Prompting In-Person Conversation Toward Empathy

Interaction Design in a Networked Environment

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Abstract

While networked technologies bring together communities on a global scale, a growing concern among sociologists is how such constant connection negatively impacts interpersonal relationships. Connected devices often interrupt and distract us from others in physical proximity, inhibiting in-person interactions—the very in-person interactions that uniquely lead to opportunities for self-reflection, understanding, and empathy. Empathy, importantly, helps individuals establish and maintain personal relationships. This study focuses on encouraging interactions that facilitate face-to-face encounters with the aim of increasing potential for empathy in and amongst people.

Although some researchers have found that the presence of technology can reduce the potential for empathy during in-person conversation, this study looks at ways that technological intervention and affordances might prompt and facilitate empathy between people working toward similar goals. The hypothesis proposes that technological interactions in a physical space can be designed to support in-person conversation and connection that offer opportunity for building empathy.

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"There's a very real sense in which the things around us are infringing a new kind of right that has not needed protection until now. We're spending more and more time responding to the demands of machines."

Neil A. Gershenfeld,
When Things Start to Think

Justification

Networked technologies today provide us with new ways to learn, research, share, entertain, and socialize. Yet, our networked devices can be intrusive at times, interrupting in-the-moment experiences and drawing us away from our co-present companions. We find it very difficult to resist the call of our networks, which lure us with promises of mysteries and excitement that are designed to be hard to resist. However, our inattention to those around us can cause us to miss out on important relationship-building cues. Head nods, smiles, hand gestures, leg crossings, eyebrow raises, posture shifts and other indicators convey subtle, but meaningful layers of information during interactions (Duncan and Fiske 3). Shifting attention to a device minimizes the amount of information obtained through perception (Misra 277). "Every time you check your phone in company, what you gain is a hit of stimulation, a neurochemical shot, and what you lost is what a friend, teacher, parent, lover or co-worker just said, meant, felt" (Turkle 40).

Research by sociologists and psychologists have shown that in-person interactions uniquely lead to opportunities for self-reflection, understanding, and empathy, and are critical for forming healthy relationships with ourselves and others (Mercola, "Power"; Turkle 66). The addition of multi-sensory input such as expressions, gestures, and eye contact in our face-to-face experiences create environments that build trust and the capacity for empathy (Mercola, "Power"). Empathy allows us to figuratively put ourselves in someone else's shoes, share an emotional response, or see a situation as someone else sees it unbiased by our own experiences (Sorrell 66).

Some research fields—including sociology, psychology, and strategic communications—have found that merely the presence of networked technologies can reduce the potential for empathy during conversation (Misra 275; Przybylski and Weinstein 237; Drago 13). People getting to know one another through moderately **meaningful conversation** felt less close and less connected to their partners, and had less empathetic concern for their conversational partners when a mobile device was present (Przybylski and Weinstein 237, Misra 290). These negative impacts are more pronounced when the conversations interrupted are between people who are involved in close relationships or are having meaningful conversations (Misra 290).

Some scholars suggest that the only way to recapture the nature of face-to-face interactions is to eliminate the technology: "...clear a path for conversations, set aside laptops and tablets. Put away your phone" (Turkle 19). However, other theorists outline the need for technology that is

Networked technologies
Systems combining embedded sensors, software, hardware, data storage, and connectivity to enable integration and coordination across individuals, channels and geography (Porter and Heppelmann 64).

Meaningful conversation
Conversations involving self-disclosure of relevant or personal information (Przybylski and Weinstein 238).

designed to support human goals, not detract from them. David Rose, MIT researcher wants "...the computer-human interface to be an empowering and positive experience—to minimize the interruption, annoyance, and distraction of our so-called smartphones and glass-faced tablets" (Rose 3). My studies align with this latter position.

Older adults (seniors ages 65 and older) are an audience who can benefit from relationship-building through face-to-face interaction. Factors such as retirement, changes in physical abilities, and personal loss can lead to isolation and loneliness among seniors (Chen). Friendships can help counteract these conditions by providing emotional support to help relieve stress and provide cognitive, social, and physical benefits (Suttie; Chen; Mayo Clinic Staff).

Older adults also have specific perspectives on technology and attitudes toward conversation (Smith 11; Mitzner et al. 1710; Stein). A study of older adults found that seniors dislike for technology to cause interruptions—e.g. unwanted calls and calls at inappropriate times—and consider interruptions to be a cost of using technology (Mitzner et al. 1710-1721). Older adults consider face-to-face contact to be the optimum form of communication and value personal contact and the multidimensional aspects of face-to-face interactions (Stein).

Meaningful interaction
An interaction in which participants are changed in ways that have lasting value (Dubberly and Pangaro 2). Knowledge sharing and self-disclosure can lead to meaningful interactions (Przybylski and Weinstein 238).

To investigate ways in which technology can encourage face-to-face interactions, I have situated my investigation within scenarios that address older adults who are co-located in a fitness environment. This environment provides an atmosphere for achieving common goals—maintaining health and socializing—and a location where the same people may potentially see one another repeatedly, but may not engage in **meaningful interactions**.

Research Questions

How can networked technology in a physical fitness environment be designed to support in-person interactions that offer opportunity for building empathy among older adults?

SQ1 How can presence be reflected through the design of an interface in a public, semi-public, and private setting to encourage meaningful interaction?

SQ2 How can exchange be facilitated through the design of public, semi-public, and private interfaces to encourage meaningful interaction?

SQ3 How can delight be incorporated into the design of device-initiated interactions to encourage in-person interactions?

Key Terms

Networked (connected) **Technologies**

Systems that combine embedded sensors, hardware, software, data storage, and connectivity that enable integration and coordination across individuals, channels and geography (Porter and Heppelmann 64).

Delight

A pleasurable moment created through the design of micro-interactions with digital devices that increase the enjoyment and fun in a designed experience (Rowe).

Device-initiated Interaction

An interaction proactively initiated by a technological device or system without being explicitly requested by a user (Ju and Leifer 72-84).

Empathy

An emotion which affords people the ability to identify with the feelings, intentions, and goals of other people and entities (Sorrell 66).

Exchange

The act or representation of giving something and receiving something in return through physical, verbal or virtual means.

Face-to-face (in-person, co-present) **interaction**

An interaction in which all participants are co-located in close enough proximity such that they can engage in conversation.

Interaction Design

A study of human engagement with technology that seeks to use gained knowledge to design artifacts that are more pleasing and useful (Kaptelinin and Nardi 5).

Meaningful Interaction

An interaction in which participants are changed in ways that have lasting value as a result of the interaction (Dubberly and Pangaro 2). Knowledge sharing and self-disclosure can lead to meaningful interactions (Przybylski and Weinstein 238-239).

Presence

A manifestation of the physical existence of someone in an environment. Presence may be represented—through a web cam, avatar, or abstraction—or be indicated when a device detects a physical presence and initiates a response—for example an automatic door opening when someone is nearby (Nevejan and Brazier 406; Ju and Leifer 72).

Public, semi-public, and private settings

Public settings are environments where information consumption is not restricted to a selective audience, for example a roadside billboard. Semi-public settings are environments where information is primarily consumed by a select group of individuals based on location, membership, or interest, but can be viewed by others. An example of this might be an office setting, computer screen, or public social media profile. Private environments are locations and interfaces where sensitive information is available to those who have privileges. A private profile, personal cell phone, or space in the home are all types of private settings. (Duncan and Fiske 3)

Assumptions and Limitations

Assumptions

The environment in the investigation is equipped with networked technology that communicates information between equipment and devices in the space and a wearable device.

Participants are willing to utilize wearable technology that may gather data regarding their location, behavior, and individual (but non-identifying) information in a fitness environment. All participants are presumed to utilize the same or compatible wearable technology, which is networked with sensors and equipment within the defined physical space.

Data gathered from individuals will be latent in nature and will be generated by their activities in the space. Any identifying data is presumed to come from the account membership.

Participants are willing to allow gathered data and membership data to be shared within the defined physical space.

Limitations

This research explores the potential of designed interactions through prototyped designs and does not include the manufacture or installation of devices described herein.

Research for this investigation has been gathered in a community which is financially stable and largely homogeneous in its demographic characteristics. Researchers studying other social groups with different demographics may reach different conclusions, even when considering the same issues in this study.

Frameworks

Activity Theory

Activity Theory examines how humans interact with technology by considering all activities surrounding the use of technology and placing importance on the meaningful context of an interaction. This research approach contrasts with other methods which focus only on peoples' needs, tasks, or how people interact with technology to accomplish those tasks. By incorporating human activity in interaction design, Activity Theory considers social, creative, emotional and cultural contexts providing a richer framework that "more closely matches how people actually use technology at work and play" (Kaptelinin and Nardi 6).

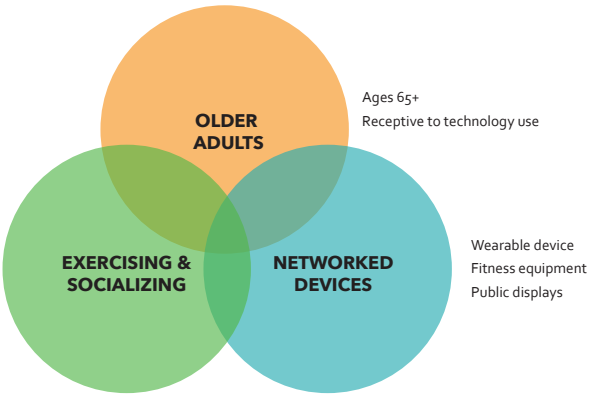


Figure 1—Activity Theory context of exploration.

The Activity Theory framework is particularly relevant to this research since it encompasses an examination of individuals, their past perceptions, and the objects they interact with to achieve their goals in a specific context. This framework has been essential to understand the motivations of older adults as well as the limitations they perceive in connecting with others using technology or within the scope of a fitness environment.

Designing for Subtlety

MIT researcher David Rose identifies a Designing for Subtlety scale which ranks the affordances of technology based on their capacity to intrude upon a user's attention. Since my research seeks to make technology less intrusive to in-person interactions, this framework is a relevant tool for framing and evaluating design solutions. I position my design investigations primarily in the awareness categories.

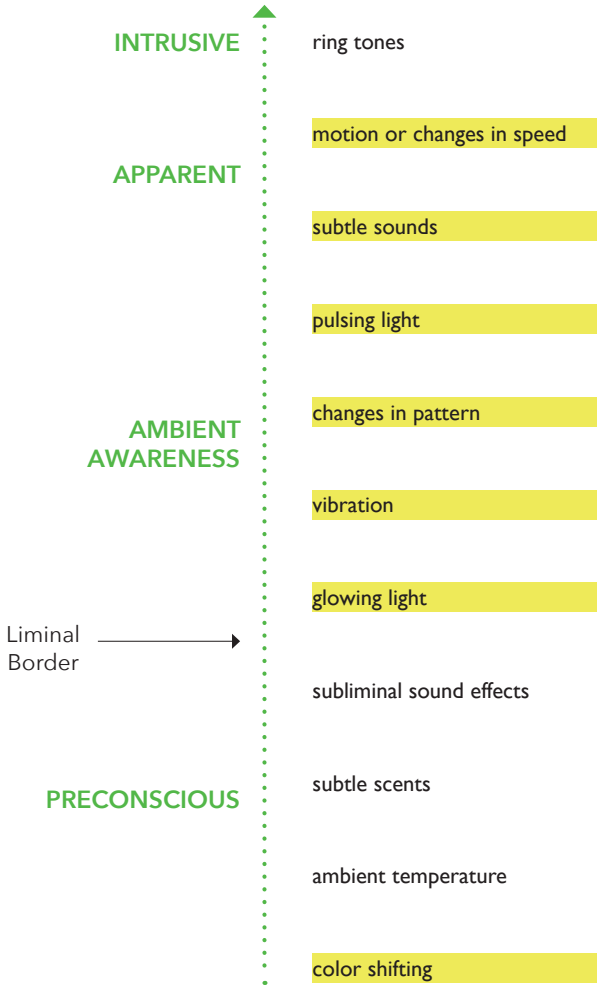


Figure 2—Diagram adapted from David Rose's Designing for Subtlety Scale and highlighted to emphasize areas of focus for this investigation.

Seven Abilities of Enchantment

David Rose also describes seven "Abilities of Enchantment," which are characteristics embodied by devices that differentiate our experiences with them from devices such as smartphones. These qualities enable a symbiotic learning relationship and to "engender trust...to act as respectful agents of our time and attention" (Rose 173). These traits are used to influence my design investigations.

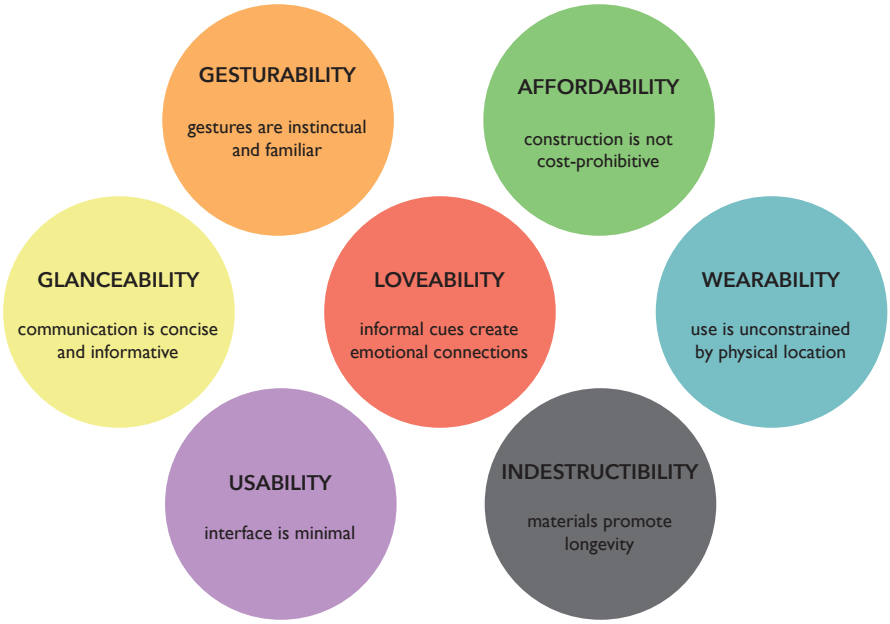


Figure 3—Diagram representation David Rose's "Seven Abilities of Enchantment."

YUPTA Framework for Presence

"The YUPTA framework, acronym for being with 'You in Unity of Time, Place, and Action,' sheds light on specific presence configurations in which a person performs presence with YOU, in the NOW, being HERE, with a specific potential to DO certain things" (Nevejan and Brazier 417).

The YUPTA framework postulates that networked technologies change our experience of time and place as well as how we relate to others and choose to act. As a tool, it aids in understanding and designing human experiences relative to the dimensions of relation, time, place, and action. The individual measures of presence create configurations that can be used to quantify how a person judges presence, and the amount of trust resultant. This framework was helpful for understanding the different types of presence that exist in a designed environment.

