

Application of Universal Design at Oki Electric

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What comes to mind with the mention of Universal Design (UD) Products designed with the intent of providing easy to use for as many people as possible? Several years ago, many people may have noticed the notches on the top and side of shampoo bottles, which was advertised as an example of UD. Rinse bottles did not have these notches, so a person could tell the difference between a shampoo bottle and a rinse bottle, simply by touching it, even with their eyes closed. This is a design that becomes useful when one can not open their eyes, a situation that many of us experience. Not to mention, this is also useful for visually impaired people.

Examples of more recent applications may be mobile phones being sold as special models for the elderly or an automobile that incorporate UD. It is impressive that unlike previous examples, these complex systems with computers have become a viable business.

In this paper, such recent situations that surround the UD will be described, followed by descriptions of the application of UD at Oki Electric.

What Universal Design (UD) means

The corporate vision of Oki Electric is "Oki, Network Solutions for a Global Society" which aims to contribute to an "e-society". Within this framework, the universal design is considered as one of the vital components that provides "human-friendliness".

The term "universal" means "for all people". Thus UD is meant to be a design not only for the elderly or people with disabilities but for as many people as possible (Fig. 1)¹⁾.



Fig. 1 Universal Design is oriented towards the creation of products for use by as many people as possible

In the past, support offered to persons with disabilities was mainly through the addition of specialized units or with the development of dedicated equipment. UD is an antithesis to this. UD is conceived for the design of products not treating persons with disabilities as exceptions, but rather treating them as one category of

users, by designing the equipments that are easy to use for as many people as possible from the beginning stage.

Then what are the requirements for a design to be considered UD? In order to answer questions such as this, it is helpful to refer to the well known UD concept (Seven Principles)²⁾ proposed by the late Mr. Ronald Mace (architect) of the United States and his colleagues.

- (1) Equitable use
The design is useful and marketable to people with diverse abilities.
- (2) Flexibility in use
The design accommodates a wide range of individual preferences and abilities.
- (3) Simple and intuitive
Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
- (4) Perceptible information
The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- (5) Tolerance for error
The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- (6) Low physical effort
The design can be used efficiently and comfortably and with a minimum of fatigue.
- (7) Size and space for approach and use
Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

In the above, principle numbers (3), (4) and (5) apply also to the easy to use in general, so principle numbers (1), (2), (6) and (7) would be the portions that are specific to UD. These items are accompanied with specific guidelines such that there will be no sense of humiliation (principle (1)), compatible for both right and left-handed persons, as well as setting the pace for easier use (principle (2)), operation is possible whether standing or seated (principle (7)).

In order to effectively satisfy the above principles and guidelines, development methods will be required, such as those described below:

- Perform several monitoring tests during development and obtain feedback on the design (a development method commonly referred to as the "human-centered design").
- Arrange for a variety of users to participate as monitors, including elderly and persons with disabilities.

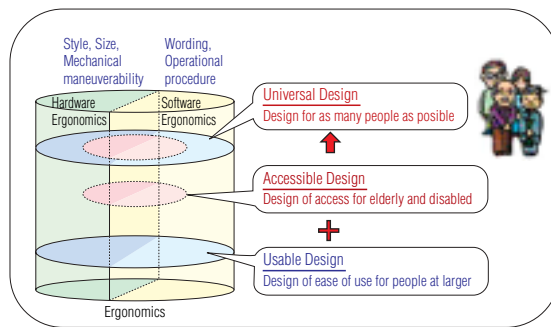


Fig. 2 Interpretation of Universal Design at Oki Electric

It may appear as if the UD is a major undertaking when it is written in this way, which may cause hesitation on the part of prospective UD. It is true that UD cannot be done in a short period of time. From another aspect, however, it creates an opportunity for cultivating the collective strength of a business, in terms of its superior design ability, technical ability and support ability.

Oki Electric uses the diagram of Fig. 2 to explain the UD in a clear manner, with terminologies that are recognized in international standard terms (ergonomics, accessibility and usability). In the words of Oki Electric, UD is a design with a consideration for both usability and accessibility.

Recent conditions surrounding UD

The surrounding conditions of UD in recent years have changed in the following manner:

- **Transition of population:** The advent of a highly aging society (by 2015, a quarter of Japan's population will be constituted by people over 65 years old), requires support of the elderly as a critical issue.
- **Consumers:** Although it will be necessary to take measures to accommodate the diverse needs of consumers, consumption by the baby-boomer generation will be the key for the future.
- **Government initiatives:** There are gaps in the information derived from disabilities, which are affecting wage disparities. Many nations are attempting to resolve the gaps in the available information ("digital divide"). In Japan, this was cited as one of the five crucial fields in the e-Japan Strategy announced in 2002.
- **Statutory regulations:** In the United States, section 255 of the Federal Communications Law and Section 508 of the Rehabilitation Law have been established. There will be an agenda for amending the Americans with Disabilities Act in 2004. In Japan, laws concerning public facilities have been established; the Heart Building Act was established in 1994 concerning Buildings, and the Transport Barrier Free Law was enforced since 2000.
- **International standardization:** Based on the momentum built up by the international standardization of the ISO/IEC Guide 71 (Guidelines for standards developers to address the needs of elderly people and disables) that originated in Japan, international accessibility standards are being established such standards as the ISO/TS 16071. In 2004, an agenda is to be implemented for three JIS standards for accessibility (JIS X 8341 series) in Japan.

