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Inclusive Design for Accessibility: A Case Study of Apple's Accessibility Features

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Chapter 1: Introduction

1.1 Background

The inclusive designs help to structure technological accessibilities. By using these inclusive designs, technologies have become accessible to a wide range. These inclusive design approaches are associated with different principles. The first principle of inclusive designs served flexibility for users. For that, the users become capable of interacting with their technologies in multiple ways (Rao, 2021). By focusing on the accommodations and diverse needs of technologies the inclusive designs of technologies additionally served accessible opportunities for disabled people. The customised infrastructure facilities of this kind of technological design help to control the features of their technologies in a variety of ways. For that, disabled people are capable of maintaining clear navigation within their technologies (Bennett and Rosner, 2019). The project simulation facilities are another effective factor which helps the technological users to serve people in designs. As follows these designs the developments of technologies are becoming more fascinating and accessible for every kind of human being (Bennett and Rosner, 2019). For this inclusive design, technological development and innovative works are taking speed and becoming more fascinating for every industry.

1.2 Rationale

The main issue associated with inclusive technological designs is their cost structure. The development of inclusive designs contained some lack of features which limited the accessibility for disabled people (Clarkson *et al.* 2018). These issues directly affected the quality of living and equality of life.

For the limited features of current technologies, as follows the inclusive research designs, the disabled people were unable to attend to their full potential in society. For this lack of features, they faced consequences in their daily educational and professional life. For that, it creates distance between society and disabled people (Clarkson *et al.* 2018). In this current situation, inclusive design, which can be budget-friendly and accessible for all populations, is a complex issue.

In addition, the function limitations in this kind of design like the Apple technologies of VoiceOver, Magnifier, and AssistiveTouch, are another issue in this current scenario. For these functional issues, the expectations and needs of disabled people are unable to be fulfilled (Fletcher *et al.*2019). Depending on these issues, this research evaluated some of the technological evaluations and revealed how to maximise the lifespan of inclusive technologies and provide better accessibility features for Apple devices for their disabled customers.

1.3 Aim and Objectives

Aim

This research aims to serve effective suggestions for tech companies to develop their products and services inclusively. It also aimed to analyse this inclusive design's impacts on productivity levels.

Objectives

- To analyse the effectiveness of Apple's present accessibility features in meeting the needs of people with disabilities.
- To address the cost-related challenges for developing inclusive design regarding Apple products.
- To investigate the impact of functional limitations within Voiceover, Margnifier and AssistiveTouch within all user experience.
- To provide recommendations for each tech company regarding improving their product inclusivity, include Apples.

1.4 Research Questions

The following list presents research questions for "Inclusive Design for Accessibility Analysis with a Case Study of Apple's Accessibility Features".

1. How is the effectiveness of Apple's present accessibility features in meeting the needs of people with disabilities?
2. What are the cost-related challenges for developing inclusive design regarding Apple products?
3. What is the impact of functional limitations within Voiceover, Margnifier and AssistiveTouch within all user experience?
4. What are the recommendations for each tech company regarding improving their product inclusivity, including Apple?

1.5 Research Significance

The research helped to improve the accessibility levels of inclusive technologies. It helped to improve the design works by depending on customers' needs and providing more freedom of access for disabled people.

Chapter 2: Literature Review

2.1 Accessibility features of inclusive design for disabled peoples

The features offered by these companies are currently based on inclusive designs. The development of inclusive designs helps to develop the features of technological companies, which simplifies the adoption levels. According

to Bryant *et al.* (2020), the virtual reality feature of the thec companies helps to enhance the experiences of disabled people. For that, they are capable of using similar experiences of normal people. The speech-language pathology features of the offers of thec companies help disabled people to maintain their engagements with their healthcare and other educational parts.

As follows the thought of Pradhan *et al.* (2018), the features of voice recognition facilities help to simplify the accessibility of these devices. For this feature disabled people are capable of using their technologies by using their voice. It serves full control of digital tools and supports disabled people to maintain their communications and attachments within society. From the viewpoint of Pradhan *et al.* (2018), the VIPA facilities served to control their home accessories like lighting and other devices. In addition, it simplifies the process of sending messages. For that, it reduced the struggle of disabled people to make connections with society. According to Johansson *et al.* (2020), not all disabled people are capable of accessing the features of digital technologies. Blind people and multiple disabled people are facing too many access issues during the time making their alignments with technological features.

