

NEC Group's Approach to User-Centered Design (UCD)

In the NEC Group Vision, we have set our sights on the realization of an “information society friendly to humans and the earth,” and have adopted Universal Design (UD) as the company-wide philosophy that will guide us to this destination, and User-Centered Design (UCD) as the most effective approach to translate our efforts into practical results. Through UD and UCD, we aim to enhance our products and services with three key qualities: “Accessibility” that enables more people to use them; “Usability” that makes them easier and more intuitive to use; and “Innovation” that delivers a leap in both value and attractiveness for the user. The UD and UCD design concepts not only apply to our development of products and services, but also can be effectively adopted in every facet of corporate activities from planning and marketing to sales promotion, after-sales service and maintenance. Even from the perspective of brand value enhancement, the NEC Group is tackling the thorough deployment of this approach.

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1 Introduction

The NEC Group formulated the “NEC Group Vision 2017,” which represents what we envision to become as a company and the society we shall strive to help create (**Fig. 1**). In this Vision, we have declared our determination “to be a leading global company leveraging the power of innovation to realize an information society friendly to humans and the earth.” In order to achieve this goal, the products and services that we provide must be not only sustainable, but also be easy to understand, optimally satisfy user needs, and be attractive for people with diverse wants, requirements and limitations. It is also imperative that this commitment to be a company that is more caring for people and the planet is reflected in the NEC Group

To be a leading global company leveraging the power of innovation to realize an information society friendly to humans and the earth.

Fig. 1 NEC Group Vision 2017.

communications activities and the actions of all our employees.

The principle of “realizing an information society that is more caring towards people and the planet through providing attractive products, services and solutions that can be used easily by a greater number of users with a variety of needs” is the essence of the NEC Group’s Universal Design philosophy. Moreover, UCD is being promoted throughout the NEC Group as the most certain and effective approach and process for implementing this way of thinking about solutions.

In this article, we would like to introduce the reader to how the UD philosophy and UCD process are becoming an integral part of the NEC Group. ^{*1*2}

2 Realizing our Group Vision with UD and UCD

2.1 NEC Group Universal Design (UD)

From the personal computers and mobile phones in our lineup of personal products to the business software, computer platforms and other solutions for business as well as the

*1 Some products and solutions introduced in this special issue are mainly provided for the domestic market.

*2 Authors' profiles in this special issue are as at June 2011. Some names of companies and departments may change after July 2011.

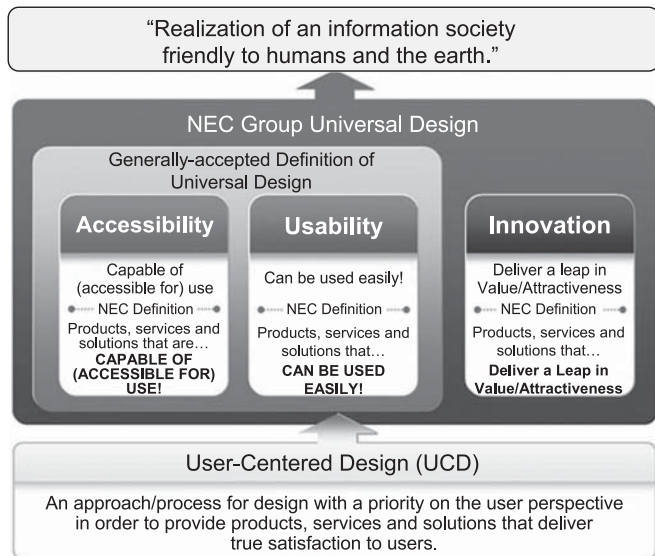


Fig. 2 UD elements and UCD concepts.

infrastructure and systems that support our lives, range of products and services that the NEC Group provides to its customers is broad and diverse. Against the background of our rapidly aging society and increasing globalization, it is necessary to take into consideration UD concepts that provides a growing diversity of people with products that are easier to understand and can be used with certainty and confidence. This means incorporating human error-prevention features and other measures in the design to facilitate operation regardless of aging and skill/experience level, even in the case of business systems that may be used only by specialists.

