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The evolution of the elevator pictogram

Pointing out trends for the future

Keywords: wayfinding, perception, pictograms, semantic, ISO 9186-1, toilet, elevator

This study draws attention to the challenging perception of two public information pictograms, 'elevator' and 'toilet'. Both indicate the location of a destination. Although the semantic information is completely different, both pictograms partly depict the same: front view of standing human figures. In certain contexts (e.g., at airports or train stations), with people in a hurry and with users from different cultures, this can lead to confusion. In addition, the representation of human figures is increasingly being questioned on the basis of public and political discussions on gender issues. Moreover, attention to accessibility is also being incorporated in these two pictograms. Thus, both pictograms are undergoing an evolutionary process in order to meet current requirements. Do more messages require more complex pictograms? As a starting point, we conducted a comprehension test based on the method recommended by ISO 9186-1. The results showed trends, but some questions regarding the two pictograms were not clearly understood by the test group members. Therefore, we conducted another test designed to determine the limits of the graphics depicted in these pictograms. We hope this study will help raise awareness about these issues. Finally, we offer five pointers for consideration when designing the elevator pictogram in the future.

1. Introduction and point of departure

1.1 Pictograms

Seventy-five percent of the human perception is done by the visual sense (Schönhammer 2009). Pictograms are important visual indicators for spatial orientation within the field of wayfinding. They communicate a compressed visual message without using language and text. In addition to the context, these graphical symbols convey a service, an identity, an affiliation to a building, a company, an era or even a country. They reflect the experience of many generations and the ongoing change within different cultures. This allows the user of a wayfinding system to quickly perceive the information and orientate him- or herself, since the message of these symbols is firmly linked to learned patterns and meanings. While regional, cultural and design variations of representation (Blake Huer 2000; Cho et al. 2007; Black 2017; Hassan 2017) give a wide range of images, the essential message remains the same according to the graphical standard to which it applies.

Pictograms are not only visual indicators of spatial orientation, they are also visual indicators of the time in which they were created. For this reason, too, we consider it important to consciously use and design the representation of male and female pictograms. We think it is important to explain when it makes sense to use them, when it is absolutely not necessary, and when to avoid gender specific symbols.

As of right now, there are two major standards for public pictograms. One is published by the International Standardization Organization (ISO), and the other by the American Institute of Graphic Arts (AIGA). Both are used internationally as the basis for many public wayfinding systems, e.g., public transport, hospitals, universities and museums.

Often two well known public pictograms, the toilet and the elevator, are represented in similar ways: the frontal view of standing human figures. But the semantic information for both pictograms is different. More complex properties require more visual search and attention from the user when a guiding feature is missing (Horowitz & Wolfe 1998; Wolfe & Horowitz 2004). The main focus, standing human figures, is the primary visual information in both pictograms. Since the users attention is limited, especially in stressful situations, the significant properties of the elevator pictogram (e.g., elevator cage, shaft) are more likely less perceived because these graphic elements guide no deployment of attention. Using a male and female shape inside the elevator pictogram aggravates this issue (see Section 1.3). When used in wayfinding and on signage, these two pictograms can lead to confusion. Examination of people mixing up these two graphical symbols on various occasions was the point of departure for this study. Our goal was to find out, how to better design these pictograms in such a way that they are less confusing? To answer this question, we concentrated on airport signage systems which usually only use genuine and proven concepts and designs. At an airport, passengers come from different cultures and are usually in a hurry. An international airport also functions as a stress test environment for every toilet and elevator pictogram. The main goal of the current study is to establish five simple suggestions for designers to help them to create successful elevator pictograms.

1.2 Perceptual psychological factors

How, and whether, pictograms are understood depends on various perceptual and psychological factors: the already mentioned stressful situation in which the user is in a hurry, different cultural backgrounds, as well as context, light, prior education, movement, and many more.

Movement, sequence or overview? It makes a difference to the user's perception whether pictograms and information are read one after the other, i.e., isolated in a sequence, with distances from sign to sign and while walking, or if the information is perceived in an overview, e.g., while standing in front of a sign (see Figure 1).

Wayfinding systems work well when a seamless information chain is guaranteed. The viewer's glance wanders from sign to sign. The viewer's eye only searches for the one desired target destination, in our case the target pictogram on the next sign. Once recognized, the eye jumps from pictogram to pictogram. In our case the user, especially under stress, relies on this information chain. If the pictograms are graphically too similar, the user's perception might be deceived during the fast scanning of the pictogram chain from sign to sign, as in our case of the toilet and the elevator. Perception is deceived by primary visual information in both pictograms due to the semantic signals of frontal-facing man and woman getting mixed up, as described in section 1.1.

