

# A Collaborative Tool for Capturing, Sharing and Connecting User Research Study in Design

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**Abstract.** The objective of our project is to build a web based tool for generating a valuable design user research resource. User research is a process of discovering desirable and undesirable users' needs and expectation from a product or service. This user research information provides crucial sources of research insights, which lead to a process of finding ideas about functionality, features, criteria, and design attributes of a product or service. Usability testing is also considered as a part of the user research process to verify the feasibility of the design. The proposed Capturing, Sharing, and Connecting User Research (CSCUR) tool can help the design researcher to record and utilize user data efficiently. CSCUR tool provides a keyword list and procedure used as a guideline for design researchers to investigate related issues that need to be considered in design process, leading to an innovative design and responding to users' needs. Searching functionality facilitates activities in exchanging ideas and encouraging teamwork among the design research community.

**Keywords:** Collaborative Design Research Tool, Design Research Database.

## 1 Introduction

User research plays an important role in both the product development and innovation process. It allows designers to understand users' actual needs and behaviors, and utilize this information as a fundamental requirement in design. These user data are valuable not only to one particular project, but could also be applicable to the other related projects. Capturing and Sharing knowledge in user research can help make use of the existing research data and can help design researchers to accelerate the process of building up diverse viewpoints of user research. To extend the use of all research records, CSCUR tool also serves as a center of design community in exchanging comments and ideas through email.

To identify CSCUR tool design requirements and criteria, this project began with gathering and understanding existing design processes. Design research theories and methods usage were collected to investigate commonalities among design process stages. Analyzing usage of each user research method and categorizing types of research findings led to generating design research guidelines and functionalities in the CSCUR tool.

## 2 Existing Design Research Theories and Methods

Though there are various different theories that seek to explain the design process, in general, these include user research, concept generation, design development, and design implementation. The following are samples of design theories that have been raised for the purpose of identifying steps in design process.

One of the design theorist pioneers is John Christopher Jones, the author of Design Methods. He proposed three stages of design process [4] which are Divergence, Transformation, and Convergence. Divergence is to extend the boundary of a design situation for designers to explore more options and creative solutions. Transformation is making patterns and turning the result of divergence research into simple, essential, and interesting issues to generate design. The convergence stage is the process of evaluation for the purpose of finalizing the design.

Similar to Jones’s model, Darrel Rhea, a leading strategic design consultant, defined extensive details in his innovation process model. Rhea’s model [5] has 2 stages, Divergent Thinking and Convergent Thinking. Divergent thinking is the process of examining a wide range of market need opportunities directed towards design innovations. Convergent thinking concentrates on prioritizing and selecting potential designs.

Another viewpoint on design process from leading design firm; IDEO has four stages of design process [2] which are Observation, Brainstorming, Prototyping, and Implementation. The user observation stage gives attention to user’s behavior and context to find new ideas and possible solutions. Brainstorming expands and explains possibilities of new ideas/concepts. Prototyping is used as a problem-solving tool to visually and physically verify user’s responses to the design. Implementation is a stage of bringing the refined concepts to life as a final product/service.

Even though these three models of design process have categorized phases in different terminologies, all three models can be arranged, analyzed, and compared as seen in fig. 1.

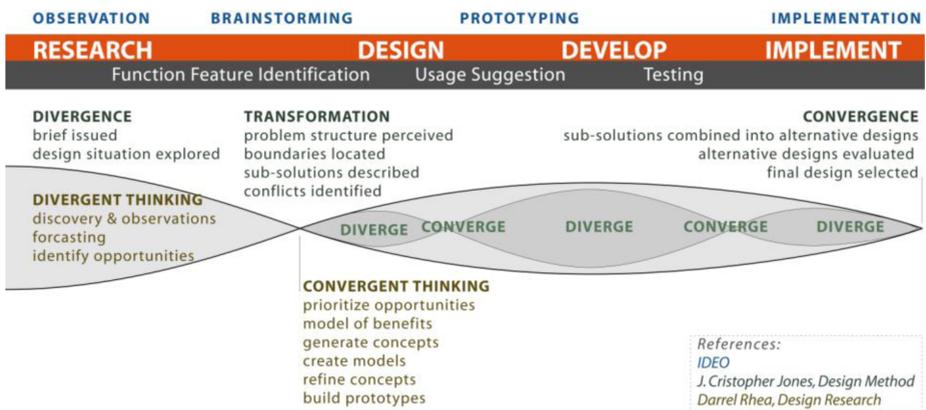


Fig. 1. Design Process Model Similarity and Diversity Chart

From fig.1, the design process stages can be categorized in four phases, which are research, design, development, and implementation. All three models share commonalities in conducting user **research**. The user insights from user research will determine the preliminary functions, features, and criteria of new products/services. In the **design** and **development** process, the designer will follow design brief, which are based on research analysis. Divergent processes (exploring extensive ideas) and Convergent processes (analyzing, synthesizing, and evaluating ideas) are iterative. **Implementation** is to integrate solutions and validate the final design before launching a product/service to the market.

