Method for Designing Smartphone Apps Considering User Experience

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In February 2014, the municipal government of Kawasaki City and Fujitsu signed a framework agreement to cooperate in finding ways to leverage big data and open data. Kawasaki City released "Kawasaki Apps," a series of apps designed to provide citizens with useful information using positioning data and linked open data (LOD), such as information for families with children and for protection against disasters. As a participant in this project, Fujitsu worked on developing a system that could provide timely information to young parents through Kawasaki Apps. We were responsible for designing an app for young parents to help them raise their children. This was done considering the user experience (UX) for various usage situations. A pilot study was conducted in Asao Ward in January 2015. About 80% of the participating users gave positive feedback such as "the app is useful" and "would like to continue using it." On the basis of the responses of pilot study participants as well as of municipal employees, this app was approved for a city-wide roll-out in Kawasaki, and went into full development in June 2015, followed by its launch in April 2016. This paper explains the UX design processes involved in the development of this Kawasaki App for young parents.

1. Introduction

In February 2014, Fujitsu and the municipal government of Kawasaki City signed a framework agreement with the aim of creating a sustainable community through collaboration and cooperation.[1)] This agreement covered areas such as enhancement of the ICT environment and development of next-generation human resources. It also included surveys and research on the use of big data and open data as a key initiative. The goal was to improve the lives of city residents and invigorate the business sector by digitizing the huge amount of information (big data) related to changes in the social and economic environment, public trends, etc. faced by Kawasaki City and providing it as open data.

In April 2016, Kawasaki City began the provision of "Kawasaki Apps" for smartphones and other types of mobile terminals with the aim of improving public services.[2)] Kawasaki Apps make use of location information and government information converted into linked open data (LOD) to provide information related to child rearing, disaster response, etc. in a timely manner. As part of this project, Fujitsu developed various types of service apps, including a portal site for Kawasaki Apps plus an open-data platform to run these apps. Among these, the authors were responsible for developing an app to support child-rearing parents. This development was undertaken with the theme of "disseminating information on child-rearing events leveraging smartphone features." The idea was to enhance the support that Kawasaki City was giving to families with small children and to popularize giving to and receiving information from city residents by using smartphones. A key feature of this development process was the inclusion of user experience (UX) design.

We first conducted surveys of the target users, namely, young parents raising their children and administrative staff of a contact/information desk and clarified the issues and needs of each group. We then identified the direction to take with this child-rearing support app and undertook its design with the aim of establishing a service with an enhanced UX and user interface (UI) for the application. The developed application was tested and evaluated through a pilot study in Asao Ward, Kawasaki City, as the "Asao Childcare

Figure 1
Screenshot of Kawasaki Childcare Portal.

Portal" in January and February 2015. Its name was later changed to "Kawasaki Childcare Portal"[3] and launched in April 2016 (**Figure 1**).

The Kawasaki Childcare Portal app was produced in three phases: user survey, UX design, and UI design. In this paper, we describe the key points of each phase and outline the pilot study.

2. User survey phase

To clarify the UX desired in the development of this app, we used the following methods to select target users and identify the experiences and issues surrounding child rearing.

1) Workshop with child-rearing parents

We held a workshop with two designers acting as facilitators (**Figure 2**) and six parents raising children aged one to ten. The parents were asked about their experiences and feelings with regard to the following questions:

- What has changed since the birth of your children?
- What concerns you about child rearing?
- How do you use your smartphone?
- What do you enjoy about child rearing?
- What is your involvement with the municipal government?

Figure 2
Workshop with child-rearing parents.

We classified and organized the replies recorded from a child-rearing time series, places where child rearing is experienced, etc., and studied the results to determine target users (**Table 1**). As a result of this study, we selected "parents with children within the period from pregnancy to early childhood (preschool)" as target users. The reasons for this selection were based on such comments as "There are few people to consult with about child rearing," "I need real-time information and information on events near my present location," and "My plans and activities change dramatically depending on the physical condition of my child." On the basis of our findings, we determined that the target users have the following features:

- PCs and smartphones are main sources of information.
- Given that a device would normally be used while looking after one's child, searching for information on a smartphone during one's spare time is more frequent than intensively searching for information on a PC.
- Since a baby's physical condition can change quickly, it is difficult to make plans one or two weeks in advance.
- It is difficult to search for a restroom that has diaper-changing facilities when going out.

2) Interview with child-rearing support staff

System engineers interviewed support staff to determine issues surrounding their administrative tasks. We were also provided with information publications issued by the municipal government. In this way, we were able to deepen our search for information deemed

necessary for child-rearing parents and to ask support staff about their expectations regarding the conversion of such information into open data.

