

How the Wheelchair Contributes to Equality in Society

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Niphattha Wongwiset
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The Importance of Wheelchairs

In 2017, the Yang-Tan Institute on Employment and Disability at Cornell University School of Industrial and Labor Relations (ILR) conducted a survey and concluded that over 20 million American people had serious difficulty walking or climbing stairs. Transportation between floors without using stairs takes a longer time and greater effort for those who use wheelchairs. Independent mobility opens more opportunities for individuals, including jobs, social interactions, and acceptance. To observe and analyze the social impact of the wheelchair, the stakeholders in this research include legal regulations, the emotional perception of wheelchair users, and the economic organizations related to wheelchair makers as well as users' employment in the study. How the wheelchair contributes to equality in terms of social outlook and mobility significantly motivates to better design consideration of future vehicles and transportation. The research applied the science, technology, and society (STS) concept of technological fix to explain how engineers construct technology in order to solve social or complicated issues but, instead, create other concerns from the solution (Newsberry, 2019). The theory clarifies the reasons why the wheelchair has inherent consequences to how wheelchair users and non-users interact with each other in society, rather than its primary purpose of providing alternative transportation. Therefore, the study from the interpretation of the framework leads to meaningful answers to the important research topics: how the wheelchair achieves better accessibility from the standpoint of legal regulations and social impact, how the economic situation of people who use wheelchairs changes, and how the wheelchair affects emotional perceptions of wheelchair users in society.

How to Analyze the Wheelchairs' Impacts on Society

Since the wheelchair's invention creates social changes, especially for wheelchair users, this study aims to evaluate how the wheelchair helps its users gain social acceptance and equality in society. By including the perspectives that describe law restrictions, economic status, and emotional perception of wheelchair users, the following questions contribute to the research of wheelchair efficiency towards social acceptance for wheelchair users.

- How does the wheelchair achieve better accessibility from the standpoint of legal regulations and social impact?
- How does the economic status of wheelchair users change after introducing wheelchair to their lives?
- How does the wheelchair affect emotional perception of wheelchair users in society?

Methods for this research include documentary research, discourse analysis, and historical case studies. The documentary research includes sources such as "The Wheelchair: Enabled or Disabled? Houston, We've Had a Problem" by Roulstone and "The Long-term Impact of Wheelchair Delivery on the Lives of People with Disabilities in Three Countries of the World" by Shores. The articles contribute significantly to explain how the wheelchair alters perspectives of people in society and leads to better accessibility for wheelchair users, as well as how the employment and emotion of people with disabilities change after using the wheelchair.

Discourse analysis explains how wheelchairs involve the emotions of the wheelchair users from their experiences, struggles, and achievements in society. The analysis includes an article interviewing wheelchair users by Ryan, "What is life really like for disabled people? The disability diaries reveal all," and 500 sample Tweets related to the wheelchair. Both the article

and Tweets illustrate insightful, qualitative data about how society thinks and affects wheelchair-related issues.

The historical case studies approach focuses on two primary cases: “Wheelchair Maker Vs. Critics” from Kleinfield and Times and the history of the Americans with Disabilities Act from the Disability Rights Education and Defense Fund. Both cases show how equality for people who have disabilities became an important issue, how the wheelchair has changed social views about people who have disabilities, and how the wheelchair improves the equality of wheelchair users in society.

History of Wheelchairs and Related Organizations

Humans first created the wheelchair thousands of years ago, (*Wheelchairs*, n.d.). Today, 1.7 million people use wheelchairs or scooters for their commutes (*Mobility device statistics*, 2018). Due to long historical development and a large number of wheelchair users, the research aims to study how the technology presents as meaningful development in social outlook and to apply the analysis from the research to other useful assistive technology in the future. In individuals’ views and development for wheelchair users, the wheelchair not only provides opportunities in mobility for wheelchair users but also supports them in terms of independence, self-esteem, confidence, and accessibility to community life (Khasnabis et al., 2012).