- **Corporate social responsibility (CSR):** UD is becoming one of the most important elements of corporate social responsibility.

Although such topical and social issues have preceded actual actions, there has been a lack in business experience, to boost business decisions on when and to what extent UD should be implemented. Recently, however, there are some successful examples, such as the aforementioned cases of mobile phones or automobiles, attempts have become more proactive. This trend is emerging as phenomena, such as those described below:

- **Public announcement of UD as one of the core elements of product development:** Businesses are including UD as a new concept for product development, along with environmental issues. Many are also disclosing specific examples.
- **Activation of disclosures by consortiums and cooperatives:** In September 2003, the International Association for Universal Design (IAUD) was founded. Further, alliance consortiums of household appliance manufactures and automobile manufactures are being established as well.

Other than the conditions described above, business demands, such as making the functions previously only available to expert workers possible for novice workers as well, are factors for pushing this trend further for the purpose of reducing operational costs.

History of UD at Oki Electric

Oki Electric has been separately involved in efforts for "usability" to provide easy to use for the individuals without disabilities and "accessibility" for persons with disabilities (Table 1: Refer to Reference Material 3 for details of history)³⁾.

Usability was already being implemented in a wide range of equipment in the late 1990s, as shown in Table 1. In such usability efforts, issues were resolved through the evaluation of usability tests that were conducted with the participation of test monitors. From 2000 onwards, such attempts were further promoted with usability dealt with, not as a response to problems found in evaluation tests, but rather, as one of important design criteria considered from the early design stage.

Accessibility, on the other hand, was being integrated into communications equipment. However such efforts required the modification of hardware, and most efforts in recent years, were limited to the addition of special units or the development of dedicated equipment.

Table 1 UD efforts of Oki Electric in recent years

Period	Efforts	Category
Late 1990s	<ul style="list-style-type: none"> Review of ATM and work terminals (U) Introduction of barrier-free efforts by other companies (A) 	US Accessibility Law Compliance WG (A)
	<ul style="list-style-type: none"> Usability improvements (U): Unmanned cash loan machines, ATMs, high counters at banks, low counters at banks and multifunctional ATMs. ATMs that accommodate visually impaired persons (A) 	
2000s	<ul style="list-style-type: none"> Review of a personal seal collator (U) Study proposal of an automated equipment screen layout (U) 	ATM with tactile symbols that accommodate visually impaired persons (A)
	<ul style="list-style-type: none"> Usability test of printers (U) Trial runs to integrate the UD into design processes (U) Reviews of bank reception systems, airline systems and personal vauthentications (U) 	
2000s	<ul style="list-style-type: none"> Preparation of web page guidelines (WU, WA) Reviews of the next generation printer and ticketing machines (U) 	Information sharing web site
	<ul style="list-style-type: none"> Electronic voting system (A) Railroad system (U, A) Reviews of the security improvement system and tele-consultation counter (U) 	
2000s	<ul style="list-style-type: none"> Formulation of accessibility guidelines (U) Airline system (U, A) Web page (WU) Automated equipment (U, A) ATM advertisements and the next generation stores (U) 	Operation by mobile phones (U, A)

(U): Usability adaptation; (A): Accessibility adaptation;
 (WU): Web Usability adaptation; (WA): Web Accessibility adaptation

For example, ATM that caters specifically for wheelchair users is shown on the left in Photo 1. Through consideration, wheelchair users are not required to put the wheelchair sideways and this design also satisfies the principle of UD (6). At that point in time, the design would have been considered a forward thinking effort.

On the other hand, the ATM with tactile symbols, which accommodates visually impaired persons (right side of Photo 1)⁴⁾⁵⁾ is a great leap in its universal design in terms of its low cost, which is a key point to make all ATMs UD. Although software modification is necessary, in terms of hardware, stickers of the tactile symbols and an earphone are only required. This result brings a reduction of costs. Since it is possible to easily convert standard equipment into equipment that is usable by visually impaired persons, the changings of existing machines into machines that cater for visually impaired persons are also feasible.