3. UX design phase

On the basis of the issues and latent needs reported by both child-rearing parents and child-rearing support staff, we proceeded with developing a UX design that could maximize the value of a child-rearing support app focusing on "to whom," "when," "where," "what," and "how" when providing information.

3.1 UX of child-rearing parents

1) To whom

Target users were assumed to be parents with preschool children centered on the period between "pregnancy and early childhood." It was also assumed that some conditions would differ from user to user such as "having more than one child" or "one's parents having a home in Kawasaki City."

2) When

It was assumed that the time period of app use by target users would be as follows:

- During the day on a weekday while at home
- In the morning on a weekday before going out
- During the day on a weekday or holiday while out

3) Where

It was assumed that the app would be used mainly at home or an outside location inside Kawasaki City. Access from outside the city was also assumed for the sake of analyzing the needs of residents in areas neighboring Kawasaki City.

4) What

In addition to information provided by the government, it was decided to provide the following types of information deemed necessary at the user's location as obtained from the results of interviews.

- Child-rearing events (publically or privately held)
- Child-rearing support facilities
- Parent-child-friendly places to go

Table 1
Results of child-rearing workshop

Category	Pregnancy	Infant (age 0–1)	Early Childhood (age 2–6)	Childhood (age 7+)
Circle of friends	• No different than before marriage • Little interaction with other expectant mothers	• Tends to be just 1-to-1 with child • Somewhat isolated • Centered on other mothers encountered at hospital	• Centered on other mothers at day care and in neighborhood • Formation of a child-rearing community	• PTA activities increase
Source of child-rearing information	• Hospital • Government – Hardly any participation in events – Parents' classes only	• Mostly government • Comments/Opinions on the Internet • Other mothers	• Other mothers are main source of information • Reference Internet information for shopping purposes • Learn about events from a notice board at city hall or neighborhood day care	N/A
Going out	N/A	• Precautions against heat are important • Use taxis more often • Go out after searching for facilities with nursing rooms	• Extensive use of all-electric bicycle • Avoid trains and other public transport during peak hours • Contrive ways of keeping child from becoming bored • Select shops with children's menus • Decide whether to go out depending on child's physical condition on that day • Worry about injuries at destination	N/A
Involvement with government	• Little motivation to learn about events before giving birth • Difficult to attend if working • Use ticket attached to maternity handbook	• Relieved if there is a counter where advice can be given • Difficult to wait in line at a counter • Paper-based information is difficult to organize • Criteria for entrance into day care (point system)		• Rarely look at government information
Target of app support	Partly supported	Supported	Supported	Partly supported

- Schedule of health exams and vaccinations
- List of medical institutions
- Links to websites with child-rearing support information

Moreover, as described above, it was assumed that the information needed would differ from user to user, so the provision of information with a certain degree of personalization was determined to be necessary.

5) How

Assuming a variety of usage situations by child-rearing parents, we considered the following types of usability.

- Quick operation with one hand
- Easy access to important information
- Quick search function for child-rearing events that one would like to attend on the same day, the next day, or in the case of a three-day weekend, the day after next
- Searching for information on nearby events
- Pleasing to the eye when using

On the basis of the above, we decided to develop a service and application assuming the following needs:

- Easy access to important information on health exams, vaccinations, etc.
- Quick search function for nearby places with diaper-changing space when away from home

3.2 UX of child-rearing support staff

We presented the following items to the child-rearing support staff in relation to "improving management efficiency by digitizing child-rearing information" and "determining the actual state of usage via a smartphone app."

- User attributes

Determine trends in the child-rearing generation such as age level, gender, family makeup

- Access day/time

Determine active time periods

- Access location

Determine place of use (home, outside location, etc.)

- Accessed information

Determine what type of information is used in child rearing on the basis of how often it is accessed

4. UI design phase

We performed a UI design for the smartphone app to achieve the UX design described above. To embody the usage methods and experiences envisioned in the UX design phase as a UI for this app, we investigated the following three points one by one: overall screen transitions, screen configurations, and visual design.

1) Overall screen transitions

To enable users to access the information they need in a relatively short time, the top screen consolidates important information while serving as a hub to connect to other function screens that have more detailed information and other types of information as well.

2) Screen configurations

In the top screen, information is arranged in a vertical manner for ease of viewing on a smartphone (**Figure 3**). Button size was designed to be about

Figure 3
Screen configuration

7–10 mm regardless of smartphone model to make button operation as easy as possible. Additionally, from among the child-rearing events registered by the government, notices are displayed for events to be held from the current day to the day after next. Also displayed is information under "My Event" (event information bookmarked by the user) and "Healthcare Topics" (medical information on health exams, vaccinations, etc.). The top screen also includes a "Local Information" button that directs the user to the "Search for Places to Visit" screen. At this point, the user can refine a search for information on nearby events in accordance with the age, gender, etc. of the child while displaying results on a map (**Figure 4**). In addition to one's current location, this search can also be conducted using one's home, grandparents' home, etc. as a starting point.

