

Literature Review on Accessibility Guidelines for Self-service Terminals

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Abstract— In the age of informatization, the informatization equipment domain is expanding worldwide. The introduction of self-service terminals has accelerated the development of the unmanned service industry, and currently, people interact with self-service terminals in various places. Although informatization using products and services related to information and communication is conducted at a significantly high speed, research on the accessibility of self-service terminals among users with physical and cognitive disabilities is insufficient. Therefore, we examined the laws and guidelines on accessibility to self-service terminals, compared and analyzed the characteristics of each guideline, and highlighted the factors to be supplemented based on the types of disabilities and User Interface (UI) functions.

Keywords-self-service terminal; kiosk; guideline; accessibility; disability.

I. INTRODUCTION

In the age of information, a significant amount of data is being processed rapidly and accurately worldwide, thus expanding the field of information equipment [1]. The trend of using touch-screen technology in self-service terminals has continued to grow, and self-service technology is becoming increasingly prevalent and crucial [2]. In addition, the introduction of self-service terminals has accelerated the development of the unmanned service industry, and the services replaced by self-service terminals are gradually expanding into high value-added industries [3]. In addition, improvement in the functionality and costs of touch-screen technology has led to self-service terminals becoming increasingly integrated into our daily lives. People now interact with self-service terminals at various places, such as local grocery stores and airport check-in counters [4].

Although informatization using products and services related to information and communication is conducted at a significantly high speed, there are growing concerns regarding the information gap. The primary cause of this gap is the limitation of physical and cognitive access, which is a result of insufficient consideration of users with physical and cognitive disabilities [5].

Therefore, in this study, we aim to analyze the trends of products and services related to information and communication and to improve the accessibility of products and services related to information and communication. So we examine international guidelines on accessibility to self-service terminals based on the types of disabilities and User Interface (UI) functions. In the study results, we present the characteristics of each accessibility guideline and the

supplementary factors of the guidelines to be developed later.

In Section II, accessibility guidelines and laws are introduced, and classification criteria are explained. Section III deals with the guidelines and statistical results on the type of disability, and Section IV explains the insights that can be obtained through statistical results. Finally, Section V summarizes the study.

II. METHOD

A. Guidelines and Law Clauses Survey

We examined new laws and guidelines that emphasize the importance of accessibility to prevent discrimination against people with disabilities while using Information Technology (IT) devices. Among a total of 12 guidelines and laws, five were selected in consideration of the law's enforceability, the importance of literature, and the relevance of kiosk accessibility. In these laws and guidelines, items related to self-service terminal accessibility have been selected. Specifically, 78 items from the Guidelines for Public Access Terminal Accessibility (PATA) [9], 13 items from Section 508 of the Rehabilitation Act (RA) [10], 49 items from The US Air Carrier Access Act (ACAA) [11], 16 items from the 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design [12], and 13 items from the European Accessibility Act (EAA) [13] were selected. Based on the judgment that common items are important in terms of accessibility, 21 items from PATA, 7 from RA, 21 from ACAA, 14 from ADA, and 5 from EAA were selected as common items, as shown in the graph below (Figure 1).

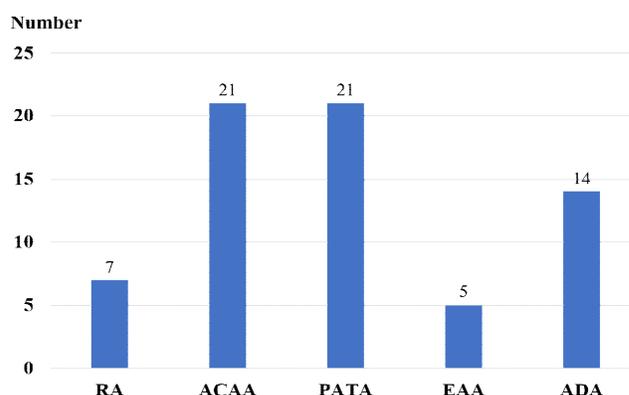


Figure 1. Number of Guidelines.

