Behavior Design

Frank Armstrong

Lecturer, Graphic Design

California State University, Chico USA

Introduction

Since the advent of the personal computer in the 80s and the internet in the 90s, the design process and the role of designers have been rapidly expanding. In the past, graphic designers created mostly printed objects, designing static compositions of form and meaning: typography, color and images with messages that attempted to engage a viewer in a passive yet thoughtful conversation. Today, we are more like choreographers, designing time-based sequences of dynamic visual elements that users experience (Pullman). We are now more directly engaging people in an active conversation and affecting their ability to make positive behavioral changes.

Steve Jobs said, "Some people think design means how it looks. But, of course, if you dig deeper, it's really how it works (Buxton, 309)." Although designers use a lot of technology, both in our process and as a display medium, we are mostly concerned with the users – enhancing their experience, augmenting their abilities and enabling them to accomplish their goals. This approach, called user-centered design, brings more respect for designers and their ability to make technology more engaging, usable and delightful.

User-Centered Design

User-centered design is a process in which the needs, wants and limitations of users of a product or service are given extensive attention (Wikipedia). Although designers have a responsibility to their clients, it's crucial that they have empathy for users and advocate for them. User experience design, interface design, interaction design, information visualization, design thinking and service design are a few related processes that share this user-centric focus.

User experience design, a multidisciplinary process that includes interface and interaction design, enhances user satisfaction by improving the usability, accessibility and pleasure provided in the interaction between the user and a product or service (Wikipedia). The goal of interface design is to make the user's interaction with the content as simple and efficient as possible, designing a unified system of visual objects and typography. Interaction design is a goal-directed design process, concentrating on the design of user behavior and the on-screen conditional motion of visual objects.

Dynamic information visualization is the process of visualizing dynamic qualitative or quantitative relationships with symbols for the purpose of explaining or exploring information. Designers use visual comparisons and interactive narratives to create context and meaning, which help users understand complex information.

Design thinking is a collaborative, multidisciplinary and human-centered design process for reframing complex problems as opportunities for designing innovative social systems and experiences. Design thinkers use ethnography to improve their understanding of human behavior and culture. In a recent issue of **Harvard Business Review,** Jon Kolko wrote that "design thinking is an essential tool for simplifying and humanizing."

Services have become complex adaptive systems of interactions, much like conversations between people. Service design is an emerging holistic approach to the design of the experiences that people have when they encounter these systems.

Designers employing these processes have the ability to apply abductive reasoning – making intuitive leaps based on inference and experience – described by Roger Martin as "the logic of what might be (Martin, p68)." This ability enables designers to create innovative products, services, visualizations and systems that help people modify their behavior and improve the quality of their lives.

Behavior Change

About 2400 years ago, the Greek philosopher Plato said that "Human behavior flows from three main sources: desire,

emotion, and knowledge."

Today, the process of designing for behavior change is based on behavioral economics, understanding how users' decisions are shaped by their previous experiences and their environment. The goal of this process is to help an individual user filter complex information, make well-informed decisions and take voluntary actions toward changing his or her own behavior (Wendel). Some examples of popular topics are budgeting/financial, diet/nutrition, energy conservation and health/fitness. In California, people are changing their attitudes and behaviors concerning water conservation.

Last Spring, Governor Jerry Brown proclaimed a drought emergency and mandated a statewide water conservation program. Suddenly, Californian's needed to change their behavior, reducing their water use by at least 20%.

In his book **Enchanted Objects**, David Rose – writing about creating products that resonate with people – identified six basic human desires (Rose, 66).

> **Omniscience.** Humans are inherently curious – we all have an appetite for learning and knowing. There are myriad channels, from traditional books to Google and YouTube, that help us search for information but "making information ambient and pervasive is the most effective way to create behavior change (Rose, 78)". The Ambient Orb changes color when there's a change in the condition of the stock market or weather.

> **Telepathy.** We have an intense desire to communicate our feelings, thoughts and ideas with others who may not share the same physical space. Skype and FaceTime allow people to have a mutual presence.

> **Safekeeping.** As babies, we learn to appreciate feeling comfortable and protected – swaddled in a blanket or connected to parents by a monitoring device. Later in life, we enjoy the comfort and security of home, family, clothing and our social network.

