Need of Technical Educational Integration in Disability Sector for Differently-abled Empowerment

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ABSTRACT

As per 2011 census there are 2.68 crore differently abled persons in the country. Assistive devices and equipments can significantly help persons with disabilities to become independent in daily activities. There are many eminent technical educational institutions in India and many are conducting research works for the development of assistive technology for the differently abled. So an extensive search was conducted to explore the assistive technology related projects undertaken in India. Out of 137 studies retrieved 34 met the inclusion criteria. The result shows that many researches are being carried out for the development of assistive technology in India. Many of the products are in the prototype stage or in the feasibility stage. It emphasises the need for extensive field testing and commercial production of the assistive technologies. Such initiatives will lead to differently abled empowerment. The authors put forward some suggestions in this regard.

Keywords-- Assistive Technology, Disability, Differently Abled, India, Technical Education

I. INTRODUCTION

As per 2011 census there are 2.68 crore differently abled persons in the country. Genetic, birth injuries, infections, accidents etc. are some of the causes of the disabilities. A major portion of the differently abled are socioeconomically poor. Locomotor Disabilities (disabilities which leads to difficulties in movement) are one of the most common type of disabilities seen [1].

Assistive devices and equipments can significantly help persons with disabilities to become independent in their daily activities. The International Classification of Functioning, Disability and Health (ICF) defines assistive products and technology as any product, instrument, equipment or technology adapted or specially designed for improving the functioning of a person with a disability[2].International Organization for Standardization (ISO) defines assistive products more broadly as any product, especially produced or generally available, that is used by or for persons with disability: for participation; to protect, support, train, measure or substitute for body functions/structures and activities; or to prevent impairments, activity limitations or participation restrictions. This includes devices, equipment, instruments and software [3]. It is evident that currently available assistive technology offers many opportunities for students with disabilities to overcome the barriers to inclusivity, reach their full potential and share their contribution towards the national welfare [4].For many differently abled children, assistive technology represents the difference between enjoying their rights or being deprived of them [5].The disabled person also gains confidence and courage as they gain control over the machine. Gaining control over the machine helps them to gain control over their life [6].Studies has shown that powered mobility through devices like electric wheelchair provides disabled individuals with an energy efficient mobility system that increases their ability to work, to take care of themselves, and engage in leisure and social activities independently. But provision of inappropriate mobility devices can lead to adverse events such as low back pain and pressure sores, badly affecting their physical functioning, safety and quality of life [7].

Recognizing its importance, the Convention on the Rights of Persons with Disabilities (CRPD) urges government to ensure the provision of affordable assistive technologies and related services in several of its articles [8]. Also Article 23, of the Convention on the Rights of the Child (CRC) specifically recognizes the right of children with disabilities to special care and assistance, which should be provided free of charge whenever possible. Assistance should be designed to ensure that children with disabilities have effective access to and receive education, training, healthcare services, rehabilitation services, preparation for employment, and recreation opportunities in order for them to achieve their fullest possible social integration

and individual development [9].Products generated should be adjustable, lightweight, durable, user- friendly, and of low maintenance. Cost of the equipments and custom modifications needed on individual basis restricts the access to such devices and equipments to a large segment of these fellow citizens.

There are a total of 23 Indian Institutes of Technology (IIT) in various parts of the country which are excellent centres of technical education [10]. Along with it there are 31 National Institutes of Technology (NIT) in India [11]. Besides, 24 Indian Institutes of Information Technology (IIIT) are producing highly skilled software engineers for the country [12]. It is complemented by around 3300 engineering colleges located in various parts of the country. It is estimated that around 1.5 million engineers graduate every year in India [13]. This reflects the volume of technically educated human resource in India.