In this technological era, the features of technologies are changing rapidly. From the viewpoint of Johansson *et al.* (2020), as compared with normal people, the adaptability capacity of disabled people is slow. As for that, the fast changes of technologies crate more complicity of adoptions new accessible tools for disabled peoples as they needed to be raised their knowledge for new tools from beginnings. As per Johansson *et al.* (2020), Of these rapid changes in technologies and their features, the thinking of disabled people is affected most as they are unable to maintain their changes as per the changes in features of technologies. Food that, they hardly deal with exclusion features offered by the technology companies.

2.2 Costs-related challenges faced by businesses during the development of inclusive products

Depending on the productional costs of the business, their costs of sales are deeply dependent on Which the adoptabilities of products for disabled people rely on. According to Tomov and Velkoska (2022), the quality costs during the time of product development affect the inclusive product development works of the business. The business served some of the unavoidable costs like inefficient utilisations of materials and losses of sales costs. They additionally faced challenges in adjustments costs during the time of developing inclusive designs for their products.

Tomov and Velkoska (2022) state that the business suffered from cost loss opportunities. In addition, the systems of inclusively designed products of the techno business are needed for high systems of quality management. Hidden failures of this quality management system of their products made direct impacts on their optional activities. As per the viewpoint of Danova *et al.* (2020), to develop inclusive products tec, technological companies need high skilled and knowledgeable employees. In addition, the business additionally served higher values for their research and innovation works. According to Danova *et al.* (2020), for this work, the business served higher

labour costs. The influencing labour maintenance costs caused by a labour shortage in this development part of the company. It is caused by slower developments of features of inclusive designed products.

2.3 Functional limitation of inclusive Voiceover, Margnifier and AssistiveTouch

Differences between inclusive products contain different functional limitations for which these products create complexity for uses for disabled people. As per the thought of Matamala (2018), voiceover facilities are helpful in translating various languages. However, during the time of translations, the voiceover facilities sometimes illustrated wrong information. In some cases, one word contained various meanings in other languages. The voiceover facility is unable to serve situation-based word translation, which is its biggest functional issue. According to Aydin *et al.* (2020), the Marguinfier technology additionally contained some functional issues. The high pixel capacity of this technology only works on low-vision screens. For that, the users of these devices need to be served their additional costs to purchase a high-vision screen first.

As per the viewpoint of Wu (2022), the AssistiveTouch screens need dexterous touch. Some of the physically disabled people are unable to serve their dexterous touch. Cerebral palsy people are one of the disabled people who are unable to use their fingers fast. For that, the faster attribute of tis device affected the use capabilities of disabled people.

2.4 Literature gap

The literature's views reflect the gaps in the accessibility and effectiveness of inclusive product features. It is unable to measure the recognition systems of inclusive technologies. For that, the voice recognition system translation issues specific for which languages are not found in this literature view. Additionally, tis literature's thoughts are unable to reveal how rapid evaluations of inclusive products are reflected. As follows, the literature is unable to access the portions of adoptions cost-effective facilities of the business and their ideas to tacked these risks.

2.5 Litretures Theory

Assistive technology theory helps to reveal the uses and designs of technologies with the alignments of adaptabilities and accessibilities of disabled people (Bennett *et al.* 2018). Using this theory, the literature's thoughts about the technological accessibilities for the difference of inclusive products of technological companies for disabled people are aligned. This theory helps to find out the functional limitations of different technologies for the user's perspective of disabled people. This theory was supported to understand the need for accessibility for disabled peoples and served the thoughts of literature to reveal the necessity of this accessibility.

