

# DESIGN TOOLS FOR USER EXPERIENCE DESIGN

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## ABSTRACT:

The purpose of this research was to develop an approach to artifact design based on information technology. To make interactive systems easy to use, many companies utilize a user centered design approach. One of the principles for user centered design is to consider the total user experience to cover all of the user's views. To consider the total user experience is not easy because a user's experience includes many aspects.

To help support this design approach, the authors propose user experience design tools named UED (User Experience Design) Studio. Based on the requirements for a design tool for user experience design, UED Studio would be an integrated application to support design. UED Studio consists of three applications, the Definition Tool, the Evaluation Tool, and the Visualization Tool.

To evaluate proposed tools, experiment to make prototype was conducted and the results indicate that the proposed approach has possibility to help designer and multi-disciplinary team to consider user experience for user centered design.

# 1. INTRODUCTION

The purpose of this research was to develop an approach to artifact design based on information technology. To make interactive systems easy to use, many companies utilize a user centered design approach. One of the principles for user centered design is to consider the total user experience to cover all of the user's views. To consider the total user experience is not easy because a user's experience includes many aspects. User experience design is a different approach to design that has wider boundaries than traditional design and it needs a variety of disciplines beyond just product design.

The web site by American Institute of Graphic Arts describes for experience design as follows;

- A different approach to design that has wider boundaries than traditional design and that strives for creating experiences beyond just products or services.
- The view of a product or service from the entire lifecycle with a customer, from before they perceive the need to when they discard it.
- Creating a relationship with individuals, not targeting a mass market.
- Concerned with invoking and creating an environment that connects on an emotional or value level to the customer.
- Built upon both traditional design disciplines in the creation of products, services, as well as environments in a variety of disciplines.

For example, what is the user's experience in making a presentation at a conference? Before the conference, the user needs to consider the title and content of the presentation, prepare the presentation slides, travel to the conference with a notebook PC, and after the presentation, the user receives questions and feedback and may change the presentation for the next conference. During the actual presentation, the user may need to set up a desk for the projector, connect cables to the projector, and decide where to put the notebook PC. Also, depending on the user's character, the presentation style will be different from other presenters. For example, a younger presenter may not think about using small text on the slides, a designer may try to use a lot of graphics on the slides, and some presenters may not use any slides at all. There are a lot of factors that are related to the user's experience.

In reality, it is not easy to adopt a user experience design approach to products and services because user experience design means covering a wide range of aspects, and without collaboration by a multidisciplinary team, the user experience design will not be successful. In this paper, the authors tried to organize the user experience design approach and propose methods for the design approach, for the processes, and for the teams in order to help designers and multidisciplinary teams. Also, to help this design approach succeed, the authors also propose the creation of a user experience design tool.

## 2. DESIGN APPROACH FOR USER EXPERIENCE DESIGN

### 2.1 ABOUT USER EXPERIENCE DESIGN

User experience design is to design products, systems, and environments by considering the total user experience that includes various aspects such as usability, accessibility, appearance, personality, branding, etc. The design should span the entire lifecycle, and not be limited to just one scene of the user's time. Also, it should cover the total environment that is related to all of the materials needed to achieve the user's goals.

### 2.2 DESIGN APPROACH FOR USER EXPERIENCE DESIGN

To approach the total user experience, the authors propose a method of designing for user experience that consists of the Lifecycle viewpoint, the Environment viewpoint, and Various User viewpoints. The Environment viewpoint covers all of the materials that users look at, touch, or feel. For example, it includes hardware products, software, applications, the space containing the systems, and the people who are communicating. The Lifecycle viewpoint covers all of the time that the user will be related to the product and its systems. For example it includes the pre-sales period, the after-sales time, support, upgrades, the product setup, and actual use of the application. Various User viewpoints cover the differences between various people. For example, it includes several user groups from the universal design viewpoint, such as users with various characters, and various emotions felt by one person.

