

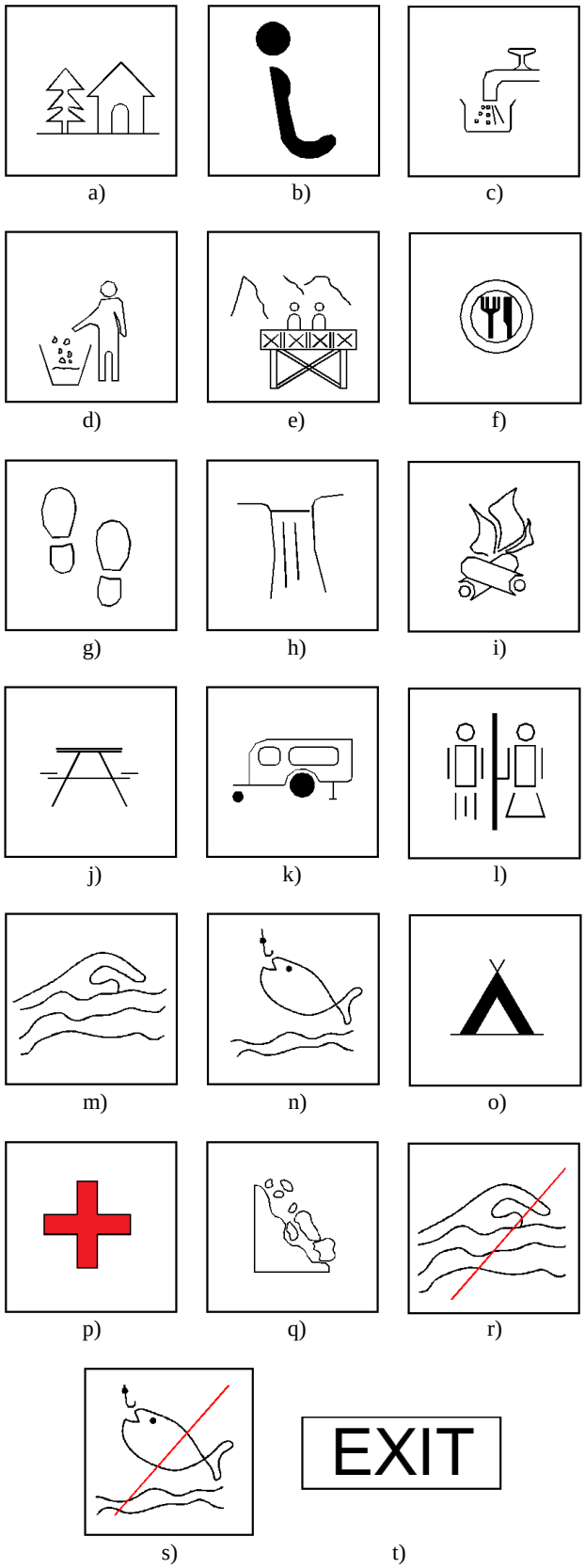


Fig.12 Pictograms included in the signage system.
a) entrance point; b) information point; c) drinking water; d) cart trash; e) landscape view place; f) restaurant; g) trail route; h) cascade; i) open fire place; j) picnic place; k) trailers camping; l.toilets; m.bathing allowed; n.fishing allowed;o.camping; p.first aid point; q.falling rocks; r.bathing banned; s. fishing banned;

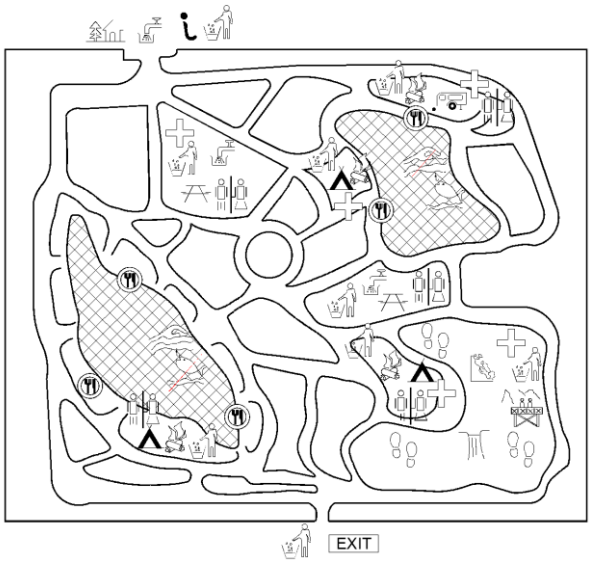


Fig.13 Signage system in a natural park

In [16] we have discovered 42 pictograms about working men who are holding shovels and digging. In 32 pictograms we have identified: a man, a shovel and a piece of ground. In 10 pictograms there are only a man and a shovel. When somebody see this pictogram (only a man and a shovel) on the road it is possible do not understand what it represents. The Figures 14 and 15 are very eloquent about these pictograms. Is important to draw very clear a graphic representation to be understood by the people. We have learned a lot of knowledge about pictograms, signs, symbols and signage systems all over the world and in different domain of activity. The bibliography which was our first step in this research way has allowed to sketch pictograms and signage systems for an airport, university, museum etc. In future papers we will present our researches about others domains of activity, by sketches, pictograms and signage system.

