GRAPHIC DESIGN APPROACHES FOR VISUALLY IMPAIRED PEOPLE

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This essay will discuss graphic design approaches for the visually impaired people. It focuses on several graphic design fields such as typography, images, printing, reading and writing, info graphic in different parts of life, packaging and web design and how they meet with the visually impaired people's needs. Many useful things were invented and are helping the visually impaired people in their daily life but I see there are still significant problems and issues that need solutions. The graphic designers are those who can do much more to help these people to be part of the society more than before and to make their life easier. The approaches include suggestions to the simple changes as well as more difficult ones being open to more discussions and further research by the scientists and specialists.

The thought behind this essay is to improve the life of the visually impaired people through graphic design, which is a powerful tool. The graphic designer's aim should not be to only produce visually nice work but to think of how the environment can be changed to make everybody feel comfortable in it, whether it is done through small changes or revolutionary ideas. It is important to take the needs of disabled, and this essay focuses on the visually impaired people around us that need to be brought into consideration.

I have tested myself how it feels to be 'blind' for some time during my research, and it helped me to clearly understand more about the whole subject. Based on my research I came up with a several ideas and helpful suggestions and solutions. Some of them might be time consuming at the beginning but when implemented I believe they could save a lot of time and mainly help the visually impaired people to enjoy their life and be an equal part of our society.

1. VISUAL VS. TACTILE

The important thing to be mentioned at the beginning is the difference between the people who are completely blind and those who are partially sighted. Within the second category, there are many different disabilities varying from the contrast sensibility, ability to contradistinguish colours, sensation of depth, ability to localise, recognise shapes or watch them in movement. It indicates that each disability faces different needs and the sensation and comfort of the graphic design elements such as colours, contrast or shapes are individual and vary from a person to person, as confirmed by Dudr (2011) from TyfloCentrum in Prague, specialist in removing the architectonic and transportation barriers for the visually impaired. Most of the visually impaired people try as much as they can to use their remaining sight to maximum effect so they try to read print materials as well as websites using optical aids or travel without the cane. They do so to keep the visibility in their life as long as possible because it helps them to orient themselves better than relying on the tactile only. It is understandable especially for those who lost their sight during the life. This does not apply only to graphic design but to their whole life in general.

2. GRAPHIC DESIGN

At this point, it would be appropriate to state what actually is 'graphic design' and how it can be represented. Most graphic designers would probably agree that graphic design is a means of visual communication using various elements such as images, symbols and words to visually interpret ideas and messages. Is then graphic design something useful for the visually impaired people? Those people without any sight problems are able to visually receive the graphic design as a complex when the designers' aim is to induce a certain impression or feeling in them. For the visually impaired people the term 'visual' loses its sense and it is important to consider they orient themselves - as for example when reading a text - by means of the optical aids. It allows them to read almost letter by letter but not seeing the whole text as one unit. Blind people use only their touch which helps them to learn about the environment and determine an object's sizes, shapes, weights, textures, and/or temperature. When narrowed to the graphic design field, according to Gonzurova (2011), a specialist from Tereza centre in Prague supporting visually impaired students, they can touch objects like shapes or embossed - always protrudent, never extruded - images as well as embossed fonts when the most used worldwide is the Braille font.

2.1 DEVELOPMENT OF THE FONTS FOR THE VISUALLY IMPAIRED PEOPLE

The first known reference about developing a font for blind comes from ancient Rome, where M. F. Quintilian, a philosopher, writer and encyclopedist mentions in his institution oratory the possibility of reading the engraved or carved font by fingers (Smykal, 1994). Before the formal education of visually impaired people began, lots of systems of special characters were developed as well as the embossed Roman characters when the blind students tend to use the special characters as opposed to the teachers who tried to adapt the Roman alphabet for reading by the touch. Among many others trying to develop a font for visually impaired people, Francesco Lana Terzi, an Italian monk was the key scholar who in 1670 developed a system out of dots and lines, numbers and punctuation, based on the analysis of all the previous known ways. His font was the first one taking not only the reading, but also the writing into consideration.

2.1.1 HAÜY, KLEIN, AND MOON

The first educational centre for visually impaired people was established in Paris in 1784 by Valentin Haüy (Smykal, 1994). He developed a font based on the Roman upper and lower cases, and he simplified it compared to the coloured print. He set a certain font size which he believed is the best to be read. The letters, however, took more space and print material was required, so he came up with an idea of implementing

the abbreviations into his font, based on adding dots or lines below or above the letters. Though this way did not allow the possibility of reading the font by the index finger and the experience showed it as a very complicated, hard to read method. When he was exploring the print of standard books, Valentin Haüy got an idea of how to emboss the letters into paper so they would be readable by touch. He noticed that on the back side of each printed paper the letters are a little pressed. In 1788 a book about French grammar was written by Haüy font, the first in the history of education of visually impaired people.

