Slow Change Interaction Design

A theoretical sketch exploring the mindsets required for creating interactive technologies that facilitate attitudinal and behavioral change over time.

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As we begin the New Year, gyms around the globe will enjoy a predictable spike in membership. For days—perhaps even a few short weeks—rows of treadmills will be clogged with neophyte runners adamant in their belief that *this year* is the year for change. *This year I will transform myself. I will lose the weight and keep it off. I'll stick to my diet and exercise regimen. This year I'll...* and then slowly but surely their commitment starts wavering. They get home from the office and they'd rather kick back on the couch than run. They'd rather order a burger than a salad.

They'd rather do anything—perhaps they'd even rather do nothing—instead of stick to their diet and exercise regimen. *The extra pounds aren't so bad. It could be worse...*

It's all too easy to rationalize away the transformation.

Self-improvements, be they physical, mental, or both, test resolve. They do not manifest a path of least resistance. For many, they are paths of the highest resistance. Anyone looking to start a new diet or exercise program or prevent the onset of disease, anyone looking to recover from addiction or reduce their personal debt, anyone looking to

Insights

- Designers and users share responsibility for the success or failure of a change initiative.
- A single design unchanged over time is insufficient to support change.
- Designing for change purposefully incorporates non-technological agents.

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increase their community civility or their environmental responsibility—in short, anyone looking to change the way they or their organization, their community, or their nation thinks or behaves has a long, arduous road to travel. These people and groups are looking to initiate and sustain a *slow change*: a change whose results may take months, years, or decades to achieve. A change that is, essentially, an endless process.

The time and energy that interaction designers spend addressing change problems should be markedly paying off. But currently, it's not.

This article sketches a theory of slow change interaction design as one way for designers to approach what we will call slow change problems—attitudinal and behavioral changes that are difficult to initiate and sustain. Those familiar with persuasive technology will recognize the theoretical foundation atop which slow change interaction design sits. The domains of persuasive technology and captology cast sufficiently wide nets as “the research, design, and analysis of interactive computing technologies created with the purpose of changing people’s attitudes or behaviors or both without using coercion or deception” [1]. Slow change falls within these domains. Importantly, however, slow change offers evolved perspectives, or lenses, on the *ethical*, *temporal*, and *systemic* thinking that any designer should adopt in slow change interaction design practice.

The ethical lens lays bare the unique dilemmas a slow change interaction designer confronts in practice, and it will suggest ways of acting in light of these dilemmas. The temporal lens advises designers to reframe their way of thinking about the lifecycle of their users. We might

summarize this lens with a modified Bill Buxton axiom: “If you do not do your best to anticipate the technical, social, and commercial ecology within which [your user] must live throughout [his or her] entire [change process], then you have not done your job [as a slow change interaction designer]” [2]. Finally, the systemic lens focuses on the complexity of the technical, social, and commercial systems within which our users (and ourselves) already exist and that we anticipate in the future. These three lenses form the underpinnings of our proposed eight themes of slow change interaction design.

PREDISPOSITIONS

To better understand the origin of our ideas, we articulate a set of starting assumptions or predispositions:

We believe that slow change is difficult. We believe that initiating and sustaining new attitudes or behaviors or modifying old ones is difficult, whereas much of the popular literature seems to imply that change is easy (*e.g., If you follow these simple steps then you can change your life... If you understand the simple formula for change then you can change... ad infinitum*).

We believe that touting a message of simplicity is unrealistic, misleading, and unethical.

We believe that people *do* want to change—that they want to improve the quality of their lives.

We believe that people need to take the first step. Change should not be forced on them.

Finally, we believe that slow change interaction design is the David in one of the David and Goliath tales of our time. The cards are already overwhelmingly stacked against those looking to initiate and sustain change in their lives. It's up to us—designers—to act. It's up to

us to change first our attitudes and approach to design practice.

Our predispositions may seem obvious, but they are too often taken for granted. We believe that taking them seriously will yield significant positive impact on the approach to and outcomes of slow change interaction design.