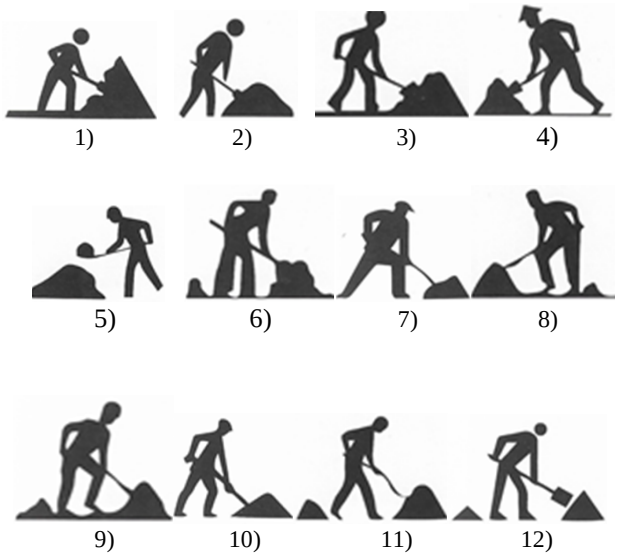


Fig.14 Pictograms for working men all over the world.
1) Shanghai; 2) Sydney; 3) Paris; 4) Taipei; 5) Buenos Aires; 6) Colombo; 7) Munich; 8) Stockholm; 9) Reykjavik. 10) Copenhagen; 11) Lisbon; 12) Warshaw;

