Inclusion of Individuals with Disabilities through Assistive Technology at Workplace

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Abstract

Assistive Technology (AT) requires an accommodation based on a system or a computer that allows a person with disability to work through or compensate for a impairment and improve person capability (Goddard, 2004). This research is conducted to identify the various assistive technologies applicable for the persons with disabilities (PwD) at work place. This study aims at understanding the key aspects such as inter communication technologies (ICT's) which is result of disruption of technology making assistive technologies cost effective. The study also highlights the role of assistive technologies in accommodating PwD at workplace. The barriers that the PwD and the employers face in implementing the assistive technologies at work place have been explored to an extent. Lastly the research comprises of general disability issues and provides recommendations for disability accommodation guidelines for assistive technology at work place. An exploratory research approach has been adapted to gain a better understanding about research objectives. The data collection methodology is based on secondary data available from various reports and research papers. The analysis is purely qualitative in nature. This research would result in understanding the role of assistive technologies in accommodating PwD at workplace and means to overcome the barriers in implementing assistive technologies

Keywords: Assistive Technology, Persons with Disabilities, Inclusion

1. Introduction

Persons with disabilities (PwD) in India are increasing every year at a rapid rate which makes it necessary for them to get employed for the growth of the economy. In 2001, the number of PwD in India were over 21 million (Census 2001) which has risen to 26.8 million in 2011 out of which only 5.8 million PwD are only employed. One the primary reasons for the huge gap in employment is the perception of employers towards implementation of assistive technologies and unawareness of PwD regarding these technologies. Very few employers are aware of information about the various assistive technologies available and applicable for the PwD due to which a pre-mindset has formed which has resulted in development of barriers in implementing assistive technologies at work place. Lack of understanding the key elements for the successful implementation of assistive technologies exists in the current scenario. This makes it imperative to identify the barriers that the PwD and the employers face in implementing the assistive technologies at work place. In order to understand the barriers, identification of various assistive technologies applicable for the persons with disabilities (PwD) at work place becomes essential. Assistive technologies can be used as strategy for organization performance improvement. Understanding the cost benefits of assistive technology should be not only an integral part of the culture of any ethical, socially responsible organization but at the heart of any business' competitive strategy.

2. Methodology

There are three broad objectives of the research. The first objective is to identify the various assistive technologies applicable for the persons with disabilities (PwD) at work place. Second, to understand the key aspects and role of inter communication technologies (ICT's) and assistive

technologies and third is to recognize the barriers that the PwD and the employers face in implementing the assistive technologies at work place.

An exploratory research approach has been adopted to gain a better understanding about research objectives and obtain clarity about the current state of assistive technologies for PwD at workplace. Hence this research will provide a basic platform to conduct an in depth research in future. The research objectives were discussed with varying degrees of scope, since this is an initial study that will form the basis for more definitive study. More over few studies has been done till date with regards to assistive technologies for PwD at workplace hence this is an effort to gain more insight.

The purpose of data collection is to gain insight into the research question by investigating and understanding the phenomenon, so that a qualitative approach to collection of data is planned, though in-depth analysis of available secondary data. Various reports published by authoritative bodies which shares the macro picture of the research goals. Apart from these reports, data from the latest Census, editorial published in websites, e-newspapers, research papers published in international journals of repute, official blogs of several organizations are the other sources from where the secondary data have been collected associated to assistive technologies for PwD at workplace. The research involves a thorough analysis of the facts and figures mentioned in the various research findings from multiple sources. The research involves a consideration of a secondary surveys conducted on disabled people and conclusions are drawn accordingly.

As per the last Census conducted in India i.e. in 2011, eight types of disability (disability in seeing, in hearing, in speech, in movement, in mental retardation, in mental illness, any other and multiple disability) were taken into consideration. Hence the statistics till date available with us are based on the data collected in Census 2011. The maximum number of PwD as per the Census 2011 was in three categories i.e. disability in movement (20%), disability in hearing (19%) and disability in seeing (19%). Hence for this research, three categories of disabilities have been focused while identifying the relevant assistive technology for them which are orthopedically handicapped (OH), visually Handicapped (VH) and hearing handicapped (HH).