ETHICS

Slow change designers confront a battery of ethical questions. Perhaps the highest-level questions are: Is there a right way to design an agent to support or augment an individual, group, or social change initiative, and what does it look like? We contend that there is a right way to design agents to support or augment change initiatives. It involves acknowledging change as a complex and difficult process. It involves a shared responsibility between the designer and the user for the change process *and* its outcome. And it involves striking a balance between the collection and representation of quantitative as well as qualitative data.

If designers frame change as a simple process, then they risk cultivating unrealistic expectations for success in their users. What will happen when these users experience the inevitable first signs of difficulty? The *less* likely outcome is perseverance, wherein users grind through the change process, approaching success. The *more* likely outcome is floundering. Users may experience a spike in short-term results, but the process will not unfold with consistency. Users will hit plateaus. They will slip. And they will give up. Giving up is not a symptom of difficulty per se. Rather, it is a symptom of unrealistic expectations for change. Implying that change is an easy process—that if you understand the constituents of an attitude or behavior, then you can change it—is unethical because it cultivates unrealistic expectations. Change is difficult, and it should be acknowledged as such. But even with accurate framing, change endeavors are bound to fail some of the time. And when they do, designers and users should share responsibility.

This is not to suggest that responsibility is shared evenly

Implying that change is an easy process—that if you understand the constituents of an attitude, then you can change it—is unethical because it cultivates unrealistic expectations. Change is difficult, and it should be acknowledged as such.

throughout the process. It might be more productive to think of responsibility along a spectrum, with the user on one end and the designer on the other. At times the burden of responsibility skews toward the user and at times toward the designer. For example, if a given thermostat has several “cues” or “triggers” designed to encourage energy-efficient attitudes and behaviors in the home and the user chooses not to act on those cues, then one might surmise the responsibility falls on the user. But we should (and perhaps more often do) also ask whether the design—and thus the designer—did all they could do to encourage the user to act.

Depending on context, primary responsibility will shift between user and designer. But never would we argue that one or the other is solely responsible. At all times both parties bear *some* responsibility for the change process and its outcome. It is not up to one or the other. It is up to both.

Likewise, in the design process itself, even if we remove the user’s involvement, the designer is not the sole bearer of responsibility. Designers exist within structures—for example, ideologies, languages, communities—and as such, their choices are shaped by these structures. It is incumbent on the slow change interaction designer to acknowledge and evaluate these mind-shaping structures and anticipate how they might interact with a particular design. The designer is responsible to these structures, and this responsibility manifests itself either in adhering to existing structures or disavowing them. This line of thinking drives the final ethic of slow change interaction design: Designers should balance the collection and representation of quantitative and qualitative data.

Collecting and representing only quantitative data reaffirms its dominance over qualitative data, and it largely reduces a change process to numbers. Before moving on, we must stop and acknowledge that numbers are an important part of any change process. It is essential to know, for example, how many steps you take in a day or your cholesterol level. Numbers are concrete and useful. They provide

quick guideposts for goal setting. If you run a mile in 00:08:30, then you can establish as a goal running a mile in 00:08:20. But it is misguided, in general, to prioritize numbers at the expense of experiential qualities with regard to slow change processes.

Although slow change can be tracked with quantitative measures, it is also a qualitative process. The quality of an experience is what drives people toward or away from it. What does knowing you jogged 3,000 steps or that you ran a mile in 00:08:20 tell about the *quality* of the jog or the run? Taking this further, what do these numbers tell about the quality of life changes resulting from the exercise? Slow change interaction designers must weigh the impact of quantitative versus qualitative data in particular contexts for particular users and generate design ideas accordingly. Capturing and representing qualitative data such that it encourages attitudinal or behavioral shifts may well be one of the “swamp problems” [3] of our time. And it is especially important for slow change interaction designers because, taken together, qualitative and quantitative data paint a much more realistic picture of a change process and its potential outcome.

TEMPORALITY

In name, *slow change* refers to the actual process of a user doing or undergoing change, for example, the amount of time it takes to break an addiction and maintain sobriety. This straightforward example exposes an underlying temporal complexity. Can such a process ever be said to end? What are the designer’s responsibilities on an endless timeline? The temporal lens suggests three ways in which designers should think about slow change problems. First, borrowing a term from Carl Honoré, slow change interaction designers should embrace a “slow fix” [4] mentality and reject a quick-fix mentality. In addition, slow change designers should acknowledge and combat what we will call the *immediacy impasse*. Finally, they should reject the notion of equilibrium as it pertains to change processes.

