

THE LABOR MARKET AND DIGITAL RESOURCES FOR THE VISUALLY IMPAIRED

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ABSTRACT

The objective for this article is to show, in some situations, how to utilize Information and Communication Technology (ICT) to insert the visually impaired into the labor market. The impaired can perform a variety of activities within organizations, since businesses that create hardware and software are concerned with accessibility. The Internet has opened up a new world of possibilities, making information and knowledge available to the impaired. The invention of new equipment permits the creation of new work processes, giving the impaired the ability to actively participate in the labor market. Changes in Brazilian legislation have provided incentives to businesses that have managed to include and hire the impaired. Nowadays, the impaired are carrying out a diverse amount of activities existent in the labor market due to the conditions made available through digital resources and the specific criteria for accessibility within the WCAG (Web Content Accessibility Guidelines).

Keywords: *accessibility; visually impaired; digital inclusion; labor market; ICT; digital resources; WCAG.*

1. INTRODUCTION

The evolution of Information and Communication Technology (ICT) is a fact that should be considered. Despite its recent emergence, it has already reached unforeseeable dimensions, be it in the workplace or be it as a universal mechanism to access cultural goods by the population.

The following are definitions for the diverse concepts, according to their sources.

The information system, as defined by O'Brien (2010, p.6): "is an organized combination of people, hardware/software, communication networks and resources of collected data which transforms and disseminates information throughout the organization. People are increasingly relying on information systems for communication by using a variety of physical devices (hardware), instructions and procedures for information processes (software), channels of communication (networks) and stored data (data resources)."

The Internet revolution as defined by O'Brien (2010, p.169): *"The explosive growth of the Internet is a revolutionary phenomenon for computers and telecommunication. The Internet has converted itself into the largest and most important network center and it continues to evolve. The Internet is constantly expanding as more and more businesses, organizations and their users, computers and networks adhere to this global network."*

ICT, according the definition by UNESCO (2015): *"Information and Communication Technology (ICT) have an increasingly important role in the way we communicate, learn and live. The challenge is effectively equipping these technologies in a manner that attends to the interests of those being educated and the great community of teaching and learning."*

ICT, as defined by the website Wikipedia (2015): *"Information and Communication Technology corresponds to all types of technology that provide interface and mediate the informational and communicative processes between people. It can also be seen as the combination of integrated technological resources provided through hardware, software and telecommunications, the automation and communication of business processes, scientific research and educational teaching and learning. It can be said that the main reason for the growth and enhancement for the use of ICT in a variety of fields was due to the popularity of the Internet."*

Visual Impairment: blindness and poor vision. On the website Bengala Legal (2015), which is a well-used site by the visually impaired community, the definition for blindness and poor vision can be found. Developed by Antonio João Menescal Conde, from the Benjamin Constant Institute, and revised and updated by Marco Antonio Queiroz states: *"Blindness or subnormal vision is present from the complete lack of sight to partial perception of light which can determine shapes from a very short distance. Medically speaking, ophthalmologists use two scales to establish the grouping of visually impaired patients: visual acuity (those that can see at a determined distance) and field of vision (the amplitude of the area visually reachable). The term, visually impaired, does not necessarily mean the complete incapacity to see. Actually, we can find people with visual impairments that have various levels of residual vision. Complete blindness or simply AMAUROSIS, implies a total loss of sight. Vision is null and not even the perception of luminosity is present. The term 'zero vision' is used in ophthalmological jargon. Medically speaking, a person is considered blind according to the following criteria: if corrected vision for the patient's best eye is 20/200 or less, that is, if they can only see at 20 ft. (6 meters) what a person with normal vision can see at 200 ft. (60 meters), or if the widest diameter for their field of vision is limited to 20 degrees, even if their visual acuity in this narrow field is above 20/200. This restricted visual field is commonly known as "tunnel vision" or "pinpoint vision". In this context, an individual is characterized with subnormal vision if their visual acuity is 6/60 and 18/60 (metric system) and/or a visual field spanning 20 to 50 degrees."*

The existent specific criteria of accessibility for the impaired can be found within the *Web Content Accessibility Guidelines (WCAG)*. The WCAG Guide, which is used around the world, pertains to the *World Wide Web Consortium (W3C)*. It establishes and publicizes accessibility standards in accordance with each specific type of disability. The W3C consortium is coordinated by the Massachusetts Institute of Technology (MIT), the European Research Consortium for Informatics and Mathematics (ERCIM) and Keio University (KEIO).

