

Assistive technology devices (atd): applications and types



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Introduction

Any discussion regarding the development of assistive technology devices (ATD), such as implantable neural prosthetics, would be incomplete without addressing the importance of understanding individual and environmental factors that influence ATD use, and how these factors interact with the societal and cultural landscape in which they operate. The following section will provide a succinct overview of the context in which most ATDs are used and by whom; the role and purpose of these devices in the lives of individuals with disabilities, and the importance of integrating direct feedback from potential device users during the development stages. A proposed mechanism for integrating consumer feedback into the device development process and finally a historical example of divergent reactions within specific disability populations to the introduction of implantable prosthetics will then be reviewed.

Assistive Technology in the Context of Disability

An essential step in the process of developing ATDs, including implantable neuroprosthetics, should be to establish an understanding of the context in which the device will be used, and who it will be used by. Because the primary consumers of ATDs are persons with disabilities, considering these factors within a disability context is imperative. Divergent beliefs regarding how disability should be conceptualized have given rise to a number of classification systems driven by medical, social, and functional perspectives. However, the global presence and integrative nature of the International Classification of Functioning, Disability and Health (ICF) from the World

Health Organization, establishes the ICF as a strong candidate model for conceptualizing disability (WHO, 2013). The ICF offers a universal nomenclature and conceptual basis for the measurement of disability, and emphasizes the integration of biological, psychological and social factors in understanding the onset and subsequent impact of disability, and how these factors interact to restrict participation in activities (WHO 2013).

International Classification of Functioning, Disability and Health

The ICF is organized into two main divisions, including: (1) “ Functioning and Disability”, and (2) “ Contextual Factors”. Each of these domains contains two additional divisions. “ Functioning and Disability” is further divided into (a) “ Body Functions and Body Structures” which are understood as the physiological functions and structures of the body, and (b) “ Activities and Participation” which represent the execution of a task by an individual, and involvement in life activities, respectively. According to the ICF, the term “ impairment” refers to “ problems in body functions and structures such as significant deviation or loss”, whereas “ activity limitations” exist when an individual experiences difficulties in executing specific activities. Finally, “ Participation Restrictions” describe difficulties or problems an individual might experience in involvement in life circumstances (WHO, 2001).

Importantly, an individual’s overall level of functioning in varying areas is thought to result from interactions between that individual, their unique health condition, and additional extraneous contextual factors. These interactions are dynamic, unpredictable, and bidirectional. That is an individual’s personal factors can influence their choice of environment just as easily as the environment can impact personal factors, while both

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simultaneous effect their experiences of a health condition (WHO, 2013). By considering these domains, technology developers can take steps to ensure the utility of ATDs, while addressing concerns and potential device shortcomings before an end product is delivered to the consumer.

The ICF describes “ Functioning” and “ Disability” as dimensional constructs that represent an individual’s interaction with their environment, rather than endogenous characteristics of that individual (WHO, 2001). This conceptualization is a dramatic divergence from early medical models, which describe disability within the individual due to diagnosed impairments related to injury, disease, or developmental processes (White, Simpson, Gonda, Ravesloot, & Coble, 2010). As defined in the ICF, “ Functioning” refers to positive aspects of the interaction between an individual and various components of that individual’s context. Conversely, “ Disability” encompasses the “ Impairments”, “ Activity Limitations”, “ Participation Restrictions”, and other negative aspects of the interaction between an individual and that individual’s “ Contextual Factors” (WHO, 2001). These “ Contextual Factors” are categorized as (a) “ Environmental Factors”, which make up the physical, social, and attitudinal environments in which people live and conduct their lives, and (b) “ Personal Factors”, which have not yet been outlined in the ICF [1, p. 171]. The ICF considers assistive technology and assistive technology devices to be an integral component of the “ Environmental Factors” domain.

Considerable conceptual overlap exists between the ICF’s “ Products and Technology” classification, and the definitions of assistive technology

previously put forth by documents such as the Technology-Related
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Assistance of Individuals with Disability Act of 1988 and the International Organization for Standardization (ISO 9999). This convergence suggests a consensus of what constitutes ATDs, and who the primary consumers of these technologies are. In the ICF, “ Products and Technology” refers to “ any product, instrument, equipment or technology adapted or specially designed for improving the functioning of a disabled person, which may lead to increased participation in activities”. This definition allows for broad interpretation of what is considered an ATD, ranging from “ low-tech” devices to “ high-tech” devices such as neural prosthetic implants. However, the defining characteristic of this definition is the focus placed on the functional improvement and increased opportunity for regular participation in desired activities and societal integration. It is this perspective, that individuals living with disabilities should have equal opportunity to engage in activities commonly accessible to individuals without disability, which gave rise to the Independent Living model.

