

An Empathic Approach in Assistive Technology to Provide Job Accommodations for Disabilities

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Abstract. When the psychologist Abraham Maslow first defined the five levels of human need in 1943, people started to realise how human needs should be fulfilled and many products have since been designed to fulfill these needs. Many researches have shown that the desire to achieve a higher level of need is no different between normal people and disabled people. However, social benefits only support a disabled person with their basic needs. To help them achieve a higher level of need, for them, finding a suitable job is the best way forward. An appropriately designed assistive technology (AT) allows the user to be more efficient at work, prevent them suffering occupational injury and enjoy a safe and comfortable work environment. It could be a good tool to help them reach their psychological needs, but designing an appropriate AT requires a designer with a high level of professional knowledge in AT, an understanding of the subject's abilities and being able to realise the task and environment that the subject needs to work in, all of which involve long term training. Additionally, the majority of designers are healthy people; it is very difficult for a healthy person to have the ability to understand the difficulties of a disabled subject, especially young designers. In this research, the researcher used a spinal injured lottery seller in Taiwan as the subject. The researcher observed and analysed his tasks and environment, collected professional suggestions from experts and, based on the user-centred design theory, compared the physical differences between the subject and healthy designers. Additionally, the results were applied to a design and an empathy tool was produced, when wearing it would allow the designers to empathise with the inconvenience of the physical conditions of the subject. The empathy tool was tested and evaluated by various product designers. The researcher designed a scenarios process and asked his participants to practice with it. The result showed that although the suit could not simulate the psychological conditions of the target user, it was, however, successful in mimicking the physical conditions of the subject and allowed the designers to realise the difficulties and problems of the subject through the simulation process. Thus, these experiences were transformed into design knowledge when designing assistive technology.

Keywords: Assistive technology, Empathic design, Disabilities.

1 Background

Job accommodation in eastern culture has a very long history. However, it was not officially managed by governments in the past and disabled people often found it hard to find a suitable job. On the one hand, according to traditional eastern thinking, no one is abandoned by God and every person should contribute to their society. This means that a person who has no “real job” will face strong pressure from their family and community, even if they have a disability. On the other hand, the help and support given by government and welfare services are often only enough for survival, meaning that disabled people need to earn a more sustainable income for their future life and family. Moreover, the ability to live independently is always the first thing that disabled people desire as earning money for themselves and their family enables them to gain people’s respect and fulfill their higher psychological desires.

Sometimes, the process of helping a disabled person back to work requires the use of assistive technologies (AT) to support them within their work environment. However, many practical researches have found that most ATs are abandoned by their users after a very short period of usage. (Kintsch, A & dePaula, R, 2002) One of the main reasons is that the assistive technology bought is unsuitable. It has also happened that, in many job accommodation cases, users and their employer are often unsure which AT is suitable for the job. Consequently, when a wrong decision has been made, in some cases, it is just a waste of money. However, in more serious cases, it can often cause an occupational injury to the user.

An appropriate job accommodation design could avoid this problem. It would consider a user’s physical character, work conditions, reasonable cost and work environment and would use professional knowledge and information to make an appropriate job accommodation assistive technology (JAAT) design. Moreover, an experienced job accommodation designer has more AT knowledge than the user himself and, with great vision and professional knowledge, he would know which kind of AT design would not damage the user’s physical condition, even if it might make the user feel uncomfortable when they first try the AT.

However, it is not easy for an ordinary person to become an experienced designer and even experienced designers have difficulties in understanding some of their users’ requirements and will sometimes make mistakes when designing the AT. Since there are so many varieties and types of disability in the world and every disabled person has different symptoms, working conditions and environment, designers find it hard to understand all situations. Therefore, in order to develop a suitable design rationale, the ability to understand the real needs of the disabled user is essential.

The empathic design model provides a process for designing commercial products and services. The model uses observation, simulation and role-playing techniques to help designers empathise with their users. It has been widely used during the design process of motor vehicles in many motor companies and it could also be employed in the process of designing AT for job accommodation.

When the empathic design model is employed to design a JAAT, the designer could use equipment to observe and record the environment but accurate simulation and role-playing techniques often require certain tools to help the designer to practice the real physical conditions and difficulties of the work environment. The precision of

these tools could deeply affect the design results. Therefore, an appropriate tool design method plays a very important role in the process.

To make an appropriate tool design, the process has to consider the user's real physical condition and work environment and compare the differences between the disabled user and the health designer, whilst also collecting professional suggestions from the medical profession and the users' employer. Finally, the designer must use their product design knowledge to design and produce the design.