By means of combining a voice synthesizer and a screen-reader installed on a computer, smartphone or tablet, not only can a person that is visually impaired access, hear and understand what is written on any text, but they can also write and communicate with other people. In these cases, this eliminates the need to use the *Braille* method for communication. Examples include email and other applications that the visually impaired can use to send and receive messages. Access to the Internet is fundamental for the visually impaired to enjoy the enormous quantity of accumulated information. In general, the visually impaired use headphones to hear the voice synthesizer. It is interesting to note that the visually impaired can work without turning on the computer monitor, since the correct interpretation of data is done by the screen-reader software, then transmitted directly to the voice synthesizer and ultimately to the visually impaired user.

Any descriptions concerning information technology very soon becomes obsolete, according to Castells (2008, p.57): *"The short, yet intense, History of the Information Technology Revolution has been recounted many times in the past few years and is unnecessary to give the reader its complete narrative. In addition, due to the accelerated cadence of this revolution, any other description becomes obsolete. Even in the short span from when this book is written until the time it is read."*

A great number of tasks can be developed on the Internet since it is connected to businesses, schools, governments, non-profit organizations, newspapers, magazines, libraries, etc. Scientists and millions of people

from all walks of life and professions, have the ability to process and obtain the information they need from anywhere on the planet by means of a computer, tablet, smartphone, netbook, phablet (the touchscreen devices that combine the resources of a smartphone and a tablet), information systems and various other types of equipment.

With the advancement in Computers and the Internet, we need to consider the importance of the amount of knowledge available to all of humanity, as described by Lévy (2001, p.79): *...offering the Internet to the entire world, the scientific community provided its collective intelligence and supplied the technical infrastructure, which without a doubt, is one of its profoundest discoveries. They have given humanity their best invention. One, which came from their very own sociability: humaneness and communication. This collective intelligence, refined over centuries, is perfectly embodied by free will, which the Web and its virtual communities provide, becoming interconnected, cooperative, competitive and without borders.*"

Businesses and centers for research are constantly inventing new equipment to access the Internet. In the labor market, it is commonplace to find a computer for each employee in a business. Employees communicate with each other via email and other apps, navigating on the Intranet, Extranet and Internet. New tools appear daily, changing the concept of communication. Due to e-commerce, people are going shopping without having to leave the house, as said by O'Brien (2010, p.22): *"e-commerce is the buying and selling, marketing, product assistance, services and information accomplished on a multiplicity of computer networks."*

In contrast to all this evolution, there is a great quantity of people around the world that are excluded due to a number of reasons. Within this category is a particular group of people who do not know about and do not partake in the evolution of Computers. They are the digitally excluded. The citizen that is deprived of access to information technology and communication is essentially, a modern day illiterate, since they are being excluded by the information age. We are witness to two types of worlds. The first, where people can enjoy the evolution in information technology, communication and the Internet, and a second, where millions of people are digitally excluded and detached from the advances in technology in a new digital world.

The access to the resources of information technology and communication facilitate the development and shaping of the visually impaired, giving them access to a respectable gamut of information on the internet and existent computing sources, as well as inclusion into the labor market. The same market that utilizes equipment and software, which are invented daily and contemplate the resources for accessibility.

To give a person that is visually impaired access to the Internet, it is *not* necessary to develop a special website which may remain unknown. This misunderstanding furnishes a type of exclusion, which without a doubt, can be avoided. When the very same elaborators for Internet content find it necessary to create a special website without images, for the sake of accessibility, exclusion becomes even more accentuated. The current importance of the Internet is shown by Laudon (2010, p.184): *"We all use it. And a many of us believe that we can't live without it. The Internet has become an indispensable tool in our professional and personal lives."*

Before the advent of accessible software and hardware, the blind, amongst others with disabilities, faced some of the most restrictions in regards to accessibility, since they did not possess the physical attributes necessary to see and access the content provided by a computer monitor, smartphones, tablets and other equipment. A fact which did not occur in the sphere of the physically, hearing or mentally impaired. The arrival of equipment that gives accessibility to the visually impaired has permitted their insertion into the labor market. At the present, equipment and software are being produced which provide accessibility to the visually impaired, especially the blind (the severest form of visual impairment). The Bengala Legal website explains: The term visual impairment does not necessarily mean the incapacity to see. In fact, in regards to visual impairment, we can find people with a varying degree of residual sight.