> **Immortality.** The desire to feel healthy and capable is one of the most powerful forces driving behavior change. Product systems like Apple iHealth, Samsung S Health and Fitbit help us to monitor our health and fitness, motivating us to make more informed choices and positive changes.

> **Teleportation.** Freedom of movement, from one place to another without constraint, is an ability we cherish. Although traveling still takes a considerable amount of time

and is sometimes difficult, a trip in the Google driverless car promises to make it seem faster and less stressful.

> **Expression.** "The urge to be creative, to lose ourselves in the flow of being generative, is a primal human drive dating back to ancient civilization (Rose, 144)". Most people enjoy the creative process and have the ability and desire to make things. Products like Guitar Hero and Lego Mindstorms help people to express themselves.

Designers need to understand how the human mind decides to act and what that means for behavior change. Rather than basing decisions on a logical thought process analyzing complex information, most people usually decide to act based on their habits or emotions – or make intuitive decisions based on their desires and past experiences. They also look to their social networks: friends and neighbors; experts or other people for their advice.

In his book **Designing for Behavior Change,** Stephen Wendel identified six common obstacles to behavior change that designers address, encouraging people to navigate, understand and act on complex information.

> **Easy.** Although some challenges are enjoyable, people generally prefer an easier task to one that is more difficult. However, the task should not be too easy because users need to be aware of their behavior – they need to see, think and feel about the process of change, which makes it more meaningful.

> **Familiar.** Interaction and interface designers use familiar design patterns, so that users can transfer previously-learned knowledge to a new context.

> **Beautiful.** It's human nature for people to feel more comfortable with a beautiful and comprehensible visual design, perhaps drawing a conclusion that it will also embody improved functionality.

> **Rewarding.** If a user receives some kind of added value or positive feedback from a process, they will consider it a rewarding experience and be motivated to come back another time.

> **Urgent.** Since most people tend to do urgent tasks first, designers create incentives or a sense of urgency to keep their users engaged.

> **Feasible.** Few people like failure, so designers provide tips and feedback to help people succeed.

Designers frame questions and create context through

narrative. We make virtual tools that use narrative to augment users' abilities and change their behaviors. To genuinely improve their lives and enable them to do things they couldn't do before, the tools need to feel natural, like a conversation that's mediated by a digital device.

Social Behavior and Cultural Invention

Social behavior is the process of multiple people communicating and interacting with a common intent. Emerging patterns of new social behaviors may affect the attitudes and values of a larger community. "Cultural invention has come to mean any social innovation that is new and found to be useful to a group of people and expressed in their behavior but which does not exist as a physical object (Wikipedia)."

In his book **Massive Change**, Bruce Mau wrote "Massive Change is not about the world of design; it's about the design of the world." Many designers are actively searching for ways to make a long-term positive impact on the lives of people within a community, particularly those who may be underserved and underfunded – creating sustainable services and systems for people that lead to social change. Design thinking, with its emphasis on human-centered design, provides a framework that enables people to channel their efforts toward affecting social change.

Changing the collective social behavior of an entire community is a complex-systems or "wicked" problem because of incomplete or contradictory requirements that are often resistant to resolution. Innovative solutions are frequently disruptive, rather than implementing incremental changes to an existing situation. Sometimes a design thinker's role is to confront controversial issues and act as the catalyst for systemic change in a community.

Designers bring empathy and creativity to changing social behavior. We understand that user-centered solutions will help people to have more rewarding experiences and improve the quality of their lives. We use creativity to solve wicked problems, prototyping myriad non-traditional concepts to break behavioral habits.

Collecting Behavior Data

People are constantly moving, either some kind of intentional behavior, like walking, or an involuntary activity, like breathing. Since most of us carry or wear digital devices with embedded sensors, we can collect geospatial, quantitative and temporal personal-activity data. With context and structure, this raw data can be transformed into meaningful information about our behaviors.

Additional context further transforms this information into knowledge, then wisdom. Visualizing this structured information enables people to see their behavior patterns and trends from different perspectives and may generate insights. Interactivity allows users to filter the information, which improves pattern recognition and augments their understanding. This process of discovering patterns and their implications, which were previously hidden, becomes a memorable experience that may either reinforce or contradict a user's intuition.