The goal of this research is to build an empathy tool which could help designer to understand the working difficulties of their disabled user; the result of the development process will be analyzed in order to build a design model of empathy tool design.

2 Research Methodology and Process

2.1 Subject Selection

To achieve the goal of research, the researcher selected a spinal injured lottery seller in Taiwan as his subject; since the lottery selling is a special permit job for vulnerable people in Taiwan. In addition, the lottery company does not provide them any equipment for their special needs. Therefore, an empathic design process to unfold their real need and help designer to build an appropriate AT for their job is essential.

The subject is a lottery card sales person with T12 spinal injured by an car accident in his ten years old, and he has moderate conversation difficulty because of his stone deaf. He has selling the lottery ticket for more than ten years at the outside of a night post office in Taichung city, Taiwan.

2.2 Literature Research

The existing literature review suggested that the job accommodation process should consider the physical and mental condition, abilities and preferences of the subject, the environment, employers, and the capability of the job; an appropriate match of these conditions could reduce the difficulties of the job accommodation.

Koskinen's research also indicated that "The key to empathic design is an understanding of how the user sees, experiences and feels some object, environment or service in the situation in which he or she uses the object" (Koskinen. I et. al, 2003). To make a successful empathic design is to allow the designer to step into users' world, and to wonder around in it then to step back as a designer. Therefore, the empathy tool is the most essential equipment to help designers to do it.

2.3 Designer Research

In order to make the empathy tool correctly, the researcher analyzed the physical conditions of the subject as well as the ordinary designers. He observed and interviewed the subject and his care givers to collect the information of the subject. In addition, the Taiwanese Laborer Body Statistics Database (IOSH, 1996) is used to gather the mobility data of ordinary Taiwanese designers. By comparing the information from both sides, the researcher identified the differences of ability between the subject and ordinary designers.

The researcher also observed subject's work environment and his working process, and analyzed the tasks of the subject to find out the difficulties of the subject in his work. The results of task analysis indicated that the most difficult parts are installation of the work station, communication and un-install the work station. The identification of both his physical difference and task difficulties helped the researcher to develop the concepts of the empathy tool.

2.4 Design Rationales

Because the empathy tool is designed for general designers, the universal design principles were employed. Hence, the design rationales of the empathy tool design are:

- It should allow general designers to use.
- It should fit the sitting space of a standard wheel chair.
- It should limit the mobility of designer's lower limb.
- It should limit the designer's waist activity
- The construction of it should be able to afford the physical strength of ordinary health designer.
- It should not harm the users.

2.5 Empathy Tool Production

The empathy tool which the researcher designed and produced is separated into three parts to limit the mobility of waist, knees and ankles of designers; all of them are produced in the plastic workshop of the De Montfort University, Leicester, U.K. The main structure is built of PVC boards, and it used vacuum forming and cutting skills to construct; Nylon straps and click lock are also used to fix designers' activities.

Without a proper scenario, the empathy tool may only let its users fool around in the subject's world. Therefore, the researcher also developed a role play SOP from the task analysis; it instructed the users what to experience step by step and gave a description of environment settings.

3 Evaluation

The empathy tool was tested and evaluated by product designers, assistive technology experts, and the subject. The results indicated that the empathy tool has enough strength to stand the muscle strength of designers, and designers did not feel uncomfortable in the empathy process; moreover, it successfully limited the activities in waist, knees and ankles of the participant designers.

4 Discussions

Regarding the views from the disabled subject, the subject appreciated the empathy tool design and believed it could simulate his situation for the designer users; the assistive technology experts suggested the researcher to shorten the waist part of the

empathy tool as the subject is injured in T12, the mobility of spine should extend to the lower end of the chest; one of expert pointed out that the paralyzed lower limbs are without nerve feedback and muscle strength, which is different with the rigid constrain that the empathy tool made. However, the empathy tool designed to bend the lower limbs of the users in 90 degree angles, the users are very difficult to stand up without the help from others; they can only use their upper limbs to move body when they want to change positions, which is very similar with the experience of losing the muscle strength in lower limbs.

5 Conclusions

In conclusion, an empathy tool for simulating the spinal injured lottery seller subject has successfully made through this research; although it is very difficult to let a health designer to experience the paralyzed limbs of the subject, the empathy tool has let designers experience the difficulties of the subject without damage their body; the process of the empathy tool design has also be analyzed become a design model for further research of assistive technology in job accommodation.

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