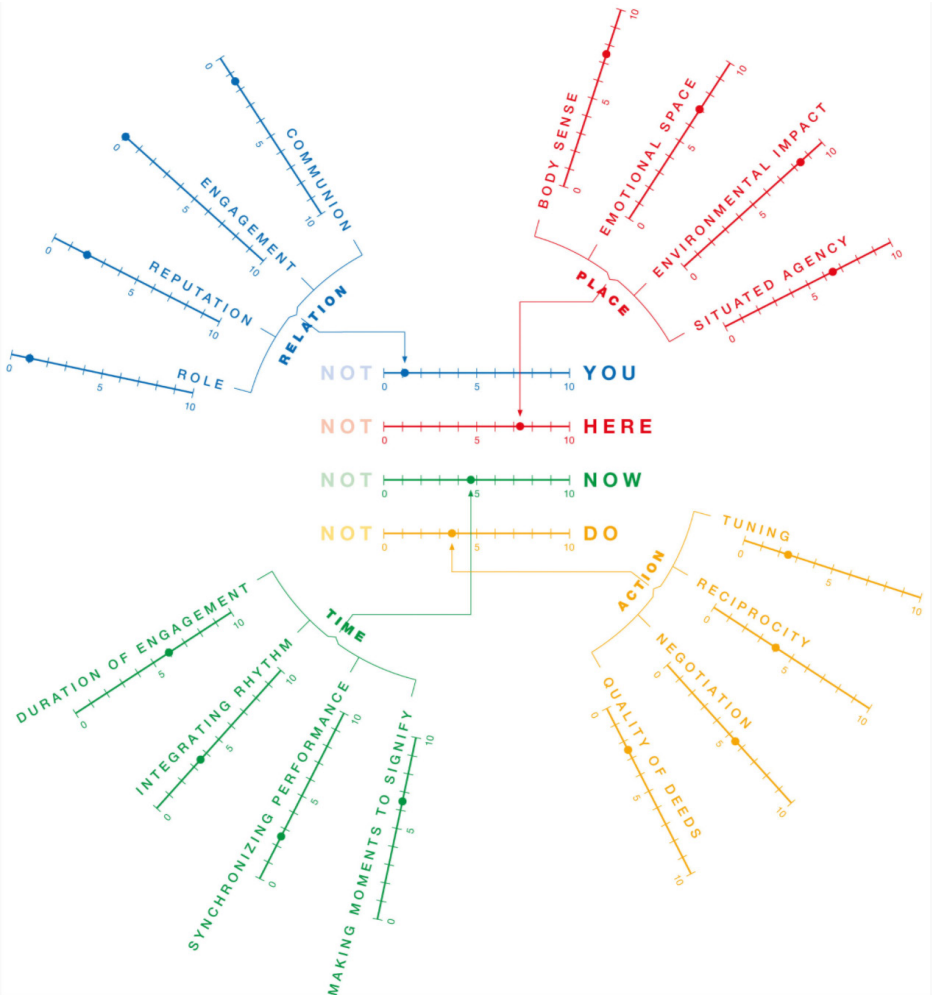


Figure 4—YUPTA framework showing perceived values of place, action, time, and relation. (design: office of CC, Amsterdam)

"We take for granted the centrality of face-to-face interaction for individuals and society."

Starkey Duncan, Jr. and Donald W. Fiske,
Face-to-Face Interaction

Literature Review

Face-to-face Interaction, Technology and Empathy

Duncan and Fiske describe face-to-face interactions as including a range of in-person encounters including greetings, conversations, and religious rituals that can occur in a variety of settings including public (sidewalks, supermarkets), semipublic (offices, classrooms), and private (homes) (3). Through these copresent interactions, people express cultural elements of significance including self-image, personal values, and beliefs (3). Face-to-face interactions can be broken into seven categories of action: paralanguage (vocalizations, not language), kinesics or body motion, proxemics, social olfaction, haptics and body contact, artifacts (dress, cosmetics), and language (Duncan and Fiske 5-6).

New options for interpersonal interactions have emerged with advances in technology. In *Networked*, Rainie and Wellman note that technologies such as mobile devices and the internet have changed how people make decisions, solve problems, learn, and support one another (ix-x). Consequently, such technologies have "profoundly transformed how we connect, in person and electronically" by expanding social networks and making them perpetually accessible (Rainie and Wellman ix, 95). Joseph Mercola claims that while connections through social media are beneficial, they cannot reveal qualities of deep intimate relationships and are not substitutes for face-to-face encounters. The multimodal sensory input generated through face-to-face interactions differentiate the experiences, and mirror neurons enable people to synchronize neurologically to better understand one another's intentions (Mercola, "How"; Sorrell 69). When people work together in copresent settings, there is more trust and willingness to confide, leading to more creative and higher quality work (Mercola, "How"). Sociologist Sherry Turkle, in *Reclaiming Conversation*, states that it is only when we are present with one another that we gain the skills to listen, self-reflect, and develop the capacity for empathy (Turkle 3). Turkle posits that conversations are the interactions by which collaborative solutions, creativity and intimacy develop and flourish (3-4).

Conversation approaches generative dialogue by moving through four gradually increasing stages of conversation: talking nice, talking tough, reflexive dialogue, and generative dialogue (Wageningen Centre for Development Innovation). Reflexive and generative dialogue are stages where empathy can begin to emerge as people consider ideas from the perspective of others in addition to themselves (Wageningen Centre for Development Innovation). Dubberly and Pangaro describe conversation as a "progression of exchanges among participants" and effective conversation

as one that brings about changes which have "lasting value to the participants," whether human or machine (1-2). Przybylski and Weinstein define a meaningful conversation in social contexts as one which involves self-disclosure of personal information (Przybylski and Weinstein 238-239).

Empathy is the emotion which allows a person to identify with and understand the feelings and emotions of another person or being (Kummer 2265; Sorrell 66). Thus, empathy is an important part of interpersonal communication, playing an essential role in human relations to help establish and maintain relationships (Kummer 2265; Mercola, "How"; Turkle 66). Research by Serrano-Puche shows a link between emotions and digital technologies, especially mobile phones, in the way technology can be used to express and activate emotions (2). Not only does technology stimulate our affectionate responses, but it also plays a role in shaping the way such affections are played out (2). Perceived as personal and emotional archives, devices can elicit attachment or dependence from their users (5-6). Technology use is driven by factors such as the fear of missing out, etiquette, emotional gratification, and to provide security (Serrano-Puche 5-8).

Turkle points out that the presence of a mobile phone signals divided attention (Turkle 319). A study by Przyblyski and Weinstein finds that just having a mobile communication device in sight can discourage the perception of empathy during a conversation between two people, negatively affecting feelings of closeness and connection (Przyblyski and Weinstein 237). Misra further shows that the impact of a device is more pronounced when conversation partners are engaged in more meaningful conversations or relationships (Misra 16). Furthermore, the distraction conflict between different relational networks—in-person and digital—can impede complex tasks such as conversation (Misra 292). Although individuals are aware that the presence of connected devices decrease the quality of face-to-face communication, individuals continue to use the devices in the presence of others (Drago 13). Yet, Przyblyski and Weinstein theorize that "mobile communication devices such as phones may, by their mere presence, paradoxically hold the potential to facilitate as well as to disrupt human bonding and intimacy" (Przyblyski and Weinstein 245).

Technology can draw attention away from intended goals through techniques such as intermittent variable rewards, social reciprocity and disrespectful interruptions (Harris). However, the constant demands from technology and continuous connectivity can lead to stress (Rainie and Wellman 96). Attentional demand is a characteristic of human-computer

interaction which describes the attention a computer system requests of the user during an interaction (Ju and Leifer 75). The attention demanded by connected information and communication technologies can lead to cognitive overload caused by a persistent state of "absent presence," micro-social fragmentation, and "horizontal relationships" (Misra 277-279). Because of this, people often employ behavioral and boundary strategies to avoid distractions during socially inappropriate situations (Cecchinato et al. 3989). Interfaces which use biomimicry or ambient information are less distracting than screen interfaces because they are glanceable and allow information processing to occur in parallel making communication less strenuous and intrusive (Rose 228, 177). Data visualizations also enable trends to be seen at a glance and enable rapid comparisons between different information sets (King 2-10).

Older adults

Many older adults want to maintain their independence and stay in their own homes for as long as possible (National Association of Area Agencies on Aging et al.). One in three women and one in seven men over 65 live alone (Chen). Having friendships can provide social, emotional and physical benefits for seniors by helping relieve stress, provide comfort, and encourage sharing (Chen). Feeling disconnected from others can lead to loneliness and put health at risk (Mercola, "Power"). However, social relationships encourage positive mental health and mobility, and emotionally supportive relationships help defend against physical and cognitive decline (Mercola, "Power"; Suttie). Seniors with a strong support network are more likely to be screened earlier for diagnoses and to receive treatment (Suttie). Studies show that high social activity can lead to 43% less disability and half the rate of cognitive decline (Suttie). The benefits of exercise apply to all ages and supportive workout partners can help with fitness goals leading to improved cognitive performance, lower blood pressure, increased immunity, lower risk of heart disease, reduced risk of diabetes, elevated moods, a counter for insomnia, and slowing the aging process (Mercola, "How").

The Pew Research Center shows that, overall, 60% of seniors go online, and going online often becomes integrated into daily routines (Smith 1). Seniors use the Internet for education, research and travelogues, making it an important medium for reducing isolation, particularly for homebound individuals (Kamiel). Older adults have adopted social platforms such as FaceBook and Skype to keep in touch with friends and family (Kamiel).

To serve the older adult online community, health professionals have created supportive online networks, senior centers have incorporated computer training classes, and universities have started offering remote education courses (Kamiel). Older adults believe that the benefits of using technology outweigh the costs (Mitzner 1710). Seniors appreciate when technology supports their activities, are convenient, and have nice features (1717-1718). Negative attitudes toward technology emerge when devices create interruptions, have unhelpful features or cause security or reliability concerns (1718-1719). While older adults are not unwilling to use technology, perceived ease of use and training programs are important (Mitzner 1720). The Pew Research Center finds that physical or health conditions may make it difficult for seniors to use technology (Smith 2). In addition, seniors may encounter learning curves when working with new devices and may be skeptical about technology's benefits (Smith 3). Tablets and e-readers are just as popular as cell phones with seniors and are more likely to be owned by a senior than a smartphone (Smith 4).

Mercola argues that connections established online through social media can help alleviate isolation among older adults, but are not a substitute for in-person relationships which take time and effort to establish and allow individuals to learn about themselves and others (Mercola, "How"). Online relationships lack the opportunity for building lasting emotional closeness (Mercola, "How"). Panel discussions with seniors finds that older adults seek multi-dimensional and multi-sensory contact, enjoy forming new connections, and prefer to remain semi-engaged rather than semi-retired (Stein). Older adults foremost value face-to-face interactions and otherwise stay connected by sharing photographs and gifts, using spontaneous phone calls, and thoughtful emails (Stein). Seniors are not interested in learning technology for technology's sake and perceive technology as an aid and not a replacement for real life (Mao). Texting and video calls are not considered replacements for in-person communication (Mao).

In designing for older adults, it is important to focus on real life moments, to communicate respectfully, provide a choice of mediums for engagement, prioritize usability over aesthetic, and be considerate of security and privacy concerns (Mao). Adults lose vision acuity as they age which causes colors to appear less bright, and consequently may prefer a high color contrast (Paul; Visual Expert).

Design Approaches

"Despite all the attention paid to new gadgets, technology does not determine human behavior; humans determine how technologies are used" (Rainie and Wellman ix).

Wendt in Design for Dasein states that "the Internet of Things and wearable computing actually have potential to introduce completely new interactions and experiences to our current concept of computing" (Wendt 8). The activities of multiple design practices may lead to the design of interactions, objects, or services; however, it is what emerges out of these designs through their interactions with each other and the user that creates an experience (11-13). Dasein is a design practice that focuses on being in the world in an embodied state, sometimes referred to as "being-there" (16). In Dasein, objects exist in two states of user awareness, "ready-to-hand" (invisible through use) and "present-at-hand" (brought to notice), and interruptions cause transitions between the two (27-29). The concept of "nearness" is defined not as how physically proximate an object is, but how aware of an object someone is at a given point in time (45). Wendt argues that designing for Dasein, or "being-there," provides the potential for developing empathy and a state of "being-with" (56).

Ju and Leifer present a framework for categorizing implicit human-computer interactions (HCI) along a range using attention and initiative as axis (75). Interaction is examined from a perspective of reactive to proactive and background to foreground to be used by designers as a tool and methodology for interaction design (75, 84). The Implicit Interaction framework and methodology address a broad class of interactions and are intended to work with technology-based approaches and analysis-based approaches to result in implicit interaction design (73). Implicit interactions "enable communication without using explicit input or output" and may be initiated by the system or occur outside attentional foreground of the user (Ju and Leifer 74).

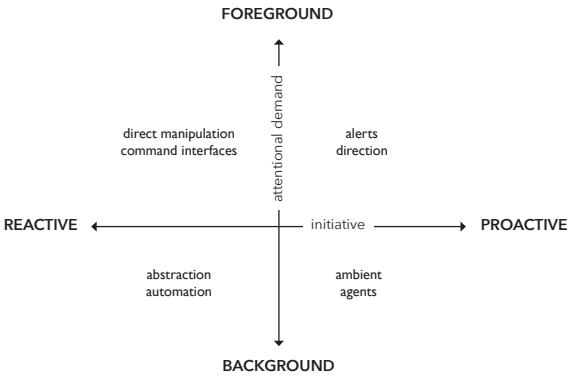


Figure 5—Implicit Interaction framework showing range of interactive system behaviors (Ju and Leifer 75).

In *Enchanted Objects*, David Rose looks at networked objects as an opportunity to make ordinary objects extraordinary (Rose). By leveraging emerging technologies such as sensors, actuators, wireless connection, and embedded processing, designers can create objects that become more useful, delightful, informative, sensate, connected, and engaging than they would be ordinarily (47). Face-to-face conversation builds familiarity, rapport, and trust between people and enchanted objects can help lower thresholds to barriers that might otherwise prevent socialization (Rose 230-232). The role of presence imparts a valuable awareness of others which can be incorporated into designed solutions to bring people closer together (93-95). Rose's "Designing for Subtlety" framework highlights a polite escalation of communication from objects across a spectrum of visible, audible, and tactile cues and serves as a guideline for designing objects to be less intrusive and more respectful of our attention (127). Enchanted systems are those which self-regulate through feedback loops from multiple components interacting and affecting one another (209). Such systems learn, change, and adapt (Rose 209).

Other theorists and designers echo Rose's sentiments. Designs need to be pleasurable in addition to being functional and reliable (Rowe). Achieving surface level delight uses techniques such as attractive interfaces, animation and sound to create pleasurable experiences, however this type of delight runs the risk of becoming a novelty factor that can fade over time (Rowe). Deeper delight seeks to make an interface disappear to the user so that the user can get into their flow and be productive, with the ultimate goal being to help a user become something better (Rowe). At the core of delight is surprise—which may take the form of a reward, joke or discovery—and uniqueness (Cao et al.). Designed serendipity utilizing machine learning can create delight by facilitating discovery of the unknown (Eagle, secs 6.4, 7). Feedback loops can be created between humans and computers to create systems that can "'sense' and interpret a user's cognitive and physiological information" using biometric data to infer context (Miller). Wearable devices are "a step closer toward the bodily adaptation and integration of technology into the user" and create a more immersive experience (Serrano-Puche 16). Synchronous gestures can reveal patterns of activity which "take on new meaning when they occur together in time, or in a specific sequence in time" and have potential as interaction metaphors and contextual cues (Hinckley 149, 157).