Fig. 2 shows the UD elements that the NEC Group aims to reflect in its business as it advances toward the realization of its Group Vision. The realization of an information society that is “friendly to humans” will require our consideration of the three elements of “Accessibility,” “Usability” and “Innovation” described in the chart.

● **Accessibility**

Accessibility is a factor that must be taken into consideration in order to enable diverse people from the elderly to those with disability to use NEC products and services.

The US Rehabilitation Act (Section 508) and Japan’s JIS-X8341 (officially titled “Guideline for older persons and persons with disabilities”) are just a few examples of laws and regulations that are part of the global movement toward setting standards for accessibility. Even municipalities are establishing ordinances to regulate accessibility, which is increasingly seen as a premise for the development and provision of goods and services. While naturally complying with

all applicable laws and regulations in the development of products and services, companies are demanded to premise design on making these products and services accessible to as broad a scope of users as can be possibly envisioned, and minimize those who are unable to use them to the absolute minimum.

● **Usability**

Usability is all about how easy it is for users to utilize products and services. This concept extends to ensuring that advanced services and complex systems can be used with simplicity and without error.

Today our lives are surrounded by services that rely on various information devices from the service terminals at city hall and financial institutions to transportation ticket dispensing systems, websites and smartphones.

In response to the rising demand for ever easier-to-use products and services, it is important to understand that each individual has different levels of information technology literacy, skills and experience, necessitating consideration of a variety of usability-related issues to ensure pleasurable usage by all.

For example, there is the need for flexibility that enables intuitive usage without any prior explanation or allows the user to choose a preferred method among multiple methods of operation. While enabling first-time users to properly operate a system by following the instructed steps, another aspect of usability lets experienced users eliminate troublesome steps with auto completion functions, for example, automatic completion of certain address fields based on user entry of the postal code. Superior usability is simply the realization of such considerations in a way that satisfies user needs.

● **Innovation**

The NEC Group’s UD philosophy also includes “innovation” as a key element. The needs of users are diversifying. NEC defines innovation in UD as obtaining a grasp of their latent or potential needs, creative formulation of a solution, and delivering products and services that represent a leap in value and attractiveness. It also means aiming at “UD that enables users to gain a new experience or enjoy new value in daily life or work.”

For example, it has been almost 20 years since mobile phones first achieved wide market adoption. Throughout these 2 decades, they have continued to see improvements in ease of use from both a design and technology perspective such as enhanced operability with improved menu design and effortless data entry in step with advances in technologies that contribute to more compact and lighter designs, advanced functions and digital technologies. Today, as a result, the mobile phone not only is used by a broad canvas of users

including the elderly and the disabled but also has become an essential tool in everyday life.

In recent years, use of the mobile phone as an Internet terminal has seen explosive growth in developing nations. The ability to let anyone simply transmit and access information is linking the peoples of the world in a community, and is providing users everywhere with new experiences and value. In this way, the pursuit of UD concepts that enables anyone to use products and services more easily is giving birth to new experiences and value, which in turn leads to a quality of attractiveness that stirs the “desire to use them.”

2.2 UCD in NEC UD

The above-described UD philosophy has been adopted as NEC's approach to realizing a wide range of products and services. Throughout the NEC Group, we are using the User-Centered Design - a methodology and process which pervasively applies a user perspective to development and design. UCD has been established as an international standard under “ISO 9241-210: Human-centered design for interactive systems,” and as a JIS standard under “JIS Z 8530: Human-centered design for interactive systems.”

This philosophy is founded on the concept that things should be made according to the user instead of first making something then thinking about the user. It is characterized by minutely defining the envisaged user and proceeding with development with a shared understanding of the user by the development team.

Also with the aim of achieving innovation that exceeds the user's expectation, we not only conduct questionnaire research and interviews to grasp the evident needs, but also observe user behavior in situ with the aim of uncovering potential needs that the user himself may not recognize. Furthermore, in order to realize a solution to those needs, it is indispensable to tackle repeated and thorough verification testing.