### 3 Analyzing User Research Methods

Design research methodologies were selected and applied in each stage of design process basically depending on the appropriateness, circumstances and nature of each project. To see commonalities among design research methods, samples of selective user research methods were collected from three resources: IDEO method cards, the Methods Lab booklet, and Methods Set.

All design research methods were grouped and plotted in each design process stage. Some design research methods from these three resources, though differently named, shared similar approaches. Methods in research stages were categorized and used to understand users' behavior and preferences for gaining users' needs. In the design stage, most of methods assist in the finding creative ideas. Methods in development and implementation stage are useful for verifying ideas.

In short, User Research Methods can be grouped based on the design process into 3 different categories: Understanding, Finding Idea, and Verifying Idea & Design as seen in fig. 2.

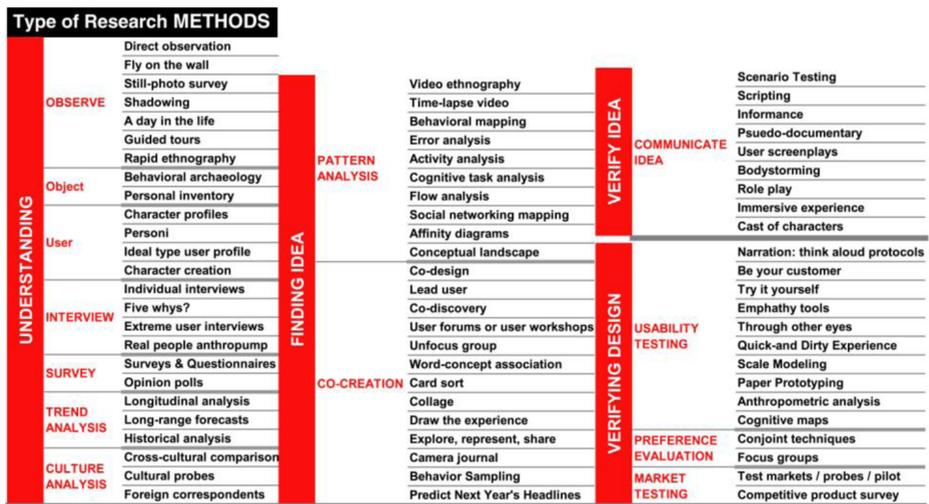


Fig. 2. Design Research Method Groups

**Understanding:** Three main groups of understanding methods, usually used for identifying users' needs and behaviors, are Observation, Interview, and Survey. Each method has different approaches of acquiring information from participants. Raw data from observation, interview, or surveys need to be analyzed and can be used for Trend Analysis and Culture Analysis. Trend Analysis can be explored and investigated by tracking research information over time. Performing Culture Analysis by comparing similar research insights among different cultures can lead to deeper understanding of users in global and local markets.

**Finding Idea:** Finding Idea methods can be divided into 2 types, Pattern Analysis and Co-creation. Pattern Analysis reflects the relationships among insights from research findings in order to forecast problem solving possibilities or generate new design opportunities. Co-creation emphasizes persuading users to participate in the idea generation process. Results from both types lead to design functions, features, criteria, and properties.

**Verifying Idea & Design:** To verify ideas, researchers create usage scenarios to Communicate Ideas. Users' opinion can be elicited and integrated in the design.

After the integration of the design brief that came from user insights, the Usability Testing process is used to test user's performance and the desirability of design functions and properties. The results of testing are used for improvements in the design development process.

To recheck how well design will be accepted by potential customers, Preference Evaluation methods are usually used for evaluating potential success in the market. Market Testing methods are also employed to set feedback from customers after a product/service has been released onto the market.

The applications of collected user research methods were analyzed to identify types of research findings as explain more details in section 4.2.

## **4 Identifying Types of CSCUR Input**

In brief, there are 3 main sections in the CSCUR interface: Understanding, Finding Idea, and Verifying Idea. The description and usage of each design research method in all three sections was investigated in relation to captured media and research findings. These can be identified as follows;

### **4.1 Types of Media**

Common captured output media can be categorized in 5 categories as follow:

Image: Picture, Illustration, Drawing, Collage Visual, Diagram, Table

Text: Written Document

Multimedia: Video Clip, Flash, PowerPoint Presentation

Sound: Audio Clip

Web: Database, URL

### **4.2 Types of User Research Findings**

Type of user research findings can be grouped into five categories, which are user demographic profile, user perception, user behavior, user context, and user operation.