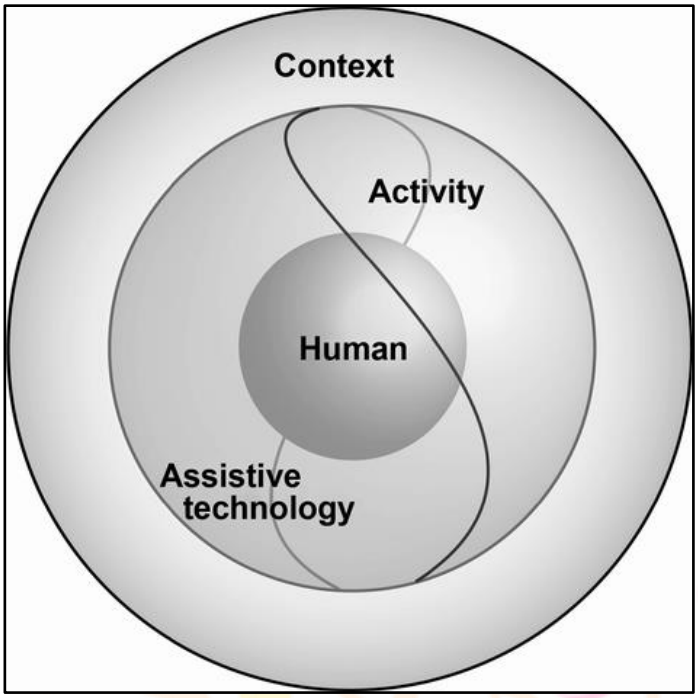

Figure 2.1: Assistive technology theory

(Source: Bennett *et al.* 2018)

Chapter 3: Methodology

3.1 Research Philosophy

The four main variants of research philosophy are ***positivism, pragmatism, realism, and interpretivism***. By using the research philosophy, individuals are capable of receiving appropriate guidance for their research. For that, the research philosophy helps maintain the consistency levels of research (Kirongo and Odoyo, 2020).

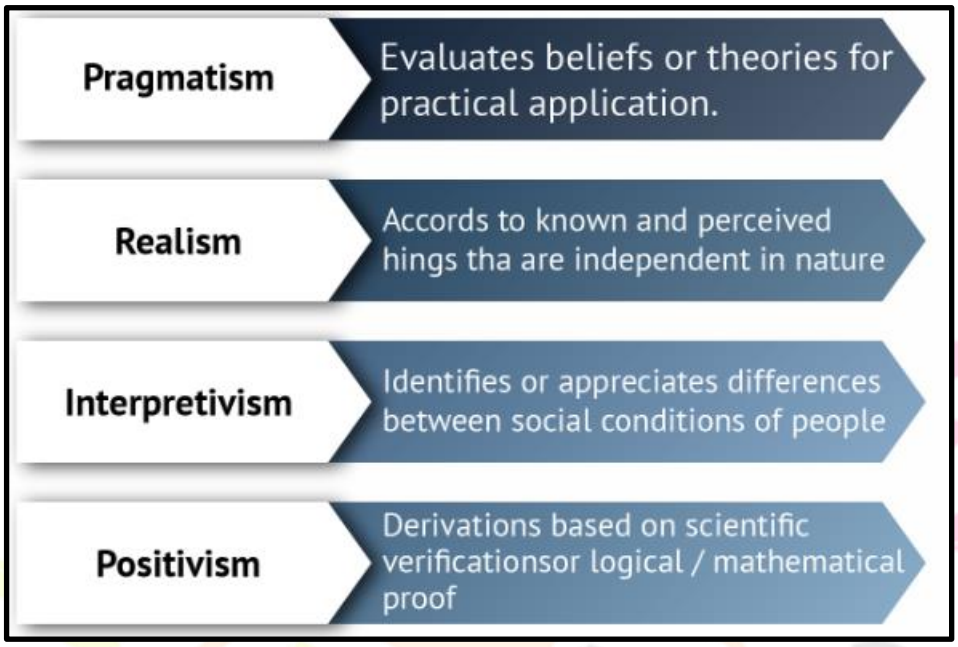

Figure 3.1: Research Philosophy

(Source: Kirongo and Odoyo, 2020)

The ***interpretivism philosophy*** was used to conduct the research on inclusive design and its features. It helped to get inside into the topic and analyse differences in individual experiences to receive the research results.

3.2 Research Approach

The research approach helps to conduct overall research plans. It influenced the structures for which the researchers could understand how the research materials were collected and analyses for the research (Taherdoost, 2022). This research used a ***deductive*** research approach to maintain proper guidance for the research. It served clear and justified arguments for the materials of research. For that, it was helpful to maintain the quality of research information for inclusive designs.