Design Precedents

Balance Table

David Rose's Balance Table (Figure 6) uses slow, ambient feedback mechanisms incorporated into the surface of a conference room meeting table to guide turn-taking in a collaborative setting. Speech causes the table to glow slowly in front of the person talking, appearing gradually over 15 seconds. During discussion, glancing at the table reveals the dominant or balanced speaking pattern. The table's use of peripheral information provides a subtle awareness of information without disruption to participants. This type of feedback can be observed and utilized by participants to change their behavior to achieve their shared goal. After using the Balance Table, users became more attuned to each other and modified their turn-taking behavior. (Rose 228-230)

A conclusion drawn from this precedent is that gradual feedback is less intrusive and just as illuminating, allowing people to draw their own conclusions in their own time. In addition, people appreciate tools that help them work together better to achieve a common goal.

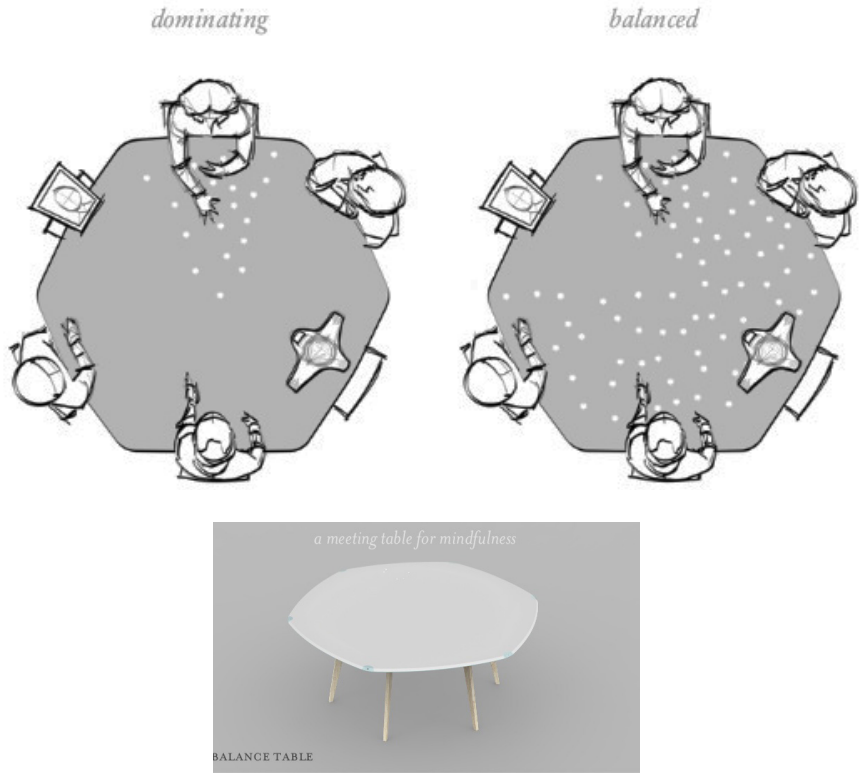


Figure 6—David Rose's Balance Table for conversational balance during collaboration.

Wikipedia Audiovisualizer by halvves

The Wikipedia Audiovisualizer is a real-time data visualization that uses simple sounds and shapes to visualize current activity on Wikipedia. In this visualization, actions on Wikipedia are uniquely described with variations of tone and scale to create a tapestry that is both visual and audible. The exploration of sound in the visualization is compelling.

This precedent provides visibility into activities occurring in-the-moment, but not necessarily within physical view. Visualized participant activities are sometimes obscured by speed, size or layered activity. Identity plays a role and participants are identified by user name, as “anonymous” or as robots. By observing concurrent activities, a collective pulse is obtained of the space which indicates that visualizing information for a collective may provide insightful or delightful experiences through elements of concealment, surprise, and simultaneity.

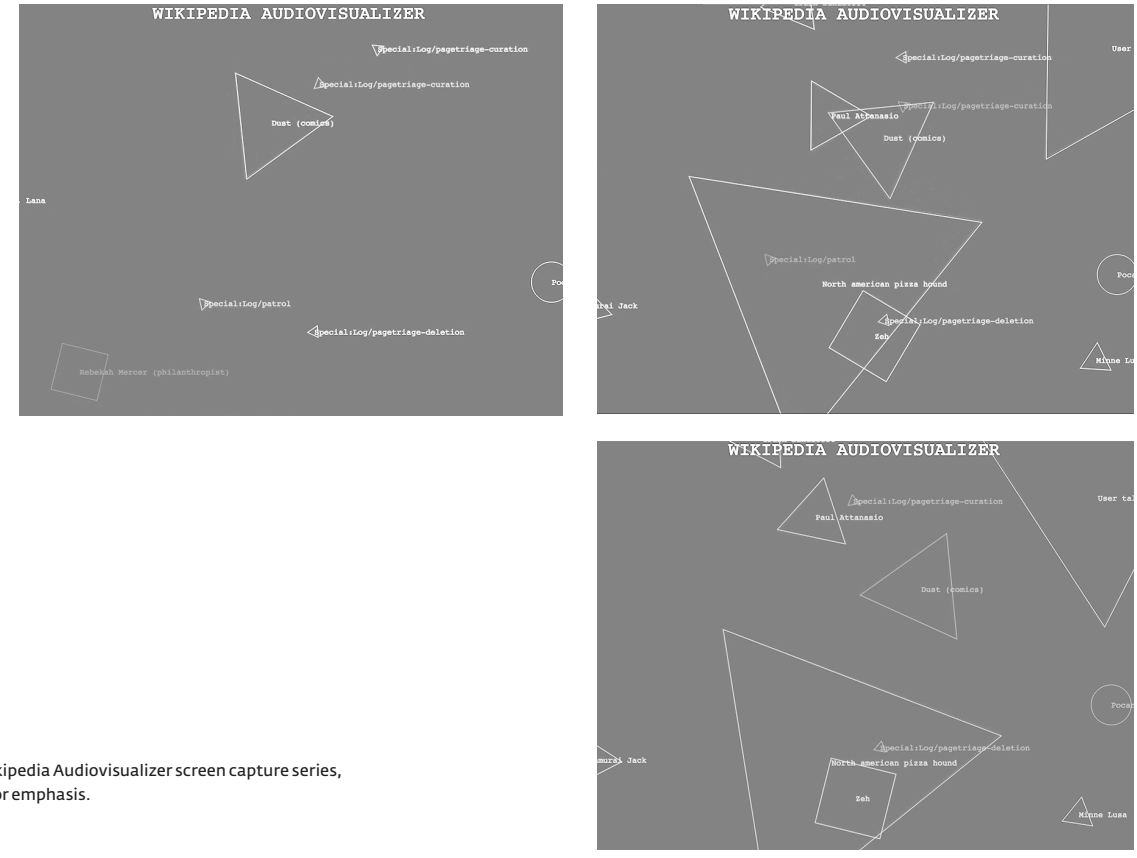
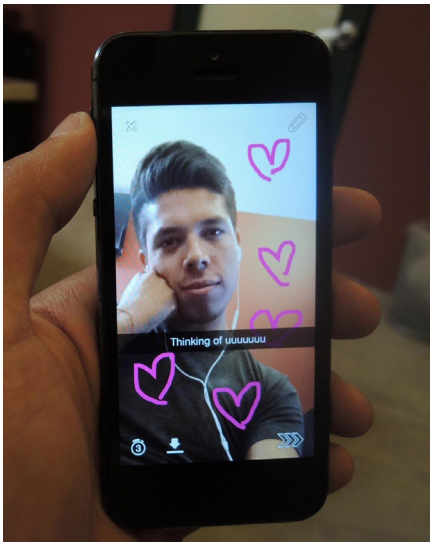


Figure 7—Wikipedia Audiovisualizer screen capture series, in grayscale for emphasis.

Snapchat

The Snapchat app utilizes an ephemeral conversation style that creates a digital atmosphere of intimacy and trust. A case study of the social and emotional experiences of Snapchat revealed that users found it to be more spontaneous than other mechanisms, but less socially supporting. However, users paid closer attention to the content, and made comparisons between Snapchat's communication style and face-to-face conversations, which led to users experiencing emotional rewards similar to those associated with co-present conversation. Seen as a platform for sharing spontaneous experiences and small, rich moments rather than big moments, Snapchat's use of ephemeral (time-bound) content posting lowered stakes on sharing, and cultivated an intimate, private environment among users (Bayer et al. 16-18).

This precedent indicates that limits, such as ephemerality can lower stakes on participation and sharing. In addition, intimacy can be fostered, even digitally, by creating safe, private environments.



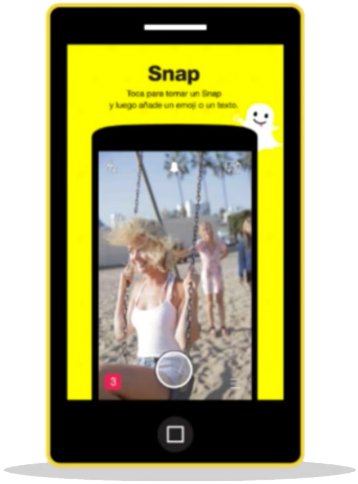


Figure 8—(above left) Photo of a Snapchat "snap." (above center and right) Portion of the "Everything A Parent Needs to Know About Snapchat - TeenSafe" video explaining how Snapchat works.

"We are mostly of a certain age and very respectful of use of technology as a rule—save the infrequent loud music or program escaping from a person's ear buds."

Anonymous,
Interviewed Senior

Design Methods

Research Through Design

The process of Research Through Design supplements technical knowledge through the use of design models and frameworks as a way to approach interaction design research (Martin and Hanington 146). For this investigation, I used a combination of primary and secondary research methods with selected frameworks to inform and validate my design explorations.

Literature Review

I performed a review of relevant literature in areas such as social sciences, human-computer interaction, and design research to gain a comprehensive understanding of my field of investigation. (See also "Literature Review" on page 23.)

Case Study and Design Precedent Analysis

I used a case study analysis to examine existing or proposed design solutions using technology to encourage or supplement person-to-person interactions. This analysis identified design precedents for this investigation. (See also "Design Precedents" on page 29, "Case Study and Design Precedent Analysis" on page 67.)

Interviews, Questionnaires, and Observation

Early interviews with subject matter experts in psychology and data visualization informed my initial investigation direction. Later, interviews with older adult gym members, a physical trainer, and a senior gym administrator identified user goals and motivations for my scenario studies. Interviews, questionnaires, and observations were used to ascertain user goals and motivations used with the Activity Theory framework. Conversations with my audience led to the use of latent data gathering techniques and subtle interface choices.

Personas, Scenarios and Journey Maps

My investigation used fictional personas constructed using interview findings and placed in designed scenario narratives to examine situations where interesting interactions might occur. This led to my decision to focus on wearables, equipment consoles, and a large screen display as networked interfaces which might encourage face-to-face interactions.

Prototyping and Role Playing

Drawings, wireframed sketches, and animated sketches enabled early design concepts to be explored and evaluated by users and against my research frameworks. Role playing allowed design concepts to be experienced in a realistic environment and allowed actual behaviors to be observed.

"The connection created between two people—and common interests, smiles, openness, and that feeling of community—draws us together."

Anonymous,
Interviewed Senior

Design Investigations

This investigation looks at utilizing the values of presence, exchange, and delight across interfaces whose publicness ranges from private to public, and whose scale ranges from a wearable device, to an equipment console, to a large public wall display.

Figure 9—Networked technology in the space.

From my interviews, I learned that older adults do not want to have to enter data about themselves in the form of profile data or other means that require manual data entry. For this reason, my design investigations incorporate latent data gathering methods to collect information from individuals in the fitness space through wearable devices. Subtle feedback mechanisms are explored for device-initiated content to encourage less disruptive interactions.

Networked devices—wearables, equipment consoles and display walls—communicate to one another and respond to changes in the fitness environment. At times this communication may be unidirectional, and at other times it may be multidirectional. Similarly, a user may be a receiver and/or supplier of information depending on the interaction.

To determine how to design an overall system of interaction, it was important to examine the role played by each of my chosen interfaces in the environment. I considered for each device its intended use in the space, its affordances, and research encountered during my research pertaining to the use of the technology.

To explore these roles, I created storyboards and animated prototypes to evaluate the devices across several design scenarios.

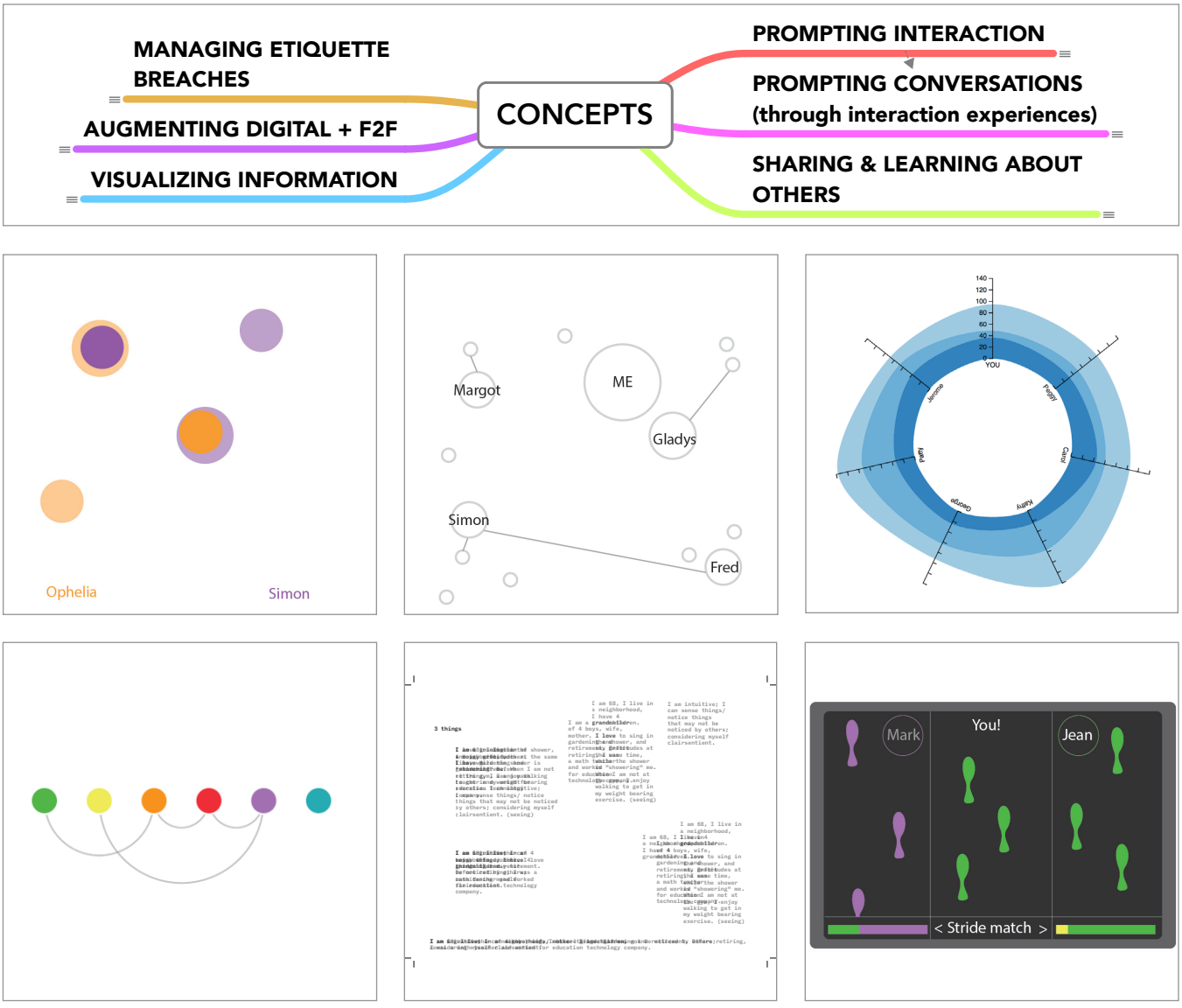


Figure 10—High-level concept map of early explorations and early trial investigations of presence, exchange, and delight.

