

User-Centered Design Employed for the Smartphone “MEDIAS (N-04C)”

YAMADA Eiko, OKAMOTO Katsuhiko, MATSUKAWA Hiroo, IWAKI Yoshihiro

Abstract

“Usability” is regarded as being an important issue in the rapid market expansion of the smartphone. This paper introduces the user-centered design (UCD) expertise that NEC CASIO Mobile Communications, Ltd. has accumulated since the age of the traditional cellular phones. It also discusses actual examples and UCD perspectives of the age of the smartphone.

Keywords

smartphone, user-centered design, prototype, usability, MEDIAS (N-04C)

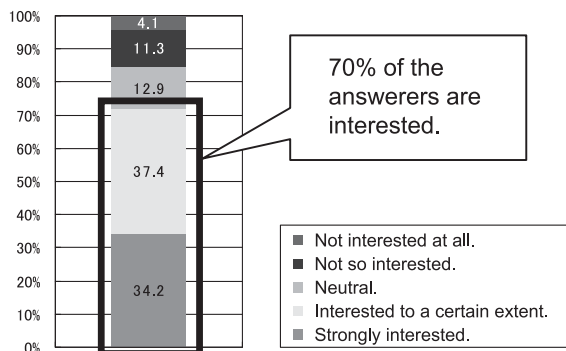
1. Introduction

As the Japanese smartphone market presented rapid expansion in 2010, some call it “the first year of the smartphone.” The number of smartphone sales is expected to reach 6.6 million units in FY2011 and 20.3 million units in FY2015 (survey by MM Research Institute, Ltd.)²⁾.

In an Internet survey of the 7,000-people scale conducted by NEC CASIO Mobile Communications, Ltd. (hereinafter referred to as NEC CASIO) in October 2010, more than 70% of the answers indicated interest in the smartphone (Fig. 1 , left). What should be specially noted here is that “usability” gained the highest score among the issues emphasized when the smartphone was purchased (Fig. 1, right).

The smartphone has a large screen and its main operations

The smartphone is a mobile phone featuring the easy addition of functions and enjoyment of the web, as for the PC. Are you interested in the smartphone?



NEC CASIO survey
 Answerers: 7,840 persons
 Period: October 2010

If you would consider the smartphone as one of the options the next time you change your mobile phone, what would you emphasize most?

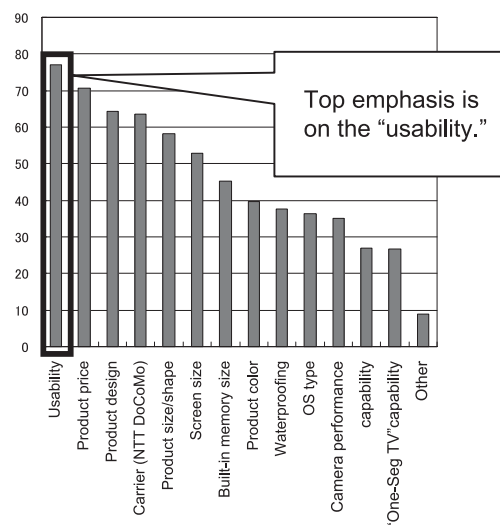


Fig. 1 Results of Internet survey.

are controlled with a touchscreen, which is different from the traditional cellular phones that are controlled mainly using buttons. We concluded that it is because of this difference in the operation style that leads to concerns among users regarding the operability and why they put so much emphasis on “usability.”

It was expected that the smartphone would expand its range among users and that the usability would be more emphasized than before. To deal with this situation, NEC introduced the concept of user-centered design (UCD) endeavoring thus to improve usability in the upstream process.

This paper discusses what form UCD should take in the age of the smartphone and also introduces examples of the UCD that were adopted for the MEDIAS (N-04C), which is the first NEC CASIO smartphone, launched March 15, 2011.

2. NEC CASIO's Approach

Employing the UCD concept is a technique for improving usability by repeating the flow of extraction of usability-related issues in user surveys and arranging their improvement. NEC CASIO have built an efficient UCD process after developing techniques and tools for UCD surveys through trial and error over many years. Our expertise in this field is also applied to the smartphone.

The UCD process emphasizes the following three issues.

(1) Execution of UCD in the upstream process

We apply UCD in the upstream process of merchandising in order to extract usability-related issues as early on as possible. This is because, in the process of commercialization from product planning to sales, the modification of the merchandise specifications becomes harder as the process advances to the downstream.

In the past, there were cases in which we failed to apply the improvement measures to the actual merchandise due to scheduling issues even though we had identified the usability-related issues correctly.