Quick fixes are temporary by design. Just enough thinking goes

into them to yield the desired results. Quick-fix thinking is “horizontal” in that it does not ask deep, meaningful questions that probe the past, present, and future forms of a given problem. Thus, it cannot be said to fully penetrate a problem. It lacks the *time* to do so. In particular contexts, quick-fix thinking may be well suited. But an attempt to solve slow change problems is never the right context. Slow change solutions must be deep-rooted, for they are long-term solutions to difficult problems. Consequently, slow change designers must understand and anticipate ways in which problems evolve. Understanding a problem’s evolution is one of the keys to addressing it effectively.

Slow change interaction designers must also recognize that when they approach a slow change problem, they are really approaching two problems. First, there is the primary problem: the attitude or behavior that a user desires to change (i.e., eliminate, modify, or initiate). In addition, there is a secondary problem that we call the *immediacy impasse*, which we will explore further in terms of Charles Duhigg’s concept of *the habit loop*.

The habit loop consists of a trigger or cue, an action driven by the trigger, and a reward following the action. Duhigg writes, “The cue and the reward become intertwined until a powerful sense of craving emerges” [5]. The key word here is *craving*. Feeling anxious (a cue) might make you crave sugar (a reward). Feeling sluggish (a cue) might make you crave energy (a reward). And there are many ways (actions) to satisfy these cravings (e.g., eating donuts, drinking coffee, jogging). The immediacy impasse is what we might call a metacraving in that it is an adjunct to most other cravings. For example, if we crave something, then we crave it now—not in five minutes, definitely not in five years. Our interactions with the world teach us not just to satisfy a craving but also to satisfy it *as soon as possible*. And this too is a Schöinian swamp problem for slow change interaction designers. It suggests a question: Is a craving, in and of itself, unmanageable, or does time make it so?

We take it for granted that when most people try to enact some kind

of slow change in their lives, they really do want to change. The New Year's gym-goers, the new employees aspiring to be optimally productive in their jobs, the community looking to change its citizens' perspectives on graffiti art—these individuals and groups *want* to change. However, given the presence of the immediacy impasse in some cases, the initial resistance that a user or group experiences is enough to dissuade them from continuing on their path. They submit to defeat.

If we fail to address this problem, then in some sense we contribute to the capitulation of a critical user agency: the agency to enact change for our world, our communities, and ourselves. No one and no thing can do slow change for us. We have to exercise the will to do it. We share responsibility with others, but this sharing does not exempt us from willful action. Regardless of the primary slow change problem, the immediacy impasse is ever present and working to undermine our solutions. We hasten to add that even though we call it an impasse, we believe there are solutions. Just as change problems evolve over time, so too can an impasse become a pathway.

Slow change interaction designers must acknowledge that things, people, goals, and environments change over time and that these changes necessitate modifications in any design. As Heraclitus said, “No man ever steps in the same river twice, for it is not the same river and he is not the same man.” People change (see Figure 1). Motivations change. Goals change. Devices and apps change, not only with new versions but also with use. For example, as soon as we use a brand-new smartphone, it is no longer the same as it was when we first opened the box. The second, fourth, and sixth times we use a fitness-tracking Web application are all unique experiences. We never step in the same river twice. Once the novelty wears off, then what?

Is it right to suppose that a system that works well in supporting a change process today will remain effective—in its current form—in perpetuity?

Slow change interaction designers must anticipate that their designs will change, perhaps even drastically,

at the individual or group level. By drastic change, we do not mean a cosmetic overhaul. We mean that a change agent or system might overhaul its functionality, possibly user by user. What works for one slow changer will not necessarily work for another, and it may not even work for that first one for very long. Embracing change requires a willingness to diverge from scalable thinking in the name of long-term success. In other words, first find out what works—even if what works doesn't *seem* scalable.