“ Nothing About Us, Without Us”

The progression towards independent living was born from the disability rights movement in the United States throughout the 1950’s and 60’s, which was propelled by the creation of membership organizations such as the National Federation for the Blind, National Alliance on Mental Illness, and Americans Disabled for Accessible Transportation (Meyer, Peck, & Brown, 1991; Pelka, 1997). These organizations catered to the specific needs and priorities of its membership, and provided a unified voice to advocate on the behalf of specific disability populations. Prior to this time disability was thought of as terrible hardship that simply needed to be endured (Barnes & <https://assignbuster.com/assistive-technology-devices-atd-applications-and-types/>

Mercer, 2005). Disability activism spearheaded by individuals with disabilities and disability groups acted as a catalyst for the move from the dependence seen in antiquated medical models towards independence, autonomy and consumer-centered service provision.

Perhaps one of the most widely cited examples of individuals with disabilities advocating for social justice and civil rights is Ed Roberts (White, Simpson, Gonda, Ravesloot, & Coble, 2010). Roberts, who had developed polio in the 1950's, wanted to advance his education at the University of California, Berkeley, but was denied admittance due to his physical disability. However, Roberts made arrangements for personal aides to assist him in preparing for classes and took up residence in the university hospital. With the help of other students who wanted to secure civil rights and entrance to the university, Roberts was able to start a disability rights advocacy group known as the " Rolling Quads" (Oxford & McDonald, 1999). The Rolling Quads primary objective was to advocate on the behalf of students with disabilities to remove barriers that precluded their involvement and access to the resources provided by the university. Roberts went on to obtain federal funding from the Rehabilitation Administrations, which he used to establish the inaugural Center for Independent Living (CIL) nationwide (Shapiro, 1994). The Oakland CIL stressed the importance of personal independence, consumer choice, and autonomy; and its success served as the catalyst for the establishment of CILs across the United States (Willig-Levy, 1988). Personal choice and consumer empowerment continue to be the fundamental tenants of CIL service delivery. However, the independent living model is more than a grassroots social justice movement; it also

represents a philosophy developed by people with disabilities that places the focus of rehabilitative services on the individual, making it's a consumer-centered practice (Deegan, 1992).

Within medical models of disability, clinicians are considered experts who normally possess unilateral decision-making power regarding treatment planning and rehabilitative intervention. This approach precludes individuals with disabilities from being active participants in their own health care, and establishes an authority role for the clinician (White, Simpson, Gonda, Ravesloot, & Coble, 2010). Conversely, conceptualizations of disability predicated on the independent living framework view disability as resultant from problems endogenous to the environment, and assert that many of the issues facing individuals with disabilities stem from dependence on professionals and family when making decisions (DeJong, 1979). However, given the frequent long-term nature of disability, individuals become experts on their own body, facilitating opportunity for direct involvement in making informed health-care choices. This gained expertise allows people with disabilities to advocate on their own behalf and provide integral information to ATD developers based on insight generally unavailable to individuals that do not share similar disability experiences.

The IL model removes individuals with disabilities from the role of passive recipient, and establishes them as active, knowledgeable, and empowered consumers who are fully engaged in managing their own lives. Involving prospective consumers of ATDs in the development process is consistent with the IL approach to disability through creating opportunities for direct engagement in meaningful decision making. Because individuals with <https://assignbuster.com/assistive-technology-devices-atd-applications-and-types/>

disabilities are experts on their own lives, they are uniquely qualified to provide information and recommendations throughout the development process of ATDs. By incorporating this feedback, technology developers can ensure that the most germane concerns and preferences expressed by prospective end-users are considered prior to the completion of a final product. Moreover, this process also protects against erroneous or inaccurate assumptions made by technology developers regarding the desired functioning of a device, the level of risk prospective users would be willing to accept when using the device, and what characteristics are likely to result in device abandonment or poor consumer satisfaction. The Matching Person and Technology (MPT) model, may serve as a theoretical starting point for ways to consider and integrate vital consumer input during device development.

