INNOVATIVE HEALTH TECHNOLOGIES PROGRAMME

A Historical Sociology of the Wheelchair

KEY FINDINGS

The main objectives of this research project were to understand wheelchairs as historical products and wheelchair innovation as a historical process, and in so doing, map the relationship between social and technological change. The project also aimed to generate new ideas about the relations between technology, disability and disabled people, and further the wider yet currently underdeveloped project of bringing the assistive device under the sociological gaze. The inquiry thus sought to open the way for a reappraisal of some fundamental concepts, namely: the relationship between technology and independence, the complex relations between the creators and users of technologies, and the impact of wider socio-cultural factors on the development and reception of technologies.

RESEARCH FINDINGS

- It is evident that the pace of innovation throughout most of the 20th century was slow and that wheelchair research and development attracted little kudos within the medical or the techno-scientific communities.
- It is also apparent that medical and rehabilitation ideology and practice interpreted wheelchair as a sign of the failure of medicine to find a cure or evidence that the user had given up on rehabilitation.
- Yet, it is apparent that wheelchair innovation emerged out of the complicated interplay of a myriad of actors including, but not restricted to: the state, the medical profession, engineers, entrepreneurs, charities and users.
- It is also clear that historically these different actors attached different and often contradictory meanings and problems to wheelchairs and wheelchair use.
- It is also evident that wheelchairs have long been a site of political struggle between a hegemony that defined disability as a problem of medicine and a social movement that defined disability as a problem of discrimination.
- As such, it is also evident that the issue of wheelchair access was misunderstood or resisted by the state and its agents, architects, town planners, and transport designers and managers throughout most of the 20th century.

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Wheelchairs as a medical device

While it is evident that wheelchairs have long association with medicine, up until the early 20th century *wheeled chairs* often intersected the divide between a mode of transport for the wealthy and medical apparatus for injured, sick and/or disabled people. This was especially the case for the British Bath Chair, which the Victorian wealthy also used in a similar manner to rickshaws. As this intersection gradually dissolved, and the medical profession gained almost total control over illness, disease and disability, wheeled chairs became primarily medical device. The violent consequences of two World Wars, which produced an intensification of the enrolment and mobilization of medical professionals by states across Europe and North America to act as gatekeepers to state provision for disabled veterans, also increasingly brought the technology under medical control.

Ironically, though, medical/rehabilitation ideology and practice, especially during the first half of the 20th century, interpreted wheelchair use as a sign of failure. With its concentration on the cure or alleviation of impairment, the traditional technologies of rehabilitation were the orthoses, the prosthesis, the calliper, the brace, or the crutch the material forms of the idea that you could replace or augment what was lost. Wheelchair use symbolised either the failure of medicine to find a cure, and/or that the wheelchair user had given up on rehabilitation: an act that countered a wider ideology, which deemed it the “duty” of disabled people to adjust themselves to society.

Wooden 'invalid chairs' (*wheelchair* is an idiom of the 20th century) with caned seats and backs appeared around the mid-19th century, especially in the United States (US) where these types of wheelchairs were in use by veterans of the civil war. Despite the introduction of wire-spoke wheels, rubber/pneumatic tyres (borrowed from the bicycle), hand cranks and suspension systems, few wheelchairs during the first half of the 20th century facilitated independent mobility outdoors. The implicit assumption embedded within most wheelchair designs, was that the user would be housebound or institutionalised.

Ascendancy of wheelchairs as tools of independence

The 1950s was a period of ascendancy for the relatively lightweight tubular-steel, folding transit/general-purpose wheelchair. The most celebrated example of this design form is probably the Everest & Jennings (E&J) single X brace, folding wheelchair, first developed by Herbert Everest (whom himself was paralysed in 1919 after a mining accident) and his partner Harry Jennings in 1933. Everest recalled in 1955 the motivation behind his invention: “When I tried to earn a living, I found my greatest difficulty was the lack of a usable, folding wheelchair.” In contrast to earlier wheelchair designs, folding tubular-steel wheelchairs afforded travel and access to many wheelchair users for the first time. Indeed, according to the Paralyzed Veterans of America the E&J wheelchair was: “A vehicle which has signed the 'declaration of independence' for many thousands of physically handicapped people all over the world.” Importantly, the ascendancy of the tubular-steel, folding wheelchair design was an outcome of its confluence with five important social, medical and technical strands: developments in antibiotics, new practices in rehabilitation, state welfare, the mass-produced/mass-consumed motorcar, and the growth of a disability movement.

The mass production of Penicillin by 1945 resulted in the rise of a new constituency of *active* wheelchair users: people surviving with spinal cord injuries. In conjunction, went the burgeoning of state organized resettlement and rehabilitation services (including rehabilitation engineering) as Europe and North America both witnessed the emergence of a political will to find technical solutions to the problems of impairment generated by the violence of World War II. The consequences of the polio epidemics of the late 1940s and early 1950s, thalidomide in the 1960s and the Vietnam War in the 1960s and 1970s all had a similar effect.

Such shifts raised expectations among disabled people of finding employment and living within their communities. The interface between folding wheelchairs and transportation also afforded not only independent-mobility within the community, but with it a realization of political empowerment and the possibility of independent living. The gradual political mobilization of disabled people during the post-war era eventually set the agenda for change in employment practices, transport and access to the built environment, and transformed notions of what independence for disabled people meant, which in turn filtered back into innovations in wheelchair design and use.