In consideration of these mistakes, we decided to perform user surveys at the stages from product planning to design specification so that the results could be fed back to the merchandise development (Fig. 2).

(2) User surveys use of prototypes

User surveys are accompanied by the presentation of as many prototypes as possible because actual prototypes make it possible to draw more realistic commendations from the

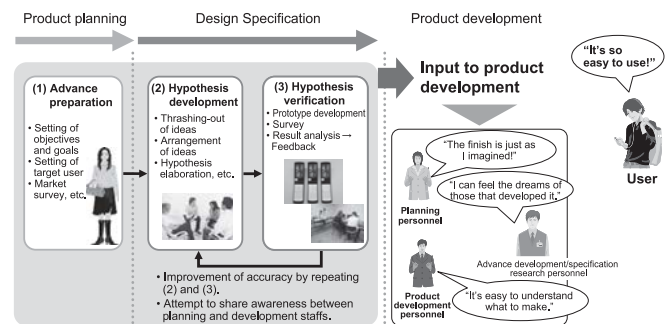


Fig. 2 Flow of UCD execution in the upstream process.



Photo HW prototype (Left: volume mockup. Right: design mockup).

users. The process is more effective if multiple prototypes with different specifications are available because these allow users to express opinions based on comparisons. The prototypes are also useful for sharing issues with the persons concerned in-house.

Nevertheless, fabrication of advanced prototypes takes time and is costly. Therefore NEC CASIO fabricates and uses the following prototypes according to the purpose and timing of the surveys.

1) HW prototype

The prototype we used in the initial stage of the design was the “volume mockup” that could be fabricated in a short period and at a low cost (Photo , Left). This prototype is suitable for confirming the approximate shape and the bulkiness. After the design orientation has been determined, the design mockup is fabricated for checking details including

User-Centered Design Employed for the Smartphone “MEDIAS (N-04C)”

color (Photo, Right).

2) SW prototype

This is the prototype for checking size issues of the displayed buttons, their display methods and for suggesting changes to the display. In the initial stage of the specification design, a simplified prototype is developed using PowerPoint or Flash (Fig. 3). After the application specifications have progressed to an acceptable stage, a test application is developed and installed on the actual device for checking and improvement, assuming actual usage scenarios.

(3) Participation in the user survey of persons concerned in merchandise issues

Persons concerned with merchandise issues (planning personnel, designers and developers) participate in the design



Fig. 3 SW prototype (Flash version/controllable from PC with a touchscreen panel).

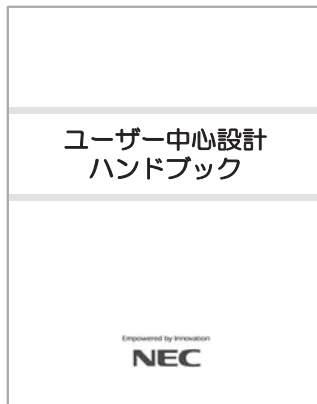


Fig. 4 User-centered design handbook.

and enforcement of the user survey. This is because the realization of the usability-related issues of persons concerned in development through direct experience can be the driving force for promoting improvement.

The user survey is carried out under the leadership of the specialized departments that possess the requisite UCD expertise (design and marketing departments) in the optimum technique matching the purpose of the survey. In the actual enforcement, those persons concerned with merchandise issues visit the survey locations in order to act as an interviewer or advisory staff and to collect the direct opinions of the subjects.

In order to share the expertise widely in-house, we have compiled the User Centered-Design Handbook (Fig. 4) and distributed it in-house. We also conduct promotional activities via in-house education.

3. Case Study of MEDIAS (N-04C)

Launched on March 15, 2011, the MEDIAS is the first smartphone of NEC CASIO. With high specifications including a 4-inch LCD, One-Seg TV receiver and *Osaifu Keitai* (mobile wallet) capability, it is the world’s slimmest smartphone*¹ at 7.7 mm and it has an ultralight weight of 105 grams (Fig. 5).

With the MEDIAS, too, we applied the usability improvement activities according to the emphasized items (1) to (3) described in section 2 above. The rest of this section describes the results of these activities.



Fig. 5 MEDIAS(N-04C).

*¹ As of February 24, 2011. Among the 3G mobile phones (NEC CASIO survey).

3.1 The Shape of the MEDIAS

The smartphone features enriched browsing type functions such as a browser, maps and document viewer. To make full use of such features, the mainstream smartphone models use large displays with touchscreen panels.

At the early stage when we examined the shape of the MEDIAS, a shape equipped with numeric keys or a full keyboard like the traditional cellular phones was considered as one of the candidates because such hardware keys can make sure that the characters are input. At that time, we thought that the difference in the character input operability would be a high hurdle to cross for the users of the previous cellular phones.