Nevertheless, wheelchairs also bring changes to society, not limited to wheelchair users. For example, the United Nations Convention on the Right of Persons with Disabilities (UNCRPD) ensures that people who have mobility impairments and appropriate wheelchairs have access to education, attainable standard of health, work, and ability to participate in public life (United Nations, n.d.). However, even though society is often passionately committed to equal human rights in the legal realm, wheelchair users still feel insecure and isolated from their society in their daily life (Ryan, 2017).

Therefore, to study the extent to which the wheelchair impacts society efficiently in legal, emotional, and economic views, the research focuses on three stakeholders: policymakers, wheelchair users, and related economic organizations, including employers and wheelchair makers.

In the legal view, policymakers contribute significantly to the accessibility for wheelchair users, especially in public transportation, after establishing the Americans With Disabilities Act (ADA) in 1990 (Bezyak et al., 2017). The ADA elevates the status of people with disabilities, including wheelchair users in society.

The emotional perception of wheelchair users illustrates how much society changes from regulated law and how society needs to adjust to the accommodating technology and related policies. For example, 46 percent of people with disabilities, compared to 23 percent of people without disabilities, reported feeling isolated from their communities (*National Organization on Disability*, 2000). Wheelchair users' perspectives on their position in society is necessary to observe how both individual and overall systems in society change due to wheelchairs.

Furthermore, wheelchair innovation and job opportunities for wheelchair users are necessary to discuss because of their influence on the economics of wheelchair production and usage. The economic organizations constitute two viewpoints from wheelchair makers and wheelchair users' employment. The studies examined in this paper aim to explore if the development of the wheelchair effectively encourages the acceptance and equality of wheelchair users in society. For example, Everest & Jennings International, a dominant wheelchair maker in the United States in 1981, did not significantly improve the quality of the wheelchair regardless of the complaints of users' discomforts because of limited competition in the wheelchair industry (Kleinfield & Times, 1981a). The inadequacy of historic wheelchair innovation raises the

question of whether the wheelchair makers have developed wheelchairs for people or profit. However, when discussing employment opportunities of wheelchair users, the research is positive. Shore's research about the long-term effects of new wheelchair users in developing countries shows that the employment rate increases in the short term and stays constant in the long term (Shore, 2017). The studies of the stakeholders in the economic part reveal how the wheelchair affects the outlooks of industrial organizations towards both the technology and equality for wheelchair users in society.

Technology Fix

The equality of wheelchair users's lives motivate the study to focus more insightfully on the STS field about how technology and society relate together. Rather than providing alternative mobility for people with ambulatory needs, the wheelchair influences policies and mindsets on each stakeholder. Therefore, the study utilizes technology fix, a STS framework, to analyze how people design wheelchairs to solve social or complicated issues, but instead create other concerns from the solution (Newsberry, 2019).

Alvin Weinberg, a physicist, introduced 'technology fix' to explore the effectiveness of technology in solving social problems. He exemplified the industrial production and hydrogen bombs, which represent a successful technology fix of poverty and war. However, he emphasized that the "technology fixes do not get the heart of the problem: they are at best temporary expedients; [and that] they create new problems as they solve old ones and recognized that technology fixes often requires social action" (Weinberg, 1997).

In addition to given examples from Weinberg, Evgeny Morozov, a visiting scholar at Stanford University and Schwartz fellow at the New America Foundation, categorized and applied the technology fix framework to explain the impacts of the Internet. He described how

the Internet creates Internet-centrism, a fixed and unified entity that is all-powerful technology with large-scale and complicated involvement in politics, culture, and everyday life (Morozov, 2017). Even though the Internet obtains a large number of beneficial applications for the sake of comfort, it is recognized as ‘solution-driven design’ which “reaches for the answer before the questions have been fully asked” (Lang, 2009). Therefore, the technology raises concerns about the motivations for our moral, ethical, and civic behaviors which are intentionally changed by the Internet (Morozov, 2017).