Matching Person and Technology: Applications to Neuroprosthetic Device Development

The Matching Person and Technology model proposes a comprehensive evaluation of the contextual, cultural, technological, and personal factors that impact the perceived success, functional gain, and ultimately the use of many technologies designed to assist individuals with disabilities. This model has close conceptual ties to the ICF, and addresses the many facets identified as potentially influential on the use of ATDs. While this model has historically been used to match individual consumers to presently available technology modalities, a study implementing the principle tenants of the MPT model suggest that it may have potential application during the development process of new neuroprosthetic devices as well (Kilgore, <https://assignbuster.com/assistive-technology-devices-atd-applications-and-types/>

Scherer, Bobblitt, Dettloff, Dombrowski, Godbold, Jatich, Morris, Penko, Schremp, & Cash, 2001).

The MPT model posits that consumers of assistive technologies have highly diverse and unique expectations which are shaped by individual needs, abilities, limitations, preferences, and past experiences with technology (Scherer and Cushman, 2001). The MPT model aims to evaluate and account for these idiosyncrasies in technology use through the implementation of a comprehensive and collaborative assessment process that allows the consumer to provide direct feedback and information regarding their specific needs and wants (Scherer & Cushman, 2001). This mechanism for incorporating consumer input into the ATD selection process allows specific technological needs and preferences to be addressed, maximizing the utility and success of the ATD in daily use.

The MPT model emphasizes evaluation of three distinct but interrelated components which have been found to influence the use of ATDs. These components include (1) the characteristics of the person who will be using the technology; (2) the technology itself; and (3) the environment in which the consumer will be using the technology. Each of these domains independently and in combination, contributes negative or positive influences on the consumer's satisfaction with the technology in use. For optimal utilization and satisfaction with a specific technology, each domain should be evaluated to ensure that the technology is successfully fulfilling the specific needs and wants of the consumer. While designing advanced implantable neuroprosthetics on an individual basis may represent a daunting and potentially unrealistic enterprise, the underlying tenant of <https://assignbuster.com/assistive-technology-devices-atd-applications-and-types/>

integrating the opinions of prospective device consumers remains integral. Doing so during the development process provides a means for addressing concerns and recommendations which may be prevalent within the specific disability population the device is intended for.

The development of neuroprosthetic devices that follows a “one size fits all” mentality, without including recommendations and considerations from stakeholders and individual users may be more likely to be abandoned or result in decreased user satisfaction. When a technology does not fulfill the need of a consumer, or does so at the cost of other areas of functioning, the device is often abandoned and goes unused. In fact, approximately one-third or all assistive technologies are abandoned by their users (CITE 13). Perhaps more than any other form of ATD, the development of implantable prosthetic devices, which are intended to become at least semi-permanent fixtures in the human body, should be informed by the recommendations of the to-be implanted stakeholders. Unlike a long-cane or wheelchair, which can be more readily replaced or adapted to fit the needs of the user, the inherent nature of implantable prosthetics often precludes easy upgrade or removal. Furthermore, involving people with disabilities in the development process serves as a mechanism for understanding how individuals that the device is being designed for are likely to react to and adopt the device into daily use. Historically, ATDs intended to restore functioning in individuals with disabilities have not been unanimously welcomed.

Disability Culture: The Cochlear Implant

While it may be assumed that ATD developers are inherently well intentioned when producing technologies designed to restore or supplement functioning in individuals with disabilities, history has proven that ATDs have not been universally accepted and adopted into disability culture. In fact, the cochlear implant, which is a “ high-tech” ATD, faced considerable resistance from the Deaf culture when first introduced, and continues to be a topic of debate and contention among many individuals who considered themselves part of the Deaf community. According to the United Nations Conventions on the Rights of Persons with Disabilities, individuals who consider themselves members of Deaf culture “ shall be entitled, on equal basis with others, to recognition and support of their specific cultural and linguistic identity, including sign languages and deaf culture”. Rather than viewing deafness as a disability, constituents of Deaf culture assert that being deaf is a variation in human experience, and any technology that intended to “ cure” deafness suggests that deaf experience is inferior to the experience of hearing individuals (Nunes, 2001).

While the proposed protocol of including prospective end users in the discussion of device development may not have completely mitigated the reaction seen with the introduction of the cochlear implant, it may have provided developers with a better understanding of what resistance they might face and how to work towards solutions that address the concerns expressed.

References

Suggested citation

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