

UX Graph and ERM as Tools for Measuring Kansei Experience

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Abstract. UX graph (Kurosu 2015) is a revised version of UX curve (Kujala et al. 2011) in which the emphasis is not on the curve itself but on the episodes that constitute the graph, hence the graph will be drawn after plotting each episodic events. Furthermore, UX graph expands its temporal scope by including the expectation before purchase and the anticipation for future.

Although the original UX graph was a paper-based method, Hashizume et al. (2016) developed a smartphone/PC application that dynamically shows the graph depending on the input episodic information and allows users to manipulate the event and the curve by finger/mouse. Compared to the original paper-based method, this interactive software facilitates users to change the coordinate of the event point vertically (level of satisfaction) and horizontally (time).

Furthermore, another method is proposed under the name of “ERM” or the experience recollection method. In this method, users are asked not to place the events at exact temporal coordinate on the abscissa but to classify them in the rough time zone. This will make it possible to represent past experience stored in memory more easily and more “correctly”.

Keywords: User experience · UX curve · UX graph · ERM

1 Introduction

Based on the idea that various aspects of the user experience (UX) are to be integrated into the concept of satisfaction (Kurosu 2015-1), the authors thought that the temporal dynamism of UX can be represented as the curve of satisfaction, hence developed the idea of UX graph (Kurosu 2015-2, 3).

As can be seen in Fig. 1, quality characteristics are divided to the objective quality characteristics (above) and subjective quality characteristics (below) and they are also divided to the quality in design (left) and the quality in use (right), thus are distinguished in four areas.

As can be seen in Fig. 1, Objective Quality in Design is linked to Objective Quality in Use and Subjective Quality in Use, Objective Quality in Use is linked to Subjective

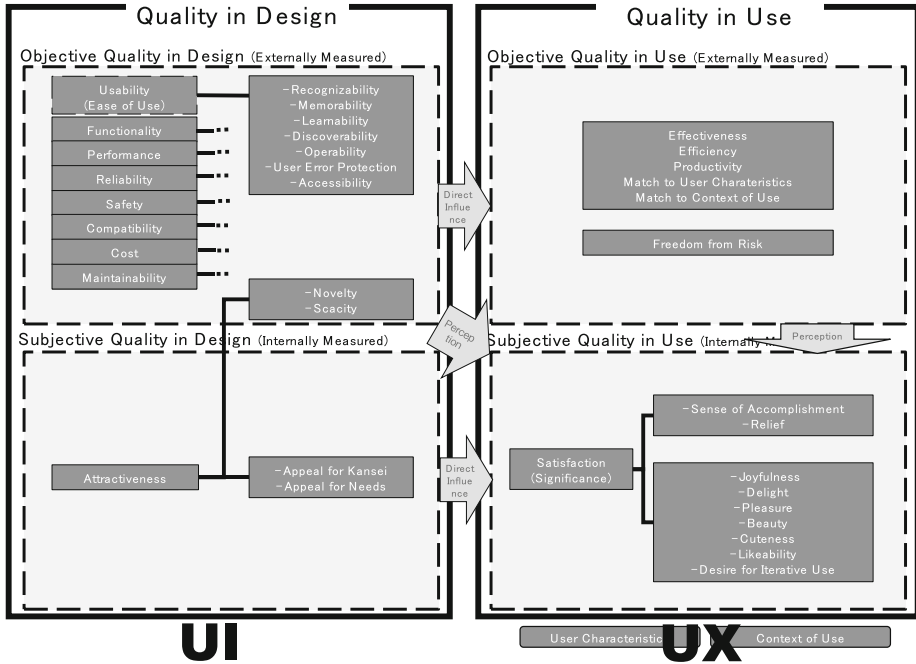


Fig. 1. Quality characteristics in four regions: objective quality characteristics (above) and subjective quality characteristics (below), and quality in design (left) and quality in use (right). (Kurosu 2015-1)

Quality in Use, and Subjective Quality in Design is linked to Subjective Quality in Use. In other words, all quality characteristics other than Subjective Quality in Use influences Subjective Quality in Use. And, in the region of Subjective Quality in Use, the satisfaction is located as the ultimate criterion.

This led us to adopt the satisfaction as the measure for the UX graph. Besides, the satisfaction can be categorized as a part of Kansei quality from another perspective, thus the measurement of satisfaction can be interpreted as the measurement of Kansei as well as the measurement of the UX.

