# Kitchen Assistant

## Introduction

I was tasked with creating an innovative voice-based kitchen assistant. The process for creating the kitchen assistant included sketching and creating a digital, physical, and video prototype to conceptualize the idea and present to stakeholders. I used paper and pencil to sketch my ideas and create a storyboard, Voiceflow to understand the user voice flow voice interaction with the kitchen assistant, cardboard, paper, scissors, and tape to create a physical prototype, and a video prototype to understand the design of the kitchen assistant in the context of a kitchen environment. The goal of the prototype is to conduct concept testing to understand if users are comfortable interacting with a kitchen assistant that has context-aware computing technology to better anticipate the needs of users and understand how they might go about interacting with the kitchen assistant given the improved technology capabilities. This voice-based prototype does not aim to capture every intent, utterance, or slot nor does it aim to capture UI designs to supplement the voice interactions at this stage in the process. Future iterations of the prototype will focus on formalizing intents and building out utterances in addition to adding complementary UI designs once feedback is received during the initial concept testing.

## Sketching

The prototyping process began with sketching to capture my ideas through pictures and words. I had several ideas I wanted to explore but was unsure where to start so I challenged myself to use the 10 plus 10 method to sketch as many ideas as possible within ten minutes (Greenberg et al., 2012). Figure One depicts my first series of sketches. I added annotations to the sketches to remember additional details about the UI to communicate with stakeholders. The sketch on the top right shows a phone chat bubbles in the top portion of the screen to provide a visual chat history of the conversation between the kitchen assistant and the user. The center portion of the screen is a visual depiction of the kitchen assistant listening and talking which is a design choice inspired from existing voice agents such as Siri and Babich's

article “A Comprehensive Guide to AI Assistant Design” (2021). At the bottom of the screen is an image of the recipe card the user asked the kitchen assistant to procure. The image to the right of the phone screen explores the idea for a different physical device, a tablet size device instead of a phone. At the top of the UI is where the user could see the words reflecting what they spoke, or the kitchen assistant spoke, for additional visual confirmation. When designing AI assistants, it’s important to continuously provide feedback to the user’s (Amershi, 2019). The remaining UI shows the recipe card with an image on the left and the ingredients and instructions on the right. The sketch bellow shows the tablet-based kitchen assistant in the context of the kitchen. While the sketches helped me as a designer to understand the potential look and feel for the kitchen assistant, I also wanted to capture through written word possible voice commands for the user to dictate to the kitchen assistant. I identified 3 categories for the voice commands: recipe, hardware, and other. The recipe category focused on reading the recipe, repeating information, and reading the instructions. The hardware category focused on utilizing the connected network of the Internet of Things to turn the oven on or off and to set a timer. The last category, other, focuses on context aware computing so users may ask about the location of kitchen items in the kitchen and integrate with shopping lists for the assistant to sense when items need to get added to the shopping list to replenish the supply.

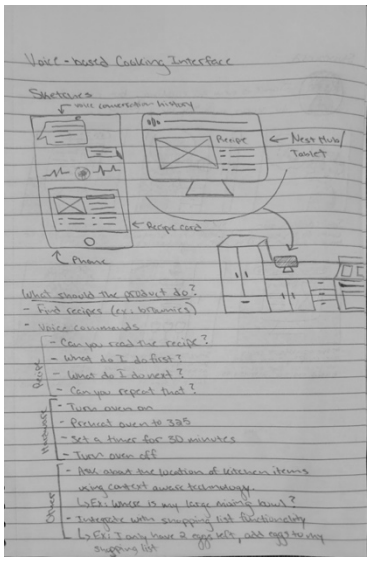


**Figure One:** Sketches of the voice-based kitchen assistant.

Based on the sketches, I created a user persona and storyboard to understand how a user might go about using the kitchen assistant to meet their needs as shown in Figure Two.

The storyboard process revealed the order in which the user and the kitchen assistant interact with one another. Featured in the storyboard is Janice, a young woman who is new to cooking but excited to learn and try new recipes. The storyboard walks through Janice's decision to bake brownies from scratch, use the voice assistant to find a good recipe to follow, ask to read the recipe aloud, and ask for assistance to locate dishware in the kitchen.