### 1) Consider user experience from the Lifecycle viewpoint

From the Lifecycle viewpoint, the system includes a user's initial awareness, through additional discoveries, on to ordering, delivery, installation, initial use, day-to-day use, service, support, upgrades, and end-of-life. For example, considering a presentation at a conference, before the conference the user needs to consider the title and content of the presentation, prepare the slides, and travel to the conference with a notebook PC, and after the presentation, the user receives feedback and may change the presentation for the next conference.

### 2) Consider user experiences from the Environment viewpoint

The Environment viewpoint is to cover all of the materials that the user looks at, touches, or feels. It includes the hardware product, software, applications, the space where things happen, and the people who are communicating. For example, for a presentation, the environmental requirements include a desk, a projector, suitable cables, the projection screen, etc.

### 3) Consider the user experience from various User viewpoints

The various User viewpoints cover various human differences. These include several user groups from the universal design viewpoint, users with various characters and personalities, and feeling various emotions. For example, for a presentation, depending on the user's character, the presentation style will be different. Younger presenters may not consider small text on the slides, designers may try to use lots of graphics on the slides, and some presenters may not use any slides. Many of these items are related to the user's unique experience.

## 2.3 DESIGN METHOD FOR USER EXPERIENCE DESIGN

The design method for user experience design has to be based on the user centered design approach because user centered design is a useful method to solve the problems from the user's viewpoint, and also it is very popular in many companies. The design method for the user experience design needs to extend user centered design to cover the Lifecycle viewpoint, the Environment viewpoint, and various User viewpoints. Also, from the corporate viewpoint, branding is very important for user experience design to succeed as a business. The design process and the design team for user experience design should be based on user centered design with extensions from the user experience viewpoint.

Here is the design process for user experience design:

- 1.Make a plan for the user experience design: It is important to have the right design process, right methods, and the right team. For this purpose, before starting the project, the project leader has to make a plan for the user experience design. The plan has to include an outline of the process, the schedule, the team members, and the budget.
- 2.Understand the background of user experience: The background includes the market, the business, the users, the stakeholders, and the branding.
- 3.Understanding the user experience of the targeted users from lifecycle, environment and various User viewpoints: This includes the people, the user roles, the user goals, the user tasks, and the user scenarios, as seen from the user experience viewpoints. To understand the users, it is very important to have user interview to get real user's opinion and design team should initiate this activities.
- 4.Concept design for user experience: This includes a low fidelity user experience prototype, and a document for the concept design and its evaluation.
- 5.Detailed design for user experience: This includes a high fidelity user experience prototype, detailed design specifications, and their evaluation.
- 6.Evaluation from the user experience viewpoint: This includes the final prototype and evaluation.
- 7.Validation of user experience in marketplace: It is important to validate the results of user feedback from the user experience viewpoint.

The design team for user experience design should be considered based on the user centered design approach. The members are almost same as for user centered design, but all of the members have to knowledge about user experience design.

Here is the list of team members for user experience design:

- Project leader
- User researcher
- User experience designer
- Visual designer (Industrial designer or Graphic designer)
- User testing specialist
- Marketing planner

### 3. DESIGN TOOL FOR USER EXPERIENCE DESIGN

#### 3.1 PURPOSE

User experience design is not easy to understand because it is a new approach and covers many different fields. It is also a new approach for currently practicing usability specialists and designers. It needs to cover various fields from the Lifecycle viewpoint, Environment viewpoint, and various User viewpoints. Also, it is important to share information for a multidisciplinary design team.

To help designers to approach the design from the user experience viewpoint, an effective tool is desirable. In this chapter, the authors describe the current tool used to help designers apply the user experience viewpoint, and also the requirements for a newer tool.

#### 3.2 CURRENT TOOL

To support user experience design, there are some current design tools such as Persona, User Scenarios, User Segment Tables, and Lifecycle for User Experience, as follows:

- 1) Persona for User Experience

A persona is an example of a person who characterizes a role that represents a user group from the user experience viewpoint. A persona describes a fictitious user including the roles, skills, goals, emotions, and other personal characteristics. It feels real to designers because it is an example of a person, not just a conceptual description. A persona helps designers understand and focus on characteristics of users from the user experience viewpoint.