In 1800, the Austrian director of the centre for the visually impaired in Vienna, Johann Wilhelm Klein, developed his own embossed font based on the Roman characters, but compared to Haüy's font it was simplified and more geometric. According to Smykal (1994), Klein for example removed the horizontal bar from the letter A. Each letter was produced separately and a set of needles were fixed on a little wooden (later on even metal) block forming the letter's shape (Fig. 1) as explored during the visit of the E. Macana print house in Prague. This method allowed writing as well, however it was time consuming as each letter had to be printed one by one (Fig. 2). This way also did not allow to print double sided as the needles had to perforate the paper to make the text readable. In spite of the Klein's font disadvantages, the alphabet was accepted and was used through several decades (Fig. 3).

Figure 1: The letter D represented by the Klein font.

Figure 2: The Klein's alphabet.

Figure 3: The last extant book with poems written by Klein font in the archive of the E. Macana print house.

Due to the regional isolation, new designers and typographers tried to develop new fonts and special characters out of the dots and lines based on reduction of the Roman alphabet and different kinds of the secret fonts. Most of the font developers became aware of the fact the Roman characters are not so suitable for reading by the touch.

The most important person in the United Kingdom and Scotland was William Moon, the English lawyer who lost his sight during his life (Smykal, 1994). He studied lots of known fonts, and in 1847, based on his knowledge, he announced his own font based on the transformation of the Roman, easily understood by the touch due to its simplification. Some specialists from England agreed the Moon's font is the most suitable for those who lost their sight during the life and those who work manually and hence do not have the sufficient sensitivity in touch. His font was the only one out of the English ones that was undertaken in practical life. Its favour however rapidly decreased due to the computer systems for the visually impaired using the Braille font (Smykal, 1994).

2.1.2 LOUIS BRAILLE AND HIS FONT

Louis Braille was a French student who was visually impaired since his childhood (Smykal, 1994). He studied in the National Institution for young blind people in Paris. He was only 16 years old when he participated in one of his school mate's competition announcing to develop better font for the visually impaired. His system of six dots placed in two vertical columns, each including three points (Fig. 4) was considered as the best one by the students. The teachers, however, did not agree with them as they considered the dot characters isolating the visually impaired from non-partially sighted who would have to learn the whole system. Louis had to wait 25 long years, until 1850 to be appreciated. According to Smykal (1994), during this year, all the Roman fonts for the visually impaired were left as unsuitable as it was understood and proved that the dots can be felt better than the lines. In the same year the first books started to be printed in the Braille font in Paris.

⠁	⠃	⠑	⠅	⠋	⠗	⠥	⠭
⠅	⠇	⠉	⠇	⠏	⠗	⠦	⠮
⠇	⠉	⠉	⠇	⠏	⠗	⠦	⠮
⠉	⠉	⠉	⠇	⠏	⠗	⠦	⠮
⠉	⠉	⠉	⠇	⠏	⠗	⠦	⠮
⠉	⠉	⠉	⠇	⠏	⠗	⠦	⠮
⠉	⠉	⠉	⠇	⠏	⠗	⠦	⠮
⠉	⠉	⠉	⠇	⠏	⠗	⠦	⠮

Figure 4: The Braille alphabet (Czech version).

The Braille font has many advantages, as for example the size of one letter is approximately equal to the size of the index finger used to read it. It means the information can be obtained more quickly than reading the Roman letters. It has special characters for the upper case letters as well as the punctuation. It can be used for mathematics, chemical or musical notation. Any language can be basically written in Braille and it can hence be considered as a separate cultural typeface. The history shows that the Braille's dot system was applied on Chinese, Arabic, and many other languages. For example, there are not many differences in the Russian Braille alphabet compared to the Roman one.

The already mentioned Francesco Lana Terzi was the first developer of the font for the blind who surmised that the dots are more important for the reading by touch compared to the visual reading where the lines work better. This fact was also confirmed by the blind proof reader in E. Macana print house in Prague (2011) who explained the embossed Roman would take too much time to read, and to explore each line forming a letter would not be easy.

2.1.3 IMPLEMENTATION OF THE BRAILLE FONT IN OTHER COUNTRIES

The Braille font was spread into other European countries as well as the USA and later on to the Arab countries and Asia. The Braille in each country had been modified according to the language and was implemented for example into these countries (Smykal, 1994):

1855 - Switzerland

1858 - Denmark (modified by J. Moldenhawer)

1859 - Netherlands

1860 - USA (S. Pollak)

1868 - England (visually impaired Rh. E. Armitage)

1870 - Italy (visually impaired organist and composer A. Ascenso)

1873 - Czech Republic (J. Maly), the author of slovak alphabet was A. Fryc

1876 - Amsterdam and Germany

1882 - Russian alphabet (A. I. Skrebickij)

1887 - A. Murray created the first system of dot font for middle-Chinese language area

1889 - Poland (Schonfeld)

1890 - Japanese

1892 - Portugal (A. Mascaro from Lisbon) and Spain

1893 - Hungary (Pivar)

1895 - Arab languages

1902 - Esperanto (H. Thilander)

1905 - Bulgarian alphabet (Donev), Romania (Tassu)

1990 - The congress of the visually impaired's teachers took place in China. It was decided to unify the Braille font for each of the three language areas of China separately.