Before the ADA was released, Alan L. Breed, an orthopedic surgeon, provided critical concerns about the behavioral changes of wheelchair users and non-users from the motorized wheelchair in 1982 (Breed & Ibler, 1982). Due to his comments about the invention, he suggested that law and education for both users and non-users were necessary. Breed’s opinion about wheelchairs significantly relates to the framework as it shows examples of how society inherently changed from this invention.

From selected scholars’ views, their researched technology devices achieve their main goals, but also shows other inherent impacts on society. Breed’s opinion about the effects of the motorized wheelchair also encouraged further developing the relationship between the wheelchair and society. Therefore, technology fix theory efficiently examines how the wheelchair has affected society and other related technologies from stakeholders’ viewpoints about wheelchairs.

How Wheelchairs Impact Society

The wheelchair not only provides mobility for disabled people but also contributes to equality for wheelchair users. The requirements of public facilities, public transportation, and education and employment opportunities for wheelchair users, included in ADA, affect the

regulated change, as well as awareness of the wheelchair in society. The positive attitudes from Twitter also show that people, both users and non-users, are more considerate about the issue. The wheelchair invention research by Shores supports that the wheelchair also opens opportunities for new wheelchair users to work and become more independent. However, the wheelchair would be developed more efficiently if the wheelchair makers were more interested in users' complaints, not only their benefits. The discourse analysis questioned whether the legal restriction effectively improves equality and respect for wheelchair users in society. Yet, the expressed concerns illustrate that the wheelchair motivated the wheelchair users to suggest and insist on their equal rights in society. Therefore, the wheelchair fits in the technology fix framework which explains the inherent effects that the inventor did not initially consider as the main goal, by raising equal rights for wheelchair users in society.

The wheelchair design evolved not only for the purpose of mobility, but also social sentiment as explained in "The Wheelchair: Enabled or Disabled?" by Roulstone. Brubaker, the US rehabilitation writer, wrote for the US Department of Veteran affairs that the wheelchair design was slowly developed due to the conservatism of wheelchair makers and lack of user-involved diversity in 1986 (Brubaker, 1986). Owing to extra costs for co-research between wheelchair users and confidence of wheelchair makers, manufacturers did not efficiently develop the wheelchair in the early twentieth century. However, present wheelchair makers collaborated slightly more with wheelchair users, so the design became more realistic and practical, by adding beneficial features such as motorized and voice controls (Buhler, 1986). As noted by Sapey, Stewart, and Donaldson, the doubled number of wheelchair orders in the mid-1980s to mid-1990s implied that disabled people looked at wheelchairs as tools for living, not a symbol of failure.

According to Roulstone, the wheelchair serves as an important tool for disabled people's mobility, as well as analysis of wheelchair makers' views towards technology. The wheelchair also relates to technology fix since it supported not only mobility but also wheelchair users' voices, as shown from more involvement and collaboration between wheelchair users and wheelchair makers. Due to slow, inefficient wheelchair development, the wheelchair inspired more research and collaboration between wheelchair users and wheelchair makers; as a result, society became more concerned about the issue of disability from wheelchair production. Also, efficient user-end wheelchair design from users' feedback shows significant improvement on both the design development and wheelchair users' voices in society.

Furthermore, Shore's research about the long-term impact of wheelchair delivery on the lives of people with disabilities in three developing countries of the world represents how the wheelchair improves the economic situation of new wheelchair users. She conducted the research with 190 new wheelchair users from Peru, Uganda, and Vietnam. Then, she recorded the data by interviewing the users after receiving the wheelchair in the following 12 and 30 months in order to explore how their health, employment, and income changed. In the following 30 months, the users who have sufficient income increased from 52.9% to 63.8%. Even though most new wheelchair users in less-resourced areas were not employed full-time, they worked in self-directed businesses such as selling candy or lottery tickets and conducting business at home. Further, the family income rose in the long term.