The actions exercised by the International Labour Organization (ILO) have contributed to the creation of the 'Quota Laws'. Years of work done by this multilateral agency of the United Nations and other international organizations were adopted by Brazil with the goal to decrease the exclusion of the disabled in the nation's labor market. According to Mendonça (2010, p.50): *"...the recommendations of the ILO provoke and evoke important discussions and are promoters for the evolution of legislative measures by nation-members of the ILO. For this reason, we can verify the credibility this organization has, not only in favor of the equality of rights for the physically impaired in Brazil, but for those all over the world."*

On July 24th, 1991, the Federal Law number 8,213, also known as the 'Quota Law', established the legal right to obtain employment for the disabled. The obligation of the law created positive perspectives for the insertion,

growth and development of professionals with impairments into Brazilian companies. The insertion occurred mainly because of legal and social impositions. The law instituted several worker protection policies to avoid any awkwardness for people born with disabilities. Article 93 states, "*Article 93: A company with 100 or more employees is required to use 2-5% of their positions for people with prior criminal convictions or with physical disabilities, in the following proportion:*

I – up to 200 employees = 2%

II – from 201 to 500 employees = 3%

III – from 501 to 1,000 employees = 4%

IV – over 1,001 employees = 5%."

Companies are inspected and are fined for not hiring the impaired. As confirmed by Ragazzi (2010, p.131): "*The company that does not obey the law may be administratively fined, through a fiscal audit in accordance with Article 627-A of the Consolidation of the Labor Laws, and will establish a Term of Commitment. If not fulfilled, a report will be sent to the Regional Deputy of Labor and submitted to the Public Department of Labor, where an adjustment of conduct will be confirmed for the fulfilling of the aforementioned employment vacancies, under penalty of a fine.*"

By practicing inclusion through management, many businesspeople see hiring the impaired under the Quota Law as something positive, providing greater visibility for business in the market as a whole. As stated by Mendonça (2010, p. 233): "*it should be highlighted that people who make social investments improve their access to capital with an increase in support from their investors.*"

2. DEVELOPMENT

Exclusion is a process that alienates and places inferiority on people, groups, communities and territories in relation to centers of power, resources and dominant values. An individual is excluded when they do not possess or participate in a determined space. On the contrary, if they do possess or participate in a determined space, they are considered included.

Although cases of exclusion against people, groups and territories can be traced throughout the history of humanity, the use of the word 'exclusion' originated in France and first appeared in 1974, published in *Les Exclus*, by René Lenoir. The book written by Lenoir coincides with the end of the era known as the *thirty glorious years of development* (1945 to 1975) and the beginning of a critical period for Western economists which was marked by the oil crisis, a rise in prices and the subsequent increase in poverty and exclusion.

There certainly exists a diverse group of people that are socially excluded, such as: those who cannot obtain formal employment, people without permission to access existing technology and the Internet, the illiterate, those without access to dignified healthcare as well as goods and services in general like, public safety/justice, the lack of a quality education, those that are physically or mentally disabled, drug addicts, convicts, abandoned children, the homeless, people who live in places of conflict, immigrants and those from racial, religious, linguistic and ethnic minorities.

Digital exclusion is a contemporary form of exclusion, which is interwoven with so many other forms of exclusion, or brought on because of them. By different intensities, it affects various forms of societies and collaborates with the amplification of social abysses.

On the other hand, *digital inclusion* is represented by the sum of forces of people and institutions (conscious of the importance of both), which help remove the barriers caused by exclusion. Their overall objective is to restore dignity, fully enjoy the information society and possess the right to access the blessings provided by technology.

The digital exclusion or inclusion of a citizen is generally the product of a collection of factors that determine the situation. A single factor, such as illiteracy, can be a determining factor in digital exclusion. Software, Internet websites, access providers and other instruments need to take into account the necessities of people. Guaranteeing accessibility is intimately related to the manufacturers of software and hardware and the creators of Internet content. They are the ones that respect the criteria that guarantee accessibility which appeal to the visually impaired.