If pictograms are at the minimum level of subtlety, only the context can give users the right meaning (Zender 2006). Though a sign in wayfinding is perceived

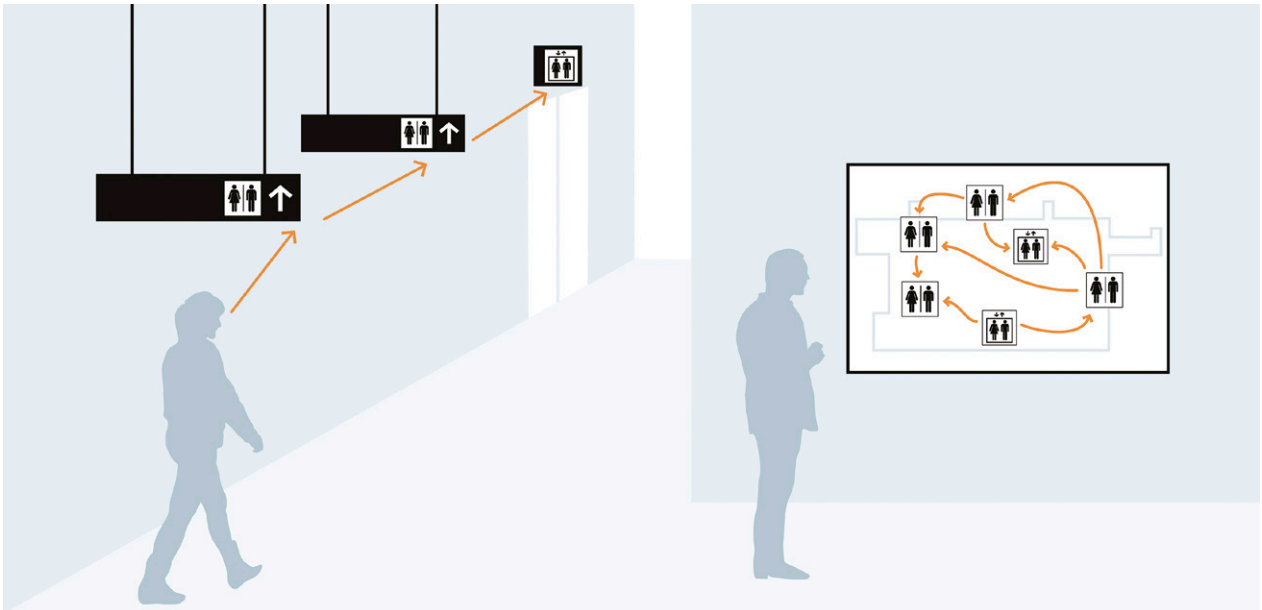

Figure 1. Whether the users see the toilet and elevator pictogram on a sequence of signs or on an overview map makes a difference to their perception.

within a context, e.g. architectural features like doors and entrances, the immediate context does not always deliver enough information to the user. This is especially the case for directional signs, in contrast to identification signs, which are usually far away from the desired destination. Information like entrances to toilet facilities or doors of elevators are not visible in the near surroundings of these directional signs. The user's confusion happens on the way to the destination, resulting in going to the wrong direction.

On the other hand, with an overview map the observer has a general view. The pictograms are distributed on one surface at a distance from each other, and are not arranged one behind the other in a sequence. The eye can take in the pictograms in a focused way, so the risk of confusion is not as high.

1.3 The example of Otl Aicher's elevator

In our research on elevator pictograms, we noticed that some signage systems have already attempted different representations of the elevator pictogram. Instead of using standing human figures for the elevator, the Munich Airport (Germany), for example, implemented an elevator pictogram using partially text inside of it (see Figure 2).[1]

Taking the original purpose of a pictogram, to represent a message through pictorial resemblance to a physical object, this is not an adequate solution, since pictograms should work universally for all languages and cultures. While this pictogram family is based on the work of Otl Aicher, the question arises why a representation similar to the Munich Olympic Games in 1972 is not