2.2 TYPOGRAPHY FOR THE VISUALLY IMPAIRED PEOPLE

The main issue as far as typography is concerned is the text formatting, however the functionality plays the most important role. The partially sighted people who are able to read the printed materials by means of the optical aids have an integrated opinion of certain font preferences such as bigger font sizes - the comfortable size of printed text in the informative magazine issued by the TyfloCentrum in Prague is mostly 16 pt, Arial font according to Kaucka (2011), qualified in the field of social work - bolder, straight font, no usage of italic, no usage of serif or decorative fonts, leading at least 25 to 30 percent of the point size - as finding the beginning of the next line while reading is not always so easy - and a bigger tracking. As far as the colours are concerned, the partially sighted people have preferences for black colour font printed on white background or vice versa, or a combination of dark blue / yellow or green / white. In most cases the red and green colours are the less visible ones and it causes troubles seeing them clearly (Dudr, 2011).

The text formatting in materials printed in the Braille font has stricter rules. The text in Braille is always read line by line which means it can not be formatted into columns. There is no problem with the bulleted or numbered listings and the preference is to transfer usually chaotic tables into a bulleted list. It is of course

possible to even write some mathematical or physical formulas however for example two characters of 22 take six characters in Braille (Gonzurova, 2011). One A4 page takes about 27 lines and 32 characters per row including spaces. Compared to the coloured print where up to 4000 words can fit on one A4 page, it makes the books printed in the Braille font a lot wider.

All the above knowledge indicates there are not many options for shortening the text in the standard Braille font. Although the shortened version of the Braille font exists it is for English speaking people only. It is called Grade 2 Braille (Tennessee Council of the Blind, 2009) where each character represents the whole word, not only a single letter. Saving the space is indeed an advantage and if it can work in one language, a shortened system could be created with Grade 2 Braille as a model that other languages could implement accordingly, especially when the Braille reading and writing system is basically the same all around the world, as mentioned in chapter 3.3 of this essay. The organisations in each country helping the visually impaired people could try to implement this system in cooperation with their governments and support its development and implementation as learning another coding system is not always welcome.

Would a graphic designer still be able to improve the formatting even without the shortened Braille version? Highlight the title by a dotted frame (proofreader of E. Macana print house in Prague, 2011) or printing the first letter of a paragraph by bigger or bolder font in the colour print could be a small suggestion of how to make the orientation within a page easier. There could be other formatting rules implemented mostly based on highlighting certain elements like paragraphs or subtitles by different characters or amount of lines for faster and clearer orientation.

2.3 IMAGES

The images that remain functional but have the ability to increase the enjoyment of reading at the same time should be the graphic designers' target in the field of image production for the visually impaired people.

I have received several anonymous responses from the partially sighted and completely blind clients of the TyfloCentrum in Prague on my questions regarding image appearance within the print materials for the visually impaired people. I also asked if the images are helpful to better perceive and understand the book's contents, if they are enriching the reading or if they are rather functionless and disturbing. To summarise this research, the images are mainly a part of educational books and if they are correctly embossed it works for the reader's benefit. Some more graphic design elements within the books or magazines are rather disturbing.

There are three ways of how to create / print images for the visually impaired people.

The first option is producing the matrix out of the different materials (textures, papers etc.) which is then vacuum pressed into a special thermal plastic sheet (Fig. 5, Fig. 6, Fig. 7) (Gonzurova, 2011). The images produced this way are usually part of some educational materials as well as the first textbooks teaching the visually impaired children about the basic shapes which help them to understand the world around them. The images produced by such way always need to be simplified as too many details cause disorientation and are hard to be recognised. On the other hand they should not be simplified too much so not to lose their purpose. There are certain rules of how high the embossed parts should be as if too low or too high they can not be recognisable. If lines are used they should have certain width for the same reason of recognisability, as per Mr. Dudr (2011) and Mrs. Gonzurova (2011). The production of these matrixes is a long-term process as it usually has to be done manually and hence these images can be expensive especially when not used for a series production.

Figure 5: The Prague's astronomical clock.

Figure 6: The tower in the book about Prague.

Figure 7: Map of Great Britain in Braille Atlas of the World.

The second option of how to produce the images is the hot print on a special micro capsulated sheet when the black colour merges with the microcapsules and so the pre-prepared image embosses out from the paper (Fig. 8, Fig. 9, Fig. 10). To reach the most functional result is to create the images out of the lines, as if bigger area would be covered it might amalgamate together and the image would not be recognisable. According to Gonzurova (2011), this special paper is called fuser paper and costs about 2 Euro each when the stove's price is up to 40 000 CZK.

Figure 8: An image showing serif and sans-serif fonts so visually impaired people can touch the difference.

Figure 9: The blind map of the Czech Republic with rivers and some major cities.

Figure 10 (right): A bicycle.