The historical development in which usability and accessibility have both evolved separately, as mentioned

above, has been changing in recent years. Due to the tendency that software outweighs hardware and operating systems provide adequate support functions, consideration for both usability and accessibility is no longer difficult. Exampmles include a web development, since operating systems and web tools will provide extensive support for accessibility. The methods for providing hardware accessibility has also been further refined and consideration for both usability and accessibility is becoming a more natural way to go.

UD group organizations at Oki Electric

The progress of these efforts depends on individuals who are core persons promoting such developments in an organized and systematic manner.

The group organizations related are shown in Fig. 3. Ergonomics Committee is a corporation-wide technical standardization committee, which has been promoting the implementation of international standards into Oki electric, while providing the function of a steering committee to promote UD efforts throughout the company. This committee has been engaged in discussions on this topic and has organized dedicated work groups (for example the US Accessibility Law Compliance WG that was established around 2001) to conduct intensive work, when necessary.

The Ergonomics Committee is made up of members of each internal company and UD experts. The committee members of individual internal companies provide the function of a UD contact person in their respective organizations and also fill the role for providing instructions and promotions. The Human Interface Laboratory (abbreviated as "HI Lab") is a research and development organization that is responsible for developing new UD designs and evaluation methods, conducting research and development of new UD technologies as well as providing corporate internal training. Oki Alpha Create is an organization responsible for implementing designs and realizing the UD for hardware and software.



Photo 1 ATM accomodating wheelchair users (left) and screen display of ATM with tactile symbols for the visually impaired (right)

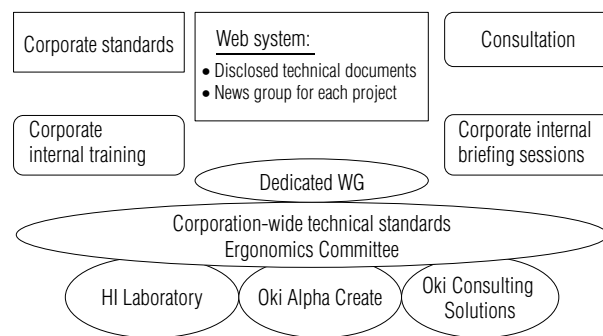


Fig. 3 UD group organization and efforts made

When planning a product, for which UD should be considered, the relevant internal companies will usually contact either or both the HI Laboratory and Oki Alpha Create through the Ergonomics Committee, to consign either a short-term response or a full-scale response requiring cooperative participation by both. There may be circumstances when only Oki Alpha Create will respond. In any event, an effective response using an information sharing web site will be provided. It is believed that the framework described here has contributed to the high ranking of Oki Electric on the management aspect in the corporate UD rankings conducted by an outer evaluation firm⁶⁾.

Conclusion

This paper has provided an overview of recent conditions surrounding UD, followed by descriptions of the UD efforts at Oki Electric.

Relevant persons at Oki Electric have been responding in an organized and cooperative manner to the need for UD, making steady progress long before the significance of UD started to draw attention. In terms of corporate internal instructions, the total sum of participants attending corporate internal training alone amounted so far more than 800, which means this many employees gained knowledge concerning this subject.

To further promote UD in the future, so that it will be accepted by as many people as feasible, not only in terms of social contribution but also to create value for business, we intend to continue steadily with our efforts, such as those activities introduced in this paper.

In the year of 2004 three accessibility standards of JIS (JIS X 8341) for electronic information systems will be implemented and the new guidelines under the Americans with Disabilities Act (ADA), which continues to influence the world over, will also be enforced. These are not merely some additions to a design or design process, but rather these laws tend to require UD that encompasses the entire business process, including the provision of satisfactory support. Such ideas have much in common with the realization of the e-society that Oki Electric aims to achieve. In the future, we intend to delve into such aspects as well.

References

- 1) "For human-friendly designs": a pamphlet of Oki Electric Industry Co., Ltd., 2003.
- 2) Seven principles of UD: http://www.design.ncsu.edu/cud/univ_design/princ_overview.htm
- 3) "Human Interface for Automated Financial Systems": Sakae Yamamoto, Mitsunobu Matsumae, Koji Ueda and Zenko Kanda, Oki Technical Review, Issue155 Vol. 59 No.3, pp. 59-66, 1992.
- 4) "Testing Public Equipment", Hosono, Miki and Akatsu, In Kurosu (Ed.) "Usability Testing", pp. 155-163, Kyoritsu Shuppan, 2003.
- 5) "Research into barrier-free ATMs that provide touch symbols and an audio guide", Nonaka, Wake, Shigeki Mogi and Miki, Visual Disability Rehabilitation Research Institute, 2000.
- 6) Sellable schemes are made this way: A starter kit for implementing UD, Shimokawa, Ota and Maruo, Nikkei Design, September issue, 2003.

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