Paulo Freire (2002, p. 60) states: "*After all, my presence in the world is not one of adaptation, but of insertion. It is the position of someone that fights not only to be an object, but also a subject in history.*"

Furthermore, it is perceivable that when talking about the Internet, nothing can be classified as definitive since new forms of access are discovered at every instant. Before long, the tendency is for simpler and cheaper means of access to appear, which will intensify the expansion of this great network at an unbelievable rate. This progress, which is the reward of such a great conquest, would in theory, benefit society due to instant availability from a respectable archive of accumulated knowledge. However, it should be remembered that what today is fascinating in regards to the Internet, information technology and communication, will certainly result in completely obsolete technology in the future.

The visually impaired do not wish to have special instruments manufactured since all software and hardware should contain a universal design, serving all people indistinctly.

To better understand the concept of products which serve all people indistinctly, the following is an example for the definition of a universal design according to PRODAM-SP (The Sao Paulo Information Technology and Communications Company) (2015): *“Universal design is the manner of conceiving products, means of communication and environments to be used by all people, for the longest amount of time possible, without the need for adaptation and benefits people of all ages and capacities. The concept of a Universal Design presupposes equality in the possibilities of use, flexibility of use, simple/intuitive use, the acquisition of information, the tolerance for mistakes, dimensions, area for use and interaction.”*

It is important to note the amount of Brazilians with disabilities. According to the Brazilian national census (IBGE 2010), 23.9% of the population possesses at least one type of disability. Whether visual, hearing, physical, mental or intellectual, that percentage comes out to 45.6 million people with a form of impairment. As specified by the IBGE census at the time, the entire population was estimated at about 190,755,799 inhabitants. Out of that number, 18.8% were visually impaired. That equals to 35.8 million people. Hence, the majority of the population with a disability was visually impaired. In view of this significant detail, it is at the minimum reasonable for manufacturers of equipment, software, Internet websites and access providers to take into consideration the necessities of the impaired.

As clearly indicated, access to information is set forth as an essential human right. Human beings that can obtain timely and necessary knowledge through universal accessibility are more apt and capable of making correct decisions. The future of democracy will most likely be one that facilitates people’s access to education and information, thus permitting a full grasp of citizenship.

An example of the indispensability of Internet access to the visually impaired is conveyed by Castells (2008, p. 220): *A new communication system which increasingly speaks a universal digital language is providing a global interaction for the production and distribution of words, sounds and images of our culture as well as customizing them to our individual tastes and identities. The interactive network of computers is growing exponentially, creating new forms and channels of communication, shaping life and at the same time, being created by it.”*

To further understand the question of giving the visually impaired access to software, hardware, the Internet and how they can utilize the tools of information technology and communication will be shown in the following examples and how accessibility occurs.

When the visually impaired, and especially the blind, access the Internet on a computer, they only use keyboard commands (not being able to see screen content, a mouse is not used) and screen-reader software, which scans the screen from top to bottom and left to right. Through the use of headphones, everything on the screen can be read, heard and understood.

To understand image content, the visually impaired need an explicative text associated to the image describing its meaning. Despite thinking that images should *not* be included, it is recommended that *all* images should be included for better accessibility. The presentation of an equivalent text for each image generates a more accessible text.

Textual content for the visually impaired can be presented through synthesized speech or in *Braille*. Each of these two processes is directed to different senses to make information accessible. Hearing in the case of digital speech and touch for *Braille*.

If the impaired user understands the relayed message comparable to a non-impaired user, it is considered as an equivalent text.

With the goal of understanding Internet accessibility of the impaired to a greater degree, the following example will present the same situation in two distinct moments:

Situation 1 – Imagine the basic concept of accessing a website on the Internet. Visualize the screen and the mouse arrow icon. Now, move the arrow in different directions to make sure it works. After that, move it to the right of the screen. On the upper right-hand corner, there is a small specific image. Click on this image and you will automatically be sent to a different screen. It is a link (gives access to new subjects, screens or other websites). In other words, a command was given, and once clicked, permits the user to go from one screen to the next on the Internet.