Orthopedically Handicapped contain two sub-categories: locomotor disability and cerebral palsy. Locomotor Disability signifies impairment of the bones, joints or muscles resulting in severe restraint of the movement of the limbs or of some type of cerebral palsy. Cerebral Palsy is a category of a person's non-progressive disorders marked by an irregular motor control posture resulting from brain attack or injury that occurs during the pre-natal, peril-natal or infant developmental period. Hearing with disabilities (HH) requires impairment in the conversational frequency range of more or equal to sixty decibels in the better ear. Visually Handicapped (VH) relates to Blindness in which an individual suffers from any of the following circumstances i.e. Total loss of sight or visual perception that does not surpass 6/60 or 20/200 in the better eye with lens correction or is theoretically capable of using vision for the preparation or execution of a job with suitable support. (RPwD Act, 2016)

3.Literature Review

Assistive technology (AT) is an object, piece of equipment, software program or product system used to improve, sustain or enhance the functional ability of disabled persons (George, 2011). Video magnifiers, electronic scanners, image recognition software, amplification software, voice processing function and electronic Braille devices etc. all offer a remedy for a specific disabled person and these computer system -related supports and tools are generally referred to as 'assistive,' 'adaptive,' 'connect' or 'enabling' technology. People can use the grouping of those technologies to allow them to communicate and function in the electronic world. (Brophy & Craven, 2007) Simply put, Assistive technologies means objects, tools or equipment which are used to preserve, enhance or strengthen the functional competency of disabled persons (Sanaman & Kumar, 2014)

As per Section 2(t) of the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995, "persons with disabilities means any individual who is suffering from minimum 40 percent of any disability from the above categories as certified an authorized medical practitioner."

(Jakovljevic & Buckley, 2011) focuses on research findings in assistive technology in a business context, and obstacles to the employment of people with disabilities in the South African context. A relatively low number of people with disabilities were found to be employed by participating organizations that did not seem to be focused on these persons while formulating their policies and ideas. Additionally, technical elements of the code remain majorly unrecognized, with no attempt being made to address the requirements of people with disabilities (Thiyagu, 2015). An even lower example of the use of assistive technology was found, along with a considerable number of conceptual and perceptual barriers that impede the jobs of people with disabilities and the adoption of technology (Jakovljevic & Buckley, 2011).

(Butterfield & Ramseur, 2004) suggests that there is a need to define clear obstacles to jobs with related facilitators that lead to the successful jobs of people with disabilities such that workplace accommodation goals that can be identified for potential initiatives that improve job outcomes for people with disabilities.

A participatory action research study recognized as Community Assistive Technology Research surveyed disabled people using Independent Living Centers across California in part to recognize barriers to jobs and study the use of work specific AT to address these barriers. The main cause of unemployment has been found to be poor education, the main reason for them being self-esteem. More over workers had to compensate for their own things at work (Yeager, Kaye, Reed, & Doe, 2006).

(McCreadie & Tinker, 2005) reflects on the acceptance of AT by elderly people and discusses one portion of an interdisciplinary research project investigating the viability, acceptability, costs and effects of implementing AT into their houses. During 2001, sixty-seven adults aged 70 or older were surveyed in-depth to learn about their use and knowledge with a wide variety with assistive technologies. Results suggest a complex acceptability model that combines a 'real need' for assistance with 'product quality.' The article concludes by considering the possible tensions in the provision of appropriate assistive technology.

(Raja, 2016) states that the integration of public and private service development through information and communication technology (ICT) and the growing number of modern ICTs that can be used as accessible tools is changing the technology-enabled development paradigm for disabled people. The Internet and ICT offered an overview of the prospects for the complete participation of people with disabilities. The paper discusses the key obstacles to achieving ICT-enabled integrated growth and provides cost-effective policy and practice suggestions for governments and growth practitioners.

4.Results and Discussions

Knowledge of Assistive technology for PwD: An effort to assess the technology needs of a individual before understanding the desires of the individual can lead to the procurement of assistive technology or skill training in the use of a tool that does not translate into a competitive position in jobs. Additionally, identifying aid technology goods without knowing what the user needs to do can be difficult, if not impossible. Requiring the technology to be identified and purchased prior to job search may delay stakeholder access. A person can learn to use an assistive technology system as a precondition for job which is not consistent with the job responsibilities negotiated. Before employment the recognition of assistive devices must be regarded if the device enhances the functional ability of the person in any environment. In other words, the procurement of AT must correlate to an individual's practical need, rather than requiring devices to be defined as a precondition for employment.

Ideally, interviews and observations must take place when performing an activity chosen by the participant in an environment of the person's choice. Using an event chosen by a job applicant with a severe impairment can give insight into his or her interests and skills. The employer can determine if the person should select an activity, set up and decide a way to get to the place, use his / her independent wheelchair, use public or private transport, etc. The recruitment specialist should be able to assess the physical capability of the person for those with a locomotor disability. The recruiter should be able to determine how the abilities of the person can be applied to a task, considering the assistive devices and other facilities in the workplace, as well as key

details that the individual offers. Without this information, a person can be "matched" to a job which is physically uncomfortable even with the use of assistive technology services and equipment.