## 2) User Scenario for User Experience

Modeling user scenarios is one of the useful methodologies to understand users and share information among designers and related people. A user scenario has many roles such as system vision, design rationale, usability specifications, functional specifications, user interface metaphors, prototypes, object models, formative evaluation, documentations, and overall evaluation.

For an innovative design, user scenarios need to be developed for each end user segment to share the goals and aspirations of these users with a variety of professionals. They use these user scenarios to create and evaluate new ideas. User scenarios are very important tools to

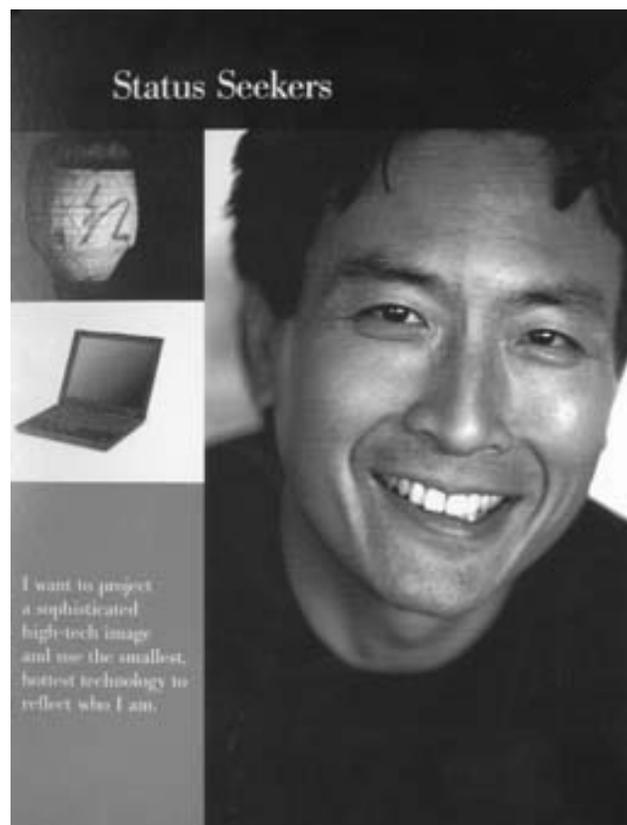


Figure 1: Example of Visual Scenario

collaborate with many professionals around the world and to create a common language for collaboration.

As shown in Figure 1, one example of a user scenario is a visual user scenario for a notebook PC. It describes the typical user scenario, gives an image of a persona and the goods, and it is like a poster to share among several people who are working on this project.

### 3) USER SEGMENT TABLE

As shown in Figure 2, the user segments table is prepared to help designers identify various types of users of a product being designed and to put these user types in some target user groups. This table constitutes a matrix of rows and columns. The columns consist of the items related to human physical and mental functions and demographic, cultural, and environmental factors, all of which designers have to be taken into account. The rows list the basic types of users, such as disabled people, temporarily disabled people, children, and so on. Some cells in the matrix are listed with typical or general user examples.

The user segments table is prepared in order to help designers identify the various types of user of a product being designed and to put these user types in some target user groups on a UD matrix (Nomura, et al, 2002). As shown in Fig. 6, this user segments table consists of a matrix of rows and columns as shown in the table. The columns consist of the items related to human physical and mental functions (visual, acoustic, motor, cognitive, etc.) and demographic (gender, economy, etc.), cultural (language, custom, etc.) and environmental factors, all of which designers may need to take into account for a given product. The rows list the basic types of user, for example, disabled people, temporarily disabled people, children and so on. Some cells in the matrix list typical or general user examples. Additional notes and related human characteristics data for some user examples are listed in extra tables and figures in the appendixes of these universal design practical guidelines.