Early Design Explorations

In my early design explorations, I attempted to isolate moments of presence, exchange, and delight as individual elements in a specific interaction. To do this I imagined a series of scenario vignettes which isolated moments of interaction on a particular device. Scenarios I examined included moments such as one person being in the space with another person, two people crossing by each other in the space, and one person performing an activity that is similar in time or action to another's activity. I drew sketches, generated graphs, and high-level wireframed storyboards to examine the designs.

These mini-scenarios revealed that the values of presence, exchange, and delight are often interwoven and difficult to disentangle from each other.

Exploring Presence

Expanding my analysis across my studies enabled me to recognize that the value of presence could manifest in a number of ways, and that presence was an overarching quality essential to encouraging face-to-face interaction. I found I could identify a representation of, response to, or reflection of presence in each of my trials.

I later encountered the YUPTA framework which categorizes presence into 16 distinct and measurable dimensions, which helped me understand the different effects of presence within my design explorations.

Exploring Exchange

I investigated exchange using the transfer of latently gathered data and personal information, such as a name. Names also represent a minimal level of personal disclosure. Exchange emerged as a potential way to encourage engagement as long as the information was meaningful to the encounter. For example, knowing someone's name was more interesting than knowing that there were people in the pool. Physical exchanges such as eye-contact, handshakes, and dialogue emerged as factors to consider in evaluating exchange.

Exploring Delight

Delight is a subjective quality. My early investigations sought to discover the types of situations that could cause delightful moments to occur. As a result, I looked at designing spaces for serendipitous discoveries: a shared friend, a shared interest, or other thing in common. It also led me to examine how elements of surprise and perhaps differences between people might also be sources of delight. For example, would users delight in the realization they were walking in another's footsteps, or by seeing a difference between their path and another's? I wanted to understand how repeatedly novel these moments would be to assess their effectiveness in prompting interaction.

The 'Say Hi' Experiment

My interviews indicated that learning someone's name might encourage users to initiate an interaction. I attempted to validate this assertion by sitting in the café at the gym with a name sign on the table in front of me to see if people would talk to me. Surprisingly to me, no one did. I speculated that people were possibly responding to the presence of the computer, may have considered me to be a sales person of some sort, or were too preoccupied with their other activities to investigate my presence. Whatever the reasons, this exercise indicated to me that physical presence and the presentation of name alone was not sufficient to motivate interaction.

Figure 11— Ambient Response Wall. This storyboard uses a physical presence to reveal information about people in the space. It uses presence in two ways, but is low on exchange and delight.

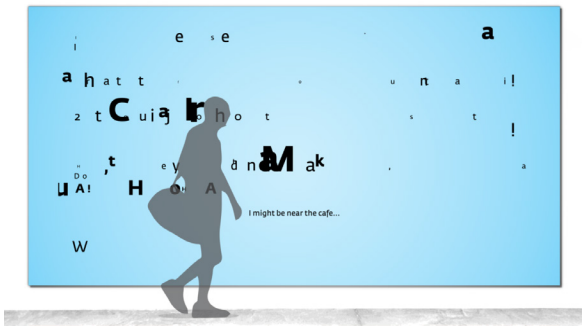
Wireframed Storyboards

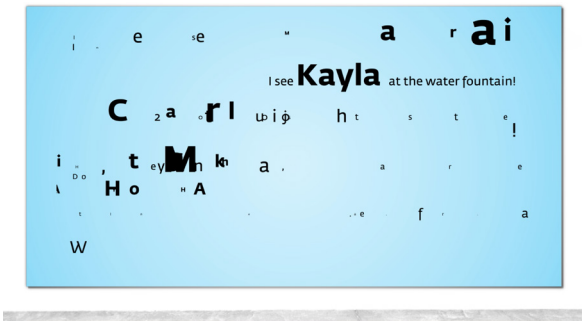
My initial approaches to investigate my subquestions prompted me to try to isolate the qualities of presence, exchange, and delight in my design investigations and to design for each quality individually. Through those early trials, I discovered that each exploration incorporates a mix of presence, exchange, and delight in varying degrees for each quality.

Drawing from the concepts that exhibited stronger potential in my early studies, I created a series of wireframes to outline the behavioral components of the studies. I used these new visual to explore how the different interfaces might respond to users.

From these explorations, I identifed elements to carry forward into an overall system of interaction. The strongest designs led to animated prototypes.

Figure 12—Contextual Inquiry. This storyboard indicates the presence or absence of people in the space and allows an exchange to be initiated. It is low on presence and delight. Additionally, it encourages interaction through an interface rather than in person.





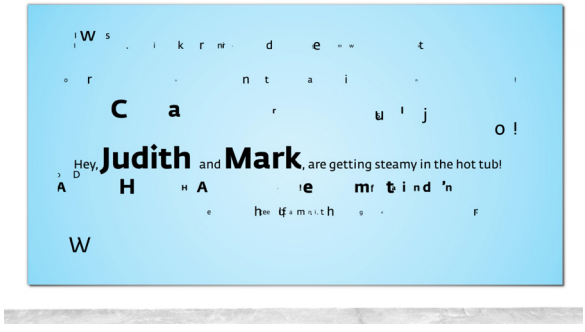


Figure 13—Representing the gym pet on a display wall led me to explore a constant state of motion, information, and behavior responsive to presence in order to create moments of exchange.

Animated Explorations

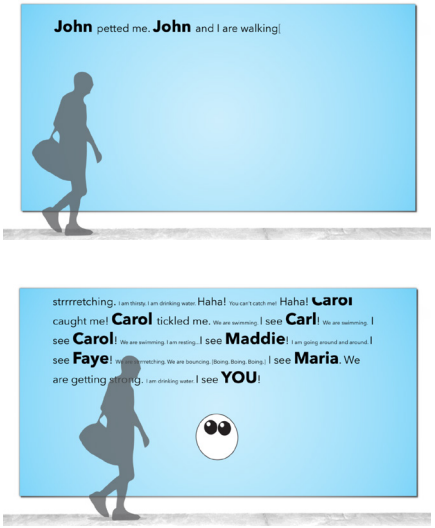
The Gym Pet Prototype

Pets can facilitate person-to-person interactions, acting as a third party initiator through their endearing or spontaneous behaviors. Drawing from the behaviors of pets as catalysts for human interaction, the gym pet explorations look at ways pet behaviors might be simulated in the environment using a single pet personality that roams amongst members in the gym, gathering information and sharing it with others.

The gym pet concept resonated with everyone I shared it with. The concept of a third party actor to create spontaneous engagements with others offered elements of delight and opportunities for exchange. An autonomous entity in the space create an additional "presence" in the space which is excused from normal etiquette rules that might otherwise act as barriers to interaction. This investigation reveals that a delightful experience can be created, in part, by the continual potential for surprise.

An obstacle to the gym pet approach is a general desire for everyone to have and maintain their own gym pet. Individualized gym pets encourage a tendency to interact more with the interface than with other people. Since individualized gym pets promote human-computer interaction over person-to-person interactions, I focused on a single pet entity within the space and examined the entities surrounding its interaction with the gym members. Observing the mannerisms of the gym pet (and pets in general) identified several elements that contribute to delightful interactions such as lowered inhibitions, playful and social behavior, and familiarity with others.

These studies showed that the level of intrusiveness of the gym pet could be high, and some activities might be negatively impacted by disruptions (e.g. monitoring a heart rate or having a conversation), so this set of studies prompted consideration for how to preserve those moments from disruption.



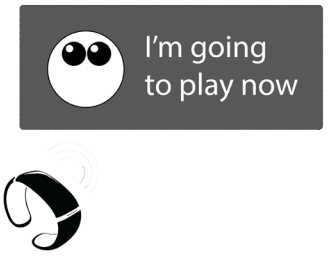


Figure 14—(top) Early animations of the gym pet explored in-the-moment activity capture as a continual feed and how to create a sense of "pet presence" by sharing the thoughts of the pet in real time as words sequentially appearing on the display wall.

Figure 15—(bottom two) Adding a visual component to the pet itself deteriorated its effectiveness as a facilitator by making the pet, rather than the people, the focus of interaction.

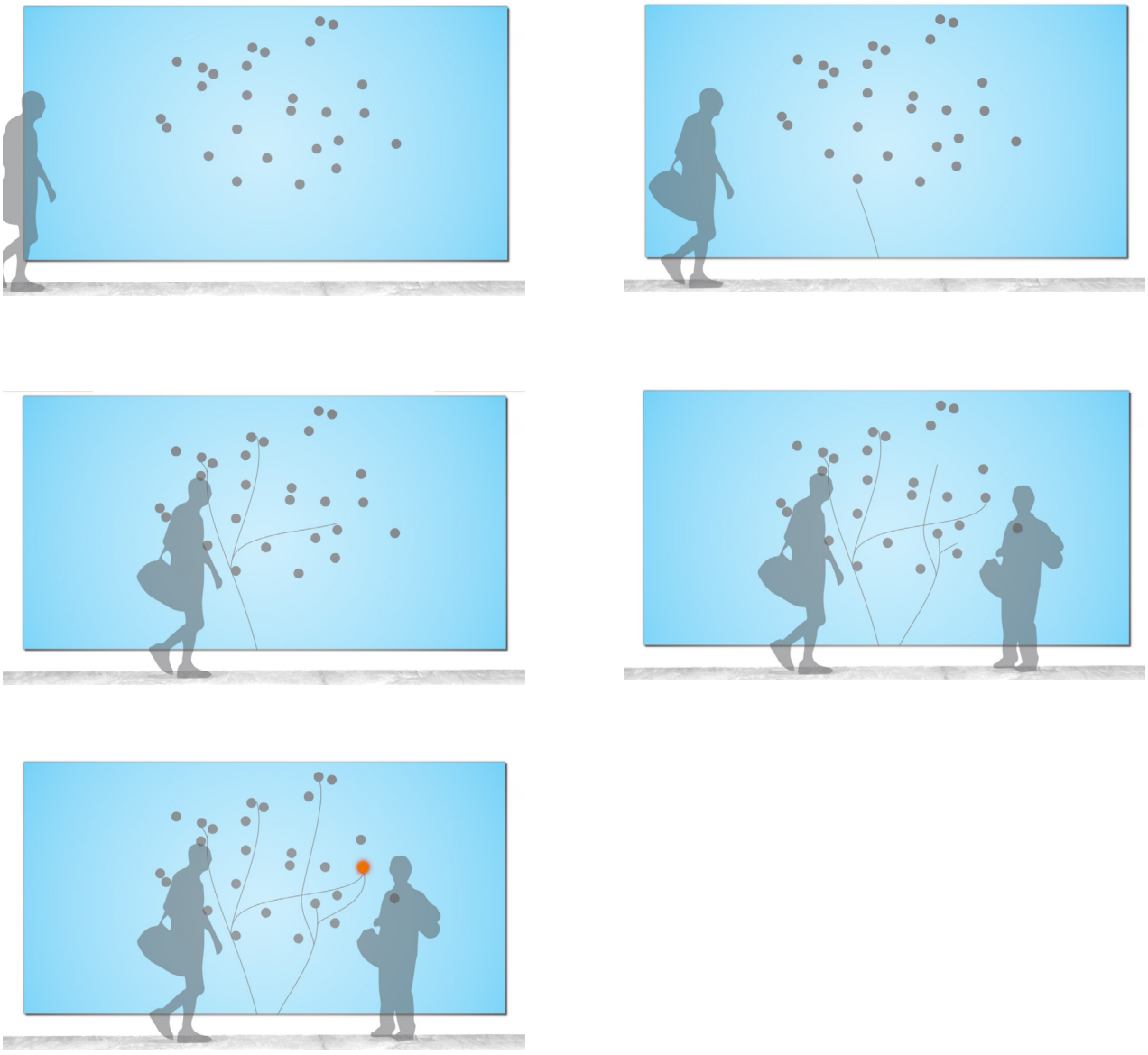


Figure 16—Visualizing responsive information on a display wall led me to explore the type of content that would promote meaningful exchange rather than a simple, response-triggered reaction whose novelty would quickly fade.

The People Trees Prototype

People can react differently when they are aware that they are being watched, and this notion of witnessed presence in an environment can factor into a person's level of awareness and trust (Nevejan and Brazier 410). Consequently, someone's behavior is partly defined by an awareness of those around them, and the social expectations placed upon that person by those others (Nevejan and Brazier 410). Use of a public wall to communicate, therefore introduces social norms and etiquettes as potential motivators for action. A large display wall provides an interface for sharing content that can be witnessed by multiple people. Because the display is public, passersby might not notice an interaction, but a witness might.

People Trees explores the potential of a responsive data visualization to elicit an interaction between people. In this case, a visualization represents other people in the gym, connecting lines between those people whom a passerby knows. Should two or more people pass simultaneously, multiple "trees" form to represent each passerby's tree of connections. If two people know the same person, that person's representation—shown as a dot in this study—is emphasized on the wall.

This study led me to consider what types of information would be meaningful enough to draw people into the information. While an abstract visualization might be aesthetically pleasant, it would soon lose novelty unless viewers could understand the representation. Abstraction lowers the exchange value by not providing enough context for the connection. These investigations identified a need for meaningful or conversational contextual prompts.

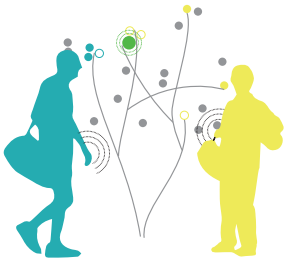


Figure 17—People Trees evolved from an idea of simulated butterflies appearing when people crossed at the wall. However, that implementation was lacking in exchange value.

Figure 18—In order for the People Trees concept to work, people had to realize that the activity on the wall was personalized for each individual. Color was one way I explored making that association visible.