2 UX Graph

Unlike the usability as a part of the design quality, the level of satisfaction is not stable. Compared to the satisfaction, the level of usability can be measured by rather fixed values as the rate of correct recognition, the rate of correct target discovery, and the learning curve. These measures for the usability are usually obtained from a group of people, thus the value is rather stable. Compared to the usability, UX and Kansei are

subjective and individualistic as written in the UX White Paper (Roto et al. 2011). Because of its subjectivity and individualistic nature, the level of UX will change on the temporal scale dynamically and no fixed measure can be obtained. Of course, we can ask users to rate the degree of the UX or Kansei at any time, but there is no guarantee that the value measured at an arbitrary time point was constant in the past and will be the same in the future. There are many events in the life of human beings and the degree of satisfaction may go up or down in relation to those events.

With this in mind, there are many challenges to measure the dynamic nature of the UX or Kansei. For example, von Wilamowitz-Moellendorff et al. (2006) proposed CORPUS that is a retrospective interview method to reconstruct the change of UX for more than a year. But this was a qualitative approach and will not bring the quantitative representation of dynamic change in UX.

Ando (2007) proposed the method of collaborative creation of chronological table of usage. This method is based on the interview and the informant and the interviewer discuss and describe major events during the long-term usage and draw a line on the time scale. But what were written on the time scale are just the events and no evaluation, e.g. in terms of satisfaction, was made.

Karapanos et al. (2010) developed an evaluation method using the computer and named it as iScale. The use of computer in this method was to help draw the line automatically on the display.

Kujala et al. 2011 developed UX curve method. Informants are asked to draw a line in terms of the attractiveness, ease of use, functionality and the degree of use. Four aspects to be described as graphs are major components of UX and do not include the satisfaction as a generic measure. At each inflection points, the informant is asked about the event that resulted in the change of the curve. In other words, in UX curve, the curve was first drawn and the points were specified later.

Based on the concept structure described in Fig. 1, Kurosu (2015-1, 2) revised the UX curve regarding following aspects.

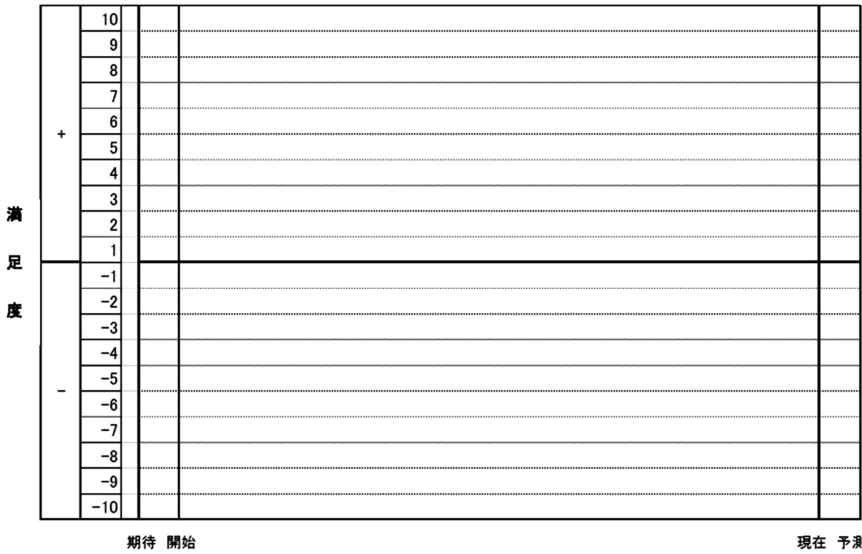
1. The graph is only drawn in terms of satisfaction as a generic measure of quality characteristics. It is observed that asking informants to draw more than one graph is time taking and deteriorate the concentration of informant.
2. The order of drawing was reversed, i.e. each event is first written down with the satisfaction rating from 10 to -10, and after that the graph will be drawn considering the coordinate of each point. The name “graph” is derived from this procedure, i.e. usually, the dots are drawn then (regression) line or curve will be drawn in the graph.
3. The abscissa or the time scale was added the phase of expectation before the purchase and the phase of anticipation at present. It is based on the idea that the UX should include such expectation and anticipation.

As a result, the format as shown in Fig. 2 were made.