The third way is using a special print machine which is the new technology nowadays working on an embossing basis, when even larger areas can be covered (Fig. 11, Fig. 12, Fig. 13). Based on the colours in the source image, the embosser is able to print different heights of the dots by variable pressure into the paper rolling through the roller die, the darker the colour, the higher the dot. The graphic elements and images are then more detailed and are not distorted as if printed by dots of the same height. This embosser allows to print diagrams and graphs (Fig. 14) which can be a strong teaching tool as more details distinguished by the variable dots height can be captured and shown. It also prints the Braille font and as the dots are sharper compared to the standard ones those people with lower tactile ability can read it more easily (ViewPlus, 2011). This method can serve even the partially sighted people as the images can be printed in colours underneath the dots and hence the materials produced in such way can serve the students with variable sight problems simultaneously. The printer (as for example Spot Dot M-Print) costs around 240 000 CZK, but the print itself is then made on the thicker papers and the cost is comparable to the ink print (Gonzurova, 2011).

Figure 11: An image of the human brain and its parts.

Figure 12: Map of the USA.

Figure 13: A heart.

Figure 14: A graph.

I have tested some of the images produced by all three mentioned ways by myself and all were hard to recognise. The most comfortable for touch was the second option that felt soft, like a suede. The best usage is where only the lines can represent the image as for example in the book about astronomy showing the constellations. The third option beside other features allows the graphs or diagrams that can be easily imported into the Word document and printed straightaway which does not require any special and long matrix preparation. The first option, however, remains the most interesting way as if the matrix is thoroughly and carefully created it can bring the person closer to the reality. It also has a great potential as far as children education is concerned when they learn about the basic shapes, animals, nature or various equipment and their imagination is supported by using the different materials in the matrix. The graphic designers should be more involved in the production of these matrixes as they could bring new ideas into the process and develop new simplified approaches.

For the partially sighted people the images should be drawn without any unnecessary details and the colour contrast and a right choice of the colours should be bared in mind. The combinations of blue / yellow, black / white or orange are comfortable for most of the people rather than green or red as confirmed by Dudr (2011).

Besides the colours choice and contrast, generally, the graphic designers creating the images for the visually impaired people should take several things into consideration. There should always be some dot or point indicating the start within an image, the construction of image is very important as well as if they are about to explore it by one or both hands. The images should not include too many details as they are mainly confusing and dysfunctional and keep in mind the images should be more illustrative and supplemental rather than beautiful. Because as Gonzurova (2011) stated, exploring the images is more or less "an analytical process".

2.4 PRINTING

The most serious problem as far as the printing is concerned is consuming lots of materials, the books are a lot wider than those printed by coloured ink as well as such amount of paper being used can not be considered as eco friendly. Blaha (2011), the manager of production in E. Macana print house in Prague, confirmed the Braille text is usually printed on a special thicker paper (135 gms to 160 gms) with the glue-coated surface so the dots remain longer and the paper is not perforated during the printing process. Blaha (2011) also explained that this special paper is more expensive than the standard one and hence despite no ink being used it increases the printing cost. The matrix for printing in Braille consists of six raised dots in three horizontal lines, each including two points, forming the Braille letters. The various combinations of raised dots in the matrix are relevant to the Roman alphabet letters. Branko Vukelic (2009) provided information about Braille printing techniques. As the roller of a printing machine rotates, the paper is pressed against the zinc matrix and the raised dots are impressed into the paper. Although the papers allow double sided printing - which is impossible for example with the Klein font - it still consumes lots of material due to limitation of the characters' amount per page. The same question of better text formatting is being raised here again as the formatting is touching the majority of the print related issues. Could the existing functional and strong graphic design typographic rules be applied into the text written by the Braille font?

Many of the print manufacturers nowadays invent different finishing methods and apply the new technologies as for example the metallic foils, relief embossing, UV or effect varnish which allows to produce variable surfaces or even different thickness on one printed page. Such methods could be applied on the printed materials as for example book covers for the visually impaired people so they had a chance to tell the books apart accordingly.

3. READING AND WRITING

3.1 READING

If you are a completely blind person and you do not know to read the Braille font than you can not read anything at any reasonable speed. The only tool you could use if you are a computer user is the software which in fact reads everything that is on the screen with a human voice. The sound is however not very pleasant as the words are compiled out of the separate prerecorded syllables, which I was shown by Mrs. Kauccka (2011) at TyfloCentrum in Prague.

The older reading tools for visually impaired people include a machine where one finger of one hand is placed onto a special metal plate from which the tiny needles come out in shape of a Roman letter, at the same time as the second hand moves over the colour-printed text by a small scanner (Fig 15). I have tested this machine myself during my visit of E. Macana print house and except for quite a pleasant vibrant feeling I was unable to recognise what letter it showed.

Another device connected with the computer is the refreshable Braille display which is an additional device attached to the standard keyboard (Fig. 16). The Braille font is displayed by raising the dots on a flat surface as the text in the computer is read. The refreshable Braille display does not allow to view the images. I have tested this device too, also with no success.