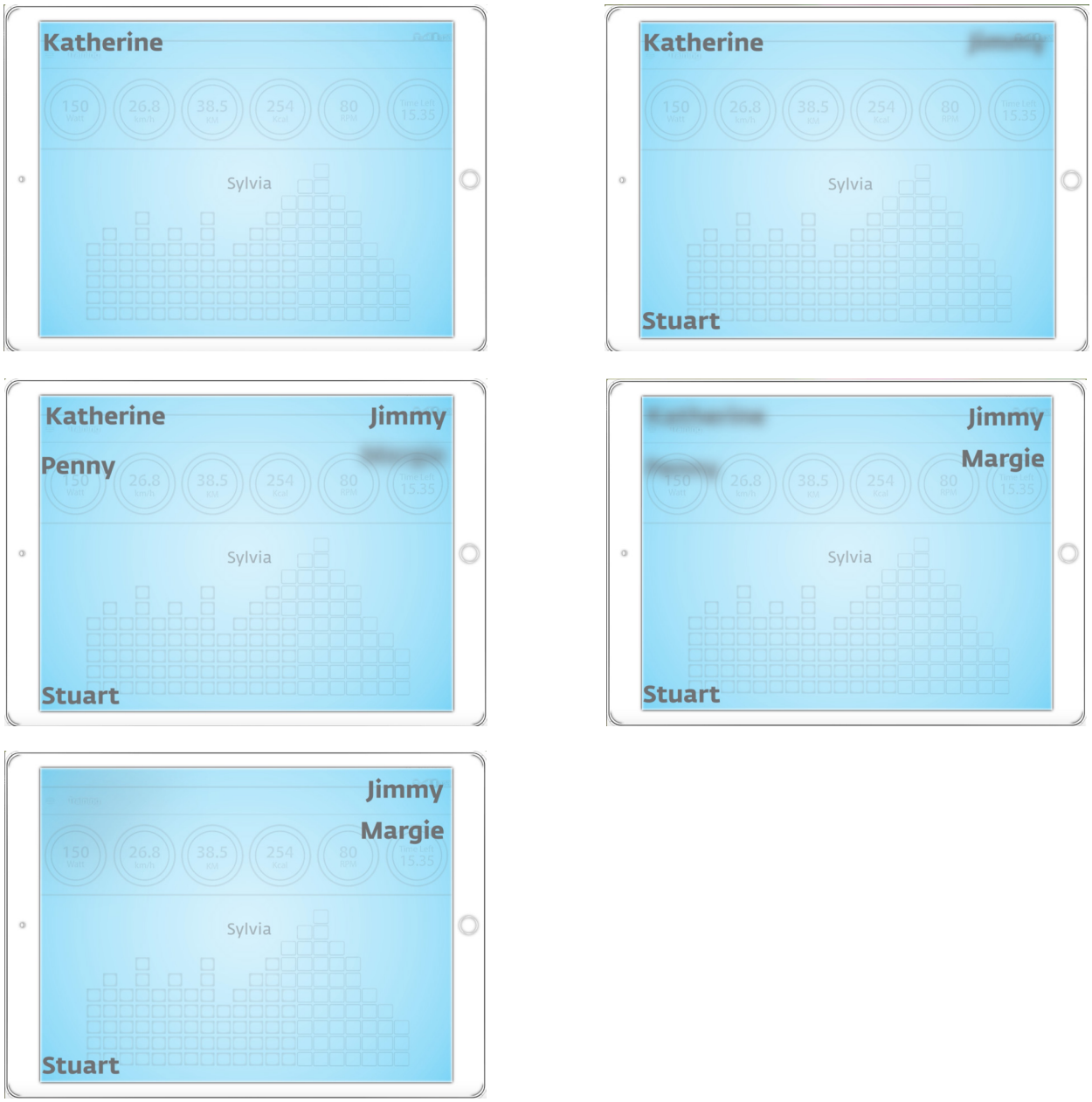


Figure 19—The name sharing prototype displays the potential for creating a story around the activities of others in a way that might lead to speculation and curiosity.

The Name Sharing Prototypes

Several people whom I interviewed mentioned that knowing someone else's name encouraged conversation with that person. This set of explorations examined ways to share the names of those around you to influence interactions.

The console interface was appropriate to explore for this interaction because users at a console are stationary, while people may come and go around them. Having the user in a fixed location surrounded by others' activities creates an opportunity, not only for representing another's presence, but also for developing a narrative surrounding the activities of those people. For example, if the names of two people appear at the same time, are they together? If one name leaves when another arrives, is there a causal relationship?

This series revealed that observing the behavior of others can cause someone to speculate about those people which might arouse curiosity.

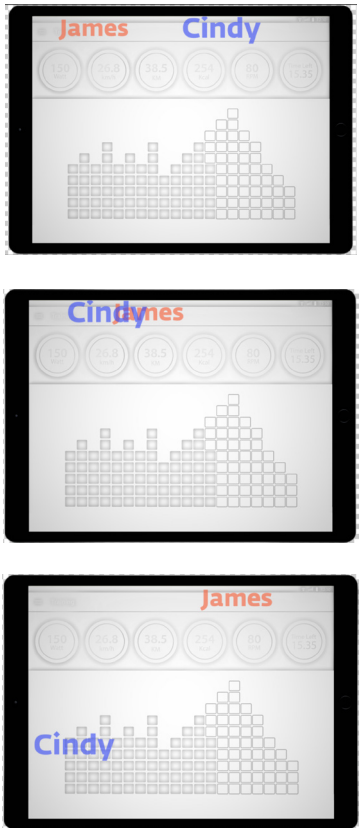
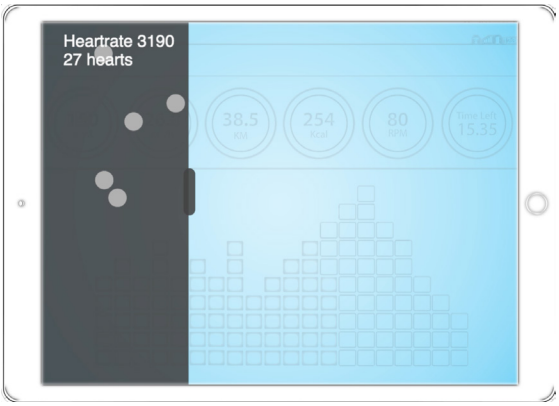
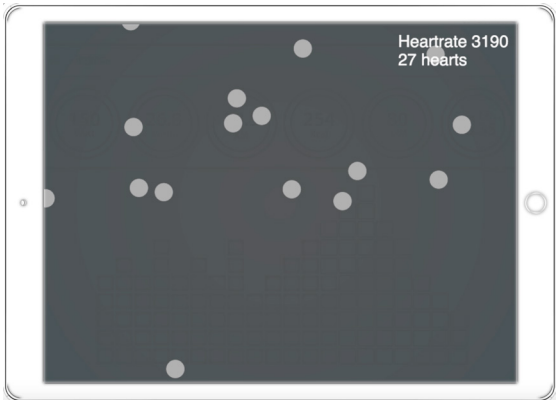
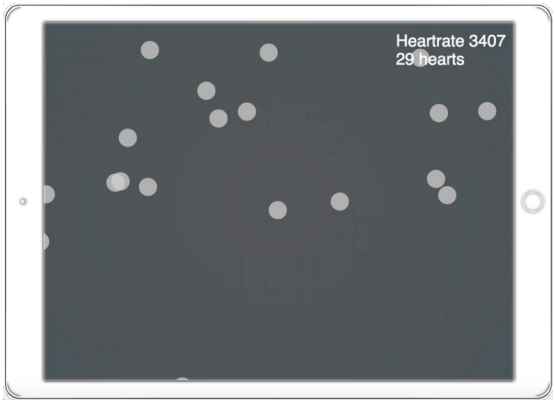
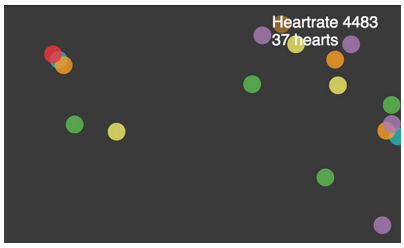


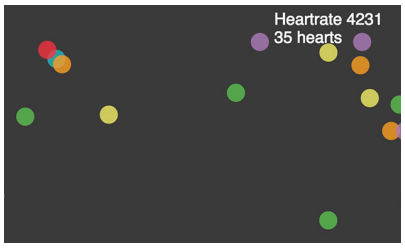
Figure 20—One series of name sharing prototypes explored scale and movement to communicate a narrative.











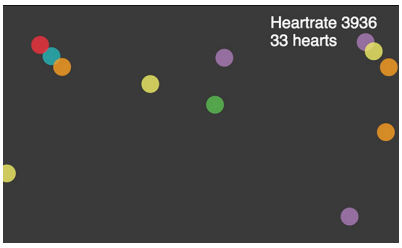


Figure 21—(top two rows) Using a hideaway layer provided an option for displaying information atop of an existing exercise console interface and offered control to the user.

Figure 22—(third row) I explored color as a way to differentiate gym goers based on their heart rates. All hearts beats in a certain range shared color as well as a blink rate to indicate the rate of activity. Individual distinctions seemed at odds with a cumulative measure.

The Collective Data Prototypes

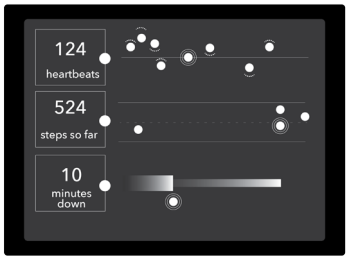
These studies examine how collective data might be visualized and how shared knowledge of that data might lead to interaction. For the majority of these explorations I examined heart rate data. If two people have the same heart rate then potentially might there be a connection? If multiple people are working toward a common goal, then is that a connection?

To explore these questions, I simulated a population of people coming and going in a space and assigned them variable heart rates that fluctuated over time. I included a collective heart rate for the space and a total number of people producing that heart rate. The intent was to see if discoveries might emerge from watching real-time biometric data from other people and seeing how that data affected the collective.

These studies revealed that moments of shared experience might occur in the space and those moments might raise awareness of others, be a form of exchange, and result in a delightful encounter.

Exploring Consoles

Both the Name Sharing and Collective Data prototypes explore a console interface for sharing data. The primary purpose of an equipment console remains the biometric and fitness information for the activity. Information about others in the space can respect and acknowledge the primary console functions. To avoid interrupting the current activity on the console, I looked at ways to add more data as a peripheral or optional layer of information.



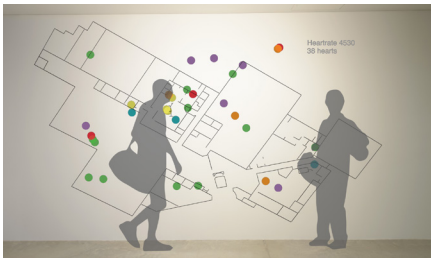


Figure 23—Individual biometric data led to this set of studies.

Figure 24—An alternate study used the idea of collective footsteps to allow a group of gym goers to reach and celebrate milestone destinations together.

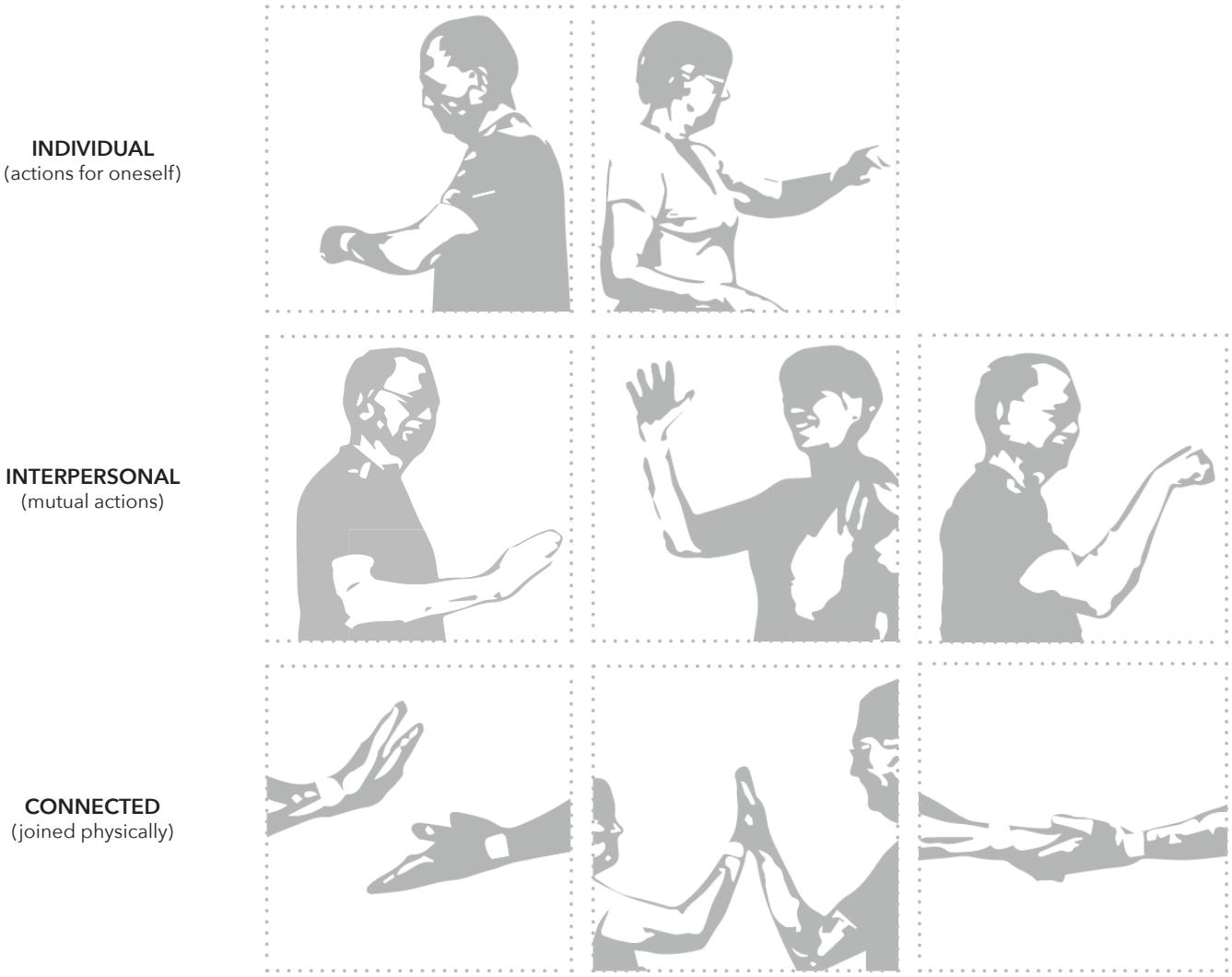


Figure 25—Detectable gestures can be categorized based on the types of social activities with which they are associated. These associations can drive the connectedness between two people.

Reflecting on Wearables

During prototyping, I noticed that several types of interactions centered around gestural movement and this prompted me to explore gestures more closely. Wearable technology is very commonly encountered in a fitness environment, however few of the seniors whom I interviewed used fitness trackers of any type themselves. Those who did not use fitness trackers said that they were not particularly interested in tracking their data—e.g. number of steps, heart rate—and did not want to be shamed by the device for their lack of exercise. For this reason I assigned the role of the wearable to be one that simply gathers data and gently reflects back some amount of non-intrusive information.

I employed wearables to indicate the presence of the wearer, the presence of others, and the closeness of interaction to another person or networked device. An escalation scale transitions from a slow glow to a pulsing light as the wearer nears another person. These types of notifications are directed at those wearing the devices. The devices may be visible to others and therefore personal notifications may be detected by others.