The economic situation from wheelchair delivery in Shore's research suggested how wheelchair users became more independent and motivated to find jobs or possible incomes. The better finance opportunities of wheelchair users represent inherent effects related to technology fix, rather than the main purpose of mobility and transportation. Even though the rate of full-time

employment for wheelchair users is not a large number, the rise of family income illustrates how the wheelchair helped improve not only the mobility of disabled people but also available economic opportunities.

The purpose of studying wheelchair makers' historical case is to analyze how wheelchair makers encouraged societal equality for wheelchair users. Even though more than a dozen companies produced wheelchairs, such as New Haven Chair, Allison, J.S. Ford, Milwaukee, and A.A. Marks, Everest and Jennings Chair was the first company to introduce a new wheelchair design known as "a folding wheelchair" in 1916. Due to a large class of veterans with spinal cord injuries after World War II, Everest and Jennings Chair controlled more than 70 percent of the market in the United States in the mid-1940 (Wolfson, 2014). However, its wheelchair users had complaints that the maker did not provide significant innovation in the 1940s. The manual wheelchair was poorly designed such that the spoke did not sustain much stress. The powered wheelchair had frequent breakdowns and took a long time to repair. In 1977, the US government prompted an antitrust suit against Everest and Jennings since the company sold the chairs at cheaper prices abroad (Kleinfield & Times, 1981b).

Although the folding wheelchair created greater mobility for the wheelchair users when Everest and Jennings initiated the design, the company tended to focus more on its own profits rather than improving wheelchair designs, in terms of both innovation and problematic issues from initial designs. Due to higher domestic prices before 1977, not all disabled people could afford the wheelchairs. However, the critics of wheelchair development showed the wheelchair users' courage to devote to the improvement of the wheelchair's design and process. The critics and government expression also represent that society became more concerned about the

technology and its related groups. Therefore, the social movement from the wheelchair issue shows another inherent effect that explains why the wheelchair creates technology fix.

The movement for the Americans with Disabilities Act (ADA) emphasizes how the wheelchair correlated to disabled people and policymakers for equality in legal views. Historically, a disability public policy occurred in 1973 with the passage of Section 504 of the 1973 Rehabilitation Act. From Section 504, the movement and advocacy efforts became critical to eliminate discrimination as a class status. The disability community gathered discrimination diaries, to serve as a documentary testimony and awareness for the ADA's revisions and negotiations (Mayerson, 1992). For wheelchair's accessibility, ADA's standards and code compliance include the specification for wheelchair ramps, public transportation requirements for wheelchair users, water fountain, and toilets (Department of Justice, 2010). The ADA also impelled equality opportunities for disabled people by prohibiting discrimination against qualified individuals with disabilities for proper education and employment (U.S. Equal Employment Opportunity Commission, n.d.).

The ADA exemplified great development for equality for disabled people, and the specification for wheelchair accessibility signifies how the wheelchair contributes to the legal action. The ADA reduced discrimination for disabled people, including wheelchair users, allowing them to freely access public services and facilities. Therefore, the wheelchair not only provides an alternative transportation option for individual users but also generates inherent effects by shaping society to reconsider and respect the abilities of wheelchair users.

To study the emotional perception of wheelchair users in society, discourse analysis is necessary. The article, "What is life really like for disabled people? The Disability Diaries reveal all," by Ryan shows how wheelchair users feel they belong to society by interviewing wheelchair

users and investigating several government surveys. Ryan interviewed four wheelchair users - Shona Cobb, Nina Grant, and Sam Fowkes - about their perspectives towards equality in society. The wheelchair users think they are “invisible” from offensive outlooks from non-wheelchair users. They also commented that the legislation is not practical. For example, accessible housing is rare and most landlords insisted on not adapting their properties for disabled people. Therefore, Ryan concluded and suggested solutions for this issue by including more clarified government policies for public accessibility. The political involvement and media will also support wheelchair opportunities and skills, as well as proper understanding and respect from non-wheelchair users.