Lighter weight

In matters of manual wheelchair design, the predominant concerns of active wheelchair users were with making the technology lighter, more reliable and of higher performance and it was from wheelchair sports that this innovation path drew inspiration. Emerging from shifts in rehabilitation practices and philosophy following the Second World War, wheelchair sports manifested groups of wheelchair athletes that began to tinker with and subtly alter their wheelchairs in order to gain better performance. Over the course of the next 40 years, this tinkering developed into an ultra-lightweight wheelchair industry that eventually challenged dominant thinking about wheelchair design and set the tone for manual wheelchair technology at the end of the 20th century. The symbol of this sea change was Motion Designs' Quickie, an ultra-lightweight, rigid-frame wheelchair developed by Marilyn Hamilton (herself paralysed after a hand-gliding accident), Jim Okamoto and Don Helman in 1979. Quickie transformed the orthodoxy of what an everyday wheelchair should look like and how it should function. Reworking innovations developed by wheelchair athletes such as Jeff Minnebraker, Motion Designs introduced colour, aesthetics and high-performance to the mass wheelchair market.

Powered wheelchairs

Electrically powered wheeled chairs first appeared at the beginning of the 20th century, though not as a technology for the exclusive use of disabled people. Their materialization in a form that people with severe impairments, such as paraplegia or quadriplegia, could use did not occur until in the late 1940s early 1950s. Despite a range of designs during this period, it was George J. Kline's development of an attachable friction motor with joystick in 1953 that influenced the innovation tack and for the next three decades, wheelchairs with motorized attachments became the dominant design form.

Powered mobility brought with it a range of possibilities, but more robust indoor/outdoor designs, the introduction of proportional controllers and use of microprocessors and computer technologies, represented the greater successes. In no small part, users influenced this innovation path. For example, the rise of the Independent Living Movement in Berkeley, California, during the 1960s and 1970s was a period in wheelchair history when disabled people challenged not only the orthodoxy in disability services, but also furthered a material and political reinterpretation of powered wheelchairs. When the founders of the Physically Disabled Students Program (the precursor to the Center for Independent Living) first developed their concept of independent living, it was apparent that along with financial benefits advice, advocacy, and a system of attendants, they had to provide a wheelchair supply and repair service, for without it they would not realize their goals. While powered wheelchairs afforded the realization of empowerment and the possibility of independent living, the unreliability of the technology hindered its attainment. In search of a solution, the wheelchair service moved beyond simple repair work to become involved in innovation projects, which paved the way for experimental work on a high-performance, purpose-built, indoor/outdoor powered wheelchairs and eventually influenced both the US Veterans Administration and manufacturers to do the same.

Wheelchair standards

A further influential tract in the progress of wheelchair technology was the emergence of national and international wheelchair standards. During the post-war period, wheelchair standards, such as they were, applied only to those devices issued by the state. In the early 1970s, however, both the British Standards Institute and the American Society for Testing and Materials began to examine ways to broaden wheelchair standards so that they would apply to the industry as a whole. By the early 1980s, a standards movement gained momentum and from it emerged the development of a system of voluntary consensus standards, which captured international attention through the International Standards Organisation (ISO). The development of ISO wheelchair standards was nonetheless a slow process and it was not until the early 1990s that the first series of wheelchair standards reached the final approval stage. Although slow, the development of wheelchair standards represented an important milestone in wheelchair history. Those early standards were the first voluntary consensus standards developed for any type of rehabilitation equipment and as such, they encouraged greater involvement of industry, government and users in the production of better technology.

About the Project

For millions of disabled people around the world one of the most important sites of technological innovation during the 20th century has been in wheelchair developments. Yet, both historians and sociologist have remained relatively silent on the subject and there has been little social or historical analysis of the technology or of the relations between wheelchair innovation and the political struggles of disabled people for independence.

At the outset we expected that the story of wheelchair innovation would provide a rich empirical example of the “social construction of technology,” (SCOT) indeed one richer than the case of the bicycle, Bakelite and the electric light used by Trevor Pinch and Wiebe Bijker to develop the approach. SCOT allowed us to view technology as more than just a neutral tool and provided a means for understanding how social relations shape technology as well as be shaped by it. However, we also considered the wheelchairs would provide a good empirical site to address Langdon Winner's critique that the SCOT approach does not address broader political questions, excludes important actors or groups, and fails to provide an analysis that incorporates the processes of structural exclusion.

Similar arguments are rallied against traditional approaches in the history of medicine, which have tended to render both disabled people and their political mobilization historically inert or invisible through their casting of disability as a matter of pathology and their positioning of disabled people as patients or dependent objects of charity. Consequently, we aimed to understand the agency of disabled people in the processes of social and technological change and drew from the social model of disability to understand the relationships between wheelchair developments and the structural exclusion of disabled people. With its focus on societal and environmental barriers (rather than physical impairment) as the principal causes of disability, the social model provided a means for understanding how disability is something imposed rather than something innate.

Combined, these two approaches enabled us to investigate how wheelchairs and wheelchair users were simultaneously co-constructed and to understand the complex relations between wheelchair developments, use and reception, and the structural exclusion of disabled people.

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