B. Classification Criteria

The self-service terminal accessibility guidelines were classified based on accessibility functions used in the previous studies [5]-[7] and reclassified in detail based on UI functions (Table 1). As a result of examining previous studies, the recommendation of manufacturer and service provider (F) deals with the physical part, unlike other provisions.

TABLE 1. ACCESSIBILITY AND UI FUNCTION

Accessibility function	UI function
Complement of color identification ability (A)	Avoid color coding
	Contrast
Complement of reaction time (B)	Sufficient time
Complement and replacement of hearing (C)	Volume control
Complement and replacement of vision (D)	Identification of input control
	Tactile information
	Input keypad
	Braille
	Text-size enlargement
Complement of cognitive ability (E)	Audio output
	Display seizure
Recommendation of manufacturer and service provider (F)	Display visibility
	Privacy
	Possibility of operation without assistive technology
	Floor or ground space
Complement hand or arm movement (G)	User identification method
	Fine motor control alternatives

The types of disabilities in the study were limited to three: visual impairment, hearing impairment, and physical disability, which are determined to affect the operation of self-service terminals. When more than one type of disability was present per clause, it was repeatedly calculated while determining statistics related to the disability type.

III. RESULT

A. Percentage of Disabilities by Guidelines

The study results show that among the types of disabilities, provisions related to visual impairment accounted for the highest proportion, whereas those related to hearing impairment accounted for the lowest proportion. The number of provisions related to visual impairment was highest in ACAA and lowest in EAA. Meanwhile, provisions related to hearing impairment were highest in the Guidelines for PATA and lowest in EAA. Similarly, provisions related to physical disabilities were highest in the Guidelines for PATA and lowest in EAA (Figure 2).

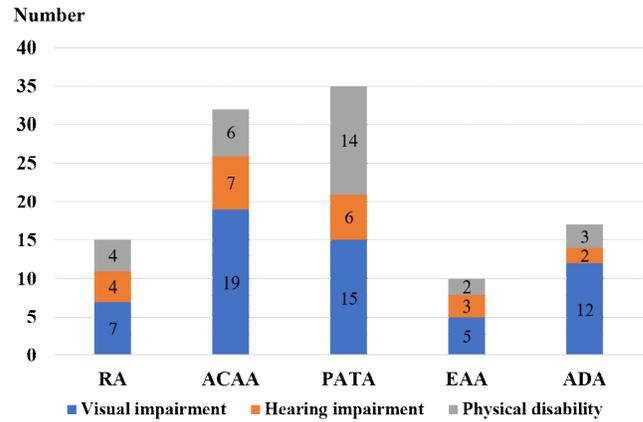


Figure 2. Percentage of Disabilities by Guidelines

B. Percentage of Disabilities by Accessibility Function

The study results show that the most common provisions related to visual impairment are complement of color identification ability (A) and complement and replacement of vision (D). Additionally, recommendation by manufacturer and service provider (F) and complement of reaction time (B) are not included in provisions for hearing impairment. Meanwhile, complement of cognitive ability (E) and complement hand or arm movement (G) have similar proportions of the three disability types (Figure 3).

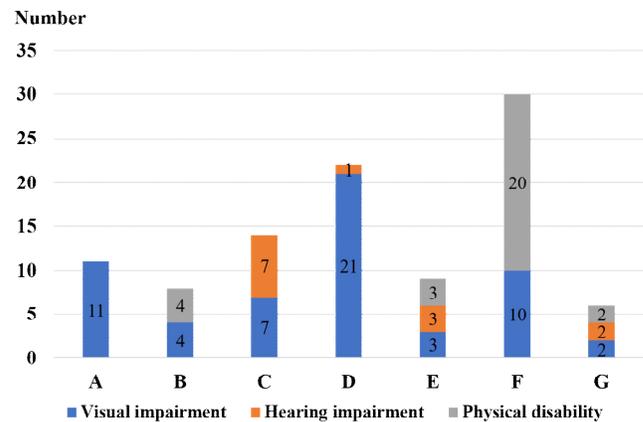


Figure 3. Percentage of Disabilities by Accessibility Function

C. Percentage of Guidelines by Accessibility Function

The complement of color identification ability (A) and complement and replacement of hearing (C) items are included in all the five guidelines and law clauses; however, the rest are included in only a few. The complement hand or arm movement (G) item is included in only two guidelines and has a low percentage. Similarly, the complement of cognitive ability (E) item is included in three guidelines and has a low percentage.