As we advance along our path to “the information society friendly to humans and the earth” envisioned by NEC, we firmly believe that the thorough and practical application of UCD concepts in every aspect of the design and development of our products and services will lead to the realization of both our Vision and UD philosophy that has a distinctive NEC quality.

2.3 Four Steps of UCD

In order to put UCD concepts into practice in the NEC Group, we are following the 4 steps described below and moving forward with development supported by repeated cycles of forming and verifying hypotheses of user needs. These 4 steps are based on the standards of “human-centered design for interactive systems” established by ISO and JIS, and even though the

object of our development and actions may vary, they all share a commitment to the user perspective from upstream in the process.

- **Step 1 Understand and specify the context of use**

While identifying targeted users and gaining a thorough understanding of their attributes, we must also obtain a grasp of related market conditions including market scale and competitive products as well as the context of usage - how a user is currently behaving or using a product or service to satisfy needs.

- **Step 2 Specify the user requirements**

This step clarifies what the user wants and then formulates the desired specifications and objectives that will satisfy user requirements based on various parameters including corporate strategy, level of technology currently possessed by the user and human resources.

- **Step 3 Produce design solutions to meet user requirements**

This step consists of translating user needs and wants into a “visible” design solution. In order to verify that the objectives are correct, a simple prototype is produced.

- **Step 4 Evaluate the designs against requirements**

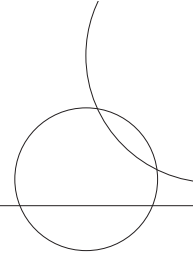
An evaluation from the user perspective is conducted on the prototype “visualized” in Step 3 and the results are fed back into the design process. Through repeated cycles of design and evaluation, the problems are revealed and corrected.

3 Our Thinking behind Company-wide Promotion of UD and UCD

3.1 Approach by Business Units and Operations of the NEC Group

The practice of promoting UD and UCD activities in the NEC Group can be traced to the 1980s and our research and development of human interfaces. In the 1990s, it was evident in the development of devices such as ATM machines that supported the needs of the visually impaired and electronic voting machines for local governments. Since 2000, our activities have steadily broadened with response to issues such as web accessibility. With the establishment of the Universal Design and Brand Strategy Office by the head office in October 2007, we launched full-scale promotion of UD throughout the entire NEC Group.

In order to realize our Group Vision of an “information society friendly to humans and the earth,” it is necessary to promote adoption of our UD philosophy (“One NEC united by UD”) not only in our development operations, but also in all our operations from business, planning and sales promotion to R&D and operational support staff. For example, by giving consider-



ation to ease of understanding and improved accessibility in activities and content that provides explanatory content to customers such as sales activities, showrooms, web sites and catalogs, we can implement UD concepts in our communication activities. Also in our after-sales and maintenance services, the adoption of UD concepts by staff can produce diverse and numerous benefits and value ranging from improvement of the ease in executing tasks and a consequent reduction in the labor burden and work time to shortening of required training time. As has been described above, the application of a UCD perspective in various operational aspects from communication activities to maintenance services can contribute to both constant improvement and elevation of the quality of our activities.

Maintaining a UD and UCD perspective is vital not only in the development of products and services, but also in all NEC Group activities including business operations, marketing and sales promotion and even maintenance and after-sales support. By thorough indoctrination of these concepts in every business unit of the NEC Group and adoption by all employees, we believe that it will create value that is uniquely NEC's and will lead to enhancement of brand value.

3.2 Approach by Product/Services Development Departments

In order to create and supply the customer with value that is unique to NEC, the development of products and services is one of our most important activities. For this purpose, we apply a UCD approach to the development of the broad range of prod-

ucts and services handled by the NEC Group, enhancing the value we provide to our customers. With the aim of building a corporate organization that will sustain this practice, we are promoting the adoption of this philosophy and approach on a group-wide scale. UCD promotion activities can be broadly divided into two categories: Basic UD/UCD Promotion Activities that provides each business department and unit with a common structure and shared functionality to support UD/UCD activities across departments, and Practical UD/UCD Application Promotion Activities mainly promotes the application of UD/UCD in each business unit and department.