Situation 2 – This time, imagine facing the screen and having your eyes closed the entire time. Reach for the mouse and repeat all of the commands given in Situation 1. The user will not advance far. Firstly, they wouldn't have the slight clue of the position of the arrow icon on the screen. In fact, they wouldn't know if the mouse was even working. Moving the mouse back and forth has no significance.

In an incredibly didactic way, this situation illustrates what happens when someone who is visually impaired, and is completely dependent on vision to execute commands on the computer, is incapable of performing basic functions.

A blind person only utilizes keyboard commands to access the Internet. When they come upon an image created by an "Internet content developer", they may only receive a message describing it as: "Image 1", leaving the impaired user with no idea of the image content.

Let's present the same situation in a different manner. A professional "Internet content developer" who understands the necessities of the visually impaired and has the technical ability to describe content, would never use the term "Image 1". The proper explanation for an image would be described as: *Sunset on the Atlantic Ocean, showing the effect of sunlight on the waves*. In this manner, the visually impaired user obtains accessibility and comprehension of the images.

A new world has opened for the visually impaired, as described by the website, Bengala Legal (2015): *"With the use of text editors, screen-readers and voice synthesizers, we can exchange emails with people from all over the world. With complete independence, we are able to read anything digitalized. Be it a Brazilian or international newspaper, book, forum or game made especially for us! The digital world is so pioneering that nowadays, we can talk or exchange emails with the deaf without either of us knowing that the other has an impairment. On a computer screen, our software can read everything, only one line, one word or even one letter, when we have a doubt about what is written."*

The majority of the visually impaired, especially professionals, who participate in the digital world, affirm that software developers should create more shortcuts to digital resources that are released in the market, to facilitate operation via the keyboard.

The lack of specific keyboard shortcuts (whose additions would not be extensive) can make life difficult for the visually impaired in the digital world, jeopardizing their employment and entrance into the professional labor market.

For those without visual impairment, when we go to a website and move the mouse over icons on a computer screen, each meaning is revealed to us through sight. If the software developer fails to include the enunciation for each icon, they have no significance whatsoever to the visually impaired. On the Internet, if no text is present to clarify the meaning for each icon, the impaired user will need to go over each one to find out the contents on the page.

Nielsen (2000, p. 302) provides an example for the urgency of the inclusion of the impaired. *"The more serious problems for accessibility, given the current state of the Web, is related to users who are blind or have other visual impairments, since the majority of pages on the web are highly visual."*

After performing research in several countries, a lot of experience has been accumulated in regards to accessibility for the visually impaired and can be found in the *Web Content Accessibility Guidelines (WCAG)*. This guide establishes and publicizes the standards for accessibility for all types of impairments. The guide is renowned for its credibility and acceptance by impaired users as well as software manufacturers, specialists in computers, worldwide entities and the everyday Internet user.

In the United States, the visually impaired were the first to lay claim to accessibility for the impaired on the Internet and opened up discussions on the subject. To answer the expectations and standardize accessibility to

the disabled, the *World Wide Web Consortium (W3C)* (2015) created the *Web Accessibility Initiative (WAI)*, who devised the WCAG accessibility guide, awakening the world to accessibility on the Web. As explained beforehand, the *World Wide Web Consortium (W3C)* is an international consortium that establishes global standards on the Internet. The following members coordinate this group: the Massachusetts Institute of Technology (MIT), the European Research Consortium for Informatics and Mathematics (ERCIM) and Keio University (KEIO).

3. FINAL CONSIDERATIONS

The visually impaired use accessible Internet, hardware and software for their activities in companies, generating greater participation in the labor market. The visually impaired need to face the same obstacles as the digitally excluded. They need to acquire and learn how to use computer equipment, software and hardware to be able to access the digital world.

The visually impaired find the Internet as useful as anybody else who uses it. They can access and read a digital newspaper, which is phenomenal, since the paper format is illegible to them. When transformed into Braille, the news is no longer up-to-date, since the language transformation process is slow.

The arrival of the Internet has given the visually impaired the opportunity to come in contact with an amount of information that was unthinkable in the past. The Internet also provides access to information, libraries and dictionaries from all over the world. A complete translation into Braille would be an impossible task. Present resources in the digital world stimulate the impaired to perform activities that would be difficult using outdated technology.