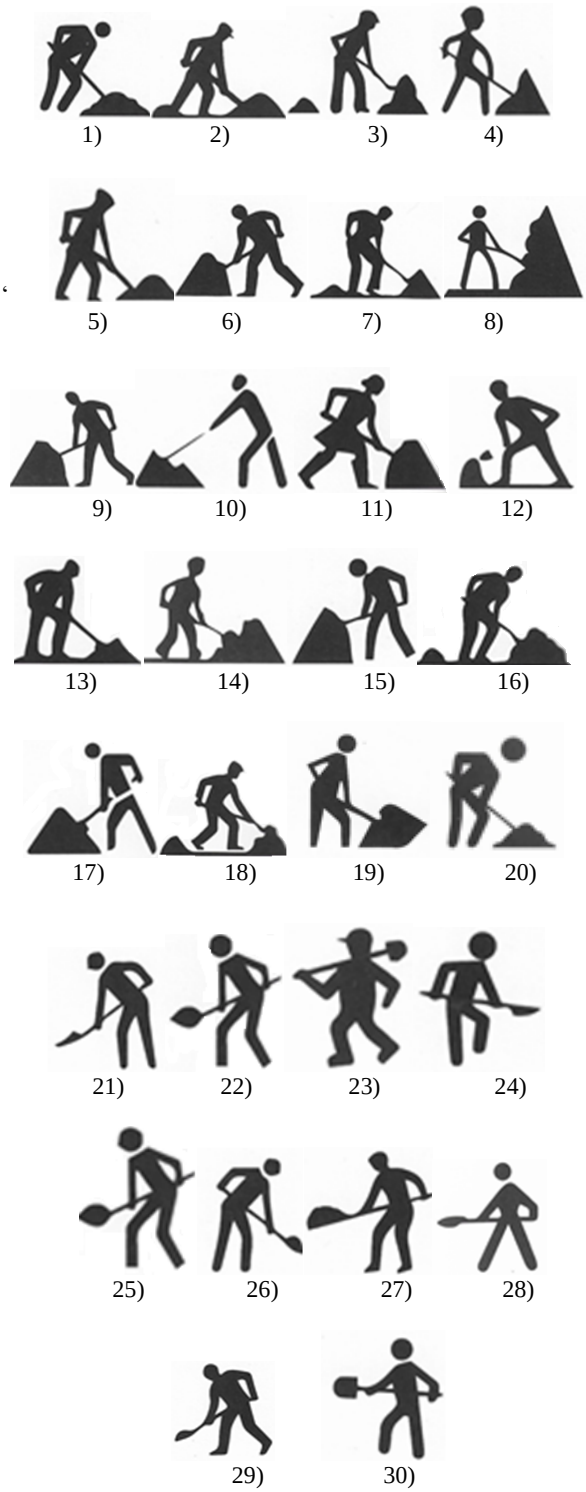


Fig.15 Pictograms for working men all over the world.
1) Rome; 2) Madrid; 3) Prague; 4) Moskow; 5) Amsterdam; 6) London; 7) Evian; 8) Beijing; 9) Dubai; 10) Ulan Bator; 11) San Francisco; 12) Tokyo; 13) Jerusalem; 14) Tangier; 15) Hong Kong; 16) Helsinki; 17) Capetown; 18) Oslo; 19) Toronto; 20) Tbilisi; 21) Lima; 22) Mexico City; 23) San Jose; 24) Santiago; 25) Mexico City; 26) Arequipa; 27) Bangkok; 28) Renaca; 29) Dublin; 30) Quito

5. CONCLUSIONS

This paper is the first step in our researches to study deeply the universe of signs, symbols and pictograms.

And, by using them, the signage systems in a lot of domains of activity. Only a graphic representation without words, beyond the boundaries of a language, is a challenge for a designer. The paper has tried to answer to a main question related to signs, symbols and pictograms: *How they are used to make possible a safety navigation for the people in a university campus, in an airport, in a museum, hospital etc*. A clear graphic representation means more than a hundred of words about something. We have presented some achievements of foreign researches and examples of our study. The way in this field is a future promise to continue.

REFERENCES

[1] O`Connell, M., Airey, R. (2011). *Signs & Symbols*, Hermes House, ISBN 978-1-84477-668-9, Wigston, UK.
[2] Chandler, D., (2007) *Semiotic: the basics*, Routledge, ISBN 978-0-415-36375-4, Abingdon, UK.
[3] Gicquel, Y., Bariety, A., S. (2009). *Analyse Publicitaire*, Le Genie de Glasiers, ISBN 978-2-84347- 818-5, Chambery, France.
[4] Adîr, V., Pascu N., E., Adîr G. (2014), *Comunicare vizuala prin grafica*, Ed. Printech, ISBN 978-606-23-0327-3, Bucuresti, Romania.
[5] Adîr, V., Pascu N., E., Adîr, G. (2016) *Design de limbaj graphic - vizual*, Ed. Printech, ISBN 978-606-23- 0693-9, Bucuresti, Romania.
[6] Crow, D. (2003), *Visible Signs*, AVA publishing, ISBN 2-88479-035-7, Lausanne, Switzerland.
[7] Dreyfuss, H. (1984). *Symbol Source Book*, John Wiley &Sons, Inc., ISBN 978-0-471-28872-5,USA.
[8] Abdulah, R., Hübner, R. (2006). *Pictograms, Icons & Signs*, Thames & Hudson Ltd, ISBN 978-0-500-28635-7, London, UK.
[9] Rüegg, R., Nakagawa, K.(2006*). Pictogram and Icon Collection*, PIE Books, ISBN 978-4-89444-505-0, Japan.
[10] Wyman, L. (2007). *Pictogram & Icon Graphics*, PIE Books, ISBN 978-4-89444-585-7, Japan.
[11] Mollerup, P. (2013). *Wayshowing Wayfinding*, BIS Publishers, ISBN 978 90 6369 323 7, The Netherlands.
[12] Smitshuijzen, E. (2007). *Signage Design Manual*, Lars Muller Publishers, ISBN 978-3-03778-096-1, The Netherlands.
[13] Elam, K. (2011). *Geometry of Design*, Princeton Architectural Press, ISBN 978-1-61689-036-0, USA.
[14] Meuser, P., Pogade, D. (2013). *Construction and Design Manual. Wayfinding and Signage*, DOM Publishers, ISBN 978-3-86922-108-3, Germany.
[15] van Uffelen, Ch. (2021). *Designing Orientation. Signage concepts & wayfinding systems*, Braun Publishing AG, ISBN 978-3-03768-239-5, Switzerland.
[16] Sockwell, F., Potts, E. (2017). *Thinking in Icons*, Rockport Publishers, ISBN 978-1-63159-314-7, USA.

Authors:

Prof. George ADÎR, PhD, National University of Science and Technology Politehnica of Bucharest, Department of Theory of Mechanisms and Robots, georgeadir@yahoo.com
Assoc. Prof. Nicoleta Elisabeta PASCU, PhD, National University of Science and Technology Politehnica of Bucharest, Department of Robots and Production Systems, nicoletaelisabeta_pascu@yahoo.ro
Assoc. Prof. Victor ADÎR, PhD, National University of Science and Technology Politehnica of Bucharest, Department of Engineering Graphics and Industrial Design, victoradir@yahoo.com
Assist. Prof. Gabriel George GEAMBAŞU, National University of Science and Technology Politehnica of Bucharest, Department of Engineering Graphics and Industrial Design, geambasu_gabriel@yahoo.com