### 4) LIFECYCLE FOR USER EXPERIENCE

A lifecycle for user experience is an approach that considers user experiences for each step of the relationships among the users and system or product. For example, for a product, a lifecycle

		Factors to consider									
Examples of user	Seeing		Hearing	Physical				Anthropometry			
	A Eyesight	B Color sense	C Power of hearing	D Action	E Strength	F Dominant site	G Voice	H Size	I Weight	J Posture	
1	Users who need not be considered										
2	Elderly	Middle aged/ Aged	Aged	Aged	Aged						Aged
3	Disabled persons	User with impairment in seeing	User with color weakness or color blindness	User with impairment in hearing	User of wheelchair or cane/ User with impairment in extremities		User with impairment in voice				User with shifted posture/ User of wheelchair
4	Minority					Left-handed		Very short/ Very large	Very light weight/ Very heavy		
5	Users of assist tools or accessories	Glasses/ Contact lenses/ Eye patch/ Cane	Sunglasses	Hearing aid/ Earphone/ Headphone	Wheelchair/ Cane/ Baby carriage/ Cart/ Artificial arm or leg/ Gloves						
6	Temporarily disabled			Pregnant woman/ Injured person	Injured person		Hoarseness	Pregnant woman			Pregnant woman
7	Users in considerable situation	User in dark space	User under coloured lights	User in noisy environment	Person with infants/ Grasping goods in both hands						

Figure 2: Example of User Segment

could be divided into interest building, serious consideration, shopping, setup, support, and upgrade steps.

## 5) REQUIREMENTS FOR A DESIGN TOOL FOR USER EXPERIENCE DESIGN

To help this design approach, the authors here describe the requirements for a design tool for user experience design:

- Understand the user experience approach including the lifecycle, environment, and various User viewpoints.
- Share the information among the project members with different backgrounds.
- Easy to update by changing the information.

- This tool can be utilized in several different steps of the design process.
- Easy to see the information for all members of a multidisciplinary team.
- The tool has to be networked application software and share the data among the team members.

## 4. EXPERIMENT FOR UED STUDIO

### 4.1 INTRODUCTION FOR UED STUDIO

To help support this design approach, the authors propose user experience design tools named UED (User Experience Design) Studio. Based on the requirements for a design tool for user experience design, UED Studio would be an integrated application to support design. UED Studio consists of three applications, the Definition Tool, the Evaluation Tool, and the Visualization Tool.

To easily define the user experience situation, the Definition Tool helps designers in ways such as selecting a user group, selecting an environment, and entering user tasks based on the Lifecycle viewpoint. The Evaluation Tool is for easily evaluating the defined user experiences. The Visualization Tool is to show the results of the evaluations by using 3D graphics to make it easy to understand the complicated information.

The Definition Tool and the Evaluation Tool are based on the three user experience design approaches, the Lifecycle viewpoint, the Environment viewpoint, and the various User viewpoints. For this purpose, both of these tools have three corresponding views to span these viewpoints.

The purpose of the user view in both of these tools is to define a target user group, and a designer is able to define several user groups by using text and images. The purpose of the environment view in these tools is to define the environment of some target user, and a designer is also able to define several such environments by using text and images. The purpose of the lifecycle view in both of these tools is to select a stage of the lifecycle, such as product recognition, shopping, use, or update. The purpose of the user tasks in these tools is to define each user task, and a designer is able to input descriptions of each user task.

Here are the steps of user experience design and the relationships with each application of UED Studio:

- 1.Make the plan for user experience design

Consider which methods and tools will be good for each steps of user experience design.

- 2.Understanding market and business including branding from user experience viewpoint

The Evaluation and Visualization Tools helps to evaluate the current products or systems and the competitors.

- 3.Understanding user experience of targeted users from lifecycle, environment, and various User viewpoints

The Definition Tool helps designers make the definitions.

- 4.Concept design for user experience

The Definition Tool helps designers remember the basic user definitions.

- 5.Detailed design for user experience

The Definition Tool helps designers remember the use of user experience design.

The Evaluation and Visualization Tools evaluate low-level user experience prototypes.

- 6.Evaluation from user experience viewpoint

The Evaluation and Visualization Tools evaluate high-level user experience prototypes.

- 7.Validation of user experience in market

The Evaluation and Visualization Tools evaluate the final user experiences.

The UED Studio application is composed of three applications, using text and visual data. The three applications are controlled with XML files, using common text data and common visual data for user information, environment information, user tasks, and the results of evaluations. It is easy to exchange text and images because the text data and image data are separate from the application. Designers can update the text data directly in each application.