In 2010, Paul Graham hypothesized that “the world will get more addictive in the next 40 years than it did in the last 40” [6]. At a little over three years into that 40-year cycle, slow change interaction design is working against forces that have a three-year head start. It can be tempting to fall into the trap of rapid scalability, for example: “If we don't come up with something that works quickly and on a mass scale, then we're going to lose the battle.” But remember two things. First, this line of thinking manifests a quick-fix mentality, which is ill suited for slow change design problems. Second, so what if we lose the battle? We may lose many battles in the process of winning the war. The problem is in abstaining from the fight, because then the addictive world wins by default.

SYSTEMICS

The phrase “the addictive world” gives us an enemy; it gives us something to blame for difficult and/or failed attempts at slow change. As Donella Meadows observes, “It's almost irresistible to blame something or someone else, to shift responsibility away from ourselves, and to look for ... the technical fix that will make the problem go away” [7]. Shifting responsibility and placing blame on some external entity skew toward reductionism, which may be conducive for certain design problems. For slow change problems, however, the distinction is less clear. For example, products, pills, and technology are parts of much larger, much more complex systems, and understanding a part (or parts) of those systems is ostensibly insufficient to understanding the whole.

We must not take this point for granted, because effective slow change design relies in large part on holistic thinking.

Slow change interaction designers would do well to achieve fluency in systems thinking because systems thinking embraces complexity rather than simplicity. It recognizes the role of a simplistic perspective on slow change problems but derives greater value from a systemic one. For instance, when a slow change designer confronts an attitudinal or behavioral change model, systems thinking suggests ways in which designers might extract complexity from the model and, consequently, attain a deeper understanding of the whole system. In addition, systems thinking guides slow change interaction designers toward solutions that transcend the purely technological. Artificial devices exist in the natural world. What role will the natural world play in slow change?

Embracing complexity rather than simplicity does not necessarily mean that an understanding of the individual parts in a system lacks value. Understanding what we might call a *microsystem*—for example, a habit—in the context of a *macrosystem*—for example, a user—is valuable because it provides crucial details about a potentially important constituent of that macrosystem. But in the same way that presenting a simplified picture of attitudinal and behavioral change to the user is harmful because it is unrealistic and misleading, a simplistic picture of any system within which a slow change problem exists is harmful to the designer because it paints an incomplete picture of the system and, thus, the problem.

When faced with incomplete or ambiguous problems, designers should plumb them for more details. Attitudes and behaviors exist alongside other attitudes and behaviors. They exist at the individual, group, and global levels. They exist within families, communities, and cities. They exist within ideologies and economies. They have histories and futures. To what extent are our attitudes toward diet and exercise economically motivated? What is the relationship between our family history and our

Figure 1. A change path is not a straight line. It is a collection of increasing, decreasing, and neutral slopes. It illustrates that as change happens, we change. We call each segment of the line a *now vector* to describe the next immediate action in a change process. (Figure designed by Chung-Ching Huang.)

personal financial management? What is the relationship between our socioeconomic status and sustainable energy consumption at home? Are we asking questions like these?

As may be apparent, unfettered systems thinking has its pitfalls. A naïve designer might easily “miss the forest for the trees.” That is, they might dive so deeply into the elements, “sub-elements and then sub-sub-elements” [7] in a given system that they lose sight of the system itself. The key for slow change designers is to strike the right balance between complexity and simplicity. Let us be clear: Simplicity in design implementation is good. Simplicity in problem setting and problem solving is not necessarily good.

For example, Charles Duhigg’s habit loop is simple. But so too is the solution to the problem of changing the loop: “If you use the same cue, and provide the same reward, you can shift the routine [the action] and change the habit” [5]. We do not wish to misrepresent Duhigg’s position. He *does* call attention to the reality of habit change: It is difficult. And we do not impugn the habit loop for being wrong. It is a useful model. Our contention is that the simplicity of the habit loop and the

simplicity of the rule for changing it obscure the complexity of the habit itself as well as its interconnections to other systems that interact with its “host system,” the system within which the habit loop exists.

Take as an example the following habit: drinking alcohol. The habit loop suggests a cue and a reward. There is a cue that causes a person to engage in the ritual. Engagement in this ritual yields a reward. This loop cultivates a craving. So, if we identify the cue and the reward then we can swap the ritual for a different one and change the loop. As Duhigg acknowledges, it is not that easy. Taking the habit loop as a starting point, a systemic slow change designer might explore the habit in terms of its elements, interconnections, and function or purpose (see Table 1).