Wearables are latent data gatherers that collect information about the user when they are kept on the person. Spatially, these devices track movement and register location, therefore, location can be pinpointed, and relative data—such as proximity to others—can be collected. Temporally, activity duration and time of day data is available. Biometric data including heart rate, temperature, sweat level can be monitored and registered. While much of this data may also be available through an equipment console, wearables differentiate themselves. Wearables are not restricted to a particular location and can gather body or gestural movements while being worn by a user.

Wearables can be seen as an extension of oneself in addition to being a reflection of activity. Recognizing this led me to examine specific socialization gestures and to consider how those gestures relate to interpersonal interactions. Observing gestures led me to categorize them on a scale of interpersonal closeness to others.

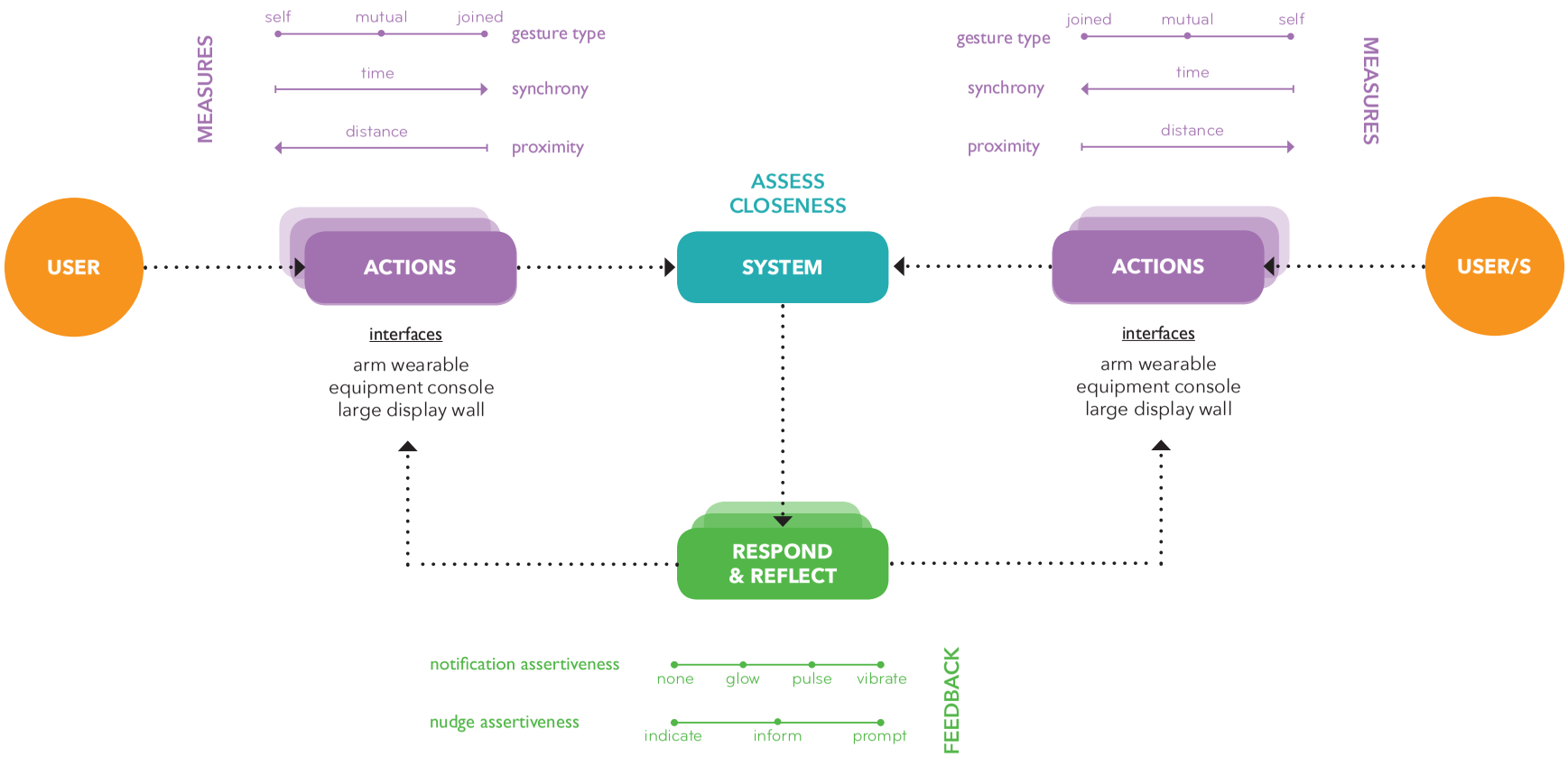


Figure 26—Contextual Interaction System diagram representing the adaptive response to user input.

Bringing It All Together

Natural gestures become a meaningful source of information gathering. Not only can individual gestures be recognized and acknowledged, but also synchronous behaviors between individuals. By examining categories of gestures, and those which involve synchronized gestures, I realized that latently gathered data could be used to generate a 'score' of closeness.

Virtual connections can be established to mirror real-world relationships by using gestural recognition, synchrony, time, and distance. The closer two people are when a synchronized moment occurs, the stronger the connection between them. The longer that the synchronized action occurs, the stronger the connection between them. Evaluated over time, repeated moments of synchronized behavior can indicate the closeness between individuals. This measure of closeness can then drive the response of the system to generate prompts and notifications to stimulate interaction.

Notifications emphasize interpersonal connections and interactions detected by the system. The presence of someone you know elicits a glow, while a high-five yields a vibration to acknowledge and reinforce the physical connection. Not only does a vibration celebrate the physical contact with another, but it is also a shared experience that encourages the user to attend to his/her copresent partner.

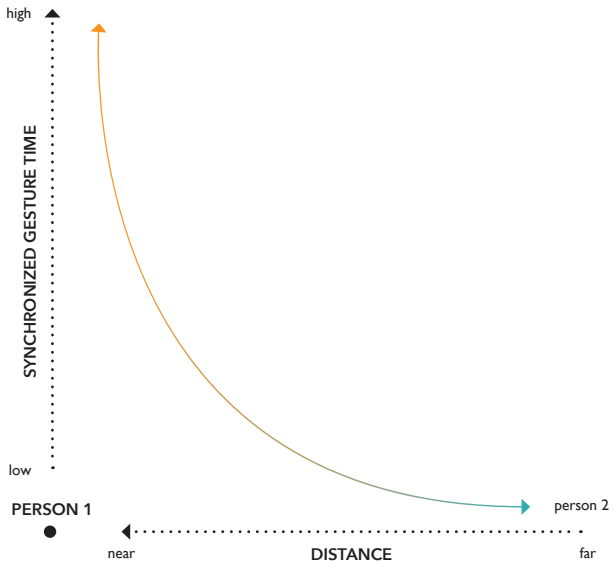


Figure 27—(left) When a synchronous action occurs, the strength of the connection generated depends on how close the two people are and how long the people are synchronized. A moment of brief, distant synchrony increases the connection between two people minimally. Close, prolonged synchronous activity increases the connection more strongly.

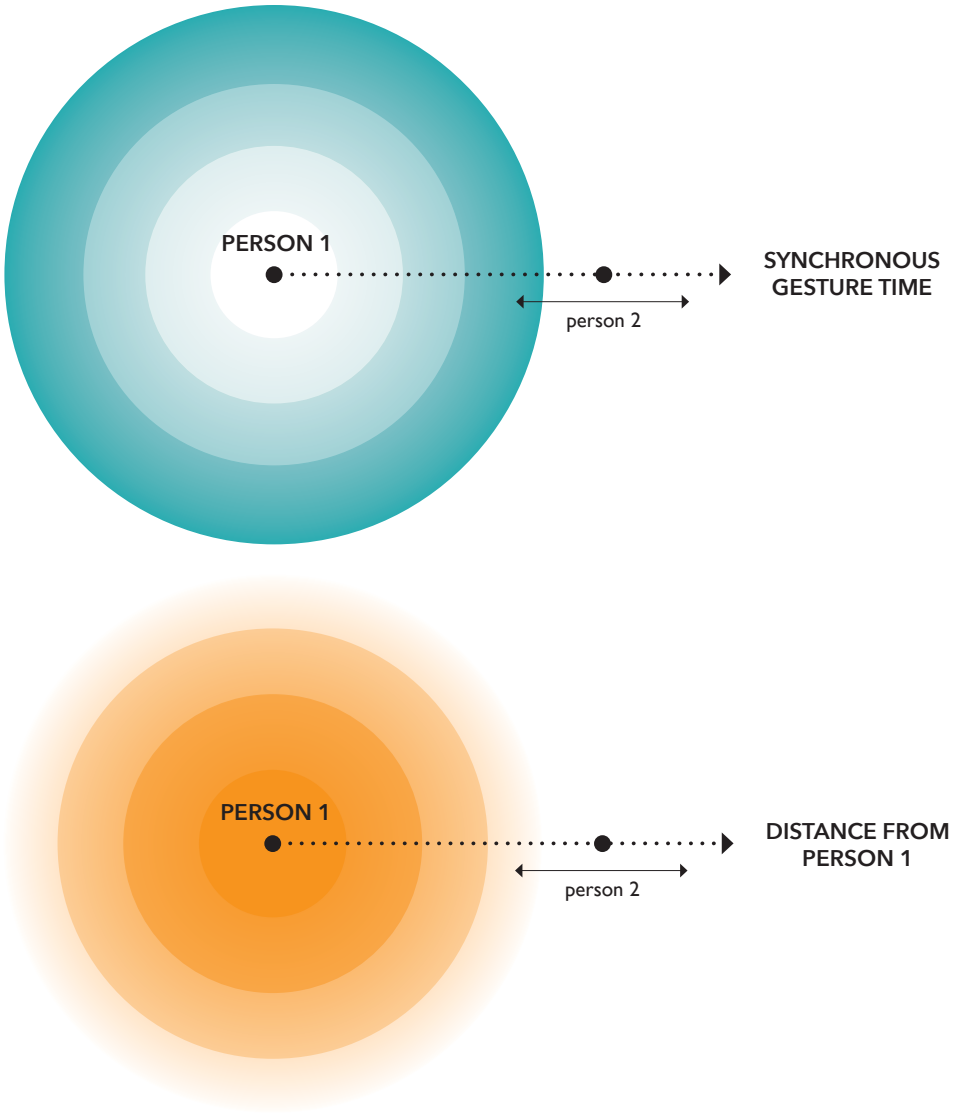
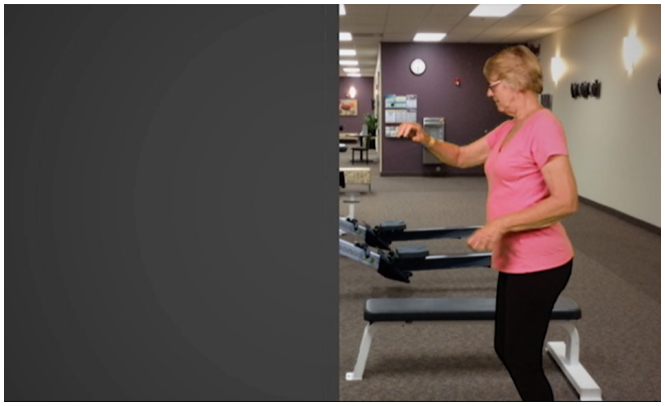
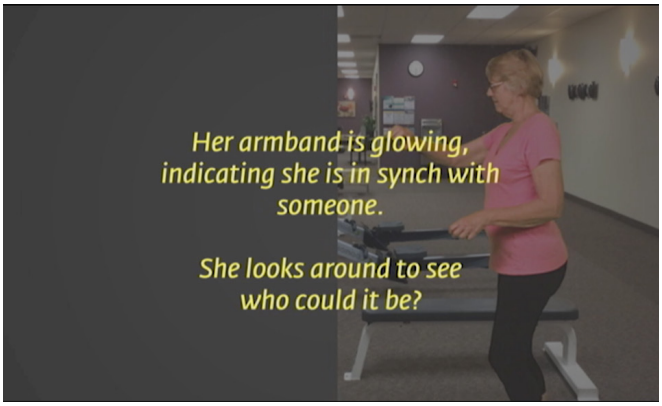


Figure 28—(top) The strength of connection in relation to time. The more that people share synchronous gestures together, the stronger the connection.

Figure 29—(bottom) The strength of a connection in relation to proximity. The closer two people are during a synchronous event, the stronger the connection.


Jackie is at the gym,
using an elliptical machine.
She is wearing her
fitness armband.




Her armband is glowing,
indicating she is in synch with
someone.
She looks around to see
who could it be?


Aha! Two gym members
make eye contact
and smile.
A tiny connection
is formed.

Final Scenario—People Connect at the Gym

Scenario Part 1

Jackie and Bill are two gym members who have not met. Through a chance encounter, they are connected when their actions synchronize during their routine exercise program on an elliptical machine. The system registers the connection and issues a glow to both of their wearables. Noticing the glow, both Jackie and Bill look around to see who else is glowing. They make eye contact and smile.

During this part of the scenario, the wearable devices worn by Jackie and Bill are tracking their movements and location in the gym. When the system detects that the movements of the gym members have become synchronized, it evaluates the connection between the two gym members. Since Bill and Jackie do not have a connection yet, the system issues an indicator to both parties that they have something in common. In this case, both of their wearables share a slow, sustained glow for a short period of time.

At this point the system identifies a connection between Jackie and Bill. Making the connection visible is important for making the participants aware of one another. The glowing wearable is a subtle prompt to be alert to others in the space. By looking around and noticing each other, Bill and Jackie have engaged in a face-to-face interaction.

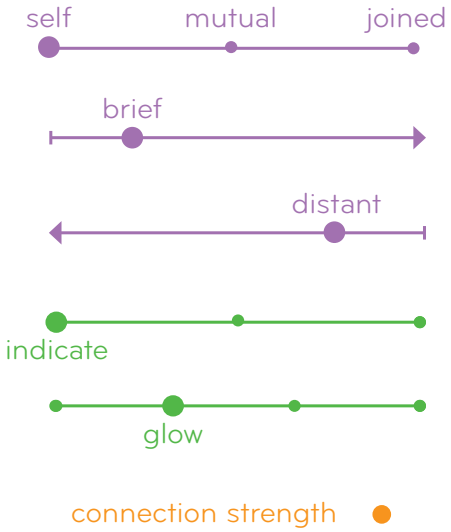


Figure 30—(above) The system evaluates the duration of the encounter and the distance between the gym members to determine the strength of their connection and the type of notification to show the users. While both participants glanced at their wearables, it was self informative.

Figure 31—(left page) Storyboard showing Jackie and Bill prompted by glowing wearable armbands to locate one another across the gym.

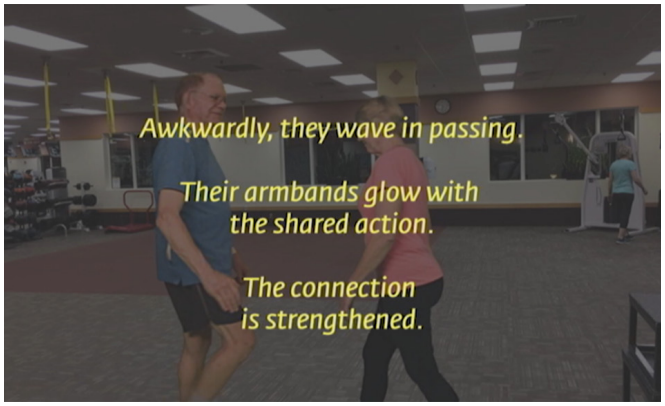


Figure 32—(left page) Storyboard showing Jackie and Bill waving as they see each other in the gym. Glowing wearables indicate the presence of the gym members to each other prior to the wave.