Figure 15

Figure 16

Kaucka (2011) as well as Dudr (2011) explained that partially sighted people use different kinds of glasses, optical aids, or magnifying lenses which might not be always comfortable. There are also special electronic reading tools where the backlit text appears on a screen, as explored on the Invisible Exhibition (2011). Such devices can be hand (Fig. 17) or in a size of the computer screen (Fig. 18) which can be used not only for reading but also for any kind of hand work. For the computer users there are special zooming software as for example Zoom Text increasing everything on the screen. Among other features it can set for example the pages contrast (Kaucka, 2011). Many visually impaired people however still use this software together with the classic optical aids.

John Mahoney (2009) introduced four designers, Seon-Keun Park, Byung-Min Woo, Sun-Hye Woo, and Jin-Sun Park from Korea who have developed the idea of an electronic Braille E-Book (Fig. 19). The concept works on a basis of the electroactive polymer raising the Braille dots and its surface is changed whenever the pages are turned. Such approaches are an innovative step forward not only because it could solve the big amount of the paper material consumption but also visually impaired people would have the access to wider range of the literature and would not be dependent on the specialised print houses which, at least in the Czech Republic, do not publish that many books per year as are available in the standard bookstores (Blaha, 2011). This solution could be applied globally and help in getting the literature, books, educational materials or magazines in different languages and would not limit the readers to gain the information in their own language only. Although the Braille E-Book invention did not see the light of day yet as there is no financial support for its actual production, the four mentioned designers clearly showed their interest in helping the visually impaired society in the field of reading. More of such inventions should be developed so to break the impediment for the completely blind people in gaining any information or getting any book of any genre they are interested in.

3.2 WRITING

The reading does not give many great options and the field of writing is not any better. The writing tools include a standard QWERTY keyboard for the computer users who first have to learn to type by all ten fingers.

The older machine similar to the typewriter is a Braille writer (Fig. 20) which comprises of six keys, each for one of the six dots in Braille cell and one extra key for space. It was developed by Oskar Picht in 1899 (Smykal, 2006, p. 301), a teacher in the Berlin centre for the visually impaired children. This machine is easy to use and the text can be written in quite a fast way as reviewed in E. Macana print house.

It is also possible to make the notes manually using the table with a handheld stylus (Fig. 21). The table contains of two parts holding a piece of paper. On the top of the table there is a custom grid where each cell has the same size as one Braille character and allows maximum six dots to be pressed by the stylus. The dots have to be impressed mirrored so to be able to read the embossed dots when the paper is taken out, as explored during the Invisible Exhibition in Prague (2011). I have tried to write three simple first names using this table, watching the Braille alphabet at the same time. It took me five minutes and one name was even wrong.

Graphic designers creating new writing tools could take the inspiration from the T9 dictionary, a useful tool saving time, people can select in their mobile phones. The special software the visually impaired people could use in specific devices or even in their mobile phones could be developed. It would enable them to write remarks, shopping lists or simple notes. The software could be connected with the voice outcome or some simplified tactile method of listing and selecting the words, based on the raised dots of the Braille font or some other characters that could be understood even by the non-Braille readers.

Figure 17

Figure 18

Figure 19

Figure 20

Figure 21

3.3 READING AND WRITING WORLDWIDE

In 1949 UNESCO set the target based on its General Conference to establish and promote Braille uniformity all around the world. UNESCO stated (1990, p. 3) that Braille symbols have been developed in each country based on phonetically sounds rather than the letters. Each country uses its own Braille font standards varying from one to another as every language has its own specific characters, however the system of reading and writing is the same worldwide, following the same international rules for printing in Braille. According to the Lebanese Institution for the Blind (2011), Hala Abdelkhaled from organisation specialising in help to visually impaired children in Egypt (2011) and Simon Ager (2011) providing information about Chinese Braille, all the visually impaired people reading Braille read it in the same way - from left to right, arranged in the horizontal lines. It means in spite the different historical, political, cultural, national, or social aspects the visually impaired people have something in common which nobody else is able to share. Their handicap gives them the unique ability to create a special environment as there is no other group including such amount of people all around the world who would use the same tool for gaining the information without any major differences. Except the font, more applications worldwide could be unified to make the visually impaired people's life easier not only in the frame of their own country. This could cover for example some of the info graphic fields.

4. INFO GRAPHIC

Seventy minutes in the absolute dark with the eyes wide open but still seeing nothing gives you the complete view of how the visually impaired people feel and live. Visiting the Invisible Exhibition (2011) forced me to think of how graphic designers can be more involved in the visually impaired people's life and how they can improve it in the field of the info graphic.

4.1 GETTING TO KNOW THE SPACE

After the Invisible Exhibition I tried to draw a plan of the exhibition place based on my sensation of the visited space. Putting logic into it, considering where was the entrance and where the exit, it would not look like I draw it which means to understand the space without seeing it might be difficult. I have asked other two non-visually impaired visitors to do the same and all three results differentiated diametrically from each other.