Responsibility of determining the type of assistive technology required for PwD at workplace: Specialists in jobs who deal with people with orthopedic disabilities also very effective at finding solutions and creating low-tech tools. In certain cases it may need the guidance of a qualified specialist. An organization may require the help of a specialist who offers technical assistance such as a rehabilitation specialist or medical, physical and/or speech therapist.

Extent of Customization of a job for PwD who is unaware of assistive technology – An Employer's View: Although learning how to use devices should not be a requirement for jobs, it can be very beneficial to recognize the assistive technology an individual already uses. How the job applicant uses assistive technology tools to complete the practical tasks should be decided. This knowledge can be gathered by casual interviews, at the time of meetings of person-centered preparation and while observations. Recognition and selection of appropriate assistive technology will start during the work negotiation and customization process.

Cost Factor of assistive **technology:** Merely rearranging the setting will make available a work-place and cost little. Low cost technology approaches seem to be less costly, whereas high-tech technologies will cost a great deal.

Various Assistive Technologies available for the PwD:

Software /Hardware available for the orthopedically handicapped (OH):

Dragon Naturally Speaking: Dragon Naturally Speaking is a voice recognition software package created by Newton, Massachusetts 'Dragon Systems that integrated with Lernout & Hauspie Speech Products and was later purchased by Nuance Communications, previously recognized as ScanSoft.

Prothetics and orthotics are health areas for people with amputations and supportive devices (orthoses) and people with musculoskeletal impairment or neurological disabilities that deal with artificial limbs (prostheses).

Smart Walker: Smart walker is the latest breakthrough in orthotic technology for gait preparation. Designed and produced by Advanced Orthotic Designs in Canada, the SMART Walker helps a person with cerebral palsy, or similar physical disability, to learn to stand up with hands-free assistance and ambulate. The device consists of two main components: a tailored brace fitted around the trunk and lower limbs of the person, and a durable wheeled frame available in various sizes.

Adaptive furniture: For individuals with mild to moderate physical participation, adaptive furniture has been built as a seating option and is available in three sizes.

Software/ Hardware available for the visually Handicapped (VH):

SAFA - SAFA Reader is an Indian language screen reader. Advancements in electronic speech have led to the creation of screen reader applications capable of capturing text from the device and converting it into audio form, which is then used by visually disabled individuals or low vision people.

JAWS - Job Access with Speech (JAWS), the most common screen reader in the world, designed for computer users whose loss of vision prevents them from accessing screen information or navigation with a mouse. JAWS provide speech and Braille processing for the most common personal computer applications.

Windows Eyes- It is the most accurate screen reader accessible in Windows 2000, Windows XP, Windows Server 2003, Windows Vista and all Windows 7 versions in the market today.

Zoom Text Magnifier/Reader - It is a fully optimized read and magnification system designed for users with low vision. Magnifier / Reader automatically resizes and enhances everything on the

computer screen, reflects the typing and important software operation and reads papers, web pages and emails automatically.

Duxbury - Duxbury Systems is world pioneer in Braille applications. The Duxbury Braille translator is used by virtually leading Braille publishers all over the world. Duxbury fully supports the world's most number of languages.

Scanner/Reader: Technology for scanning and reading starts with the use of a printer to scan paper documents onto a PC. Software will then convert into digitally so that it is readable and editable. This process of translating a text image, such as a scanned paper document or an electronic PDF file, into computer-edited text is called an optical character recognition (OCR) process.

Talking Calculator: This will check the accuracy of pressed keys and provide user input when making calculations. A talk calculator is a cost-effective and useful tool for those with mathematical disabilities.

Braille Printer/Embosser: Braille printers collect data from electronic devices and use solenoids to monitor embossing pins to emboss information on paper in Braille. Usually, braille printers print on heavyweight paper and use more pages for the same volume of information as normal printer papers.

Software/Hardware's available for the hearing handicapped (HH):

Dragon Dictate: It is a speech recognition software package which can be used by hearning impaired people.

VV Talker: It is an electronic tool particularly designed for those with hearing loss. It helps to overcome difficulty in speaking effectively. People, who find learning faster as a challenge, can use this tool that makes the learning process quicker and more accurate.

TTY: Fitted with a keyboard and a small visual interface, this tool helps users to type and send their messages over phone lines. Two deaf people can communicate directly with one another using TTY.