However, the results of surveys (group interviews and center location tests (CLT)) showed that the straight-type shape was collecting support from most subjects. What they needed was a large screen with touchscreen, a new feature proper to the smartphone, rather than traditional operability. We decided to give the MEDIAS a straight type shape based on the survey results and to add the slim technology developed jointly by NTT DoCoMo Corporation and NEC CASIO to increase the product appeal.

3.2 Design of the MEDIAS

In order to provide both good design and high usability, prototypes were fabricated and checked for detailed improvements. In order to continue to the production stage it was found necessary to solve the following three issues.

1) Design emphasizing the slimness

The CLT in the survey made it clear that the slimness of the MEDIAS is very highly desired by users. So we studied a design that could enable added slimness in order to enhance the MEDIAS product appeal.

The finally adopted T-shaped cross-section (**Fig. 6**) looks even slimmer than it actually is due to the two lines with different shadings, colors and materials at top and bottom. In addition, the T-shaped cross-section also has a usability effect because the ease of hooking fingers prevents it from being dropped and it also facilitates picking it up from a horizontal position.

2) Design enhancing strength

There has been concern pointed out on the strength issue due to the ultraslim design. We therefore reserved rigidity by using a hybrid construction that integrates stainless steel, resin and aluminum frames on the left and right sides. Since the side aluminum frames contact the hand directly, they

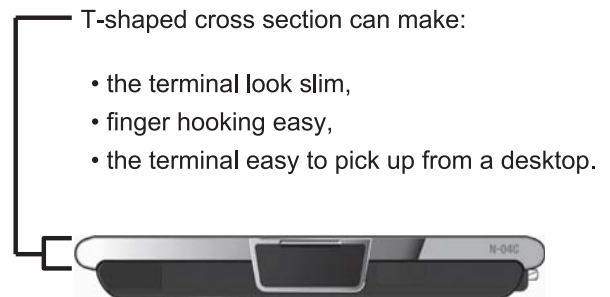
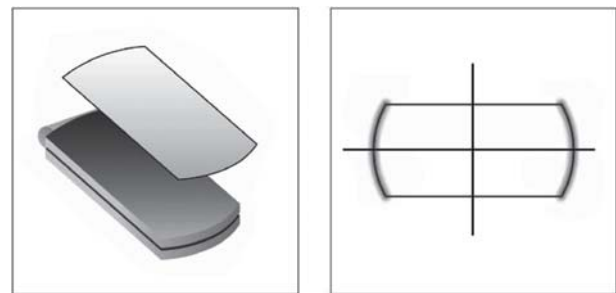


Fig. 6 T-shaped cross-section.



Shape combining curves and lines, appropriate to the N Series

Symmetries in the horizontal and vertical axes

Fig. 7 Shape of the MEDIAS.

also have the effect of communicating the impression of high precision and grade in addition to a feeling of rigidity.

3) Coexistence of an image appropriate to the N series with ease of holding

The shapes combining the curves and lines of the previous N-series cell phones have been highly acclaimed by the users. We decided to continue to adopt this shape in our smartphone in order to satisfy the users.

The smartphone is often used in the widthwise position for viewing movies, etc. This means that it should be designed in order to be easily held, whether it is held lengthwise or widthwise and whether by the left or right hand. In addition to continuing use of the shape used for the N-series, we also decided to implement symmetries in both the horizontal and vertical axes (**Fig. 7**).

3.3 Character Input of MEDIAS

The touchscreen character input is the point that most perplexes the user when shifting to the smartphone from

User-Centered Design Employed for the Smartphone “MEDIAS (N-04C)”

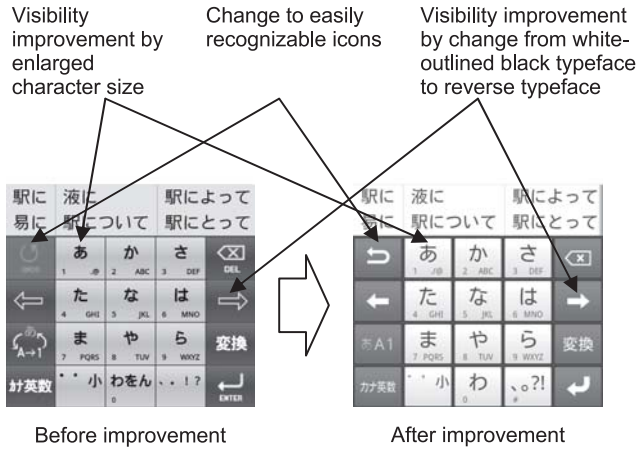


Fig. 8 Character Input of MEDIAS (ATOK Display)

* Courtesy JustSystems Corporation

traditional cell phones that had keyboards.