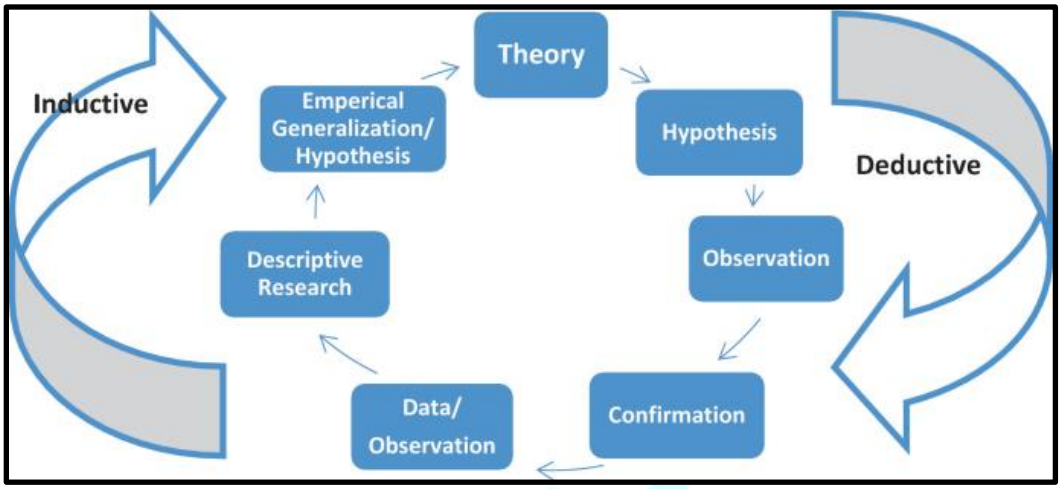

Figure 3.2: Research Approach

(Source: Taherdoost, 2022)

3.3 Research Design

The research design helps to reveal the structured plan and stage by stage process of research. By following the structures and stages of this research design, the research work can unpack its findings and reach its most justified (Asenahabi, 2019). The research on the accessibility features of apples was addressed by using an ***Explanatory*** research approach. This research approach was helpful for guidance and served to support the research process.

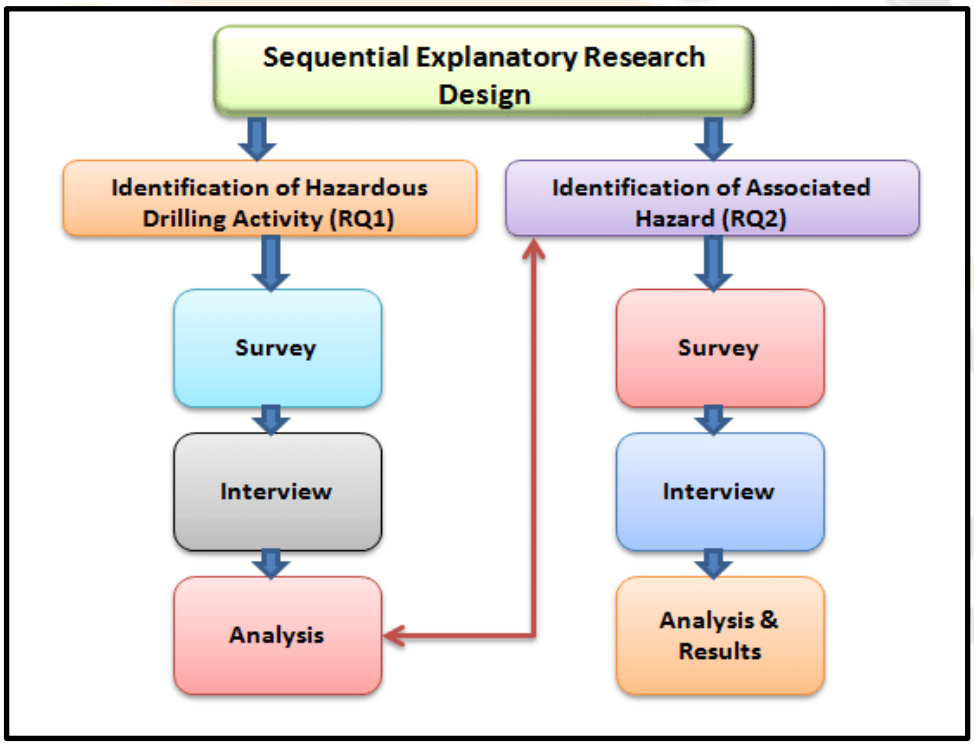

Figure 3.3: Explanatory Research Design

(Source: Asenahabi, 2019)