Gestural Interfaces

Mobile apps provide interfaces for these visualizations that help people evaluate the results of different scenarios – seeing how different behavior information might affect their goals – and make informed decisions at a time and place of their choice. Enabling the direct manipulation of visual elements on touch-sensitive screens, gestural interfaces establish a physical connection between user and a visual representation of data – making the results more meaningful.

These dynamic finger gestures are a rich language of expressive and meaningful motion that cause objects on screen to react in different ways, such as scaling and moving. Apple 3D Touch is beginning to explore pressure as an extension of other haptic gestures. What happens when we have non-haptic motion sensors, like a miniature Kinect, that interpret facial expressions, emotions or other body movements and produce meaningful reactions on screen? In these cases, the meaning of gestures will also depend on context and culture.

Sight and touch are only two of our five senses. Our ability to hear has been used for interfaces in a very limited way, primarily as alerts. Sound has three quantitative properties: amplitude (volume), duration (time) and pitch (frequency); as well as one qualitative property, timbre, which enables us to tell one voice from another. Could our sense of hearing be

used in a more meaningful way – maybe as ambient sounds that encode data? What about binding smell and taste parameters to functions in interfaces? To different degrees of effectiveness, most of us can multitask – but can we perceive and respond to multimodal affordances by prioritizing sensory inputs?

Wearables

Wearables are digital devices that, like clothing, eyewear, jewelry or watches, attach to our bodies and become easily usable, augmenting our real-life experiences. Sensors embedded within these devices may continuously monitor biometrics and provide quick access to information through multimodal interfaces that appear on demand, then disappear.

Since mobile and wearable users tend to focus more on specific functions or tasks, rather than browsing, designers are able to sequence brief chunks of visual information, creating a more fluid or conversational narrative. Software agents, such as Apple Siri, Google Now and Microsoft Cortana, employ voice recognition to facilitate multimodal user interactions on both mobile and wearable devices.

There's a social aspect to any new technology, particularly wearables, because they're integrated within a person's visual identity. During a conversation between two people, wearing Glass or a headset seems more disruptive than a sleeping smartphone or watch because of the uncertainty – whether the person wearing the device is actually engaged in the conversation.

A user's perception of usefulness and usability of a wearable device determines a her attitude, which then affects her behavior. New and unfamiliar gestures may disrupt existing mental models of mobile experiences, leading to frustration.

Affective computing is the process of developing systems and devices that can recognize, interpret and process human emotions to simulate empathy. A device would adapt its behaviour, giving an appropriate response for those emotions (Wikipedia). When a device is able to perceive what a user wants without her asking, it's perceived as magical or enchanted.

Enchanted Objects

The recent convergence of cheap sensors, fast networks and

distributed computing is rapidly transforming ordinary analog products into enchanted objects. Each of these new objects is a complex system that combines sensors, controls, data storage, microprocessors, software and connectivity with a remote user interface to augment functionality.

The enchantment that people perceive from one of these objects is based on seven abilities (Rose, 173).

> **Glanceability.** Enchanted objects are ambient displays – they should not demand your attention. Using the principles of preattentive processing and cognitive load, people notice subtle yet meaningful signals, like a change in color, that the objects display or emit.

> **Gesturability.** Human gestures are affordances – enchanted objects will recognize and respond to them.

> **Affordability.** The cost of augmenting an ordinary object with a camera, connectivity and sensor should be incremental.

> **Wearability.** Miniaturization is the key to embedding sensors and connectivity into our clothing, buttons, zippers and other personal accessories, like eyewear and jewelry.

> **Indestructability.** Unlike most mobile devices, which are loaded with electronics and relatively fragile, enchanted objects tend to be more durable because they are built and used for specific purposes and contain a minimum amount of chips and sensors.

> **Usability.** The objects and services that perform their functions autonomously in our cognitive periphery with a minimal interface tend to be the most usable.

> **Loveability.** Think about how we are emotionally connected with our pets. Can we design visual affordances and gestures into objects that help their users to become more engaged and delighted by them?