3) Visual design

To develop a satisfactory visual design for the UI, we surveyed the preferences of mothers, which we assumed comprised the highest percentage of target users, and designed a color scheme and visual styles accordingly. In the end, we adopted a pastel-pink design as an overall color tone.

5. Pilot study and UX evaluation

We developed a child-rearing support app called "Asao Childcare Portal" on the basis of the UX design that we proposed and conducted a pilot study from January 6 to February 28, 2015, in Asao Ward, Kawasaki City, monitoring 100 residents as study participants.[4)]

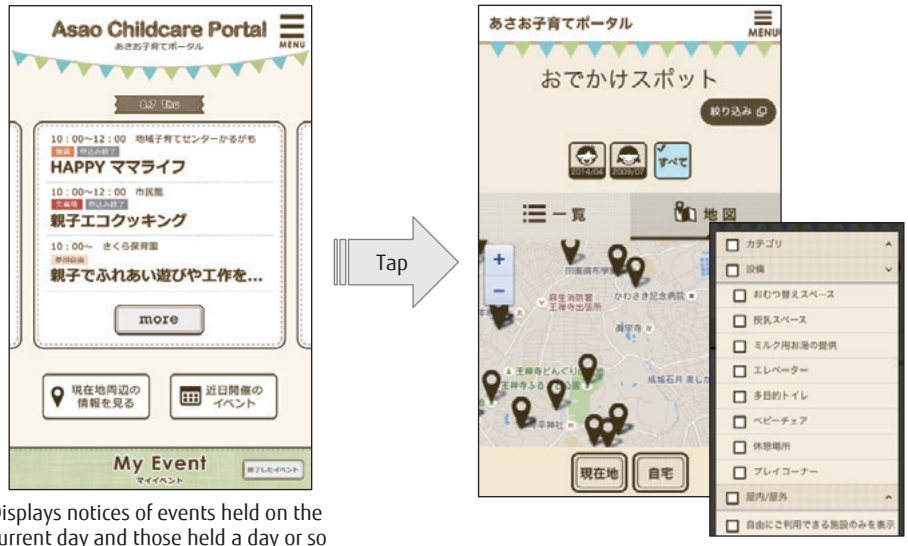
This study was conducted to evaluate the following three points:

- Improvement in public services (accurate and timely provision of information needed by city residents)
- Improvement in efficiency and execution of administrative tasks
- Development of an LOD usage model

On completion of the study, we evaluated the results by analyzing portal access, giving a questionnaire to study participants, and interviewing the municipal support staff. The results are summarized below.

1) Fluctuation in number of users

The number of users accessing the app was about 41 per day and 173 per week on average. Access was high on weekdays and low on Saturdays and holidays. Access numbers increased dramatically after Kawasaki City sent information on services to participating users by e-mail.



Displays notices of events held on the current day and those held a day or so after on the top screen.

Displays information on events held nearby. Information is displayed in the order of proximity to your location.

Figure 4
Refining search through location information.

2) Questionnaire

The following summarizes the results of a questionnaire given to users participating in the study. This questionnaire consisted of questions related to app convenience and continued use.

- Convenience of app: 73% replied that the app was convenient (91% for parents of babies less than one year old)
- Continued use of app: 73% replied that they would continue to use the app (94% for parents of babies less than one year old)

The above results led us to conclude that the Asao Childcare Portal app had a high possibility of improving the UX value of "child-rearing parents in the period from pregnancy to early childhood (preschool)" as envisioned in the UX design phase. In addition, the results were used to analyze user attributes, places of use, etc.

On completion of the pilot study, we received a variety of comments from the Asao Ward support staff that registered events and performed other tasks. For example, they said "This app helps to improve public services," "I would like to continue to use this app to provide residents with information in a timely manner," and "This app helps to reduce the administrative workload of Asao ward." We also received considerable feedback on how to enhance this "Kawasaki Childcare Portal" such as giving opinions on making improvements, offering support to expand to other wards, etc.

6. Conclusion

As an example of app development, we introduced a procedure for executing UX design in business to business to consumer (BtoBtoC) service development and presented the results of a design project. We believe that formulating a UX vision and designing an application UI on the basis of surveys and interviews with target users is an approach that can improve the quality of a future service. We also believe that this technique can be effective not only in BtoBtoC services but also in the development of a wide variety of services and applications. We plan to continue using this technique with the aim of raising the quality of Fujitsu products and services.[5)]

Finally, we would like to add that the Asao Childcare Portal introduced here won praise from outside parties, receiving both the GOOD DESIGN AWARD[6)] and the IAUD AWARD in 2015.[7)]

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