Final Scenario—People Connect at the Gym

Scenario Part 2

On subsequent occasions while passing in the gym, Jackie and Bill notice their wearables glow. As a result of the visual reminder, the two gym members often wave to each other. The system registers Jackie and Bill waving and issues a slow pulse to their wearables, acknowledging their synchronized gestures. The connection between Jackie and Bill is strengthened in the system. Over time, repeated encounters continue to reinforce the virtual connectivity shared between the two gym members.

When Jackie and Bill cross paths and wave, they are performing a mutual gesture at a near distance. Prior to the wave, the system alerts both users that the other is nearby using a soft glow. When the system detects the mutual wave gestures, the system issues an indicator to both parties that they have made another connection. Both of gym members' wearables share a pulsing glow during a mutual wave.

With each interaction, the system strengthens the connection between Jackie and Bill. The pulsing wearable emphasizes the mutual gesture and is a sign of interpersonal connection. By waving at each other, Bill and Jackie have again engaged in a form of face-to-face interaction.

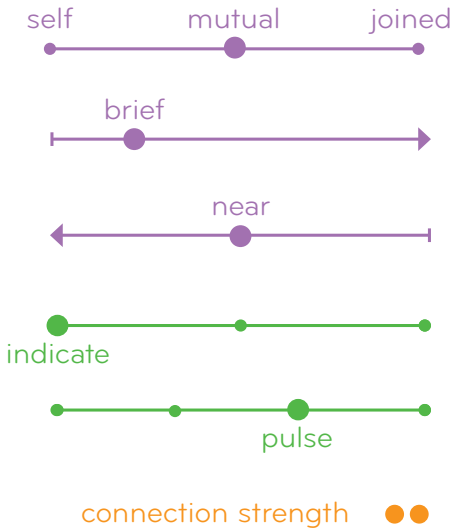
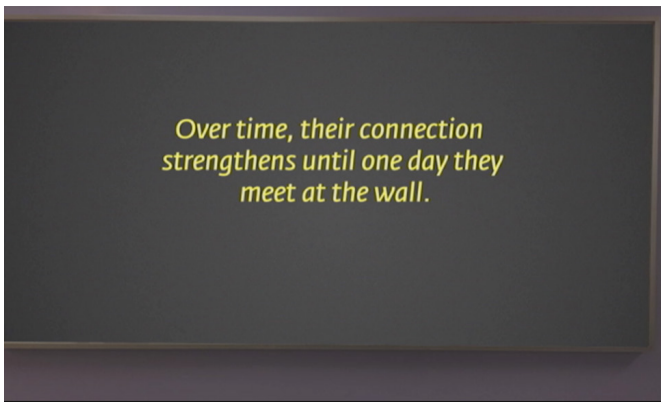
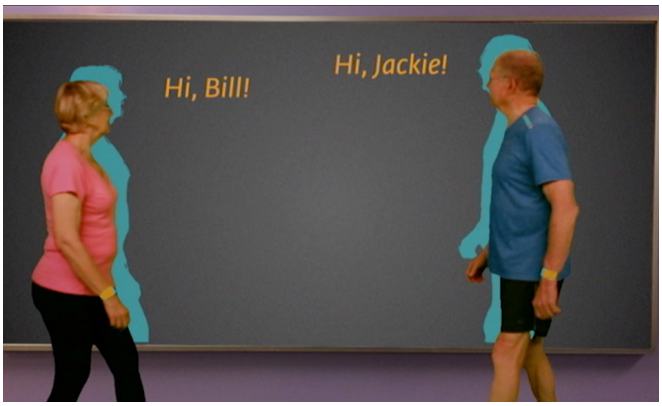
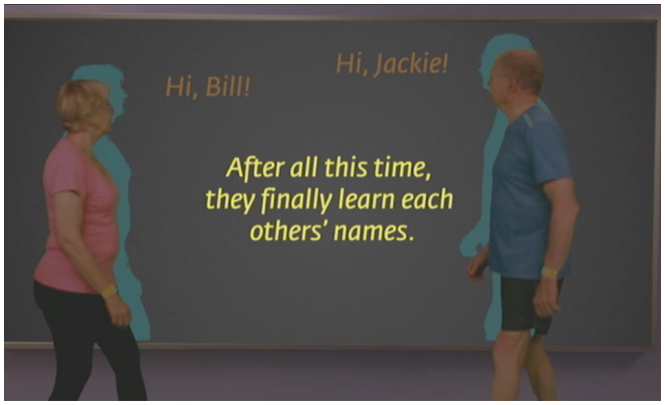


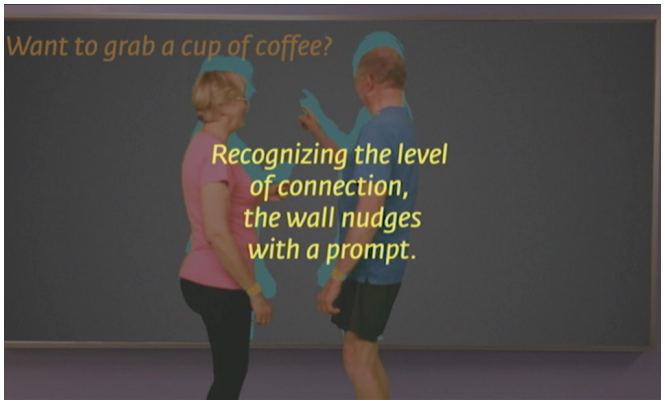
Figure 33—The system evaluates the synchronous wave gesture between the gym members. The wave is a mutual gesture and signifies a stronger amount of synchrony. The gym members are nearer and synchrony is higher so the system strengthens the connection.


Over time, their connection
strengthens until one day they
meet at the wall.


Hi, Bill!
Hi, Jackie!


Hi, Bill!
Hi, Jackie!
After all this time,
they finally learn each
others' names.


Hi, Bill!


Want to grab a cup of coffee?
Recognizing the level
of connection,
the wall nudges
with a prompt.


Want to grab a cup of coffee?


Want to grab a cup of coff

Final Scenario—People Connect at the Gym

Scenario Part 3

Jackie and Bill eventually cross at a large display wall where the system display their names in a playful greeting on the wall. The system recognizes a repeat connection between the two gym members and raises a prompt on the display. Jackie and Bill see the prompt, are delighted, and decide to spend some time together.

The system detects the presence of Jackie and Bill crossing in front of the display wall and acknowledges their presence by displaying their names on the wall. This form of exchange benefits the real world connection between Jackie and Bill by providing the gym goers with more detail about one another.

The connection between Jackie and Bill is strong enough that the system initiates a prompt to the gym goers to have coffee together. By acting on that prompt, Bill and Jackie have the opportunity to engage more deeply and empathetically through an extended face-to-face interaction.

The system is an omnipresent entity which facilitates and coordinates moments of exchange and delight between gym goers.

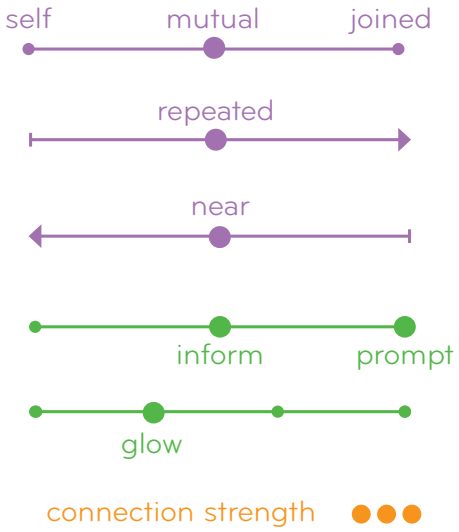


Figure 34—(left page) Storyboard showing Jackie and Bill exchanging names and then being prompted by the wall to spend time together.

Conclusion

My research finds that technology does not need to be seen as a barrier to face-to-face communication, rather it offers an opportunity to respect and celebrate shared in-person experiences. The values of presence, exchange, and delight strengthen creating an environment for in-person interactions.

Approaching this investigation I had a preconceived notion that the large display wall would be the main contributor to facilitating face-to-face interactions. Its sheer scale and information publication seemed to create a space for conversation most likely to occur. However, my studies suggest that the wearable devices are the most compelling for prompting interactions. This opinion is largely in part to the ability of wearables to imitate and interpret human movements and to utilize those movements to establish digital social connections which can prompt interaction. Constant physical contact with a wearable allows the wearable to be treated as an extension of a person and his/her values. Wearable devices can represent and respond to presence, and facilitate exchange, and create moments of delight. As with any system of coding, the meaning of colors and alerts must be learned; however this decoding process can also encourage in-person interactions.

A system of interaction which offers information to people in the environment can be beneficial in many settings for older adults. For seniors in a retirement community, such a system could ease feelings of disorientation and instability for newcomers. A system also could provide reminders of things for individuals with memory loss or cognitive issues.

While this investigation focuses on older adults and socialization in a fitness environment, the designs proposed may be adapted to apply to other age groups, generations, or groups of individuals sharing a different common goal in a different environment.

Implications of This Study

This research explores systems of interaction that work to preserve the values of in-person experiences in the presence of technology. The investigation examines a relationship between networked devices, the use of latently gathered data, and the presentation of such information to older adults in a fitness space to facilitate in-person communication that has the potential to promote empathy. Information displays consider factors such as data privacy, device appropriateness, disruptiveness, and the needs and concerns of older adults.

The findings of this investigation may interest designers concerned with Experience, Interaction and Environmental Graphic Design. User Interface Designers, Data Visualizers, and Human Factors researchers, and Technologists may benefit from the exploration of technology choices, data collection, and information representation across interfaces.

This research may benefit researchers interested in the attitudes and behavior of older adults in a health and fitness environment, particularly with respect to the use of technology in that space.

Further Research

This research points to several avenues for further investigation. The emergence of new technologies such as flexible displays could redefine our use of equipment consoles by providing more information on wearable interfaces. How would a system of interaction such as the one proposed by this research change with the additional functionality of a wearable? Also, what other technologies might be introduced into such a network to achieve similar goals? Could a mobile phone or other functionally-overloaded device apply some of these same techniques to respect our humanistic values?

Another direction to explore could be how the addition of sound and other visualization styles can be combined with ideas presented by this research to strengthen interpersonal awareness without becoming intrusive?

The ability of technology to subtly prompt, detect and encourage face-to-face interactions could be beneficial in different contexts. How might similar systems work at conferences, disaster relief situations, or creative spaces? An intimate setting such as a home would be another application and could allow families to keep up conversation or keep tabs on one another.

Artificial intelligence (AI) would be a logical addition to the described system since AI incorporates vast amounts of information into the decision-making processes to determine an action.

In this research, interactions are facilitated through the networked environment, however, people are not always in the fitness center. Future investigations could explore how to maintain connections between people once the people leave the gym.

Appendices

Case Study and Design Precedent Analysis

Allo

Google chat tool which enables customization of images, text, and embeds Google search capabilities to provide in-app lookup of addresses, videos, etc.

Interaction values
Presence, exchange, in-the-moment

Take aways
Immediacy of information without having to switch tools and mindsets.

Balance Table (Rose 229)

Collaborative meeting table that slowly glows in front of a person talking. Glancing at the table reveals the dominant or balanced speaking pattern.

Interaction values
Ambient feedback, activity reflection, acts as mediator

Take aways
Gradual feedback is less intrusive and illuminating. Making an individual's performance public makes sense

Cell Phone Tower (Drago 16)

Strategy used by groups of youth while eating out whereby all phones are stacked in a pile and the first person to touch their phone pays for the meal.

Interaction values
Social responsibility, collaborative goal

Take aways
People are motivated by norms of social etiquette.

Communication Grill/Salon (Sueda et al.)

People employed talking and texting to achieve a shared goal of preparing food for meal sharing.

Interaction values
Exchange, collaborative interaction

Take aways
Shared goals and experiences facilitate conversation.

Conversation Portal (Rose 231)

A lunch dining table uses hi-tech teleconferencing equipment on wall to connect 2 lunch room tables to enable conversation.

Interaction values
Presence simulation, serendipity

Take aways
The unexpectedness of finding such a thing can bring about an interaction.

Empathy Machine (Kummer et al.)

Designers prototyped using music to help communicate empathy from one person to another.

Interaction values
Empathetic communication

Take aways
Music can enhance an emotional connection.

Holocaust Museum hall

Digitally scanned thoughts that people write in response to a prompt are posted in a digital collage on the wall.

Interaction values
Participation, exchange

Take aways
Prompts might help people share information.

MemoMi (Rose 245)

A mirror records a brief video of one modeling an outfit. Multiple snapshots can be recorded and compared.

Interaction values
Past representation

Take aways
Being able to experience separate experienced moments simultaneously is interesting. The concept of time, something done once and being revisited. Time as part of an experience rather than an archive.

MS Surface Table

The original table enabled multi-touch to manipulate photos, maps and materials on a table surface. It interacted with other devices, acting as a median to connect different devices with similar needs.

Interaction values
Exchange, networked interaction, gestural manipulation

Take aways
Technology can be a median.

Museum Guidebook

Designers prototyped digital guidebooks to evaluate the shared experience of visit for two people.
Using a conversational strategy led visitors to treat the digital guide as a third person during interactions.

Interaction values
Shared experience, third party mediation

Take aways
Jointly shared information provided better experiences for conversation on topics.

Relay Robot (Knapp, Zeratsky, and Kowitz 12-15)

A hotel robot brings amenities such as toothbrushes to guests in hotel. People wanted to converse with it.

Interaction values
Exchange, loveability, presence

Take aways
Personality of objects is important, as is simplicity.

Sign Language Gloves

Physical gloves translate common sign language gestures into spoken words to enable communication between deaf and hearing participants.

Interaction values
Assistive, exchange, empathy

Take aways
Enabled translation from one language to another. Respected the needs of the participants.

Snapchat case study (Bayer et al.)

In this case study of the social and emotional experiences of Snapchat, participants found the app to be more spontaneous than other communication mechanisms, but less socially supporting. Ephemerality lowered stakes on sharing, and an intimate, private environment was created.

Interaction values
Conversational interaction, ephemerality, exchange

Take aways
Limits can lower stakes on sharing. Intimacy can be fostered by creating safe, private environments.

Sustainable Mobile Phone study (Lilley)

Designers employed a number of strategies to make owners aware of the distractibility of phone use when around others. Visualized emotional characteristics for the phone enabled it a to have personality.

Interaction values
Presence recognition, networked interaction

Take aways
People do not like technology to make subjective decisions for them. Escalating levels of intervention allow for a richer experience.

Team Tile and Team Garden (Rose 228)

Team Tile: A 3x3 grid of panels where each panel connects to a remote team member. Color and brightness show the availability status of a remote team member.