User demographic profile is a common piece of information on most of research projects. User perception can be revealed through interview and survey methods. Observation methods demonstrate deeper understanding of user behavior, user context, and user operation.

Research	Design	Development	Implementation
<b>Understanding:</b>	<b>Finding Idea:</b>	<b>Verifying Idea &amp; Design:</b>	
<p><b>User Perception:</b> Meaning, Preference, Interest, Opinion, Attitude, Social Value, Concern, Motivation, Believe</p> <p><b>User Behavior:</b> Activity, Interaction, Emotion, Habit, Lifestyle</p> <p><b>User Context:</b> Environment, Event, Characteristic, Condition</p> <p><b>User Operation:</b> Object, Property, Usage, Performance</p>	<p><b>Function:</b> Purpose, Usage, Component</p> <p><b>Feature:</b> Selling Point, Characteristic</p> <p><b>Criteria:</b> Physical, Psychology, Operation, Service</p> <p><b>Design Attribute:</b> Physical, Psychology, Operation, Service</p>	<p><b>Physical:</b> Appearance (form, color, texture), Size, Weight, Material, Ergonomics, Accessibility, Space Requirement</p> <p><b>Psychology:</b> Affordance, Constrain (semantic, cultural, logical), Emotion (visceral: 5 senses, behavioral, Reflective), Perception</p> <p><b>Operation:</b> Function, Interaction (individual and social), Usage</p> <p><b>Service:</b> Supported System, Maintenance System, Network System, Transportation System</p>	

**Fig. 3.** Conclusion of Relationship among Design Processes, Types of User Research Methods and Types of Research Findings

From fig. 3, most of Design Research Methods used in research phase are for understanding various aspects of user perception, behavior, context, and operation.

Insights from the understanding stage lead to the process of finding ideas about functions, features, criteria, and design attributes of products and services. Designers can apply this information to generate design solutions in detail. Study through various cases can stimulate interesting ideas and enhance design solutions.

The result of design testing in verifying idea & design assists the design development process and ensure that the final design reflects both physical and psychological values. Findings in design testing in a similar target group profile can open unthought-of viewpoints and can display commonalities among a group of participants.

Keywords listed in fig. 3 can be used as a guideline in CSCUR tool for novice design researchers to investigate related issues that should be considered during the design process. Thinking through these categories while designing can generate innovative designs that respond to users’ needs and could potentially create success in the market.

## 5 CSCUR Design Interface

The interaction needed for the application is fundamentally divided into 2 categories; inputting and searching (viewing). Input interaction is for capturing research information. The search function facilitates sharing and connecting inputted research information and further study.

## 5.1 Capturing: Input Function

There are three capture modes that reflect the broad stages of the design process as discussed above: understanding, finding idea, and verifying idea. These three modes have similar required fields and layout. General requirements for all three modes are *project name, author, author's email, section name, research question, and date*. CSCUR tool provides a flexibility of inputting research data and uses a non-linear approach. Input steps are provided but are not obligatory.

Methods of capturing user research information range from ethnography, focus groups, interviews observation, surveys, etc. Due to the flexibility and variety of research methods in each project, CSCUR tool offers a list of research methods to facilitate the inputting process. Types of research method are listed as exemplars and for learning purposes, especially for new researchers.

A guideline for entering research data has become a significant part of the application. The application contains research pre-defined grouping category guides for inputting research data. The pre-defined grouping categories help researchers to selectively address and focus on one particular category of finding at a time. This will allow them to investigate a problem thoroughly leading to a deeper understanding of the analytical data and possible multiple problem identification. In addition, this guideline helps researcher to arrange and group records of information conveniently. Due to differentiation of research finding guidelines in these three modes, pre-defined pull down menu guidelines contain different lists of items as seen in fig. 3. The distinction of analysis finding fields' names in Understanding, Finding Idea, and Verifying Idea are called *insight, design property, and design recommendation* respectively.

Section naming for data input automatically groups chunks of relevant information which assists in searching functionality. The section name can be customized and selected from previous custom names. Media such as images, diagram, video, and audio can be uploaded as evidence and visual references with text description.

Participant's Demographic profile is common to all three modes for assisting the analysis process especially for the relationship between users' research finding and their profiles. This user demographic information can be shared among the Understanding, Finding Idea, and Verifying Idea sections, when input research information is related to a particular user in demographic profile section. Moreover, recording this information helps researcher tracking opinions of different target groups.

The information entered can be reviewed by the administrator. However, as long as, the administrator has not approved the entry, the user still can make changes to the entry and resubmit these to the system.

