Envisioning a novel complex system, such as a service robot, requires identifying and fulfilling many interdependent requirements. As the leader of an interdisciplinary team that designed and implemented a social robot and its service, I used human-centered and service design approaches to address this challenge. This is one of the first such design cases for a social robot service [1]. Two products of this study, a service concept and a blueprint method accounting for adaptive robotic interaction [2], were integrated into a service design course at CMU, and became the basis of a new course, Adaptive Service Design.

**DESIGNING A WORKPLACE ROBOTIC SERVICE**

Envisioning a novel complex system, such as a service robot, requires identifying and fulfilling many interdependent requirements. As the leader of an interdisciplinary team that designed and implemented a social robot and its service, I used human-centered and service design approaches to address this challenge. This is one of the first such design cases for a social robot service [1]. Two products of this study, a service concept and a blueprint method accounting for adaptive robotic interaction [2], were integrated into a service design course at CMU, and became the basis of a new course, Adaptive Service Design.

**SERVICES DESIGN**

Workplace study revealed needs for healthy, social snacking

**HEIGHT EXPERIMENT**

Compared different heights (the smallest one was perceived as submissive)

**SERVICE DESIGN**

Workplace study revealed needs for healthy, social snacking

**EARLY PROTOTYPE & INTERACTION TEST**

Drove around a prototype to observe people’s natural interactions

**operator interface & snack ordering website design**

**TWO-MONTH FIELD EXPERIMENT**

MODELING HUMAN COLLABORATION FOR HUMAN-ROBOT INTERACTION

How are people able to hand each other objects without having to exchange any words? Modeling human-human physical collaboration processes, I developed design principles for fluid human-robot handover behaviors [5]. I video-recorded 27 pairs of people handing objects to each other, and analyzed nonverbal cues they used to coordinate when to start and where to hand off the objects [6, 7]. Collaborating with roboticists, we implemented these behaviors on HERB, a semi-humanoid home butler robot, and evaluated their effectiveness. The results suggest that people work with the robot more efficiently when it utilizes human physical collaboration cues [8].

WEBSITE DESIGN FOR SERVICE & RESEARCH

I designed two websites that not only provided helpful services that people use, but also served as research platforms. These sites allowed manipulations for controlled field experiments and theoretical hypotheses testing. Fitbit Plan helped Fitbit users increase their daily steps with personalized plans and progress-checking features. I tested motivation-boosting strategies drawn from reflection and goal-setting literature [9] by manipulating the plan set-up process. On the Snackbot website, people placed orders for snacks to be delivered to their offices. Drawing from behavioral economics, I tested strategies to promote healthy choices by manipulating the order and information presented with snack options [10].
2003, KAIST | I designed and built Wonderland, a tangible, interactive toy set for children that creates animated stories on a computer. As the children place the toys on the play mat, characters associated with each toy appear on a computer screen and move as the children move the physical toys. Wonderland records the animation along with the children's narration.

SPEED DATING DESIGN METHODS

I co-developed “speed dating,” a design method that consists of principles and techniques that guide designers through the process of examining a set of design concepts and variables with users through low-fidelity 2D scenarios and 3D mock-ups [11, 12, 13]. The speed dating method was originally conceived of as a qualitative method. I extended it to a scenario-based online experiment that quantitatively compared recovery strategies for robotic service breakdowns [14] in a study that received a Best Paper Award. Widely used in research projects, this method has been included in a design method book [15], the curricula of HCI and interaction design courses, and about sixty academic publications.

LEVELS OF AUTOMATION IN SMART HOME

Built a rough smart home using foam cores and whiteboards and acted out different levels of automation in smart home to quickly assess user experience [12, 13].

SERVICE RECOVERY STRATEGY

Experimentally compared recovery strategies for robotic breakdowns [14].

ROLES OF SMART HOME

Reviewed 22 concepts to find overlaps in needs perceived by designers vs users [11].

TANGIBLE INTERACTION TOY FOR STORYTELLING

2003, KAIST | I designed and built Wonderland, a tangible, interactive toy set for children that creates animated stories on a computer. As the children place the toys on the play mat, characters associated with each toy appear on a computer screen and move as the children move the physical toys. Wonderland records the animation along with the children's narration.
Based on my research on dual-income families [16], I designed the concept for Smart Bag [17], a reminder system that helps children remember their schedules and what they need to bring while encouraging parents to engage in parenting. Smart Bag is introduced in two books on technology design for children [18, 19].

**SCREEN-BASED INTERFACES**

2004, SK Telecom | Our team designed user interfaces for a commercialized mobile phone and a conceptual prototype of a home information robot.

**WEARABLE COMPUTERS**

2002, KAIST & Samsung Electronics | Our team designed a wearable computer concept for everyday information management.

**“EMOTUITIVE” INTERFACES**

2003, KAIST & Samsung Electronics | Our team designed an interface concept that communicates the status of home electronic appliances in an intuitive and fun way.

**LIGHTING DESIGN**

2000, KAIST | Lighting made of translucent epoxy

2005, CMU | Typography poster
REFERENCES