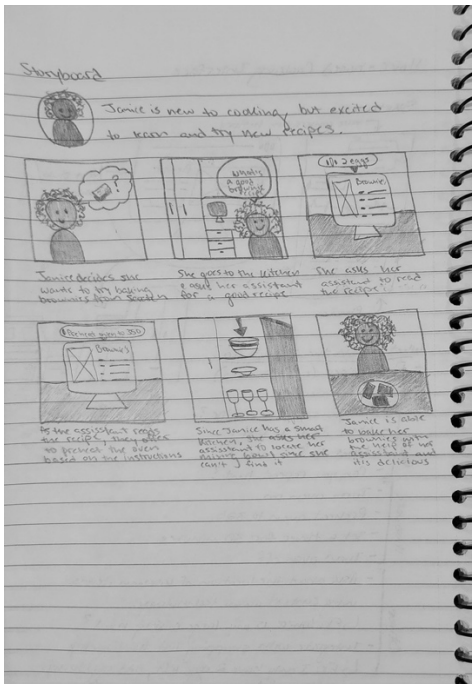


**Figure Two:** Storyboard depicting the process of using of the kitchen assistant.

The last series of sketches focus on the design of the physical device the kitchen assistant software will run on. I sketched a series of eight different hardware designs exploring various shapes and sizes with devices that would either have large, minimal, or no digital screen. I decided to build a physical prototype based on the third sketch from the top because of its compact design, large digital screen area, and the angle for which the screen is positioned. I considered using a smart phone as the hardware because of its accessibility since many users have one and won't need to buy a new device, and its portability to move around the kitchen or house with the device in a user's back pocket. However, choosing to pursue a hardware design that would solely exist within the kitchen helps users understand the permanence and purpose of the kitchen assistant which is to assist with tasks solely in the kitchen.

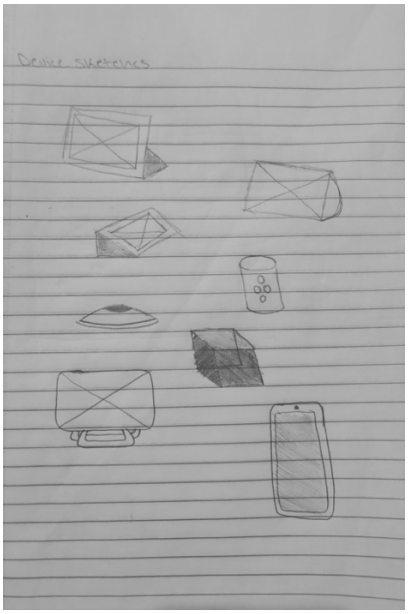


**Figure Three:** Sketches of the physical prototype.

As a result of the sketches and storyboard, I felt comfortable to begin prototyping the kitchen assistant.

**Prototyping**

I began prototyping the kitchen assistant using Voiceflow because of the software's ability to capture users' voice input and tailor custom responses. The prototype consists of yes/no answers supplied by the user in combination with open-ended kitchen related questions asked by the user. Figure Four shows a zoomed in snapshot of the Voiceflow user flow. The focus in the flow is the happy path, but there is some consideration for when the user says no. While most voice assistants can only enact specific intents and understand specific utterances, the prototype focuses less on capturing all the variations a user can use to ask the voice assistant to do something and instead explores ways for users to interact with the kitchen assistant in a colloquial way as if talking to another human to help meet their kitchen needs (Voiceflow, 2020). In my prototype example, the user asks for a brownie recipe, but in a fully built out system, the idea is that they can ask for any type of recipe. Although Cathy Pearl recommends in her talk "Designing Voice User Interfaces" that voice assistants should have a narrow focus and avoid trying to do too much, I wanted to explore in my prototype how users

would react to a voice assistant that anticipates various needs using Internet of Things and context-aware technology (2022). For example, the assistant can parse the recipe card and ask the user if they should pre-heat the oven to 350 degrees and then turn the oven and set it to the desired temperature. Additionally, the assistant can ask the user if they should set a timer for 40 minutes because that's what the recipe calls for. Furthermore, the voice assistant is also able to sense that there are less eggs in the fridge and asks the user if eggs should get added to the shopping list while also having the ability to direct the user to where certain kitchen items such as dishware are located. Current voice assistants do not have this ability and my prototype aims to understand users' comfort level and expectations with this type of technology before further exploring all the various utterances a user can speak and creating accompanying UI designs. However, one visual design was included in the prototype, the brownie recipe card for the user to look at while interacting with the kitchen assistant. Visit the Voiceflow prototype to interact with the prototype in real time.