## 5.2 Sharing and Connecting: Search Function

To share research data and connect design researchers, the database can be accessed from any computer, anywhere, and anytime. To achieve full accessibility, CSCUR tool is implemented as a web based application. The Interface of CSCUR tool supports and encourages the process of discussing ideas and connecting people involved in related research. The main users of sharing are web browsers. The application allows browsers to search by keywords and/or category of research findings which

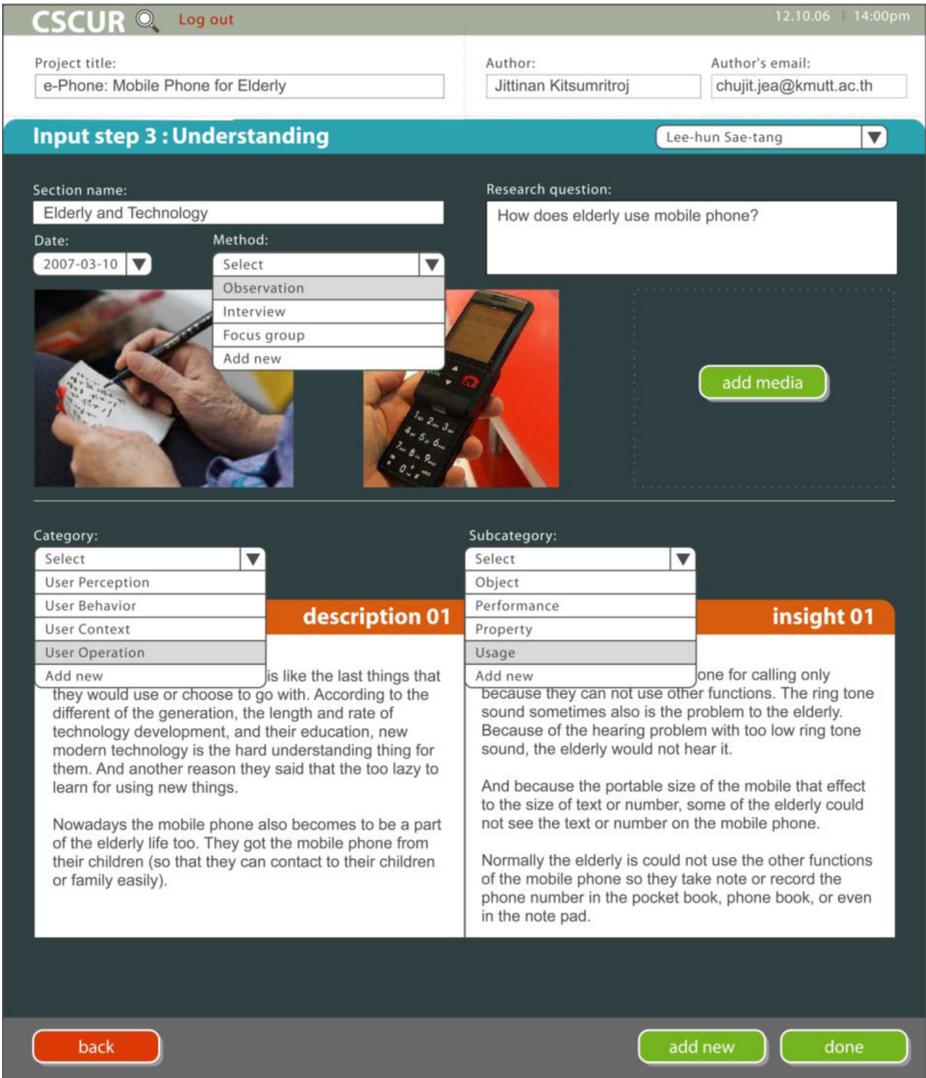


Fig. 4. Interface of Understanding Mode

comprise of activities, user behaviors, etc. for typical search. In advanced search-mode, browsers have the capability of filtering their search by time, project name, and author. The system can search by field and media file name throughout the entire database.

To promote the process of discussing idea and connecting people, the CSCUR tool has provided an email enabled capability which allows all parties to suggest or request further details or discussions from the author.

## 6 Discussion and Future Research

The collection of obtained user information and research findings is valuable to the design research community. A web application is a good and convenient tool for connecting people, who have the same interests, especially designers, researchers, and other design related specialists. This CSCUR tool is intended to serve as a tool for generating a coherent user research resource in design. It was created primarily for design students at KMUTT. After usability testing with students, there are opportunities for developing this CSCUR tool. For the next version, we will investigate ways of enhancing methods for easy retrieval and comparing information between Understanding and Finding idea section. For connectivity, instead of emailing, the system should be able to show and track all comments, suggestions, and discussions.

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