3.4 Data Collection Method

Data collection methods are mainly divided into two variants, which are ***primary reserach and secondary research***. It helps to gather appropriate information for the research and find answers to the research objectives (Barrett and Twycross, 2018). For this research, it was used the ***secondary data*** collection method. Using this research, different articles, books, company websites and literature papers are analyses to collect appropriate information on Apple and its inclusive designs.

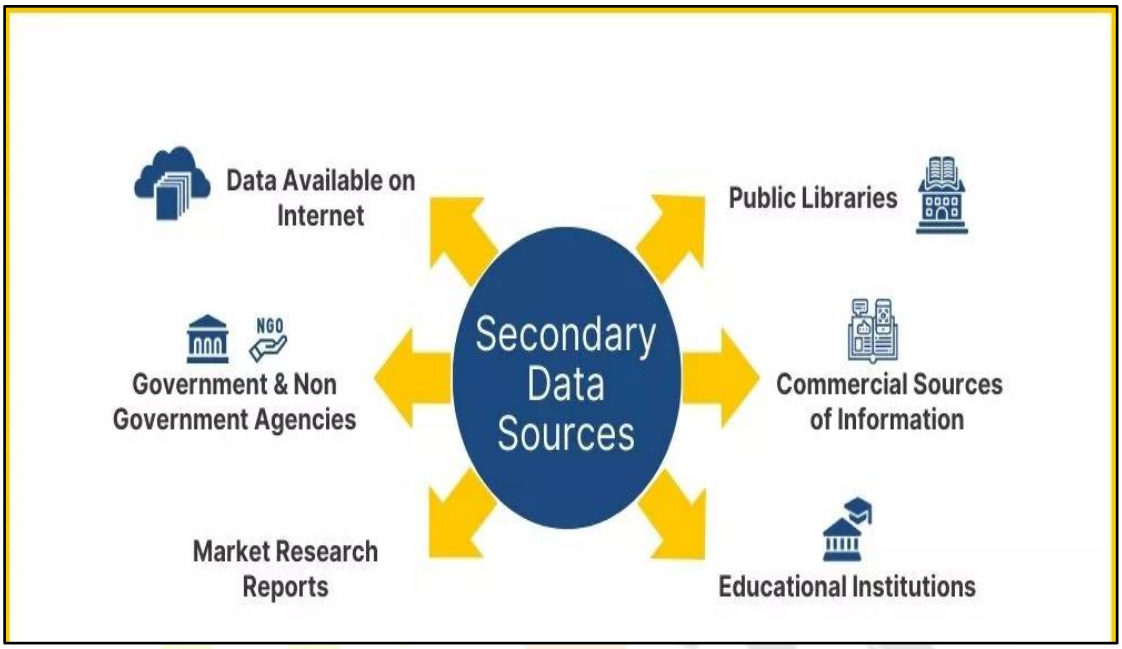

Figure 3.4: Data Collection Method

(Source: Barrett and Twycross, 2018)

3.5 Data Analysis

The process of data analysis helps to find valuable and reliable information from a large group of data. After findings valuable information, it analyses their needs for the research and interpretive its information to conclude understandable results for the research (Hammer and Harper, 2024). As for this research, it used the case study analysis method. This research on Apple's accessibility features is supported by this method, which helps to analyse detailed information about their product features and accessible capacity for disabled people.

