

# Development Methodology: Keeping Users in Mind - UX (User Experience)

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## Abstract

Technology in the latter half of the 20th century, and especially in the 21st century, has been developing at a faster pace than at any other time in human history. This has made it exceedingly difficult for technology companies to stay competitive. Starting in the 90's companies such as, Apple and Samsung came to this realization, and decided to make a shift in their developmental process in order to stay competitive. This shift led them to focus on making experiences supported by technology. It is why when you talk to people about their computers and smartphones they often describe them in non-technical terms; easy, simple, friendly, convenient, smart, etc. This is now commonly referred to as the products User Experience (UX).

To craft product experiences that generate competitive products it takes the skill of talented engineers, planners, and designers working together. This paper describes in summary DENSO TEN AMERICA Limited's definition, process, and method for generating the best Automotive UX. We are sharing this process with the hopes that you can take from this article tips for starting, or enhancing your own understanding and process for product development with a focus on creating meaningful experiences for user.

## 1. Introduction

You might see these people talking about the new technology they just used. (Fig. 1)



Fig. 1 North American Users talk about their experience of new technology during user testing

Think back to your own experiences using an iPhone or Android device for the first time. Maybe

you were excited like these people, or maybe you were not impressed. Positive or negative this experience sticks with you as a memory. This article will introduce you to User Experience (hereinafter, called "UX") Group of DENSO TEN AMERICA Limited (hereinafter, called "TNAM") and some techniques everyone can use to help improve every customer's experience.

In the spring of 2011 TNAM formed a UX Group to stay competitive with other technology companies in North America. These other companies found success in the consumer market by focusing on making technology provide Users with positive experiences. They had discovered that their products did better in the market when people forgot that they were using technology, and instead remembered the joy, excitement, and success they experienced while using a product.

GM came to a similar conclusion, but slightly earlier. In *Journey: General Motors' Move to*

*Incorporate Contextual Design into Its Next Generation of Automotive HMI Designs* (<http://www.auto-ui.org/10/proceedings/p156.pdf>), the authors discuss how in 2001, after many years of relying on suppliers such as Delco Electronics, and Denso, GM decided to take ownership of in-vehicle interface design. GM wanted to do more than simply meet a spec requirement, and in-order to do this they began to focus on UX.

This shift allowed them to launch the 2008 CTS, CNET Tech Car of the Year, and eventually the Cadillac CUE system. CUE fittingly is an acronym for Cadillac User Experience which expresses GM's commitment to UX (<http://www.cadillac.com/cadillac-user-experience.html>).

## 2. What is UX?

UX as an industry objective was being developed throughout much of the 20th century. However, prior to the Mid-1990's the term UX was not used to describe these efforts. It was at Apple, in 1993, where Donald Norman acquired the first job with the title of User Experience in it. As the internet and mobile technology developed and grew so did the prominence of UX. Currently the Internet and mobile technology are inseparable from UX those working at Start-ups, Banks, and even the Military. All of whom

all employ UX techniques and expertise.

So what is UX? In simple terms it is the feelings you have before, during, and after using a product. In more detailed terms the UX is how well all aspects of a product meet a specific persons expectations. Think back to the last product you bought. It might be a camera, a fishing reel, an iPhone, or even a new car. How did you feel before you bought the product? Were you excited, nervous, or even hesitant? How about after you bought the product and started using it? Did you feel triumphant, satisfied, so-so, or let down? This feeling is the result of a product's UX, and for companies like Apple and Tesla a good amount of time and effort is invested to make sure that what you feel is exactly what they want you to feel.

For TNAM's UX Group we simplify this into an equation. System Performance / User Expectation = User Experience. When you look at **Fig. 2** you can see that the systems performance is a combination of both the Machine and the User Interface. These are also the parts that we make. This includes the features, processors, displays, and other hardware parts that will be manufactured. We also make the Graphical User Interface (GUI), Voice User Interface (VUI), and Physical User Interface (PUI). All of these parts have to work together to meet the User expectations. To do this we follow a human centered design process.