Since 1995 the Czech Ministry of Health rewards the people who work for the benefit of their disabled fellow-citizens. In 2006, Dudr (2011) was awarded for his work for the benefit of the visually impaired and partially sighted. He was involved in the implementation and promotion of the audible alarms at crossroads, the public buildings of the transport constructions, the means of transport or information boards on the bus stations and in the airport. These inventions help the visually impaired people to orient themselves on the streets but what about the unknown interiors? According to Svoboda, owner of the RE/MAX Harmony (2011), real estate companies use special devices for measuring room sizes relying on the ultrasound waves or laser beams. Its function is simple and it calculates the room's size quickly. Such device could be developed even further to serve visually impaired people to understand the space they are currently in, considering a specific reach of the meters as well as indicating any impediment or object on their way describing its size and position. It could work specially inside of the buildings and rooms which are unknown to the blind visitors. The outcome could be by a voice describing the situation or by touching the specialised screen of the device or mobile phone that would create the embossed 3D plan calculated from the data of scanned surrounding. The inclusion of the objects could be optional depending on the user's current needs.

4.2 HOSPITALS

When at the point of the unknown places, visiting the hospital is not a pleasant activity but is a serious one and the hospital management should try to make it as stressless as possible. If one can not find his department because of a wrong information system, it does not help it. Some big hospitals have the colour navigation system (Fig. 22, p. 24) or using any other information graphics like signs, symbols or pictograms (Fig. 23, p. 25) but they do not always work properly. I am sure in some hospitals they might have special assistance available for the visually impaired people but what if not and what if these people want to be self-dependent and manage to freely arrange all what they need by themselves to feel they live full-valued lives and are not outside of the society?

Figure 22: The info system in the hospital Na Homolce in Prague.

Figure 23: The info system in the hospital Na Bulovce in Prague.

The info graphics in the hospitals have a solution. Brightly coloured hand railings could be implemented when each colour would correspond to some embossed pattern on the top of each hand railing, either it could be a dotted pattern, one to several lines next to each other, the pattern of arches, waves, rectangles or triangles and many other variations. The bright colours could serve as a clear navigation to the people with no visual problems too, as well as to the partially sighted ones.

To make it easier for the patients, the hospitals could unify the info system so that people will know a red colour with two lines pattern always takes them to the cardiology and a dark blue colour with a triangle pattern to the stomatology. The problems could appear in case the hospital has too many departments and there will not be a sufficient amount of the bright colours. The combination of the coloured strips could however be the solution. Another problem could appear with usage of more patterns on one hand railing or using more hand railings on one wall same as if the crossroad is reached. At the beginning and end of each hand railing there could be a note of where the certain pattern / colour leads and where it ends, eventually small arrow indicating which direction to go to continue on the crossroad. Already existing hospitals could face some difficulties if they try to implement this system but it depends on their wish to improve and implement new helpful strategies.

4.3 SHOPPING

We should be meeting more visually impaired people in the shops. But the shopping malls or even some smaller shops with clothes or any other common products are sometimes hard to orient within even for the people with no sight problems. Again, the orientation within space can be one problem but not only that, there are not many blind friendly labelling systems applied in ordinary shops, which is something the graphic designers have the ability to change.

4.3.1 FOOD

Most of the shopping malls place a big board at the entrance and sometimes in every floor, listing all the available shops, for example the shopping centres Letnany or Palladium in Prague (Fig. 24). They sometimes even provide a small printed booklet with all these information (Fig. 25). To comprehend all the spaces would be probably difficult for the visually impaired people but why not to apply this system into single shops with for example food and modify it by the embossed lines forming the shop's shape with all its sections? Each section could include a description in the Braille font and a button with the voice outcome, serving the non-Braille readers. The same system could be implemented to the shop inside, each section would be clearly labelled and described on a small board. The visually impaired people could have the possibility to borrow a device at the shop's entrance leading them through the shop with prerecorded voice informing them about the section they are currently in. The device could also include a special code scanner enabling them to read information such as the description and / or the price of each product. If the food producers agree to add the same special codes on their products than the visually impaired people owning the device could use it practically in any food shop worldwide.

4.3.2 EVERYBODY LIKES TO BE ADMIRER

How do the visually impaired people recognise the blue jeans from the black ones or whether the jacket can be washed in the washing machine? How do they recognise how much does the T-shirt cost or what size it is available in? Every piece of the cloth in the shop includes a label with certain information about it, for example in Jannis, C&A or Marks&Spencer shops (Fig. 26). As these labels are being produced, they could include the most important information like the price, colour, size and how to wash it written also in the Braille font. To extend the labelling system on non-Braille readers the special code or chip carrying all important information could be included and scanned by a special device available to borrow in the shop or even by the specialised software installed in the user's mobile phone, both including the zooming and the voice outcome options.

Figure 24

Figure 25

Figure 26

To save time a machine could be installed at the shops' entrances where the requested item could be asked for. The machine could respond whether it is available or not, providing a small plan of where in the shop the required item can be found. This system could even be used by people who are not visually impaired but for example are in a hurry. As everybody likes his look to be admired we should help the visually impaired people to get the same feeling out of shopping and help them to participate in daily social life. This could also work as a good marketing tool to bring new customers who can not be attracted visually.