Chapter 4: Findings & Discussion

4.1 Findings

Apple's present accessibility features

The ***voiceover*** facilities of Apple help to serve auditory descriptions of the screens of the users. It additionally aligned with different digital devices of Apple like phones, watches and Macs. For that, these device features help disabled people navigate the outputs from their onscreen content (Centers, 2023). The business additionally offered ***eye-tracking*** features for their ***iOS*** and ***iPad*** customers. Using this facility of their devices, the customers can use the elements of their Apple devices by using the fluctuation levels of their eye. In addition, the feature of ***vocal shortcuts*** additionally helps customers and disabled people make their social connections and manage their digital engagements (Apple, 2023). This vocal shortcut feature served total control of their apple devices on the speech of the users.

Cost-related challenges faced by Apple

The Digital Market Act of the EU slowed down their international expiration efforts. For the huge competitive mobile market, the sales capabilities of Apple have decreased by 24% in the international market. In addition, the global inflation rates made direct impacts on their productional works (LinkedIn, 2024). For that, the productivity of the company received downtrends in the global market where's the inflation raised their costs of products. In addition, the regulatory limitations by EU committees are raising their taxation costs (LinkedIn, 2024). As a result, the costs of production of Apple are getting higher in today's world, which has additionally raised their product prices.

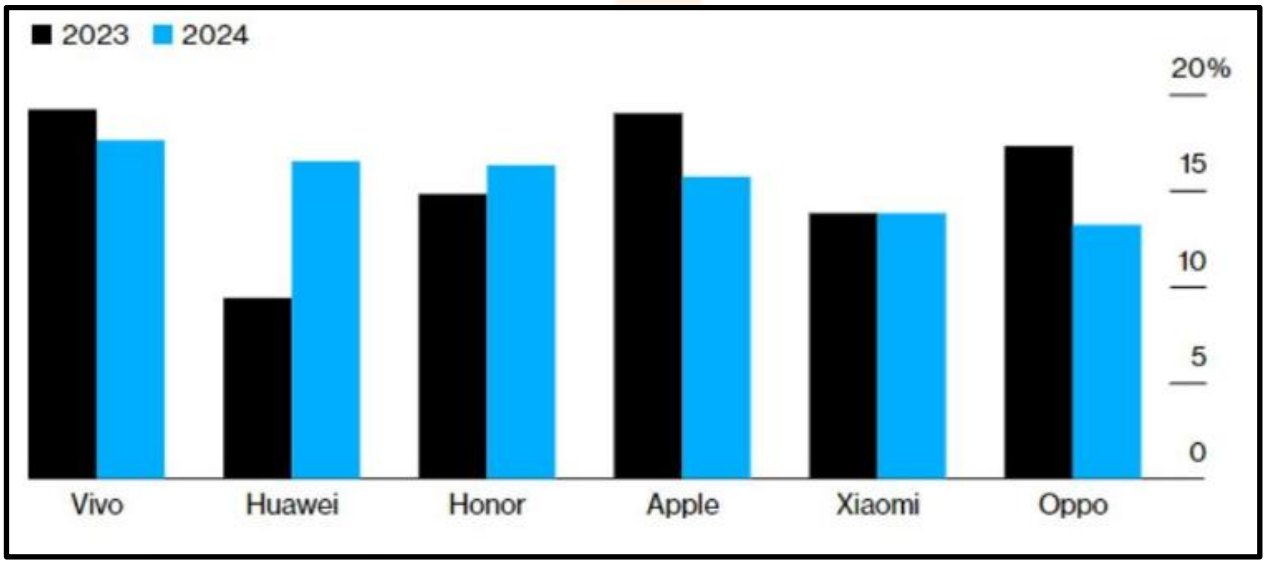

Figure 4.1: Sales fall of Apple compared with global competition

(Source: LinkedIn, 2024)

Accessibilities of inclusive products

Disabled people faced several accessible issues with this ***voiceover*** feature. This voice-over system of Apple does not recognise customers' UI. For that, it needed to implement this UI facility manually, which not be possible for

disabled people (Apple, 2024). It was additionally an unstable facility where users needed to add descriptive text firsts on their Apple devices. Of that, disabled people are not able to serve primary descriptions on voiceover devices of Apple (Apple, 2024).