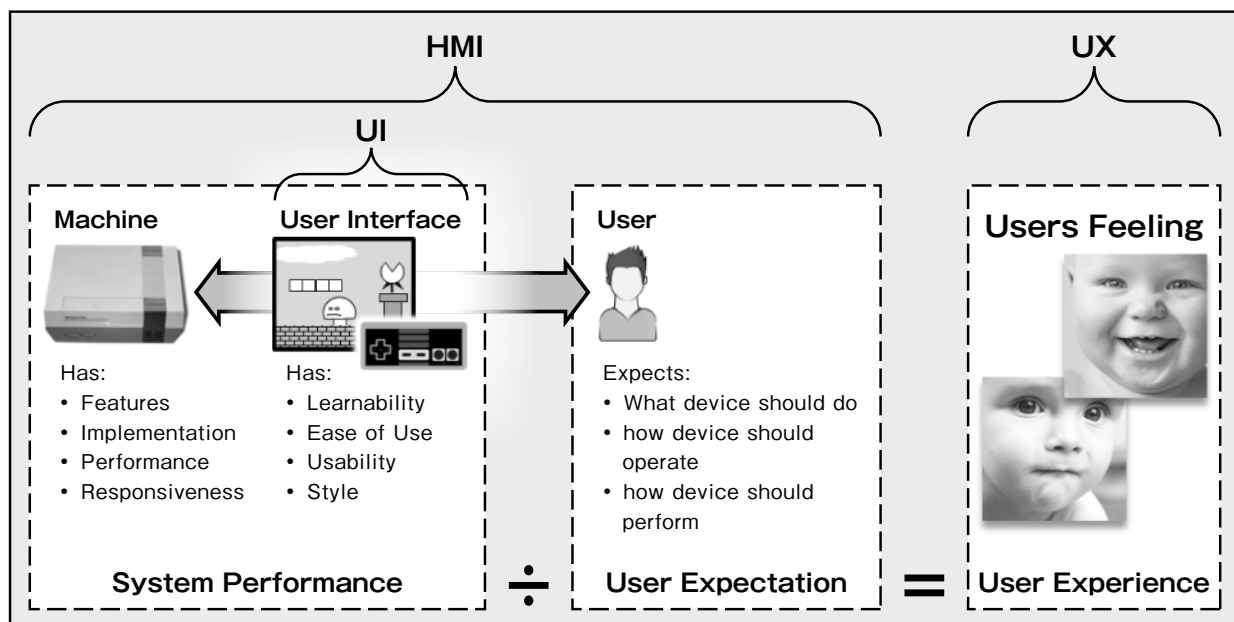


Fig. 2 diagram of UX, HMI, and UI in relationship to full system

### 3. The Process of UX

The Human Centered Design process is an iterative process that seeks to rapidly develop, validate, and select the best options. What is unique about it is that it places Users and Customers at the center of the process. If you already use the Plan - Do - Check - Act Process (PDCA), then the Human Centered Design process will be familiar to you.

The first step is to LEARN why Users/Customers expect certain things (1 in Fig. 3). For example in a driving situation we might want to know why drivers use their phone, or why they can't pair Bluetooth®. To determine this we can use several different types of research methods to be able to learn enough information about user to form a hypothesis. This hypothesis is an idea about how to best meet the Users expectations, and thus create a positive experience. In some situation due to the complexity of the data collected or the interactions the User have with the system; it is necessary to model the information so that all members of a project can understand the situation.

The models help keep everyone on target, as well as share objective with other teams and management. They often highlight areas needing improvement, as you can see in the sample Experience Map (Fig. 4). The "X's" represent problems that the Driver faces using their car's radio and these problems are areas that we can form hypothesis for how to improve our product. When no more "X's" exist, then we are safe to launch the product to the market.

In the next step (2 in Fig. 3) we rapidly BUILD a simple prototype to test our hypothesis. The key is building quickly, so we don't build a complete system. We only build what needs to be tested, at the quality that needs to be tested. Sometimes this is done with paper, power-point, or special UI prototyping software. Again the focus is on building quickly, because we want to test early and test often.