UX グラフ記入用紙 対象 _____

氏名 _____ 記入年月日 _____ 年 _____ 月 _____ 日 _____ 性別 _____ 年齢 _____

- 1) 年については分かるものだけ記入してください。各欄には、出来事とそれに対する気持ちを書いてください
- ① 期待 _____
 - ② 開始 _____ 年 _____
 - ③ _____ 年 _____
 - ④ _____ 年 _____
 - ⑤ _____ 年 _____
 - ⑥ _____ 年 _____
 - ⑦ _____ 年 _____
 - ⑧ _____ 年 _____
 - ⑨ _____ 年 _____
 - ⑩ _____ 年 _____
 - ⑪ _____ 年 _____
 - ⑫ 現在 _____ 年 _____
 - ⑬ 予測 _____
- 2) 出来事について記入したら、グラフの評価値の座標に丸数字を記入して、最後にグラフの線を入れてください。



グラフ 満足度 _____ 利用の程度 - - - - -

3) 満足度のグラフを描いたら、次にグラフの上半分に利用の程度のカブを描いてください。

Fig. 2. UX graph sheet (in Japanese)

3 Interactive Tool for UX Graph

After collected more than 300 data, it was realized that it should be better that the computer support is introduced. There are some problems to be fixed for UX graph as follows.

1. As it is hand-written on paper, the co-ordinate points and text (experience episodes), once written, can be difficult to correct, and even when corrections are necessary, they may not be made at times due to it being troublesome.
2. If writing is untidy for the same reason, being handwritten, the characters in text can be difficult to read.
3. Some people tend to mix-up the positions of the default horizontal axis co-ordinates (prior expectations, the start of use, current, prediction) and the additional text from the start of use to current, and forget to label the horizontal axis co-ordinates.
4. Even though a text entry area has been provided in the form for creating the UX graphs, some people tend to write the text inside the graph area.

Hashizume et al. (2016) developed a web-based UX graph tool on the PC. The β -version of UX graph tool is available free of charge (on <http://ux-graph.com/>) from December 11th, 2015, and it can be used by anybody, under the environment of use described later. Renovation of functions and the user interface are currently underway.

The UX graph tool can be used under a PC environment as follows.

- The device allows the mouse operation.
- The device is equipped with an internet environment that allows access to the website.
- The device is equipped with an environment that allows for saving /browsing of PDF files.
- The device is equipped with an environment that allows for use of modern browsers such as the latest version of Firefox or Chrome.

Procedure for using the tool is as follows.

The first step is the entry of information on informant and the targeted experience. The “age” and “sex” of the Informant is selected, and the artifact targeted for evaluation is entered into the “experience” section.

Figure 3 shows the entry screen for the episodes (event). Episode entries are made while imagining the expectations (prior expectations) before acquiring the artifact (the targeted product), impressions at the start (at the start of use), experience episodes from the start until now, current evaluation (current feelings) and future predictions (expectations beyond the current state).

Episodes on prior expectations, start of use, and current and future predictions were regarded as fixed episodes, with their “content of experience” all being regarded as essential. The number of episodes from the start of use to current can be set optionally, and the order of each episode can be switched around by dragging and dropping through mouse operations. Aside from the content of experience, episodes consist of “time of experience” and “satisfaction (−10 to +10),” but the entries concerning the time and satisfaction are optional. When all the content for each of the episodes has been entered, a UX graph chart, drawn according to the episodes, will appear underneath the episodes section (Fig. 4). While all initial values for “satisfaction” on the UX graph charts have been set to “0,” the UX graph charts were made to reflect any entries made concerning satisfaction at the same time that episode entries are made.

The axes on the UX graph charts were set to be the time on horizontal axis (past towards the left, future towards the right) and the satisfaction levels on the vertical axis

(above the origin being positive, and below the origin being negative), same as with the UX graphs. The episode point created on the UX graph chart after entering the episode details is dragged up and down through mouse operations to control the “satisfaction” levels, in order to create the graph.

The content of experience appears when hovering the mouse cursor over the episode point and it was made possible to edit the content of experience by clicking this display. Furthermore, the order of the “episodes” from the start of use to current, which are not fixed episodes (prior expectations, start of use, current and future predictions), can be switched around by dragging the vertical axis of each episode between the left and right. Whenever the “Satisfaction” levels are controlled, or the episode orders are switched around, the UX graph chart is re-drawn, so as to connect the points.

Fig. 3. Data entry screen

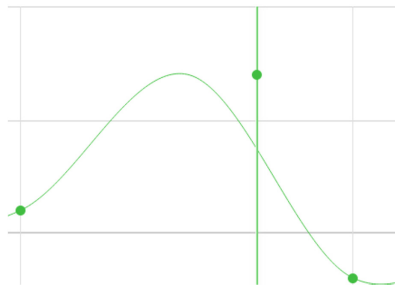


Fig. 4. Graph displayed on the screen

4 ERM (Experience Recollection Method)

Although the usability of UX graph was improved by implementing it to the PC, UX graph has a strong constraint for the user to specify the time of occurrence of each event. As Ross (1989), Oishi and Sullivan (2006) and Norman (2009) wrote, human memory is not much reliable. Some past event might be exaggerated, some others might have been forgotten, etc.