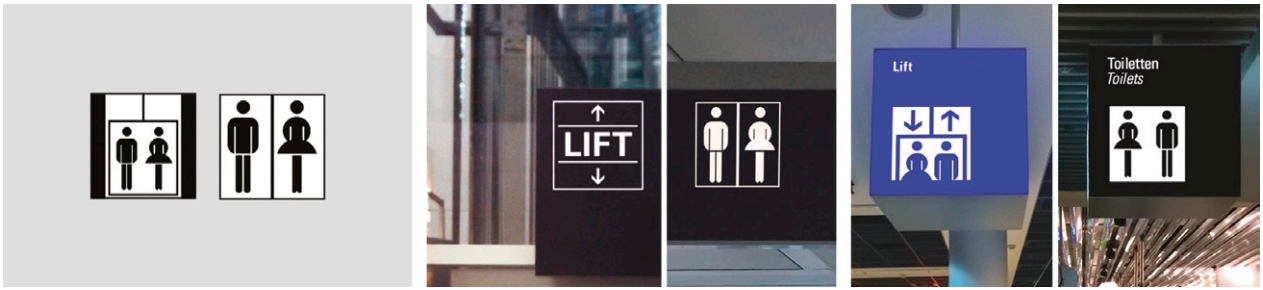

Figure 2. Toilet and elevator pictograms for the Munich Olympic Games in 1972 (left, Aicher & Krampen 1977). Munich Airport uses an elevator pictogram with the text 'LIFT' (middle). Frankfurt Airport (right) uses a slightly altered version of the design distributed by ERCO (2019a), a German luminaire manufacturer that takes care of the further development of the pictogram system in the spirit of Otl Aicher.

in use (see Figure 2, left). Knowing that there is usually a reason for certain solutions, we compared this to the pictograms of the wayfinding system of the German Frankfurt Airport, which uses also the pictogram family designed by Otl Aicher. As you can see in Figure 2 (right) the pictogram representing the elevator is further improved by cutting off the lower part of the human figures and adding arrows, a solution which emphasizes the movement of the vertical transport. We speculate that the confusion was already identified in the early 1980s and this version of the elevator pictogram was introduced to solve the problem.

Why was the elevator pictogram altered into a different representation, while the toilet pictogram remained unchanged? Our working hypothesis is that the toilet pictogram that uses two human figures, a male and a female, is a powerful universal concept, making it easier to alter the elevator pictogram to disambiguate the two symbols.

The number of flights in Germany rose sharply in the 1970s. Many airports were expanded or newly built. The importance of wayfinding systems and pictograms for airports was also recognized. Two pictogram systems were introduced at all major German airports: the pictograms of the ADV *Arbeitsgemeinschaft Deutscher Verkehrsflughäfen* (Association of German Airports), a compilation of a standard from 1969 (Kapitzki 1997; ADV 1974), and a pictogram family developed by Otl Aicher. In the early 1970s, Aicher and his team drew the pictograms for the Olympic Games in Munich and for the Frankfurt Airport at about the same time (ERCO 2019b). The same set was also used in the Munich Airport, which opened in 1992, and are still used today. Otl Aicher's pictograms from the 1970s still form the basic idea for many pictogram families of wayfinding systems being developed nowadays. There is a need for new and revised pictograms given the growing number of new requirements in complex buildings like airports, not to mention current issues, such as accessibility, gender equality, etc. They are being developed to meet the needs of today.

1.4 Related studies and research objectives

There are different methods to evaluate the comprehension and usability of pictograms. Akolkar & Bhutkar (2015) categorized between expert-based methods (lexical analysis, semiotic analysis) and user-based

methods (test without context, test with context, test with comparison along with user survey). Different approaches should be used homogeneously to obtain pictograms with high comprehension and usability (Akolkar & Bhutkar 2015; Clara & Swasty 2017). On the one hand expert-based, qualitative methods help to ensure high standard concepts while on the other hand user-based (qualitative and quantitative approaches) methods give useful feedback from the target group. Both, experts and target groups, are valuable to achieve high quality concepts.

There are several international recognized standardization bodies which have published graphical symbols (Boersema & Adams 2017). In specific, the International Standardization Organization provides a description of a standardized evaluation method for testing proposed pictograms, the ISO 9186-1. This ISO test defines a procedure for testing the comprehensibility of graphical symbols. This is to ensure that pictograms are easy to understand when no additional, explanatory text is depicted (ISO 2007b). Not all pictograms published in the ISO 7001, Graphical Symbols – Public Information Symbols, (ISO 2007a) went through the extensive evaluation of the ISO 9186-1 (Boersema & Adams 2017). According to Boersema & Adams (2017) the currently advised comprehension correctness rate of 66 percent could be too low for some pictograms at an airport terminal. To gain more insights and information about wrong responses, previous studies have altered the ISO testing methods to their needs (Adams, Boersema & Mijksenaar 2010; Foster, Koyama & Adams 2010; Boersema & Adams 2017).

Further inspiration came from the expert Keiichi Koyama, i Design inc., who has been concerned about the elevator pictogram in Japan and specially in Japanese airports for years. He provided us with information about a first unpublished comprehension test done in 2000 (Koyama 2000), which he created according to ISO 9186-1:1989, and a second unpublished comprehension test done in 2012 (Koyama 2012) which he created according to ISO 9186-1:2007. Together with Jeremy Foster and Austin Adams, they have further conducted investigation with the help of the ISO 9186 comprehension test on other pictograms, e.g., priority facilities as an aid to redesign symbols and elements of the discussed symbol (Foster, Koyama & Adams 2010). Koyama's insights gave us valuable help in conducting our own studies.