The ***magnifier*** facilities of Apple products contain optical of 5D portable videos. To use this facility, the users need to join a short training. For this training, the users need to be served some of the additional costs which raised their costs purchase (Wittich *et al.* 2018). Though this product is user friendly for all of the disabled people, it is not adoptable friendly for them due to its price (Wittich *et al.* 2018). These issues have affected the trust of their customers.

Features	Optelec Compact 5 HD	Apple iPad Air (2013)
Price (Can$; April 2018)	950	429
Display size	12.7 cm/5 in	24.6 cm/9.7 in
Screen resolution (pixels)	800 × 480	2048 × 1536
Screen contrast ratio	500:1	1000:1
Screen brightness (cd/m^2)	350	415
Dimensions (cm)	13.7 × 8.8 × 2.3	24.0 × 16.9 × .75
Weight	294 g/10.4 oz	469 g/16.5 oz
Camera (megapixel)	8	5
Magnification	×1.5–×18	×1.1–×15
Camera field of view (degrees visual angle)	64.0–7.2	39.6–2.6
Distance viewing	Up to 1 m/3 ft	Up to 10 m/32 ft
Battery life (h; constant use)	3 (measured)	9.5 (measured)
Illuminator	1	–1
Contrast change	1	1

Figure 4.2: Raising costs of Apple

(Source: Wittich *et al.* 2018)

Assertive Touch facilities of Apple's iOS and other significant devices are affected by its time of operations. The response times of disabled people are slower than normal people. However, to use this assistive touch facility of the business, the users need to react fast, which creates use issues for disabled people. This system of the business does not serve some additional features like it unable buttons and Centrix control, and it serves images without ALT texts. Without these features, using this Apple facility would be harder for disabled people (Martz, 2024).

4.2 Discussion

The analysis of the findings reveals the usefulness of Apple products. It revealed that the inclusive products of Apple help their customers to simplest their access. The voice recognisation facilities of the business served as appropriate support to use their facilities for disabled people. This usefulness of inclusive products is refectes by

the thoughts of Bryant *et al.* (2020) and Pradhan *et al.* (2018). This literature reflects how the technological business is served their inclusive products to support the social interactions of disabled people.

The findings additionally reflect the costs related challenges front of Apple for which their costs of productivity are increased, and the price of their products are getting higher. The thoughts of Tomov and Velkoska (2022) and Danova *et al.* (2020) revealed unnecessary costs of the business, and their high numbers of labour costs are caused by raising the productional costs of technological business. The findings additionally reflect some of the technological errors of Apple for which disabled people are unable to access their technologies. These technological errors of Apple are supportively aligned with the thoughts of Matamala (2018), Aydin *et al.* (2020) and Wu (2022). This literature was revealed Voiceover, Margnifier and AssistiveTouch issues, which also faced by Apple to serve effective futures to their disabled customers.

Chapter 5: Conclusion and Recommendations

5.1 Conclusion

This research served detailed analysis of inclusive technologies. It analysed the differences in benefits of using inclusive technologies for disabled people. It additionally served the thoughts of literature about the matters of inclusive products of the technological business. It additionally described the research methodologies, like secondary research and case study analysis, to reveal the procedures of conducting research. It additionally analysed the inclusive technological developments of Apple and their features. It found out the costs and challenges faced by Apple during the time of their operational process and the issues of their technologies for which they are unable to serve appropriate user-friendly technologies for disabled people.

5.2 Recommendation

Apple should serve their primary focus to reduce its operational costs. For that, the business can adopt advanced manufacturing devices. By using advanced manufacturing devices, businesses can reduce their labor costs and improve their productivity levels. By taking support of these manufacturing devices, the business can improve their sales costs, which can help to raise their customer range (Pereira *et al.* 2019). The business should raise their investments in the parts of sustainable innovations. As a result of these innovations, the business can introduce more sustainable and innovative products. It can help businesses raise their competitive levels and secure their global market positions. It additionally supports attracting the attention of new customers and raising the range of their global customers (Saunila *et al.* 2018). Apple should additionally improve their access to their technologies in Voiceover, Margnifier and AssistiveTouch. by improving these technological errors, the business can serve better connectivity with disabled customers. It helps the business to raise their goodwill and provide better accessibilities and effective services (Dahlman *et al.* 2020). As for that, the trust levels of their customers within the business are going to be improved.

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