I Communicator: It makes successful two-way contact possible for the deaf, hearing-impaired or experiencing particular communication difficulties.

eSpeak: It uses a method called "formant synthesis." This enables the provision of several languages in a limited scale. The voice is audible, and can be used at high velocities, but is not as realistic or smooth as larger synthesizers that are based on recordings of human speech.

Assistive listening System: Assistive listening technology is used to enhance people's hearing capacity in a number of conditions where no voice can be detected in noise. Sometimes, it's almost impossible for a hard-hearing person to distinguish one voice from another in a noisy or crowded room. The listener who is hard to hear must distinguish between background sound, noise between them and other speakers and then the effect of room acoustics on the quality of the sound that reaches their ears. Hearing aids can enhance and filter these sounds and increase the ratio of speech and noise, but if the sound is too distorted by the time it reaches the listener, even the most effective hearing aids can fail to disrupt the signal.

Cochlear Implants: A cochlear implant is an electronic medical product which replaces damaged inner ear function. Unlike hearing aids, that makes sounds sharper, cochlear implants do the work of weakened inner ear sections (cochlea) to send the brain sound sensations.

Inter communication technologies (ICT's): An accessible ICT product or service is one that all its intended users can use, taking into consideration their different capacities. Accessible ICTs have the ability to provide unprecedented educational opportunities, vocational training and jobs for people with disabilities, as well as the opportunity to engage in their community's economic, cultural and social life. ICT uses multiple communication-speech, text and gestures-to reach and connect with others, helping to address long-standing barriers to touch and interaction. ICT permits multi-media content production and distribution in various formats. Individuals with disabilities have access to content through television and radio, landline telephones, cellular and mobile audio telephony, text messaging / SMS, websites, emails, instant internet messaging and voice over Internet Protocol services, video conferencing and social networks. Remote work

systems and policies offer flexibility for workers to arrange work. Mobile apps allow work anywhere and anytime. Employees can operate from comfortable, physical locations (Raja, 2016).

Web Accessibility by PwD: Individuals with disabilities use hardware, software or combination assistive devices that allow these users to perform tasks that they cannot otherwise perform.. Visually disabled people use Screen readers where using synthetic speech, the device translates visual information on the screen to an audio stream. Secondly, in screen magnifiers the screen is magnified by the program. Third, it is an electro-mechanical device for viewing Braille characters by means of a refreshable Braille display, usually by increasing the dots through holes in a smooth surface (Prasad & Agarwala, 2009). Those with orthopedic disabilities use mouth handle, which used to type and even control a trackball. Second, through Head wand that is a stick attached to the head and used to type characters, web page navigation, etc. Third, through Voice recognition software enables speech alone or in conjunction with alternative keyboard / pointing tools to be typed. 'Close Captioning' for hearing impaired individuals, which includes text interpretation of the audio tracks in the film so that the user can understand the video. For cognitive disabled user 'Word Prediction Software' which predicts the words of the user based on the recently typed words and the frequency of use of the words. Secondly, using a scanner which transforms typeset or typewritten content into clearly articulated synthesized voice

5.Limitations of the research

The current study is based on the availability of secondary data that could differ when performed by primary methods of data collection i.e. a reality check with regards to assistive technologies is absent. Secondly assistive technologies are not well promoted due to which the literature covered during the research may not have the most updated facts. Third, as per the Rights of Persons with Disabilities Act, 2016, the categories of disabilities has been increased to 21 which includes categories such as dwarfism, thalassemia, Parkinson's disease, acid attack victims etc. Assistive technologies applicable for these categories have not been included in the research.

Conclusion

Research states that assistive technologies will help disabled to bridge/reinforce in jobs. Usage of technology for empowerment of disabled is not new but the financial conditions of the disabled are limiting them in using assistive technologies. Specialized, independent, AT used to improve, preserve, or enhance the technical capacities of disabled persons. It can be cost prohibitive for individuals with disabilities without external monetary supports or subsidies. Various devices and software are trying to include features to empower the disabled and new initiatives of cloud technology to deliver the assistive technologies are being taken as result of technological disruption. Many disabled people would require more than one form of supportive technical solution to boost their self-governing living and socioeconomic involvement. With the rising number of apps and internet-enabled services, multiple assistive features can be bundled and accessed within a single or restricted number of devices, hence growing affordability, performance and usability. In fact, usage of assistive technologies are increasing job satisfaction, motivation and decreasing absence of employees yet the overall the usage of assistive technology is primarily less in India and employers still have duty to employ people with disabilities whenever appropriate. Employers lack knowledge of assistive technologies available and resulting of no strong commitment. Majority of the employers do not even make an attempt to measure the benefits made by assistive technologies. Assistive Technologies should be seen a business strategy rather than a social element

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