## 4.2 UED STUDIO: THE DEFINITION TOOL

The purpose of the Definition Tool is to help a designer define target users from their user experience viewpoints. When a designer develops products or systems from the user experience design viewpoint during the concept design stage, this tool helps the designer to define target users including user roles, user characteristics, user tasks, and user environments. As shown in Figure 3, this tool consists of three views, one for the user, one for the user's environment, and one showing the user's tasks within the lifecycle.

To define a target user, the following is the process with UED Studio:

- Start from the main menu of the Definition Tool
- Define a user group

The designer needs to select the user definition view from the main menu in order to define each user group. As shown in Figure 4, the user view has many examples of user groups with pictures and detailed definitions, and the designer can select various user groups by clicking the pictures.

- Define user environment

The designer needs to select the environment view to define each user's environment. Like the user view, the environment view has many examples of user environments with pictures and detailed definitions, and the designer can select various environments by clicking the pictures.

- Define lifecycle and user tasks

The designer needs to select one of the lifecycle phases and input each user task.

- Returning to the main menu allows looking at overviews of the definitions

### 4.3 UED STUDIO: THE EVALUATION TOOL

The purpose of the Evaluation Tool is to help a designer evaluate products or systems from the user experience viewpoint. As shown in Figure 5, the Evaluation Tool consists of a lifecycle and task view, an environment view and various user views. A designer evaluates the user experience and selects one of the five steps. This tool has a capability to convert the data and save it as a CSV file for use by other software.

### 4.4 UED STUDIO: THE VISUALIZATION TOOL

The purpose of the Visualization Tool is to show the results of the evaluations using 3D graphics to make the complicated information easy to understand. The 3D graphics are created automatically with the data of the Evaluation Tool. As shown in Figure 6, the Visualization Tool has 3 axes. The author-designed X-axis is for time, the Y-axis is for a variety of users, and the Z-axis and each surface have pictures that are related to the functions. This picture is also relevant for the Evaluation Tool. The columns are visualized as the results of an evaluation. The color and diameter of each column is related to the results of an evaluation. The authors intend that the designer will find it easy to quickly recognize the results of evaluation.

## 5. CONCLUSIONS

To help designers, the authors have proposed a design process by using UED Studio. After creating the proposal, this process was introduced to several companies as a design process from the user experience design viewpoint. We need further study in practical situations to evaluate this design process and the next steps should include experiments in real product design processes. For the next step, the author is planning to enhance UED Studio to make it easier to input user tasks. In addition, based on the current UED tool, the authors are planning to perform experiments to get designers' feedback.

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Figure 3: Definition Tool



Figure 4: User View of Definition Tool



Figure 5: Evaluation Tool

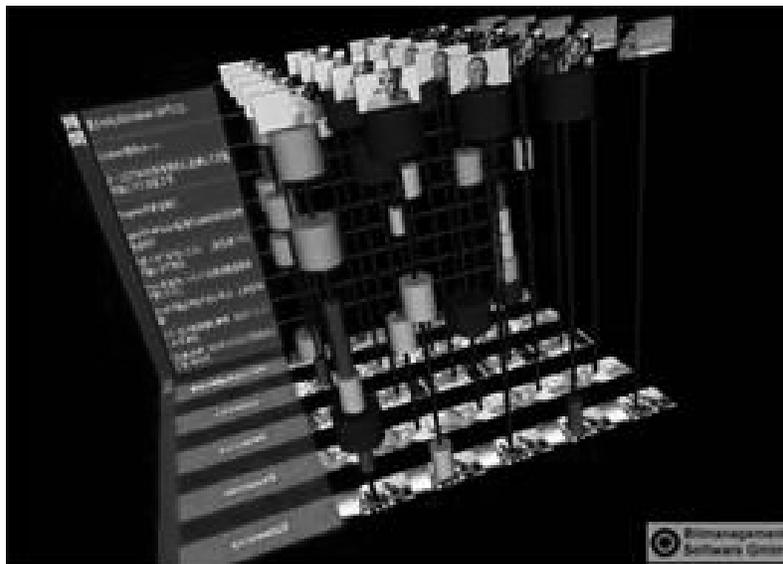


Figure 6: Visualization Tool