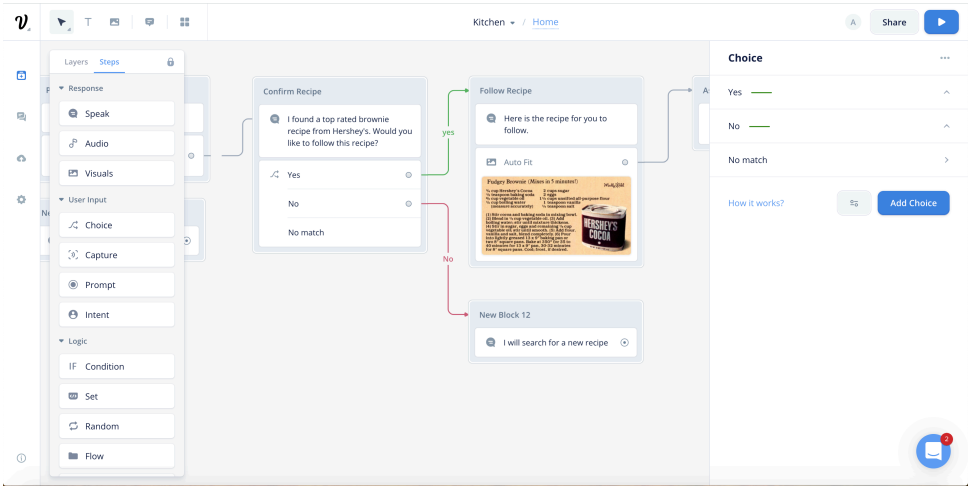


**Figure Four:** Section of the Voiceflow user voice interaction flow.

Once the voice interaction flow was mapped out in Voiceflow, I began working on the physical prototype based on my sketch in Figure Three. I created the physical prototype using cardboard, paper, scissors, and tape. The focus of the physical prototype was to create a well sized digital screen and determine the correct angle to position the digital screen. Since many users will most likely stand while cooking, the screen is angled up to optimize a user's view of

the recipe card or other UI elements. While this is the current prediction of user behavior, user testing will reveal if the angle of the screen is indeed optimized. To ensure optimization, I will include various users in the testing process including those who may sit while cooking whether it's in a chair or wheelchair while also considering the experience for users who are shorter to create an accessible product. Figure Five shows a side view and a top view of the physical prototype. The white paper represents the digital screen. A low fidelity wireframe was created using paper and pencil to represent the recipe card the kitchen assistant procures. I chose to create the UI using paper and pencil to indicate that the digital UI screen design is not the focus in this iteration of prototyping but is still open to feedback if users were to have ideas about what they wanted to see while interacting with the kitchen assistant. If I had chosen to use a higher fidelity wireframe such as a wireframe created in Figma, users would think it's a more finalized design, be less likely to provide feedback on the overall concept and vision, and instead focus on typography, colors, and other graphic elements.

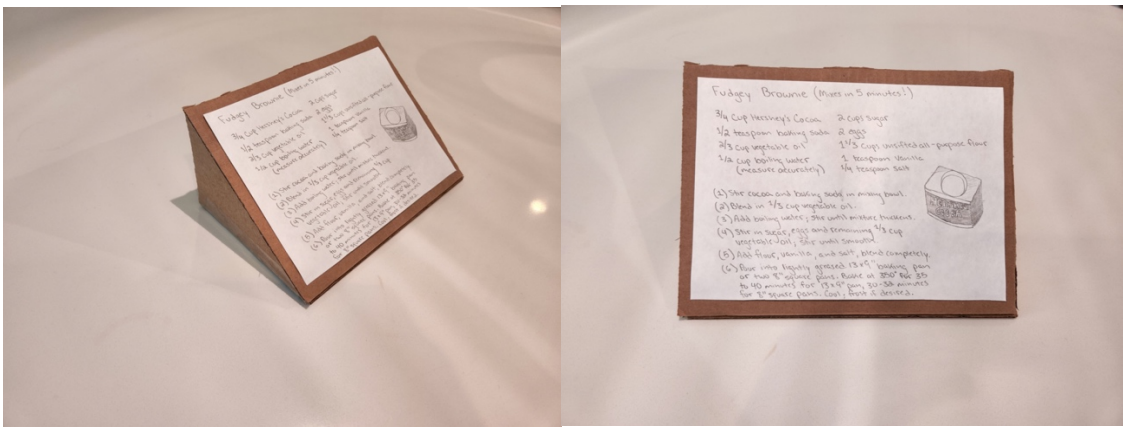


**Figure Five:** Physical prototype of the kitchen assistant.

Once I created the physical prototype, I created a video prototype. The video prototype is a combination of functional video and a concept/visioning video because the video demonstrates the limited functionality of the kitchen assistant while also exploring future concepts surrounding the Internet of Things and context-aware computing. The video prototype is not a step-by-step guide on how to use the product. The purpose of the video is to expose users to new ways interacting with voice assistants and familiarize them with the

interaction, so they feel more comfortable to try using the kitchen assistant themselves during testing of the prototype. Figure Six shows the environment setup to demonstrate the kitchen assistant. The physical prototype is situated on the right side of the counter. The Voiceflow prototype is used in the video prototype to demonstrate the interaction between the user and the kitchen assistant system. Watch the kitchen assistant video demonstration to understand the use of system in context of the kitchen.