Department of Empowerment of Persons with Disabilities (Divyangjan) under Ministry of Social Justice and Empowerment is co-ordinating activities in the disability sector in the county. There are 8 National Institutes working for the prevention and rehabilitation of various disabilities as follows;

1. National Institute for the Empowerment of Persons with Visual Disabilities (NIEPVD), Dehradun.
2. Ali Yavar Jung National Institute of Speech and Hearing Disabilities (AYJNISHD), Mumbai.
3. National Institute for the Empowerment of Persons with Intellectual Disabilities (NIEPID), Secunderabad.
4. National Institute for Empowerment of Persons with Multiple Disabilities (NIEPMD), Chennai.
5. Pt. Deendayal Upadhyaya National Institute for Persons with Physical Disabilities (PDUNIPPD), Delhi.
6. Swami Vivekanand National Institute of the Rehabilitation Training and Research (SVNIRTAR), Cuttack.
7. National Institute for Locomotor Disabilities (NILD), Kolkata.
8. Institute of Sign Language, Research & Training Centre (ISLRTC)Delhi.

Apart from that here are 13 Regional Centres/Regional Chapters of the National Institutes functioning in various part of the country. Fourteen Composite Regional Centres (CRC) for Persons with Disabilities are also established in various parts of the country to enhance the accessibility to persons with various disabilities [14].

Beside the Central Government institutes there are many reputed State government/Private owned rehabilitation institutes and institutions providing long term HRD courses in Physiotherapy, Occupational Therapy, Prosthetics & Orthotics etc.

Currently the eminent technical education institutions and institutions working and providing training in the disability sector in India are functioning as separate compartments. Active involvement and collaborative research works of technical education institutions and rehabilitation institutes will be mutually beneficial as well as a blessing for the millions of differently abled citizens of the country. Hence, we decided to explore the possibilities of such an integration and to understand the current status of technical education institutional activities in India in the disability sector.

II.   METHOD

Extensive internet based search was conducted in online databases like Pubmed, Google scholar as well as in Google with interchangeably using the key words; Disability, Disabled, India, Devices, Technology, Assistive Technology, Institutions, Engineering, Academic, Technical, Project, Research, Persons with Disability, Empowerment.

III.   RESULT

The search retrieved 137 articles. The authors individually verified the articles and 34 articles met the inclusion criteria and were included in this review. Many research works were conducted for the development of assistive technology for the differently abled in the Indian context. But many of the studies are in the prototype stage or have only undergone feasibility studies. Large stage field trials and commercial production is not been conducted. The relevant studies are selected for discussion.

IV.   DISCUSSION

There are many innovative products designed for persons with various disabilities which are at various technology development phases by technical institutions in India independently or in collaboration with international institutions/organizations. Enlisting some of them;

1. Care for Stroke', a web-based educational intervention for use by the Stroke survivors who have any kind of rehabilitation needs to independently participate in his/her family and social roles [15].
2. Prototype of a leg operated two wheeler for hand disabled [16].
3. A Virtual Reality (VR) based engagement sensitive system with an adaptive response technology for intervention of individuals with ASD [17].
4. Physiology-sensitive virtual reality based system for children with autism [18].
5. Gaze-sensitive communication platform for the elderly and disabled [19].
6. Low cost adaptive balance tanning platform for stroke patients [20].
7. Walking aid system for Parkinson patient [21].

8. Virtual Reality Based Rehabilitation System for Post-Stroke Hand Movement Disorder [22].
9. Cable driven leg exoskeleton [23].
10. Mobility device for use by women with ambulatory disabilities for doing ground level activities [24].
11. Low-cost electric powered wheelchair for India [25].

Centre of Excellence in Tactile Graphics (CoETG) which was set up at IIT Delhi in 2013 with the support of Ministry of Electronics and Information Technology, Government of India has developed several tactile books in collaboration with NCERT and many other organizations [26]. A multi-institute project, participated by IIT Kharagpur, IIT Delhi, IIT Madras and NIT Agartala has been undertaken for development of bundle of specific Assistive Technology systems, for different disability sectors [27]. In this context I would like to share the inputs provided by a faculty working in one of the National Institute of Technology. He said; "Many of our students had developed equipments helpful for persons with difficulties in moving. There are mostly in the prototype phase and are not field tested."

A collaborative study between a United States University and an Indian Spinal Injuries Hospital shows that individuals who received assistive technology from the hospital experienced increased community participation and enhanced skill in assistive technology usage [28]. Another collaboration undertaken by a US-based lab and a manufacturer in India resulted in the production of high quality wheelchairs with manual folding cross-brace design with several points of adjustability, thus meeting various needs in the Indian context [29].