1.5 Gender-sensitive pictograms

Nowhere in the world do women traditionally wear miniskirts. Is the skirt a visual phenomenon or a male wish? Women and men with long skirts can be seen all over the world. Quindós & González-Miranda (2015) point out that each pictogram conveys an identity, these symbols can originate from an ideology, and they transport the values of a society according to the time in which they originate.

To depict women with short-skirts today is obsolete and downright contemptible. This typical male view of depicting sexualized attributes should be replaced by relevant characteristics and – where not absolutely necessary – should be abandoned altogether.

This topic is particularly relevant for our study of the elevator pictogram, in which we have to consider not only gender-specific symbols but also all aspects of complexity, as discussed in section 1.1. In our view, the user does not have to distinguish between man and woman to perceive persons. This will free us to consider new topics such as accessibility, which will add complexity to the pictogram.

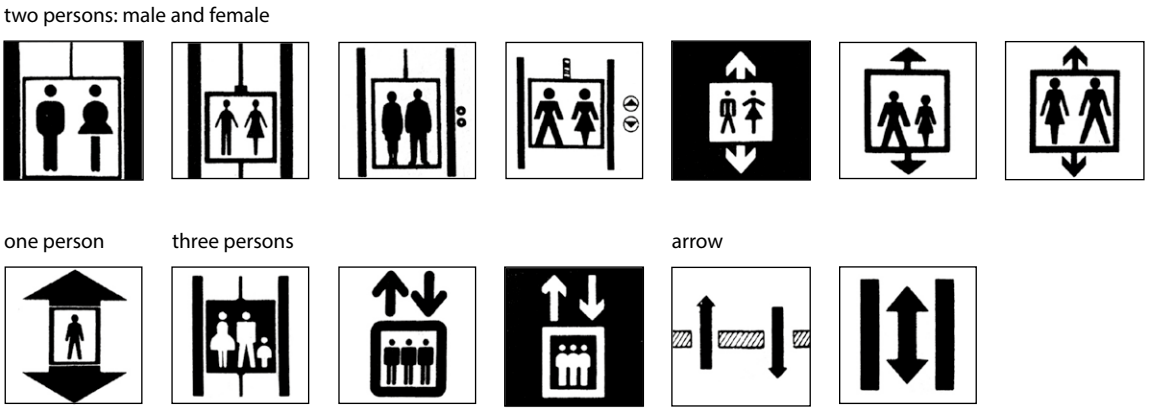

Figure 3. Thirteen international elevator pictograms from 1976 arranged by number of persons. The majority uses two persons – always with a female and a male. From Rudolf Modley, *Handbook of Pictorial Symbols* (1976).

2. Experimental procedures

We took four steps to get to the bottom of the confusion surrounding the toilet and elevator pictograms. Each of these steps gave us new findings/answers about this issue, which we describe below.

2.1 Evolution of the elevator pictogram

In the first step, we realized that there has been an evolution in the design of the elevator pictogram and research of historical examples (Dyson 2017) was needed. Rudolf Modley's *Handbook of Pictorial Symbols* from 1976 gives us a good overview of thirteen then-used elevator designs in worldwide signage systems (see Figure 3). The designs ranged from one person in an elevator, using the up and down arrow, to the majority of the systems using two persons, interestingly always with a male and female human figure. Only three systems used a concept with three persons. Arrows pointing up and down were used in two of the designs, a concept which is not widespread even today.

Today we have two standards, one published by The International Organization for Standardization (ISO 2007a) and the other by the American Institute of Graphic Arts which was commissioned by the United States Department of Transportation (DOT), first published in 1974 and completed in 1979 (AIGA 2019). They serve internationally as a basis for many elevator pictograms (see Figure 4). These two standards use either one or three human figures in a frontal view and the up and down arrows. On the one hand, ISO features an elevator shaft with one person pushing buttons, while

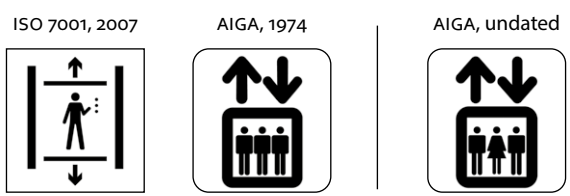

Figure 4. Today's standards for the elevator pictogram. From ISO 7001:2007 (ISO 2007a), AIGA 1974 (AIGA 2019) and AIGA undated (Hora 2017).

on the other hand, AIGA emphasizes the elevator cage and three persons forming a crowd. Neither pictogram depicts a female person. In a recent publication by Mies Hora (2017) the AIGA pictogram family is shown with an elevator pictogram using a group of three persons with a female human shape in the center. In an analysis of 100 international airports (see also Section 2.2) we found this exact design in two cases: at the Dubai and Montreal Airport. Very close designs are used at 6 other airports out of the 100 international airports of our analysis.