• Basic UD/UCD Promotion Activities

These activities span training in UD/UCD for personnel involved in development, the development of useful tools for the effective practice of UD/UCD, and the standardization of the UD/UCD approach through the formulation of guidelines and the development of standard designs (design patterns). Other promotion activities in this category are the sharing of information such as "best practices" and practical case studies as well as lateral development/execution.

• Practical UD/UCD Application Promotion Activities

These activities focus on the promotion of UCD-applied development of products and services by each business unit. It is vital that the promotion of these concepts be applied not only in the development of individual products and services, but also throughout the departments which are the focus of development and in interdepartmental execution.

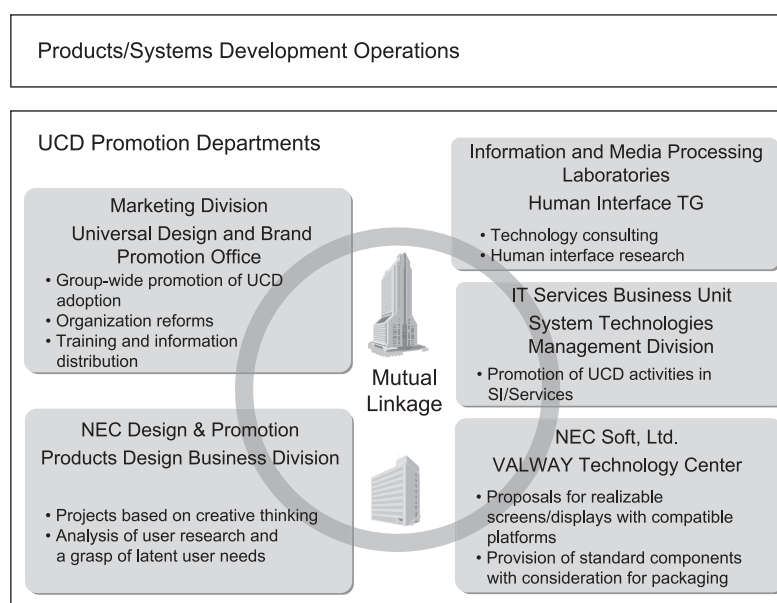


Fig. 3 Organization to promote UCD in the development of products and services.

As shown in **Fig. 3**, the UD/UCD promotion system consists of the setting of group-wide promotion policy by the Universal Design and Brand Strategy Office, interface technology development and technology consulting by the research laboratories, and supervision of development NEC Design & Promotion, IT Services Business Unit and NEC Soft expert teams to provide interdepartmental coordination for the practical application of UCD concepts.

Serving as a link between the concerned departments shown in Fig. 3, this system facilitates periodic sharing of information related to UCD such as projects during the development process, inquiry and consultation, which leads to timely consultation with the concerned departments. In addition, while supporting the practical application of UCD concepts within each department, the system also pursues activities that serve as a group-wide platform for standardization of development within the NEC Group and the improvement of development tools.

4 Key Points for Successful Group-wide UD/UCD Promotion and Future Prospects

The methodology and process of UCD itself can be applied to a wide range of products and services, but when actually practiced in development, there are quite a few cases in which its application does not proceed smoothly due to differences from conventional development thinking and approaches, delivery date and scheduling issues, budgetary restrictions and priority conflicts.

Also for the application of UCD concepts to lead to the development of superior products and exploit maximum effectiveness from this approach, it is necessary to develop separate guidelines and tools, comply with existing standards, re-examine the review methodology and establish other practical skills and know-how to respond to the needs of the development workplace.

In order to encourage workplace acceptance of UCD concepts and promote their practice, NEC has pursued a program of activities to date. The key points of our group-wide UD/UCD promotion are summarized below:

1) Clarification of Development Objectives

Because the most effective methodology and application of concepts will vary depending on whether “Accessibility,” “Usability” or “Innovation” is the main objective, it is vital to clarify the priorities of these elements.