It is not desirable that the operability of the frequently used basic functions such as the character input is changed frequently. However, considering the projected expansion of the smartphone market in the future, it is necessary to implement more universal operability.

Therefore, we prepared operational prototypes and performed usability tests using senior staff. As a result, we discovered that the problem lay in the displayed guidance rather than with the operation flow. Many subjects could not recognize hardly visible indications and unfamiliar icons and thereby failed to achieve their tasks. We therefore improved the guidance of the MEDIAS so that it could be understood even by first-time users (Fig. 8).

4. Conclusion

Since the launch on March 15, 2011, the MEDIAS has been increasing its sales smoothly and has satisfied more than 80% of its users (after-purchase survey conducted in April 2011, with 2,077 answers). One of the causes of this favorable result is the UCD.

Many overseas manufacturers are actively investing smartphone products in the Japanese market, and applications from all over the world are provided to the end user via the market. Unlike the traditional Japanese cellular phones that are called “Galapagos syndrome or Jalapagos” the development of the smartphone required competitive supremacy to win the world

market.

The UCD manifests its strongest effectiveness in the speedy improvement in usability in the new market. At NEC CASIO, we are determined to accumulate more UCD expertise in order to create merchandise that will lead the world.

* *Osaitu Keitai* (mobile wallet) is a registered trademark of NTT DOCOMO, INC.

* ATOK is a registered trademark of JustSystems Corporation.

* PowerPoint is a registered trademark of Microsoft Corporation in the United States and other countries.

* Flash is a trademark or a registered trademark of Adobe Systems Incorporated in the United States and other countries.

References

- 1) MEDIAS (N-04C) products information.
<http://www.n-keitai.com/n-04c/index.html>
- 2) Market scale forecast of domestic cellular phones and smartphones.
<http://www.m2ri.jp/newsreleases/main.php?id=010120100831500>

Authors' Profiles

YAMADA Eiko

Manager
Business Strategies Division
NEC CASIO Mobile Communications, Ltd.

OKAMOTO Katsuhiko

Manager
NTT DoCoMo Business Division
NEC CASIO Mobile Communications, Ltd.

MATSUKAWA Hiroo

Manager
NTT DoCoMo Business Division
NEC CASIO Mobile Communications, Ltd.

IWAKI Yoshihiro

Assistant Manager
NTT DoCoMo Business Division
NEC CASIO Mobile Communications, Ltd.

Information about the NEC Technical Journal

Thank you for reading the paper.

If you are interested in the NEC Technical Journal, you can also read other papers on our website.

Link to NEC Technical Journal website

Japanese

English

Vol.6 No.2 User-Centered Design

Remarks for Special Issue on User-Centered Design
NEC Group's Approach to User-Centered Design (UCD)

◇ Papers for Special Issue

Basic activities supporting practical projects

User-Centered Design Promotion Activities in NEC
The Role of Design in UCD (User-Centered Design)
User-Centered Design in SI/Software Development
Development of Design Patterns for HI Design
Development of Accessibility-Related Tools and Their in-House Applications

Product development case studies/Accessibility

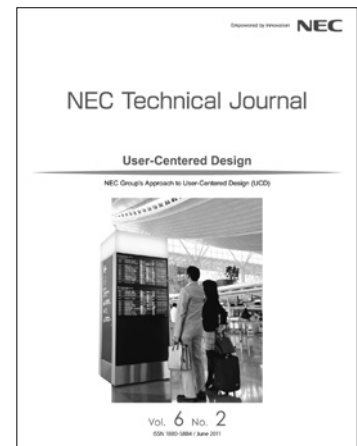
FIS (Flight Information System) Design at Haneda International Airport
Innovative ATM Development Pursues Usability and Environmental Performance from the Viewpoint of the Customer
Approach to UD Font (Universal Design Font) Development
User-Centered Design Activities of NEC Infrontia

Product development case studies/Usability

Development of Server Management Software "ESMPRO/Server Manager" Based on User-Centered Design
VoiceGraphy, Solution Supporting the Preparation of Minutes for Meetings Using Speech Recognition Technology, and Its UI Design
User-Centered Design Employed for the Smartphone "MEDIAS (N-04C)"
Human-Friendly UI Design for "Cloud Communicator"
User-Centered Design Activities for PCs

Product development case studies/Innovations

User-Centered Design for Projector Product Planning
Marketing of the "ShieldPRO" Rugged Notebook with User-Centered Design



Vol.6 No.2

July, 2011

Special Issue TOP