2.2 Analysis of 100 international airports

In the second step, we investigated how these two standards are currently implemented worldwide. So far, we have researched 100 international airports. We used images from our own photo database (see Figure 5) and we also searched for additional images on the internet.

In carrying out this study, we realized that there are countless alterations of the ISO and AIGA elevator concepts, while the toilet pictograms have remained close to the standard concepts.

To better compare and to obtain more useful results as well, we focused on two main characteristics of the graphic symbol: the number of human figures inside the elevator and their individual gender. While investigating the number of people inside the elevator, we came to the conclusion that all concepts (one person, two persons or three persons) are represented. Even though this research does not represent all international airports,

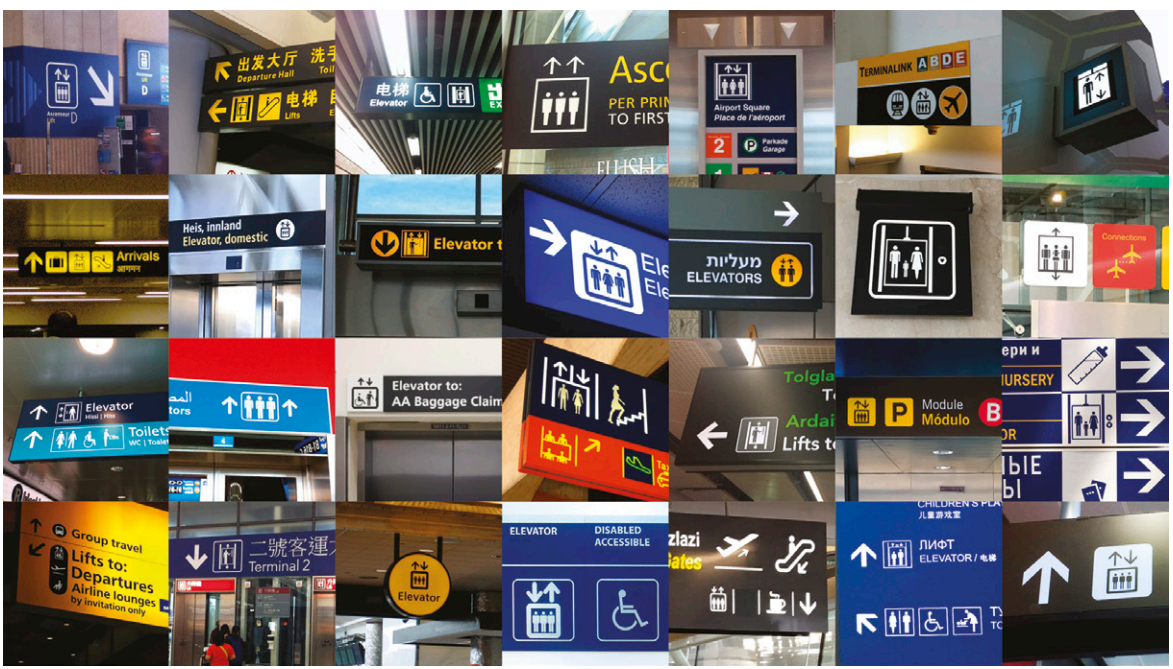

Figure 5. Investigating 100 international airports has shown a variety of elevator design concepts.

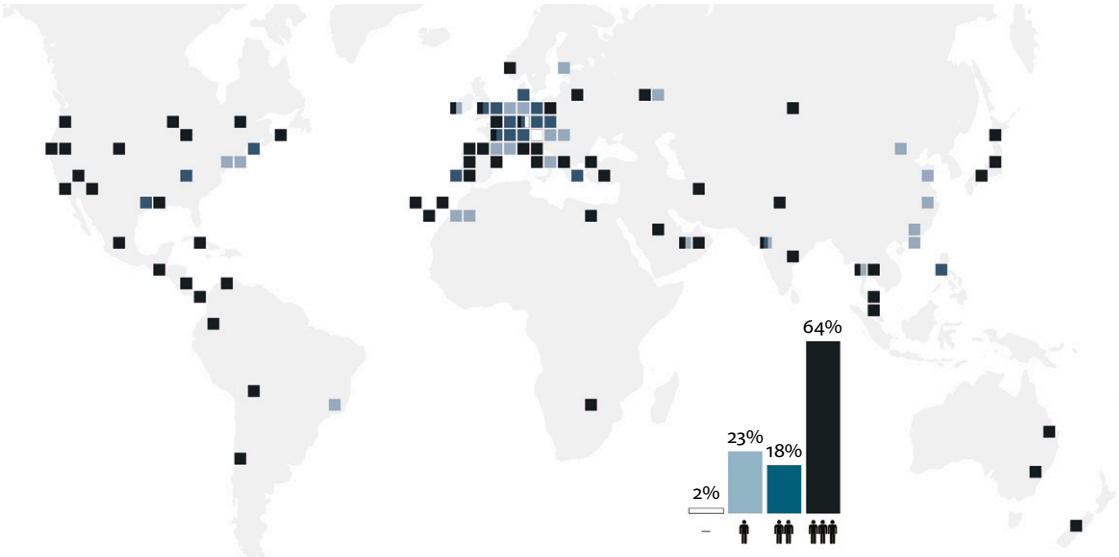

Figure 6. Analysis of 100 international airports: number of people inside elevator.