2) Working in a Framework that Makes Efficacy Visible

By gathering a variety of practical case studies with concrete results, categorizing them by the beneficiary of the efficacy and using this understanding to establish a framework, we build a shared consciousness of targeted efficacy.

3) Analysis of Existing Innovation

Existing innovation is analyzed from the perspective of UCD, and the points of excellence are identified. Through this analysis, we gain an understanding of the reasons behind successful innovation from the UD/UCD perspectives.

4) Execution in Conformance with the Workplace Mission (Issue Consciousness)

Putting a policy into practice in line with the department's mission is another key. For example, a department responsible for standardization or the development process can draw up a checklist of aims to systematically raise the standard of quality for Accessibility or Usability and establish a policy of standardization. In a planning or marketing department, this could mean practical application of UCD activities that targets Innovation.

5) Expert Participation

In processes that are determined to be a key to success or present risk, the involvement of experts is essential.

6) Accumulation of Methodologies to Exploit Research Data

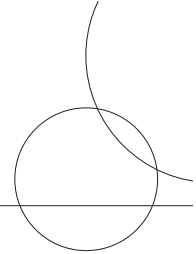
How do we exploit research data gathered in the practice of UCD at each checkpoint in the development process? What judgments were made and why were they reached? These are made transparent and are accumulated for future reference.

These key points are reflected in our pursuit of a variety of activities from group-wide employee training and workplace good practices to rollout case studies.

Our group-wide UCD promotion also must respond to future social changes and further elevate its effectiveness. For example, in step with globalization, providing superior products and services that are easier to use and satisfy the needs of people from many countries around the world is increasingly in demand, and we believe that the importance of UCD in meeting this need will grow. In this area, we must confront a variety of issues such as how swiftly can we develop products and services that can be enjoyed by more people globally and the identification of elements shared globally and those shared locally.

Another consideration is the arrival of the Cloud Society and the importance of developing easy-to-use cloud service interfaces - an element that will have a profound influence on our corporate competitiveness. While seeking higher development efficiencies, we must realize service that delivers customer satisfaction.

By further accelerating and deepening our efforts to establish UD and UCD promotion activities in response to these important future issues, NEC Group would like to develop excellent products and services that respond to the needs of society and the changing environment.



5 Structure of This Special Issue

In this special issue, we would like to introduce the reader to our efforts to promote UD and UCD activities in the NEC Group from the perspective of the previously described (1) Basic UD/UCD Promotion Activities and (2) Practical UD/UCD Application Promotion Activities.

(1) Regarding the Basic Activities, this special issue will provide a look at the guidelines, standardization, tool development and design activities that support the practice of UD/UCD concepts across a broad range of fields from a group-wide promotion perspective.

(2) Regarding Practical Application Activities, we would like to present the reader with case studies that highlight the three constituent UD elements targeted by NEC Group: “Accessibility,” “Usability” and “Innovation.” In each case study, the narrative will put the spotlight on characteristic aspects of development. We will also introduce our approach to taking know-how from stand-alone projects and sharing it across our organization and systematically deploying UCD concepts and practices.

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Development of Design Patterns for HI Design
Development of Accessibility-Related Tools and Their in-House Applications

Product development case studies/Accessibility

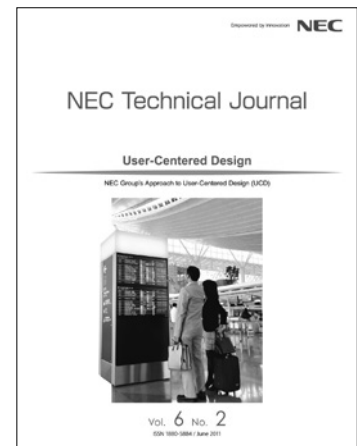
FIS (Flight Information System) Design at Haneda International Airport
Innovative ATM Development Pursues Usability and Environmental Performance from the Viewpoint of the Customer
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