For example, if two adjacent events A and B were wrongly remembered as A after B, the corrected graph with B after A will give us a different impression compared to the graph with A after B. And the gradient of the graph is not so much important. Actually, it was found to be difficult for users to clarify the time when each event actually happened.

Because of this nature of the UX graph, the ERM or the Experience Recollection Method was proposed. In this method, the satisfaction graph was discarded because of uncertainty of the time of each event. Instead, only the rough time sequence is given verbally to the user. As can be seen in Fig. 5, there are ‘the evaluation at early days

Recording Sheet for ERM: Experience Recollection Method Target Item Smartphone (iPhone 6) Male/Female Age 27

1. Write what you experienced at each phase and fill in the evaluation by +10 to -10 rating.

Phase		What you experienced	Evaluation (+10~ -10)
Expectation before purchase		I expected to get the latest model of iPhone on the day of sale.	8
Evaluation at the time of starting to use	Year 2014	I was bewildered for the larger screen compared to my previous model (iPhone5).	5
Evaluation at early days from starting to use		I got used to the large screen soon. And I felt the advantage of large screen for enjoying the game.	10
Evaluation during the use		The body was bent, but was straighten back by pushing it harder.	5
Recent evaluation		The power loss of battery is unexpectedly fast.	-5
Present evaluation	Year 2016	It's now a must to carry the backup battery.	-5
Evaluation in the near future		I will use this until the next model will appear.	-2

2. Draw the curve of frequency of use since starting to use

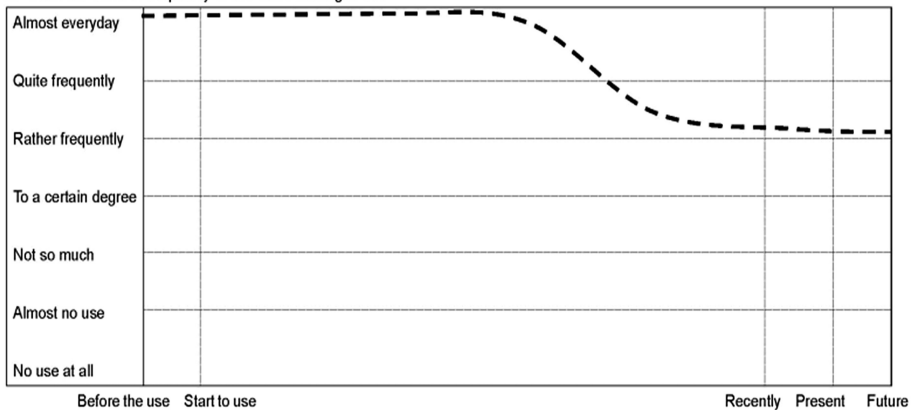


Fig. 5. Recording sheet of experience recollection method

from starting to use', 'the evaluation during the use' and 'the recent evaluation' are inserted between 'the evaluation at the time of start to use' and 'the present evaluation', because such rough time segmentation was thought to be sufficient. Other features of the UX graph, i.e. the satisfaction rating from +10 to -10 and the curve of frequency of usage are kept.

The satisfaction rating is important as was in the UX graph to realize how much each event recollected from the past experience is evaluated positively or negatively. For the purpose of user research, events that resulted in positively should be maintained in the next version of the product or in the future service activity and events that resulted in negatively should be improved in the near future considering the degree of the rating.

In the example described in Fig. 5, we can see that the big sized screen that astonished the user at the first time was gradually accepted, hence we can think that the size of this smartphone (iPhone 6) can be accepted by (this) user. But the hardware feature or the battery life is a serious issue to be improved in the next version. Fortunately, this user is not leaving the iPhone and is expecting a better new model coming. Because other informants who filled in the ERM format wrote in the same way about the battery life as a big defect as large negative aspect, the manufacturer should take this issue very seriously.

The ERM is a qualitative method and it is recommended to confirm the tendency found in the result by conducting the quantitative method, e.g. the questionnaire for 300 or more informants, based on the hypothesis generated by this method.

5 Conclusion

Based on the UX curve, we first developed the UX graph, then implemented it on the PC. And based on the reflection that the severe temporal constraints are less meaningful, we developed the ERM. We are going to implement ERM on the PC, too.

ERM is a tool to measure the dynamic change of satisfaction, that is, it can be used for measuring the UX and Kansei (or the subjective aspect of UX).

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