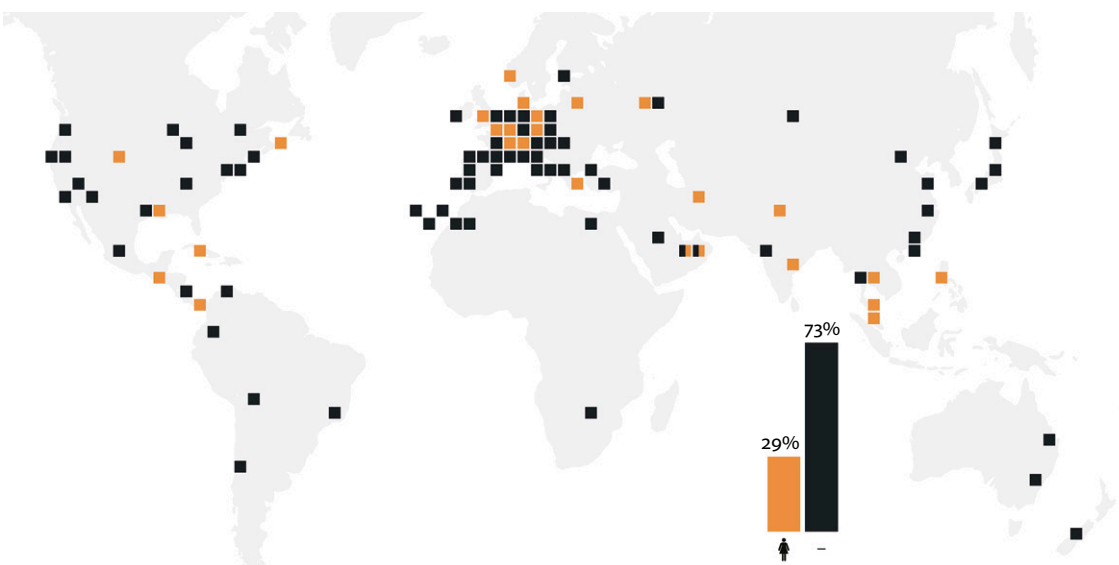

Figure 7. Analysis of 100 international airports: elevator pictogram with female or without.

there is a preference toward the use of three persons (see Figure 6). We also evaluated which airports use a female human figure inside the elevator pictogram, and it turned out that the majority of these 100 airports use no female figure (see Figure 7). A minority of one third shows a female shape of a human body, which is not explicitly depicted in either the ISO or AIGA standards (see Figure 4).

2.3 Comprehension test

After the first two steps, which mainly focused on qualitative research, we then decided to conduct two surveys using two different test designs. Based on our previous findings, we wanted to know how strongly our observation of the confusion of the elevator and toilet pictograms is reflected in a test environment.

First, we conducted a comprehension test with new designed pictograms (see Figure 8) based on the ISO 9186-1 test. In this test we evaluated two elevator pictograms among a total of 13 randomly arranged graphical symbols covering other destinations like baby care, toilet, pharmacy and police. As a part of the test requirements, we stated that these pictograms can be found at airports, train stations, in shops or in public buildings. The test was conducted both in print and online in the German language, with a total of 53 participants.[2]

Figure 8. Results comparing two elevator pictograms on the base of the ISO 9186-1 method for testing comprehensibility.

Our result showed the tendency that the two elevator pictograms, (A) and (B), performed differently (see Figure 8). Among the participants, 22 percent believed the elevator pictogram (A) was a toilet. Only 8 percent described elevator pictogram (B) as a toilet. We believe using an elevator shaft as depicted in the ISO standard, using three persons and the arrows above the cage as shown in the AIGA standard (see also Section 2.1 and Figure 4) improved the overall result of (B).

2.4 Perception test under stress

Since the ISO 9186-1 test was not tested in a real context, we decided to develop another test with the goal of simulating the stress of a real situation. We examined this situation with six different concepts in six different groups with a total of 135 participants in an online test, in order to preselect the most successful representations for a later in-situ field study.[3] Because international airports are sensitive surroundings with high security, we chose a test environment which was available for us. We selected a shopping mall in our city, where we have experienced and observed the difficulty of conflicting elevator and toilet pictograms on directional signage before. As a further step, we are planning a shadowing (Stickdorn & Schneider 2011) to compare the three most successful designs in an in-situ field study, which we have not yet conducted. Even though the location of a shopping mall in comparison to an airport is not exactly the same, we found this location as a good approximation, since many international airports are focusing on shopping mall environments in order to increase their revenues.