When the visually impaired encounter difficulty on a determined webpage on the Internet, they search for information on another, simpler webpage. This process is basically the same for everyone that uses the Internet. However, regardless of who is accessing the website, developers should be concerned with installing more didactic navigability, making it more accessible and user friendly. This criteria is used to design websites that give importance to structure, information clarity and the facility to navigate for Internet users.

Upon completion of a book, once digitalized, it can be read using a screen-reader and heard using a computer's synthesized voice, greatly increasing the quantity of editions available in comparison to those published in Braille. A digital scanner can be used, for example, to replicate any image or text on a page and then is sent to an Optical Character Recognition (OCR) software, which has the ability to identify the text content and make it available as an accessible archive. OCR is a system of converting scanned printed/handwritten image files into its machine-readable text format.

The use of ICT and the resources that are important for anyone who uses the Internet is even more paramount for the blind, since they had no prior access to the quantity and variety of information available. Paulo Romeu Filho, who is visually impaired and is a speaker for various institutions, including the Visually Impaired Group of Brazil, made the following statement. It shows the expectations in regards to Internet accessibility for the visually impaired. *"The visually impaired are conscious of the fact that they will never partake in the Internet in the same way as other citizens, however, we hope to arrive as close as possible. For this to happen, it is imperative for all the content on webpages to have the necessary resources for accessibility installed, which have already been invented."*

The Internet has also made communication easier for all of the impaired throughout Brazil. This is one more way to strengthen communication and unite the visually impaired in the fight for their rights as a part of society. The amount of content on the Internet is good. The bad parts are the existent obstacles of a poorly designed website which the impaired need to overcome. In terms of information and the provision of services, what is good for the visually impaired is also good for the person that can see. In this context, the Internet is an ocean of information and it is up to each individual to find what interests them.

The software that provides accessibility is the software that will be used. The impaired use accessible software designed by *Microsoft*. In the Section 508 Amendment to the Rehabilitation Act of 1973, public institutions were orientated to preferably buy software that is accessible to people with disabilities. It encouraged American companies to invest in products with accessibility, since the American government is a substantial client.

The visually impaired use software such as, but not limited to: *Jaws*, which reproduces computer screen content through a voice synthesizer, *Reflection Terminal Emulation*, which emulates the use of a mainframe terminal,

DosVox (an operational system), *Virtual Vision*, which enables the use of *Windows*, *Office*, *Internet Explorer* and other applications through menu and screen readers of the programs and transmitted via a voice synthesizer. The fact that all of the *Microsoft* programs have similar models, makes it much easier to access their software when compared to the access of a variety of websites on the Internet, where each one is constructed in a different way. All of which end up using *Microsoft* products, which has been determined by the market and is no different for the visually impaired.

For the people who were alphabetized in Braille, the computer is also useful because it permits communication by email to people who not read Braille. Despite all this, Braille is very useful in the initial alphabetization of the blind. Although it requires the sense of touch, Braille requires the blind to learn how words are spelt. The computer does not teach how to read words correctly.

Internet access and ICTs represent a means in which the visually impaired can become trained or qualified for a number of activities. Through these methods, conditions are enabled for effective communication and inclusion into the labor market.

The fact of not being able to see does *not* impede the visually impaired from using a digital medium and Internet access since it is currently attainable. As was previously stated, through the use of a voice synthesizer and screen-reader installed on a computer, not only can the visually impaired access, hear and understand what is written in any text, but they can also communicate with other people. A good example of this is their use of email, generally used to send and receive messages. After all, the use of digital resources aids the visually impaired in many activities, makes learning less of a challenge and facilitates their inclusion into the labor market.

Current digital resources and the Internet permit the visually impaired to become able to understand and operate labor processes in a wide range of companies and organizations, which contribute to their inclusion into the labor market. The creation of the Quota Laws, which determines that a specific percentage of the disabled must be employed in proportion to the total number of a company's employees, also establishes their inclusion into the labor market.

Making sure that the basic needs for digital inclusion are met for all citizens alike, conforming to the criteria for Internet accessibility and *not* considering the visually impaired as the exceptions, but as the rule, it is possible to provide them with unlimited access to information; contributing to their education, development, the formation of their knowledge and their inclusion into the labor market.

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