Government of India is also supporting research activities for the creation of assistive devices and technologies helpful for persons with disabilities. Department of Science and Technology (DST) is calling applications throughout the year for the project, Technology and Interventions for Disabled and Elderly (TIDE) for creating devices and technologies which will enhance the quality of life of disabled and elderly [30]. Department of Empowerment of Persons with Disabilities (Divyangjan) launched "Central Sector Research Scheme on Disability related technology, product and issues" in 2015 for preventive and rehabilitation use of assistive tools, devices and technology in the disability sector [31]. This opens avenues for high quality collaborative research works in the creation of cost effective and effective assistive technologies and equipments for the differently abled.

Apart from government institutions, other organizations and institutions are working towards the creation of assistive technologies for the differently abled. Red Cross conducted "Enable Makeathon" in 2016 to generate low cost aids for people with disabilities, especially in rural India [32]. Besides Microsoft India hosted it's first-ever Accessibility Summit, "#ThinkAccessAbility" to enhance technology access for people with disabilities [33]. During discussion happened with a Technical Start Up team leader, came these insightful words; –"We are technically competent to design and develop electronic devices to meet the various needs of the customers. We are like sculptors who can make any features, but experts like you has to guide us what to make which will benefit your differently abled clients". This points out the need of on-field interactions with children/persons with disabilities and experts in the field of rehabilitation for refinement of disability related technologies and effective design of equipments.

United States of America (USA) had developed a detailed project for Technical education integration in the rehabilitation sector [34].In Qatar, Mada Assistive Technology Centre; a public private partnership established a non-profit organization that provides assistive technology services as well as undertakes assistive technology research [35].India is also taking steps in this direction. National Institute for Inclusive and Universal Design (NIIUD) is planning to be established in Delhi, for designing products, buildings, softwares and transportation for the differently abled persons, making their access a hassle-free process [36].

It is believed that disruptive technologies such as Internet of things, artificial intelligence, robotics, cloud computing, and big data can radically change how persons across the spectrum of disabilities control and interact with their surroundings, access and create information, and manage and receive services. Digital technologies are a catalyst for promoting equity and inclusion for persons with disabilities in all aspects of life, including independent living, education, employment, access to financial services, and disaster risk management [37].

Tele-rehabilitation involves use of telecommunication technology for providing support, assessment and intervention to individuals with disabilities from a distant location [38]. Tele-rehabilitation offers many opportunities for alternative rehabilitation service provision [39, 40, 41].Tele-rehabilitation have the potential to improve the delivery of services to people with disabilities, especially to those residing in rural areas. Technical institutions can help to develop efficient tele-rehabilitation units in our country catering to the specific needs of children/persons with disabilities considering the diversity of our country. Tele-rehabilitation Research Unit at the University of Queensland is a good model [42].

V.   CONCLUSION AND SUGGESTIONS

If a segment of the technical education students is up taking research works in the disability sector, it will produce significant and productive changes. The vibrant and creative skills of the young engineers/engineering students should be effectively channelized for the betterment of lives of differently abled. More opportunities should be arranged for field testing of the developed assistive technologies for the differently

abled. The authorities, faculty and students should take active initiatives for such a change to happen in near future. We suggest that NIIUD should be functioning as the nodal agency for the following recommended functions;

1)   The nodal agency must co-ordinate research, development, and evaluation of innovative technologies and strategies, so new or improved products, devices, and technologies are integrated into rehabilitation services in clinical or community settings.

2)   The agency should communicate with the various stakeholders involved like central government, state government, persons with disabilities, caretakers of persons with disabilities, NGO's, Academic and research institutions etc.

3)   The agency should formulate relevant policies, guidelines, and standards for successful integration and collaboration between the various stakeholders for the mission.

4)   The agency should arrange provisions and support for prototype testing, feasibility studies, knowledge transfer, knowledge translation and commercial production.

5)   The agency should assure accessibility and awareness of persons with disabilities and relevant stakeholders regarding the new and effective technologies available for their empowerment.

6)   The agency should liaison with international institutions and organizations for collaborative research works for creating technologies and devices of mutual interest which is beneficial for differently abled persons in the country.

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