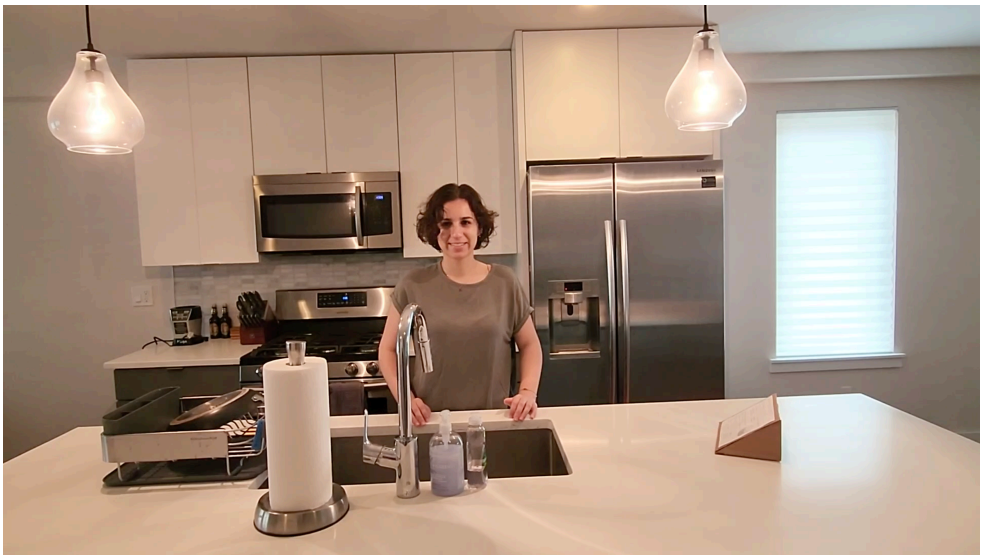

**Figure 6:** Video prototype of the kitchen assistant

To test this early concept of the kitchen assistant prototype, I would use a Wizard of Oz technique where I would act as the wizard to respond to the voice commands of the users (Buxton, 2007). The Wizard of Oz technique is appropriate for testing since the early stages of a digital experience like Voiceflow would not be able to account for every variation a user can speak. In addition to responding to the users, I would also change the recipe cards on the physical prototype, although the recipe card is the extent in which the digital UI will be considered within this iteration of the prototype. The Wizard of Oz technique will offer insights to user's reactions and provide valuable feedback to create additional iterations before moving to a higher fidelity prototype which can include more formalized voice commands and/or addition UI screen designs.

**Reflection**

Overall, I believe the prototyping methods and level of fidelity chosen to prototype the kitchen assistant were appropriate to meet my goals. As a result of having taken this course what I will remember most is: the 10 plus 10 method, parallel prototyping, dark patterns, preserving sketches and artifacts, and understanding when to use each prototyping method and at what fidelity. Throughout each of my prototyping assignments this quarter I challenged myself and my team to create at least ten sketches within ten minutes; the 10 plus 10 method. This certainly helped me to worry less about perfection and strive for idea generation. At first it was difficult for me to overcome thinking through each idea to made sure it made sense before sketching it, but I tried to push past that feeling and focus on capturing both the good and bad ideas because even the bad ideas can lead to good ideas. This nicely ties in with parallel prototyping and Bill Buxton's pottery example (2007). Sometimes knowing where to start especially when seeking to design the perfect product is the hardest part of the process but understanding that working on several potentially mediocre ideas will eventually lead to one great idea is important. Knowing this, I encourage myself to explore multiple ideas at once before focusing on one idea early on because I will most likely surprise myself and create something even better than planned when parallel prototyping. Avoiding dark patterns is important to create ethical designs that support user's needs without causing harm. According to Colin Gray, dark patterns include nagging, obstruction, sneaking, interface interference, and force action when designing products which are patterns, I should be aware of in case they present themselves in a product even if not intentionally designed to be malicious (2018). Throughout the course I was also fascinated by Buxton's emphasis on methods to display sketches, capture ideas, and share ideas. There are many affordances that a sketch board has, however, in a world where collaboration is becoming increasingly remote synchronous (and even at times asynchronous) it's important to understand how to transfer the best elements of the sketch board to a new medium given the current work environments. I was fascinated by Buxton's example of the CoWall created by Sweeden's School of Arts and Communication. The CoWall displays objects within plexiglass cubes and uses RFID technology to scan each object for additional information. I think this is a brilliant collection management strategy. As designers we find inspiration all around us and it's important to document that inspiration for

future use. Lastly, this course has taught me to understand the prototyping method and level of fidelity needed at each stage of the design process. Each form and level of prototyping invites different types of feedback so understanding when to use each type will effectively help me to receive the necessary feedback at the various stages of designing. Prototyping is an invaluable tool and as I move forward in my career, I'll have these tools to guide me in my design process.

**Appendix**

https://creator.voiceflow.com/prototype/6296cc2cc907b293d8187acb

https://1513041.mediaspace.kaltura.com/media/Final+Prototype/1_hgz3cssu

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