4.3.3 HOW DO THE OBJECTS LOOK LIKE? BUYING A CHAIR.

People sometimes buy things they do not need, they do so just because the thing looks nice. Sometimes it is the shape deciding what product we buy. And sometimes, besides the functionality, the shape is the most important characteristic. For example a chair. Everyone, including the visually impaired person would probably test the chair by sitting on it and testing whether it is comfortable or not. But there are hundreds and thousands of comfortable chairs available so which one to choose? The designers could develop a device being able to scan the object and transfer its shape onto a screen where the special technology would transfer the shape into the embossed 3D object. So the user would be able to touch it and get a better image of how it looks. Such device could be effective also for the visually impaired children and students who need to learn about the basic shapes. It would save the cost for producing specialised educational matrixes as well as printing materials all together with the whole printing process.

We are regularly meeting the visually impaired people travelling alone by the underground and other means of public transportation. So it should not be that difficult to bring them into the ordinary shops. It is up to the designers to find the solutions.

5. MILK OR JUICE?

How do the visually impaired people recognise the milk from the juice inside their fridge if some of them are packed, at least in the Czech Republic, in the same boxes? (Fig. 27)

Many special aids for the visually impaired people helping them to manage their everyday life already exist as for example the watches, compasses, rulers as shown by Kaucka from TyfloCentrum in Prague (2011) (Fig. 28), medication boxes with the first letters of each day embossed, signature template (Fig. 29), talking cans / bottles / household sprays content identifier, voice labelling systems for the home, tags for labelling clothes, documents organiser and others available at MaxiAids (2011), and blind people even invent their own most suitable ways within their own homes. However there are still possibilities to invent new labelling systems that would be brought directly to the people homes upon purchase. The manufacturers of the mentioned milk and juice boxes all around the world could implement simple embossed marks on their packages identifying its content. For example circles for the milk - one circle for the skimmed milk, two for the semi-fat and three for the full-cream. The juice could have squares or lines. Nobody would ever be in doubt of what he is buying as well as what is in his fridge.

Such system of the labelling boxes could be introduced in any other products industry using the boxes as a packaging solution. For example the shoes. Many people store their seasonal shoes in the boxes they bought them in during the time they do not wear them. The boxes for the summer shoes could have different symbols than those for the winter which would serve the visually impaired people in two ways.

Figure 27: Juice and milk boxes

Figure 28

Figure 29

6. WEB DESIGN

Nowadays many web pages are not blind friendly. My anonymous questionnaire already mentioned in chapter 2.3 also focused on a question regarding web design. I have asked what is the biggest impediment in the area of web sites readability as well as what change would help to gain the information more comfortably. The majority of all who answered find difficulties with the text being created as an image which makes the web page unreadable. The big concern was also about badly structured websites and the priorities listed as well as the excess of unnecessary, unimportant and unclear information. All the visually impaired people called for simpler and more well-arranged pages.

According to the specialists in web design for the visually impaired people, supporting the Blind Friendly websites (TyfloCentrum Brno, SONS Czech Republic, 2011) there are several rules all the web designers should take into consideration when building a website, for example:

1. adding the alternative text (alt) to every graphic element
2. the information being communicated through the scripts, objects, cascading styles or images should be available without these elements
3. the tables should be read by the rows
4. the contents of the web page change only when the user activates some element
5. every link includes the description and its target
6. the information being communicated by the colour should be available even without the colour differentiation
7. the background and foreground colours are in a sufficient contrast
8. the font size does not use the absolute size
9. the HTML or XHTML code is valid
10. the correct usage of titles and lists in the code
11. every element within the form has an apposite title

Some corporations require to present themselves with a website that might break some of the above rules as for example the table's structure or the background / foreground colours contrast, but still wish to create blind friendly web pages. It could be solved by a special interface for the visually impaired people or simple additional pages with possibilities to set the background and text colours as well as the text size. The pages would be structured in a simple, one column way focusing on the most important information written in a clear way. A good web design is not only about the proper arrangement of its elements which work well visually but also about its functionality and accessibility. And that is what the visually impaired people need most of all as in many cases they use the voice outcome when browsing the internet and if clear data are received than the clear and understandable outcome is provided to them.

7. GOVERNMENTAL SUPPORT

Graphic designers regularly come up with ideas of how to improve the visually impaired people's life and how to help them to be an independent part of the society. Some ideas would however not be accomplishable without the help of the government or specialised organisations. Makovcova (2011) from the Ministry of Labour and Social Affairs in the Czech Republic confirmed that governments in the European

Union support the organisations focused on visually impaired people or children, as well as the individuals with a wide range of social benefits that vary in each country and are based on the individual's needs. For example in the Czech Republic the state covers 50 - 100% of the purchase cost of specialised and rehabilitation aids helping and supporting the visually impaired people's needs (Czech Republic Ministry of Labour and Social Affairs, 1991).