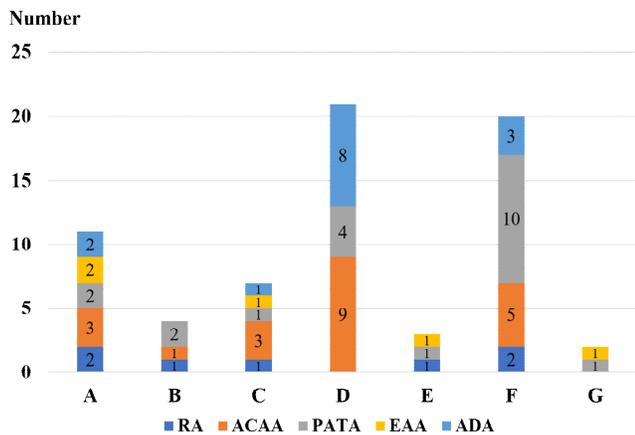


Figure 4. Percentage of Guidelines by Accessibility Function

The complement and replacement of vision (D) item is significantly included in the ACAA and ADA Standards for Accessible Design; however, it is completely excluded in the RA and EAA. In addition, the recommendation of manufacturer and service provider (F) item was primarily noted in PATA (Figure 4).

IV. DISCUSSION

The statistics of the graph presented in Figure 2 show that there are many provisions related to visual impairment, whereas those related to hearing impairment and physical disability are relatively fewer. The results also show that more factors are related to visual impairment, compared to hearing impairment and physical disability, because of the characteristics of self-service terminals that use touch-screen technology. The most important provisions related to physical disabilities are included in the PATA; however, the other guidelines have relatively fewer provisions related to physical disabilities. To develop future guidelines, it is necessary to promote provisions related to physical disabilities, such as installation location, passageways, and touch-screen interaction. In fact, most mobile devices provide touch-screen interaction, which can be particularly problematic for people with physical disabilities. Moreover, studies focusing on the design of touch-screen interfaces for users with physical disabilities are insufficient. The recommendation of manufacturer and service provider (F) item was considered a notable factor of visual impairment and physical disability, because there are many provisions for installation sites and spaces.

The statistics of the graph presented in Figure 4 show that the complement of color identification ability (A) and complement and replacement of hearing (C) items are included in all five guidelines; however, the others are included in only some guidelines. Therefore, it was determined that the specific factors for each guideline differed. In addition, the complement hand or arm movement (G) item is included only in the PATA and the EAA. Therefore, they must be considered and included in future provisions of other guidelines. The complement and

replacement of vision (D) and complement of color identification ability (A) items related to vision were primarily noted in the ACAA and the ADA Standards for Accessible Design, whereas the recommendation of manufacturers and service providers (F) item was primarily noted in PATA. Hence, the ACAA should be analyzed for guidelines related to vision, while the PATA should be analyzed for guidelines related to kiosk manufacturing.

Other disabilities were not considered in this study because the types of disabilities were limited to visual, hearing, and physical disabilities, which are related to the operation of self-service terminals. Future studies may also focus on mental disabilities, such as intellectual disabilities.

Statistical calculations were conducted based on the number of guidelines; however, detailed evaluation methods are required to accurately evaluate the self-service terminal accessibility guidelines. For example, ANOVA can be used to evaluate the difference for each guideline, and Fisher test can be used to perform a post-test.

V. CONCLUSION

In this study, international guidelines related to self-service terminal accessibility were examined and classified based on three types of disabilities and seven accessibility functions.

Based on statistical information, we determined the UI functions and types of disabilities that characterize each guideline, as well as the percentage of the types of disabilities, according to the accessibility function.

The study results show the characteristics of the overall self-service terminal accessibility guidelines and the factors to be supplemented. This information will be useful for future studies aiming to further develop the self-service terminal accessibility guidelines.

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