Even though the article provided meaningful qualitative data for how wheelchair users feel about their positions in society, Twitter data is another beneficial approach in observing and analyzing how people think about the wheelchair in general. Sentiment analysis or opinion mining, a process that categorizes each Tweet as positive, negative, or neutral (“Twitter sentiment analysis using Python,” 2017), allowed for descriptive analysis using Python. The program gathered a total of 500 Tweets containing keywords ‘wheelchair’ and categorized all Tweets into three explained categories. From 500 Tweets, 48.24%, 15.29%, and 36.47% are positive, negative, and neutral respectively (Wongwiset, 2020). The positive Tweets show a group of non-wheelchair users and wheelchair users who support equality for wheelchair users in society. On the contrary, the negative Tweets present complaints about poor public accessibility and poor understanding of non-users towards equal rights for wheelchair users.

Discourse data provides both broad and specific views of wheelchair users' emotions and status in society. While the wheelchair acts as an important factor for government policy, the policy does not fully cover equal accessibility for everyone in terms of emotional acceptance and

practical accessibility, agreeably to the negative content from Twitter. The analysis results also show that the wheelchair is not only a transportation option for people with disabilities but also a device for societal improvement. The wheelchair effects from this study include how to adjust the other technology (housing and public accessibility in this case), education about the wheelchair users to non-users, and political structure for efficient improvement of equality for wheelchair users in society; these topics are important inherent effects due to wheelchair representation as technology fix in society.

How to Improve the Studies of the Wheelchairs' Effects More Insightfully

Although the results efficiently explain how the wheelchair supports wheelchair users's position in society from earlier beneficial sources, sentimental analysis, and qualitative data, the environmental and timeline factors are important for better analysis. Owing to various locations of conducted researches and interviews in this study, the interpretation affected how the wheelchair influences societies in different locations or vice versa. Since the author did not directly interview the wheelchair users or policymakers, the qualitative data improvement is necessary to draw a more accurate conclusion. The direct interaction and feedback from wheelchair users are beneficial in order to gain the most recent data and compare how their emotional perception changes from earlier interviews/studies. Also, the Twitter data in this study is raw data, which may contain a few unrelated sources, so the quantitative result may obtain errors.

The wheelchair represents a great factor for a better standard of life for wheelchair users. The wheelchair affects not only mobility but also the perspectives of users towards equal opportunities in society. However, the accessibility for wheelchairs in different countries significantly contributes to different outlooks and effectiveness of the technology. Since the

developed countries maintain legal action for disability, wheelchair users focus on the adjustment of physical and structural change in society. On the other hand, wheelchair users in the developing countries viewed the technology as an assistant tool for movement and their individual independence. Therefore, future studies should include location variation in order to examine different views and how the technology and environment shape society. Even though technology fix is efficient to analyze how the technology inherently effects related technology's stakeholders, in the future study, technology momentum is another important framework to include in the study for meaningful analysis on how society or the environment impact wheelchair design and equality for wheelchair users.

How We look at the Wheelchair from Now

In this research, the wheelchair not only provides an alternative mobility option for disabled people but also impacts equality for wheelchair users in society from the points of view of legal regulations, users' emotional perception, and economic organizations. Technology fix efficiently emphasizes and demonstrates that the wheelchair presents critical concerns for related organizations as Buhler discussed after the invention of the motorized wheelchair. Even though society and wheelchair development still need to improve for the emotional acceptance of wheelchair users' equality as described in the discourse analysis from Twitter and interviews, the study shows that the wheelchair supports more awareness and positions in society as seen in legal registration, outspoken opinions, and suggestions from wheelchair users towards wheelchair designs and public policy modification. The inherent effects, included in the technology fix framework in this paper, of the wheelchair's invention are a crucial consideration for the development of alternative transportation and assistive technology in the future.

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