

An Empirical Framework for Designing Social Products

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ABSTRACT

Designers generally agree that understanding the context of use is important in designing products. However, technologically advanced products such as personal robots engender complex contextual characteristics that are not yet well understood. The social context of use shapes the roles that the user and the product play in the interaction. For instance, an intelligent agent that acts as a coach for an exercise program and one that supervises a physical rehabilitation regimen for the physically challenged function in different social contexts. Only a few studies to date have considered the social context of use as part of the design. My research proposes a conceptual framework for understanding the critical social aspects of interaction with products such as the social context of use. I combine interaction design and social science methodology to make an evaluation of my framework with a series of empirical studies.

Author Keywords

Interaction design, design methodology, social interaction, social context of use, user attributes, social products, personal robots

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces – Evaluation/methodology, User-centered design.

INTRODUCTION

Recent advances in technology have made possible a new breed of products, personal robots, which serve people as skilled agents in tasks that are repetitive, difficult, unsafe, or unpleasant for humans. These robots can potentially help with tasks such as doing laundry or dishes, assisting in the care of the elderly, ensuring that children arrive at school safely, or acting as caretakers for individuals within a home or institution. Many of these tasks involve close social interaction between the robot and the people it serves.

A variety of point designs have been developed for these products including personality [4, 8], appearance [8] and aspects of social and emotional expressivity [1, 3]. The social context of use and the human experience of use greatly affect the interpretation of these design variables [5]. Nass and his colleagues have shown that user attributes are critical aspects of interactive computer interfaces [6]. Age, gender, and personality types of users are examples of these attributes,

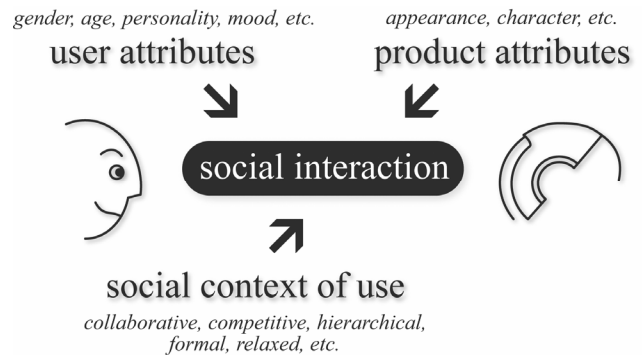


Figure 1. A proposed framework for designing social products.

which suggest that experience of a product differs based on the difference in these attributes. I suggest that such attributes will play an even greater role in people's experiences with embodied products that possess social characteristics such as a personal robot.

Elements of social context of use also play a critical role in the interaction design of such products. The skills, domains of knowledge, resources, and behaviors that a personal robot might require in order to perform a function will be different in different social situations. For instance, an intelligent agent could present these features differently when acting as a coach for an exercise program, as opposed to a physical rehabilitation regimen for the physically challenged. Only a few studies to date have considered this aspect as part of the design [3].

In this research, I propose a framework that would allow designers to evaluate and understand the critical "social" aspects of interaction with products with products that possess social characteristics. These aspects are categorized as social context of use (e.g. roles that user and product play in the interaction), attributes of the user (e.g. gender, age, mood), and attributes of the product (e.g. appearance, character).

The main goal of this research is to provide designers with a framework and a particular methodology for designing products with social behaviors. I combine ethnographic studies, empirical studies, interaction design, and technical implementation to form such a methodology.

CURRENT RESEARCH

My proposed framework suggests that a critical set of social factors significantly shape user experience and each design problem would be concerned with a particular subset of such

factors. For instance, the design of a personal robot that interacts with users in a diversity of age groups requires an understanding of how age affects user experience, so that the product attributes can be designed appropriately.

In my previous research, I explored competitive vs. co-operative roles in the social context of use among the above-mentioned set of factors. Since many tasks that are envisioned for personal robots involve co-operation with the people they assist, I focused on how co-operation and competition shaped people's perception of a robot as well as their experiences with the robot.

Social responses to interactive computers are shown to be similar to responses to other people [7]. Our study extended this finding to humanoid robots and used the social science literature to examine how these responses take place. Research on conflict in small groups shows that members of co-operative groups approach their group members more positively than members of competitive groups do [2]. Based on these results, we hypothesized that people who interact with a robot in a co-operative context will perceive the robot more positively and feel more positively than people who interact with the robot in a competitive context.

I tested this hypothesis in a laboratory experiment where people interacted with ASIMO, a humanoid robot developed by Honda, in the context of a two-player videogame. The roles of the players were manipulated to be either co-operative or competitive. 26 (16 females, 10 males; average age 21) participants were recruited. The results showed that people differed in their perceptions of the robot and in their positive experiences with the robot based on whether they co-operated or competed with the robot. However, this result held true only for men. Male participants perceived the robot as more socially desirable and intelligent in the co-operative interaction than in the competitive interaction. On the other hand, they felt more positively and were more involved in the interaction when they competed than when they co-operated.

CONCLUSIONS AND FUTURE WORK

My study showed that the level of co-operation involved in the task affected a participant's social experience with a robot. The results suggest that designers of social products should ascertain in advance that the interaction style of the product fits the social context of use as well as individual attributes of the users (i.e. their gender). For example, men found ASIMO less desirable in the competitive task than in the co-operative task, implying that ASIMO should act co-operatively with men when social desirability or acceptance is required. On the contrary, when involvement in the task is a priority, such as helping the elderly maintain an exercise regimen, better involvement would be achieved if ASIMO acted competitively.

My next study aims to explore how user experience is affected by product attributes, in particular by how a robot uses its gaze in a storytelling task. I have built an empirical model of how storytellers use their gaze and implemented it

on ASIMO. In the experiment, ASIMO will gaze at the participants either $\frac{1}{4}$ of the time or $\frac{3}{4}$ of the time. Based on empirical results on gaze, I expect participants to have a more positive overall experience, engage more in the task, and evaluate the robot's characteristics more positively when they are gazed at longer.

I believe that a number of such studies, which look into different aspects of interaction, will provide the necessary background to form the proposed framework and methodology. As a full description of this framework, my dissertation will serve design researchers and practitioners with two key contributions. First, it will provide a framework to help designers understand how different aspects of social interaction would affect their designs and user's experience. Second, it will include several example studies that outline a methodology for predicting and evaluating the effects of particular design decisions.

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