CONCLUSION

Although it does not seem obvious from the beginning, graphic design for visually impaired people is a wide topic covering many fields and looking into lots of aspects in depth. The historical evolution goes back to ancient Rome and some parts of it are still being developed nowadays, for example the Braille font implementation into certain countries. I am fascinated that all the visually impaired people use this system in exactly the same way no matter their culture, origin or nationality. The Braille font indeed gives big possibilities and I consider it as a unique and wise system. It still however brings impediments that need to be solved which I trust is in the hands of the graphic designers. My main concern is that the text formatting does not allow the books to be printed in a smaller and compact format. This might be the reason the specialised print houses do not print that many materials. Of course the amount of visually impaired people is not the same as sighted ones but they should still have access to any book, magazine, or educational material they need.

The existing ways of interpreting images for the visually impaired people have been improved and the new technologies allow better displaying, however if more technologies are involved, the process of producing the matrixes could speed up. The development of new software could be the solution for completely new ways of displaying images as well as objects which would not only bring a pleasant feeling from reading but could also serve learning purposes and could improve the orientation within the space as well. Such ways would have a significant impact on the printing process as its main concern is the consumption of lots of material and the printed outcome can hardly vary in the term of the size.

There are many technologies for the non-visually impaired people supporting them in gaining information especially when they work with the internet. They can download, stream, watch and search online at a very high speed and the reading is getting faster. The visually impaired people do not have such possibilities and I believe in today's world where we are surrounded by so many technologies there should be a way to improve it. The Braille E-Book is a great example of the innovative approach that more graphic designers should share. The same attitude applies to the field of writing. I understand it is not easy for the visually impaired person to make notes when basically seeing nothing, but again the technologies could help. And not to leave everything on the technologies, the human factor should be involved as well. A new attitude towards these people could help. The wish to change something and to involve more people whether they are the general public or the producers, package designers, shop owners, business men, or even organisations or governments, all of this could help. And although the governments and different organisations support the visually impaired people, I think even more can be done and graphic designers should be those to assist it.

I am sure obtaining the information could be easier if the websites are build in a more proper way following the basic rules which I do not see as anything difficult. The graphic designers should be taught to keep this in mind already when they learn about web design whether it is in the school or from learning materials, while the websites owners should keep the visually impaired people in mind when they are building their websites. Not only the marketing point of view but foremost the functionality and better involvement in the social life for the visually impaired people should be the graphic designers target. ■

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IMAGE LIST

Figure 1 - 3, 5 - 18, 20 - 29: Jakoube, H. (2011) [Photograph].

Figure 4: United Nations Educational, Scientific and Cultural Organisation, National Library Service for the Blind and Physically Handicapped and Library of Congress (1990) *World Braille Usage*. Paris: UNESCO, Washington DC: Library of Congress, p. 21.

Figure 19: Braille E-Book (2009) Available at: <http://gizmodo.com/5219669/braille-e-reader-concept-raises-dots-with-e-ink> (Accessed: 13 May 2011) [Photograph].

APPENDIX 1

suitable for
their selection
and those who
usually and when
is sufficient
ouch.
His font was
of the } English
undertaken
its favour
decreased
systems

By WILLIAM CASLON, Letter-Founder, in Chifwell-Street, LONDON.

Two Lines English.

Quousque tandem abutere, Catilina, patientia nostra? quamdiu nos etiam furor iste tuus elu-

Quousque tandem abutere, Catilina, patientia nostra? quamdiu nos etiam furor

<p><i>Pearl Roman.</i></p> <p>O dii immortales! ubi-nam gentium fumus? quam rempib. habemus! in qua ubi vivimus? hic, hic fuit in nostro numero, P. C., in orbis terrae factitiosum gravissimoque confilium, qui de meo, nostrorumque omnium interitu, qui de huius vultu, atque adeo orbis terrarum exitu cogitavit. Sed ego, sed ego confilii, & de republica ferentis caput: & quae ferro confilii, & de republica ferentis caput: & quae ferro</p>	<p><i>Pearl Italian.</i></p> <p>O dii importanti! ubi-nam gentium fumus? quam rempib. habemus! in qua ubi vivimus? hic, hic fuit in nostro numero, P. C., in orbis terrae factitiosum gravissimoque confilium, qui de meo, nostrorumque omnium interitu, qui de huius vultu, atque adeo orbis terrarum exitu cogitavit. Sed ego, sed ego confilii, & de republica ferentis caput: & quae ferro confilii, & de republica ferentis caput: & quae ferro</p>
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Da he ða mid gnummum ⁊ tint
negum pæced pær ⁊ he ealle þa
pitu ðe him man dyde geþylbelice
⁊ geþeonde for ðurme abær an

Brevier Greek.

Πρόθε· ὁ σοφὸς ἐν τῷ συλλεγμένῳ τῷ περὶ τῆς ἡρακλίας· (ὅτι δὲ ἡ πλῆθυσ ἐπιπλάττειν) ἔτας περὶ τῆς ἀφ' ἧς ἀποφάναι, ὡς πᾶς λίσον, ὅσα ἐν ἡμῶν.

ἡμῶν μὲν ἡρακλία, ἐπὶ ἐκ παλαιῶν ἐκ τῶν ἀρχαίων, (ἐν ᾧ οἱ νῦν αὐτοκράτορες

Comparison with the specimen sheet of 1734 shows this to be a printing of the identical type specimens but with the address changed in the second line.