After building a simple prototype we MEASURE with Users/Customers (3 in Fig. 3). One simple measure is a usability test. A User is asked to perform a task using the prototype and insights are gathered. Did the User struggle to complete the task, and why? When they completed the task, were they satisfied, and why? The findings from this step will be used again in step 1 as we LEARN how to further improve our product.

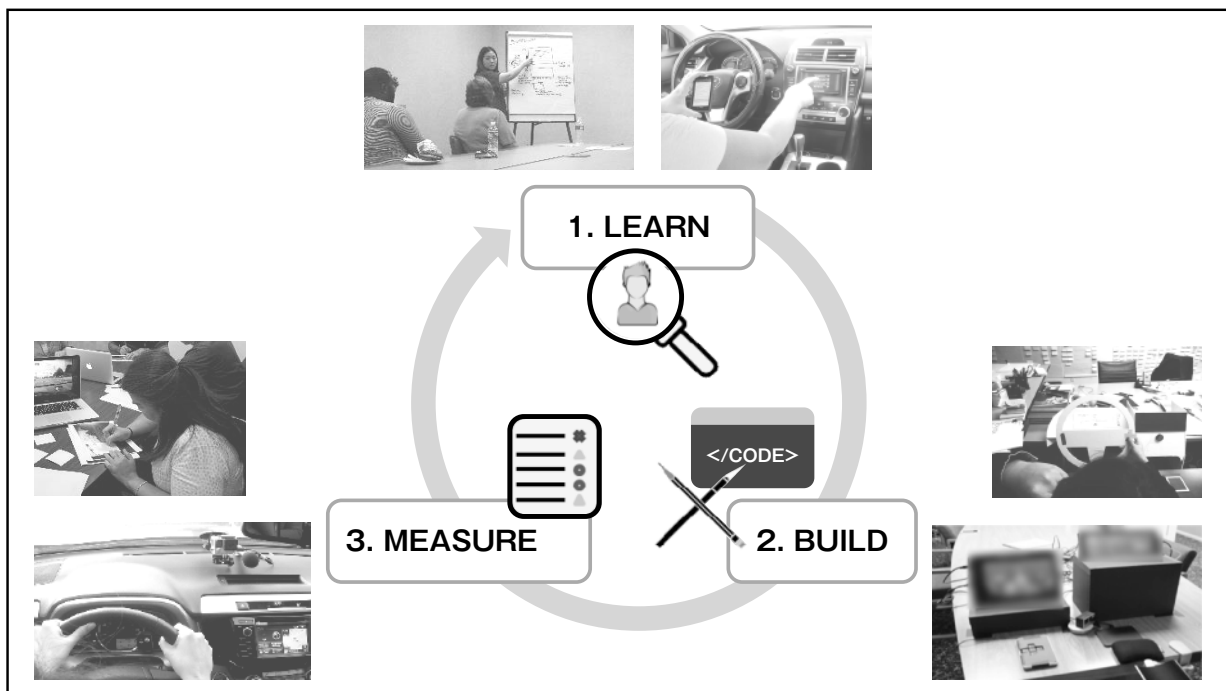


Fig. 3 TNAM UX Groups Workflow



Fig. 4 Sample Experience Map

A sample of this process can look like this.

Table 1 Specific process flow example

1.LEARN -->	Drivers can't find where to pair Bluetooth® .
2.BUILD -->	Create a prototype with an easier to find Bluetooth® pairing
3.MEASURE -->	test if Driver can find where to pair
1.LEARN -->	Drivers are nervous to try Bluetooth® pairing so even with easy to find Bluetooth® they can't find it.
2.BUILD -->	Create a prototype with a Bluetooth® connection agent
3.MEASURE -->	test if Driver can pair device
1.LEARN -->	SUCCESS! Drivers are can pair their device and are happy with Agent.