For the online test we used an image of a preselected situation (see Figure 9). Busy window displays were chosen as the focal point, as they are typical in shopping malls and present a situation of information overload. Similar to the ISO 9186-1 test, we waived the use of text to

intensify the stress level of the participant. Each participant in the group saw the same images but with one of six different elevator pictograms above the window display. They saw this pictogram among five other different pieces of information (arrows and pictograms) on a directional sign for 3.5 seconds. As seen in Figure 9, we placed a toilet pictogram on the left and an elevator pictogram on the right side of the directional sign.

We wanted to know how well the participants could distinguish between the toilet and the elevator pictograms in a short amount of time, and if they would mix them up. Every participant had to recall this information

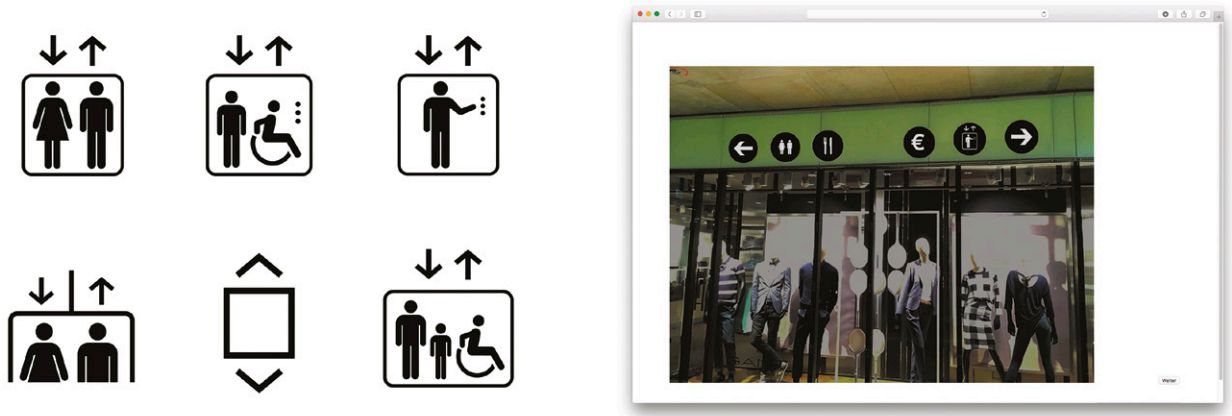

Figure 9. Six different concepts of the elevator pictograms (left) were tested in an online stress test as shown in the screen shot (right).

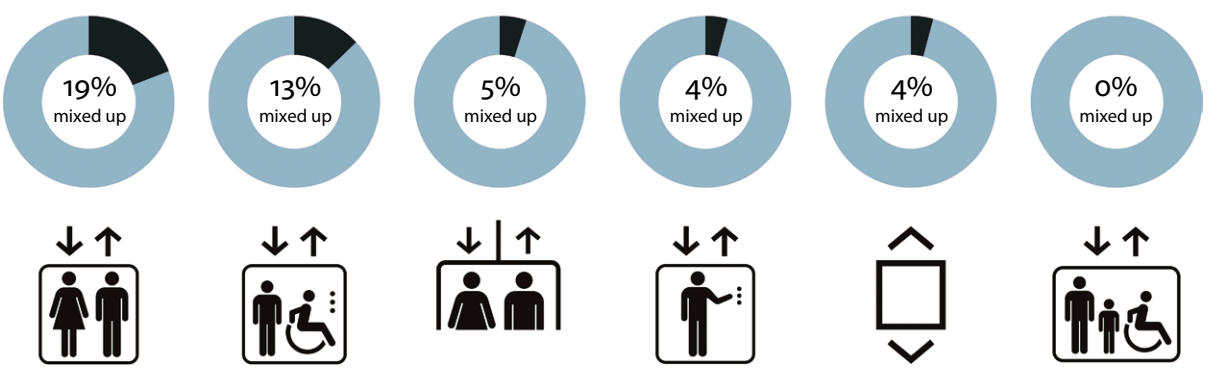

Figure 10. Our test results showed that the elevator pictograms with the closest representation to a toilet pictogram are mixed up the most.

afterward and place a corresponding shape with description text on an image with blank shapes. We evaluated the test by reviewing all the participants' recalled information and if they had accidentally placed the shape with the text 'toilet' on the position of the elevator pictogram. Our results have shown that the pictograms with the closest representation to a toilet were mixed up the most (see Figure 10).