Team Garden: A set of plastic stalks displaying a photo on top for each remote team member. The photo lights up when a team member is available. When someone is off-line, their stalk wilts and fades over a period of ten minutes.

Interaction values
Presence reflection, unidirectional information sharing

Take aways
Gradual feedback mechanisms can imitate nature. Less traditional interfaces may be less distracting than a screen.

Wikipedia Audiovisualizer (halvves)

A real-time data visualization that uses simple sounds and shapes to visualize current activity on Wikipedia.

Interaction values
Presence, in-the-moment, knowledge sharing

Take aways
Sound in a visualization is compelling.

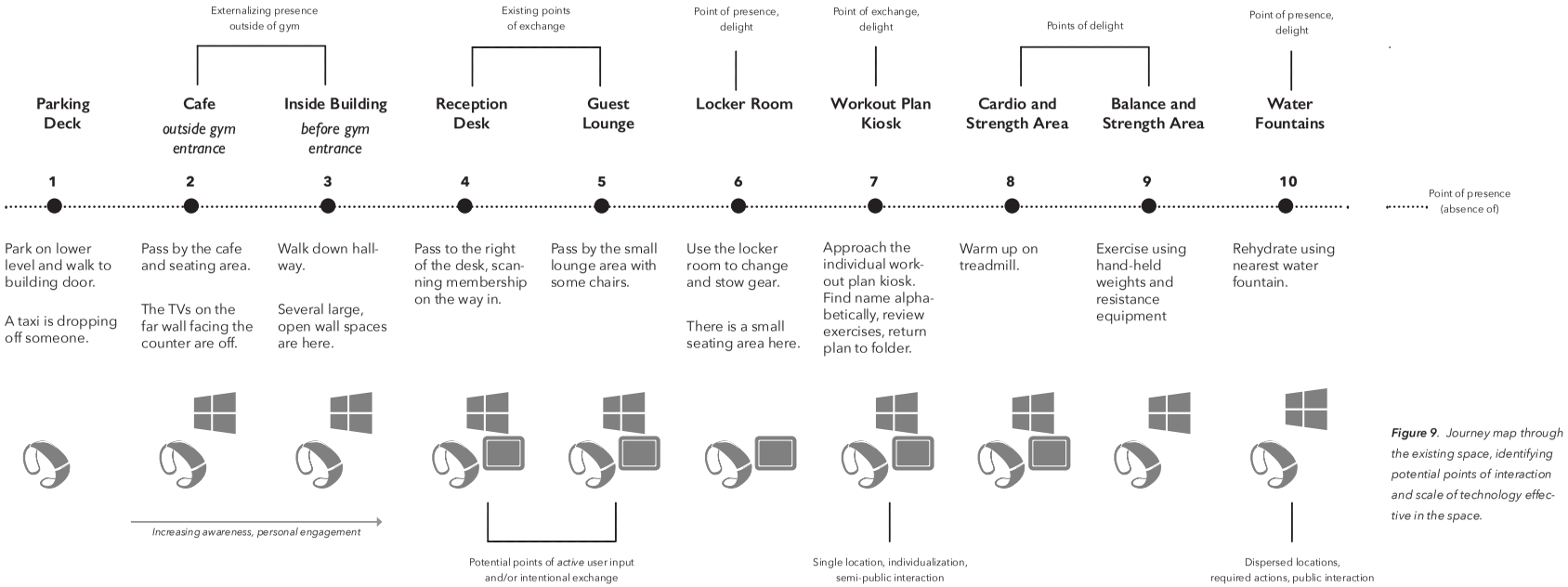


***Figure 9**. Journey map through the existing space, identifying potential points of interaction and scale of technology effective in the space.*

Figure 35—Journey map of a possible user path through the physical space and points along the journey for investigation.

Journey Map and Floor Layout

Creating a floor layout diagram of the physical space allowed me to pinpoint zones of activity for my investigation, and shaped the inquiries identified in my journey mapping.

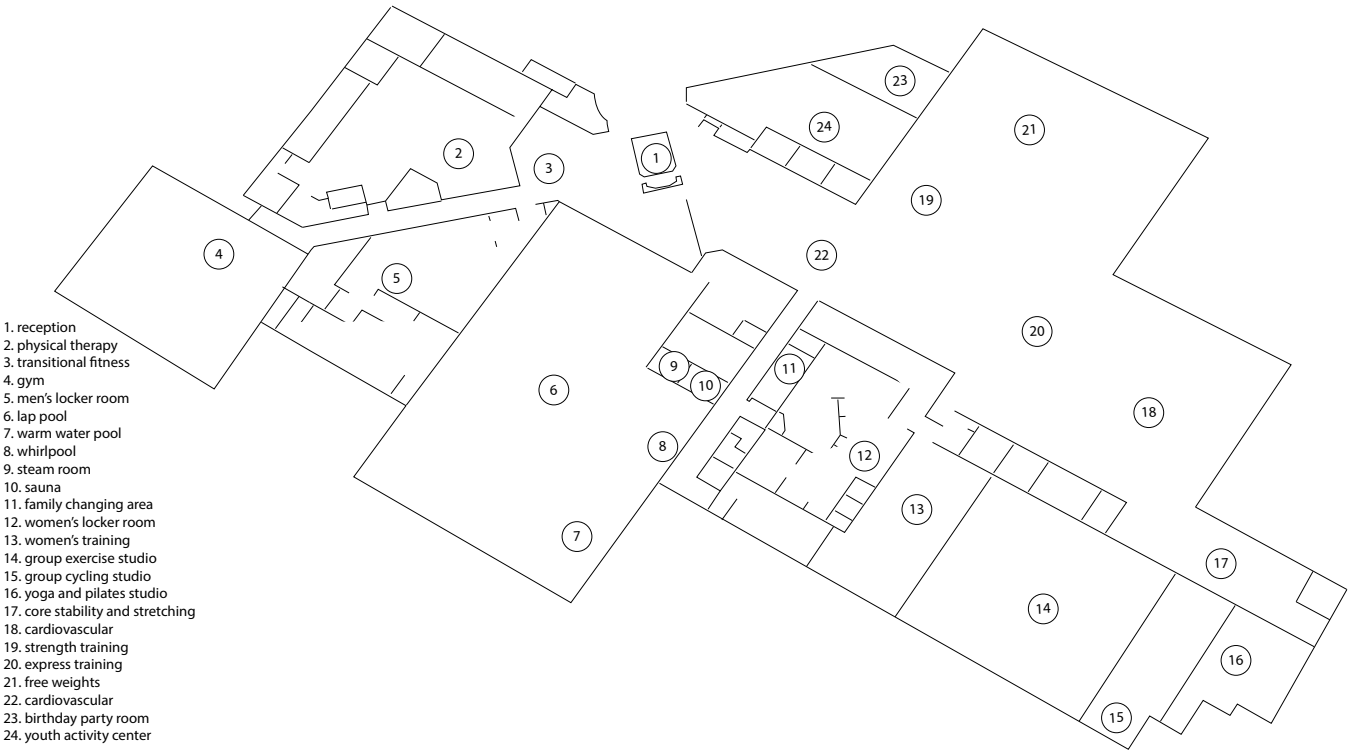


Figure 36—Floor layout of observed fitness space.

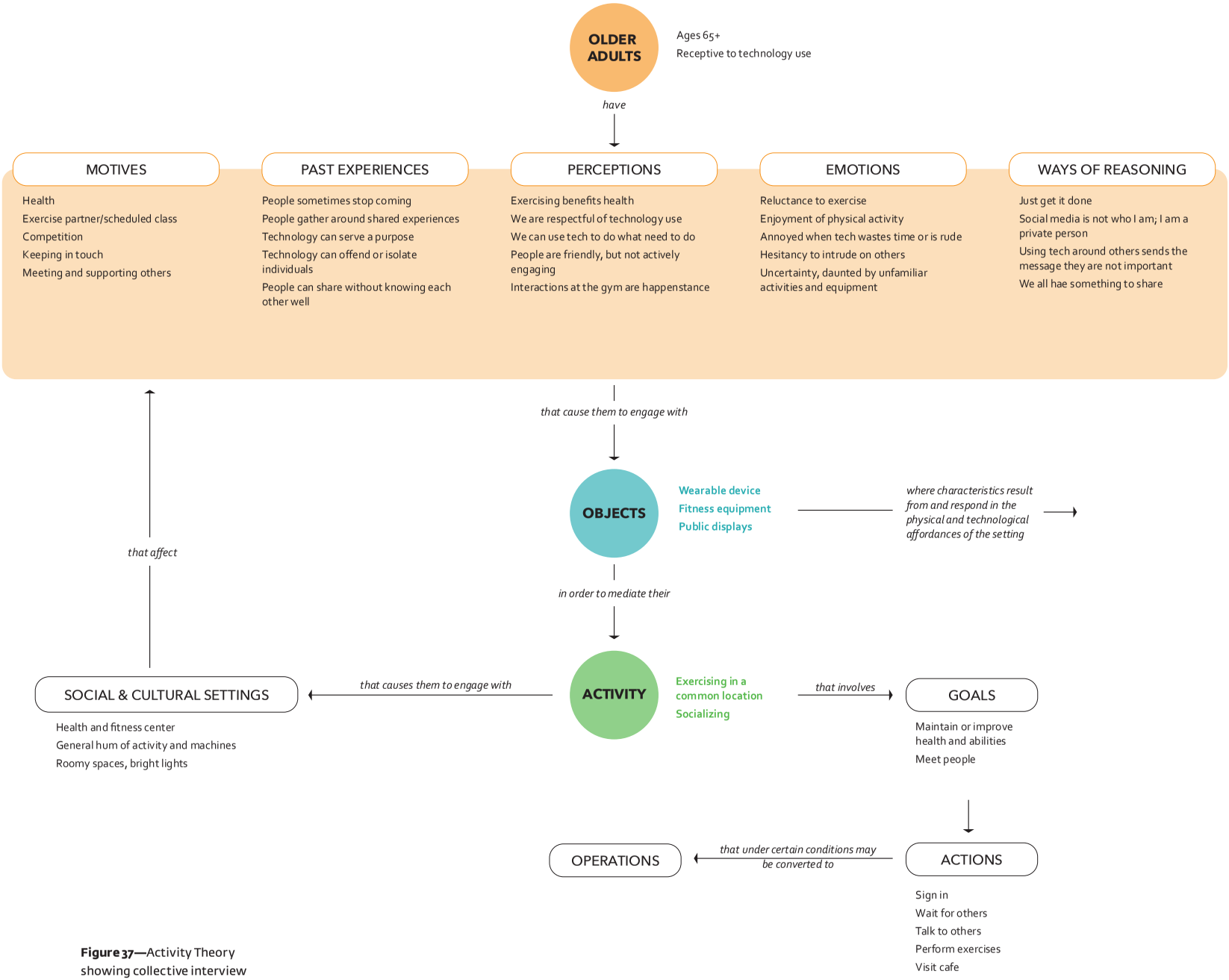
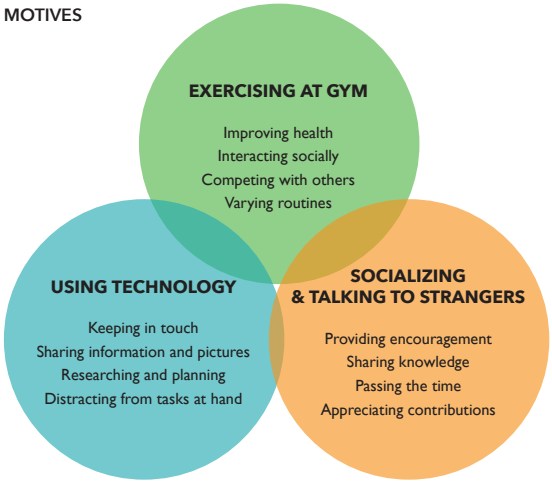


Figure 37—Activity Theory showing collective interview data and design approach.

Interview Findings

I used semi-structured interviews to gather information from three older adults with gym memberships, a personal trainer who works with older adults, and an administrator at the facility with a large senior citizen membership. I wanted to learn what motivates older adults to use a fitness center, how they perceive technology and its use, and how they form connections with others.

After compiling the results of the interviews, I applied my research to the Activity Theory framework (Figure 37) to shape the design investigation. Summarized findings are further detailed from Figure 38 to Figure 42.



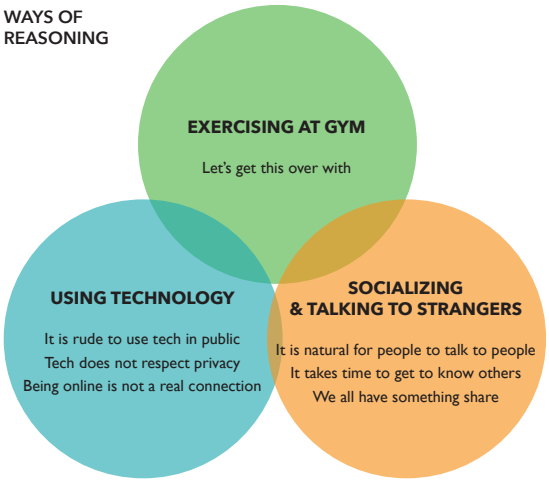
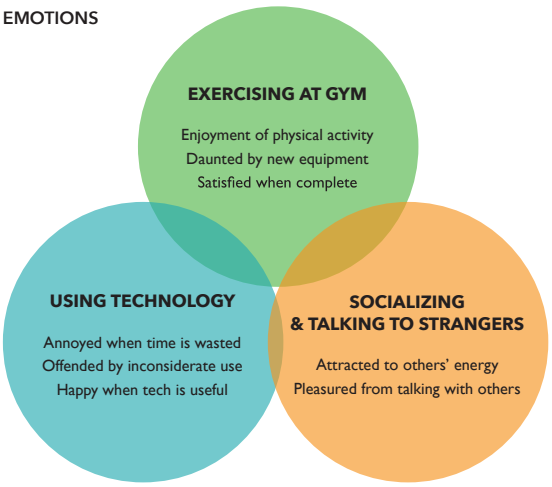


Figure 38—(above left) Interview analysis of user motives.

Figure 39—(above right) Interview analysis of user ways of reasoning.

PAST
EXPERIENCES

EMOTIONS



PERCEPTIONS

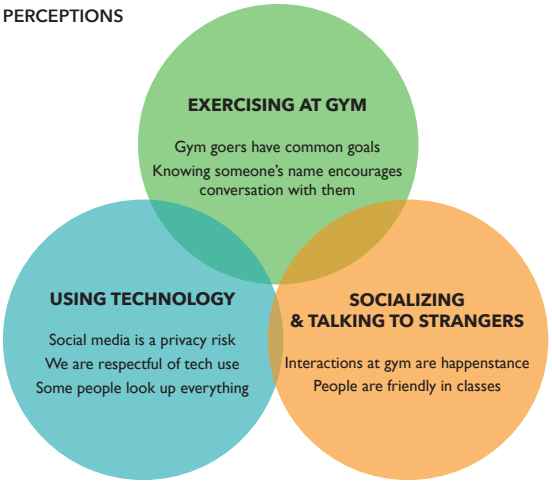


Figure 40—(top left)Interview analysis of users' past experiences.

Figure 41—(above right)Interview analysis of user emotions.

Figure 42—(lower right) Interview analysis of user perceptions.

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