#### 4. Collaborative Team

As we previously saw on **Figure 2**, the User's Experience is made up of a combination of the Machine, the User Interface, and the User. To be successful in creating a great user experience it takes a team of experts in many different fields working together. Take for example a Voice System. You would need software, hardware, and sound engineers who understand the capabilities of the machine. A voice expert, linguist, and/or a psychologist, who understands the processes of human communication, and the intricate details of the languages to be used. An Interaction Designer to translate the human machine dialog into a sequence of events and conditions. As well as a Visual Designer to help visualize the interface, if it has a graphical user interface accompanying it. It might seem like each of these people have a different responsibility, but for UX Design they all have the same responsibility and goal; to understand the User, and create the best possible experience for that User.

This is why within TNAM's UX Group; we make an effort to maintain a collaborative multi-

disciplinary team. The group is currently comprised of quantitative and qualitative researchers, strategists, engineers, interaction, and interface designer. Some of our current projects include Voice Recognition, Multi Angle Vision™, and Next-Gen Multi-media; all of which require many additional experts. To fill the gaps the UX Group maintains a collaborative working relationship with several other functional groups within TNAM. You can easily do the same for your project.

## 5. Everyone Can Do UX

As a company we have a corporate philosophy of creating the best quality products for our customers, for TNAM's UX Group seeking to improve the experience of all human machine interactions (HMI) is crucial to creating the highest quality products for our Users and Customers. The Human Centered Design Process is a tool that all of us can use to help us maintain our focus on both Users and Customers throughout the development of our products and services. The similarity of this process with other commonly used processes also means that all of us can participate in Kaizen our User/Customer Experience. It is as simple as taking what you are working on and asking a non-project related coworker to use it. Maybe someone in accounting, customer support, or even an office worker can help you build the future.

In a recent Voice Recognition Benchmark our engineering team did just that, and discovered some interesting insights. In the past they had tested the system's ability to detect and process specific phrases. This time they asked local staff to perform some tasks that had been reported as problematic by North American Drivers. One of these tasks was to pair a phone by Bluetooth®, and then play music from the phone. What the team discovered was that the people could not imagine using the word Bluetooth® in the command. Instead they tried to say things like “pair/connect my phone,” “play my music,” and “play music from phone.”

The team doing the test was surprised by how easy it was to do, and the insights that they gained. It showed that really anyone can do, and gain benefit from the UX Process. Through

collaboration, iteration, and remembering to always validate your work with our Users/Customers; any of us can create a positive User Experience that our Customers and Users will appreciate.

## 6. Conclusion

In this article we have covered the history of TNAM's UX Group, and the field of User Experience. Additionally we have given you a quick summary of the Human Centered Design process that all User Experience Designers use to craft meaningful product experiences for Users/Customers. With this you should have some basic tools to validate your hypothesis and product use cases with actual users.

If you would like to learn more about the processes and tools you have read about, or would like to know more about TNAM's UX Group feel free to contact the authors.

You can also refer to the following links:

### Articles:

Japanese ONLY - <http://techon.nikkeibp.co.jp/article/FEATURE/20140728/367643/>

### How to Guides:

#### Beginners

Japanese - <http://amzn.asia/d45CViS>

English - <http://a.co/4DMjqr>

### IDEO Human Centered Design Toolkit

English, Japanese, Spanish, French, Korean, Portuguese, and Czech -

<http://www.designkit.org//resources/1>

### UX Design Text Book

Japanese ONLY - <http://amzn.asia/c96qNGW>

### Research Methods

Japanese - <http://amzn.asia/3Tz3rF1>

English - <http://a.co/6NAhGHH>

### Theory Books:

#### Design of Everyday Things

Japanese - <http://amzn.asia/agq0B8O>

English - <http://a.co/3PyCsU8>

### Emotional Design

Japanese - <http://amzn.asia/aGQ2tdt>

English - <http://a.co/3vKCuw9>

### Design of Future Things

Japanese - <http://amzn.asia/3H2xT0I>

English - <http://a.co/8fj6wFV>

- iPhone is a trademark of Apple Inc.
- Android is a trademark of Google LLC.
- Bluetooth® is a registered trademark of Bluetooth SIG, Inc.

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## Profiles of Writers



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