3. Conclusion: How can we solve this problem?

Apparently, there is the tendency for our brains to mix up the toilet pictograms with the elevator pictograms, especially under stress. With this tendency we have come to the conclusion that the toilet pictogram has a stronger recognition factor. Based on our test results, we contend that the toilet pictogram overrules that of the elevator. Our findings indicate that to avoid this mix up, the elevator representation should bear as little resemblance to the toilet pictogram as possible. To help designers create successful elevator pictograms, we have come up with five simple suggestions (see Figure 11) which can easily be implemented in most elevator pictograms while staying within e.g., the corporate style:

1. Avoid gender specific shapes, especially the female shape, which leads to confusion. Try to design a gender-neutral human shape that is not congruent to either the female or male shapes within your pictogram family. We also think using gender-specific shapes in elevator pictograms is an outdated representation.
2. Use a mass of people to create density. When people are in a rush and have limited time to perceive information, using only two human figures could be a representation which is too close to the toilet pictogram. With that, also keep in mind new trends, especially the 'family toilet', which uses up to four humans: a woman, a man, a child and a person in a wheelchair. This upcoming new public pictogram is more and more in use and can potentially make this

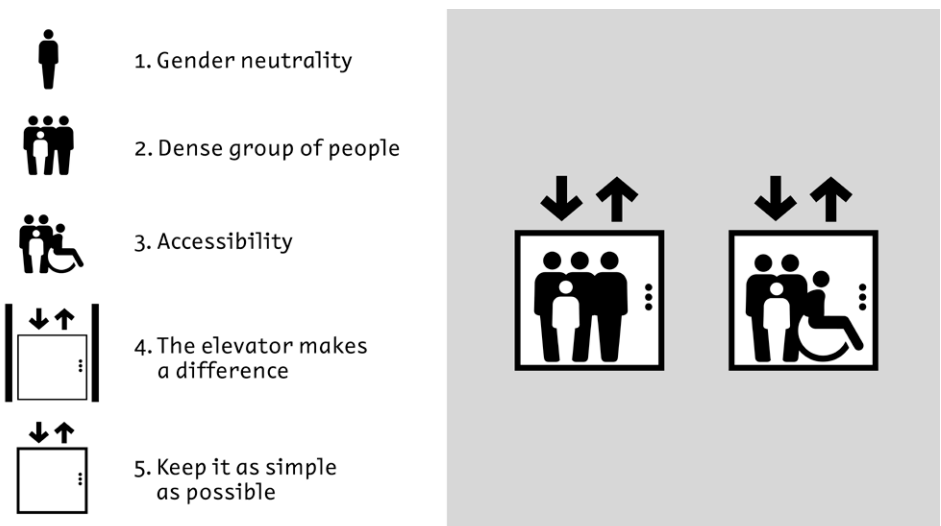

Figure 11. Five recommendations for helping information designers create a successful elevator pictogram.

problem worse. Overlapping shapes in order to create density can help the elevator pictogram to stand out from the different versions of the toilet pictogram.

3. Pay attention to accessibility. Given the rapid demographic changes in our society, accessibility is vital for many people, not just the disabled, and is rapidly becoming a general service feature. In short, we can assume that currently 10 percent of the population is absolutely dependent on accessibility, while 30 to 40 percent need it as a necessary help in coping with everyday life (SenStadtUm 2012). Accessibility is an improvement in comfort for all of us.
4. Including elevator features in its design helps differentiate it from other pictograms. Make the elevator be the main message communicated by the pictogram. Use elements which are advised in the ISO and AIGA standards, like the elevator shaft or cage, the pushing buttons and the up and down arrows.
5. Keep it as simple as possible. Pictograms are limited in their legibility. The pictogram and its details also need to work in small sizes.

As practitioners in the fields of information design and wayfinding, we are currently evaluating this five-step approach in our own projects. As a positive outcome so far, this method has helped us to transfer the knowledge gained to both our team members and our clients. It serves as a basis for discussion and has even brought us more insights from experience reports. In a next step, we would like to pursue an in-situ field study using eye tracking technology.

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Notes

1. The signage system of the Munich Airport was designed by Eberhard Stauß, Otl Aicher, Mac Kneißl and Hans-Busso von Busse for the Terminal 1 opening in 1992 (Flughafen München GmbH 1992; Hildebrand & Wallbaum 1992).

2. 53 participants. Gender – female: 60 %, male: 40 %. Age – 15–30 years: 43 %, 31–50 years: 39 %, above 50 years: 18 %.

3. 135 participants. Gender – female: 60 %, male: 38 % male, diverse: 1 %, no answer: 1 %. Age – below 20 years: 4 %, 20–29 years: 24 %, 30–39 years: 12 %, 40–49 years: 15 %, 50–59 years: 34 %, 60–69 years: 9 %, above 70 years: 1 %, no answer: 1 %.

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