Intelligence and connectivity enable new product functions and capabilities, which can be grouped into four areas: monitoring, control, optimization and autonomy (Porter). Enchanted objects may use connectivity to communicate with a paired mobile device that analyzes and visualizes collected information. Assessing this information, people may decide to modify some behavior. This information might also affect other context-aware smart products that are linked together in a higher level ecosystem that provides a service. The ecosystem could then initiate a coordinated change in behavior without human intervention.

Designers have an opportunity to create enchanted objects

with connected interfaces that assist people to accomplish behavior change. There are five steps in the process of designing enchanting experiences (Rose, 193).

> **Connection.** Adding sensors and cloud connectivity to an object enables the recording, processing, storage and distribution of information to either an application on a mobile device or another enchanted object.

> **Personalization.** Enabling objects to recognize individuals means that their own historical data could provide context for the display of personalized information.

> **Socialization.** Creating a social network of connections between selected objects and people enhances a user's ability to retrieve, compare and share information.

> **Gamification.** Designing methods for social challenges, such as accumulating points and receiving rewards, help people reach their behavior-change goals.

> **Story-ization.** Imbuing objects with stories provides the context and meaning for people to engage with a subject like behavior change.

Dynamic Adaptive Systems

A network of enchanted objects is a dynamic system. Each object continuously monitors data from its sensors, as well as contextual data from each of the other connected objects. Dynamic systems are inherently self-regulating through feedback loops and have the ability to learn, change and adapt.

New service ecosystems are emerging that dynamically adapt to changing contexts or circumstances. They are able to perceive a change in an environment; create a new model of the environment, based on this perception; and adapt the performance of the system, based on the new model (Dubberly). In the context of a service experience, connected objects would modify their own behaviors, based on new information about a user that was perceived from sensors. The user's experience would seem to be almost magical – one that is uniquely adapted for her.

The Internet of Things is generating massive amounts of time/event data and dynamic systems are becoming pervasive – constantly collecting data, running algorithms and calculating outcomes. Increasingly, designers are choreographing user experiences and services through dynamic visualizations, interactions and interfaces for applications that monitor and control ecosystems of dynamic

systems. The availability and design of this information is affecting our attitudes, behaviors and cultures.

Footnotes

Buxton, Bill. *Sketching User Experiences: getting the design right and the right design.* San Francisco, CA: Morgan Kaufmann Publishers, 2007. Print.

Dubberly, Hugh, Shelley Evenson and Justin Rheinfrank. "Ability-centered design: from static to adaptive worlds." <http://www.dubberly.com/wp-content/uploads/2013/06/Dubberly_Ability-centered-design.pdf> Retrieved 25 September 2015. Web.

Kolko, Jon. "Design Thinking Comes of Age." Harvard Business Review. September 2015. Web. <https://hbr.org/2015/09/design-thinking-comes-of-age>

Martin, Roger. *The Design of Business: why design thinking is the next competitive advantage.* Boston, MA: Harvard Business Press. 2009. Print.

Mau, Bruce. *Massive Change.* London, UK: Phaidon. 2004. Print.

Plato. <http://www.brainyquote.com/quotes/quotes/p/plato384673.html> Retrieved 25 September 2015. Web.

Porter, Michael E. and James E. Heppelmann. "How Smart, Connected Products Are Transforming Competition. Harvard Business Review." November 2014. Web. <https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition>

Pullman, Christopher. "Some things change, some things stay the same" 6 May 2014. Web. <http://christopherpullman.com/home/some-things-change-some-things-stay-the-same>

Rose, David. *Enchanted Objects: design, human desire and the internet of things.* New York, NY: Scribner. 2014. Print.

Wendel, Stephen. *Designing for Behavior Change.* Sebastopol, CA: O'Reilly Media. 2013. PDF.

Wikipedia. "Affective computing." <https://en.wikipedia.org/wiki/Affective_computing> Retrieved 25 September 2015. Web.

Wikipedia. "Cultural invention." <https://en.wikipedia.org/wiki/Cultural_invention> Retrieved 25 September 2015. Web.

Wikipedia. "User-centered design." <https://en.wikipedia.org/wiki/User-centered_design> Retrieved 25 September 2015. Web.

Wikipedia. User experience design." <https://en.wikipedia.org/wiki/User_experience_design> Retrieved 25 September 2015. Web.