We do not offer Table 1 as a consummate depiction of this habit. Yet we can see this particular habit is more than just a cue, a ritual, and a reward. Changing it might not be as simple as switching one routine for another. A designer, taking Table 1 as a starting point, might create similar tables for additional systems that interact with the habit, for example: home, bar/liquor store, self, family, school/

office, and so on. Such an exercise might yield unforeseen patterns across these multiple systems.

With such a high volume of systems at work, it should come as no surprise that designers need to balance the use of technological and non-technological agents in their solutions to slow change problems. That is, systems thinking has the potential to illuminate and negate the degree to which slow change designers might fetishize purely technological solutions to problems. There may well be a device or “an app for that [slow change problem]” but that device or app is not the complete solution. Perhaps interaction designers take this as axiomatic. But do users?

When we think of interaction we tend to think of users interacting with technology. This is, after all, the foundation of our domain of practice. But for slow change interaction design, we anticipate the need to “think differently.” By thinking differently, we mean the need to incorporate non-technological agents purposefully into a given user’s change process. For example, the solution to technology addiction cannot be purely technological, but neither can it be purely non-technological.

DRINKING ALCOHOL

Elements	Interconnections	Function or Purpose
Person (or people)	Legal drinking age	Relief
Bar (or liquor store)	Budget	Forgetting of problems
Glass	Community	Avoidance
Alcohol	Cost of gas (or other energy source)	Coping
Money	Cost of drinks	Substitution (e.g., sex)
Liver	Information about the best places to drink or the best type of drink	Pride
Bartender	...	Peer acceptance
Transportation		Fulfillment
Commercials		Escape
...		...

→ Table 1. An explication of the habit: drinking alcohol. “*Elements* are the visible elements within a [habit] system... *Interconnections* are those relationships that bind the elements together... And the *function or purpose* is discernable only through observation of the behavior of the system” [7].

Though technology seemingly permeates every system in which we interact, we must not lose sight of the importance of non-technological interaction. Ultimately, slow change boils down to sustaining improved qualities of life. The systems thinking designer wants to know the long-term consequences for ever more reliance on technology to solve our problems and combats them with systemic solutions in the present.

SLOW CHANGE INTERACTION DESIGN THEMES

In light of the preceding discussion of the ethical, temporal, and systemic lenses, we offer the following eight themes of slow change interaction design. These should be evaluated as a high-level, practical framework for thinking about and evaluating slow change design solutions. For each of the eight themes we designate the dominant underlying lens or lenses in parentheses.

Singularity (ethics/systemics). Designing for the 5 to 95 percent may work often for most types of design, but for slow change interaction design, small differences among

users differentiate successful change from stasis. Change agents may need to be fine-tuned to these small differences in order to initiate change. We acknowledge commonalities of the human condition that enable particular tools or techniques to work broadly. But we claim that even wide-reaching tools or techniques have to be malleable for fine-tuning per individual user.

Flux (ethics/temporality/systemics). With each accomplishment, we are not the same person we were before. As Meadows observed, “You can be doing something that has worked and suddenly discover, to your great disappointment, that your action no longer works.” [7] As users progress, for better or worse, on their slow change endeavors they will change. Their motivations will change. Their abilities will change. Their needs will change. From this we infer that a static system—a system that does not also change with the user—is insufficient to meet the user’s needs.

Realism (ethics/temporality). A major source of discouragement and, thus, quitting a change process, is an inability to meet

goals for progress. *How much should I adjust my caloric intake? How many degrees should I adjust my thermostat? How should I distribute my monthly budget across food, clothing, transportation, entertainment?* We rely on the expertise of our support mechanisms—thus on the designers of those support mechanisms (technological *and* human)—to provide us with trustworthy guidance. Setting up realistic, achievable goals increases the likelihood for consistent success, which does a great deal to motivate adherence to a change plan.

Accommodation (temporality/systemics). While we would like to imagine that people never fail to achieve a goal, we need to recognize that “slips” do happen. The most effective change agents account for both positive, negative, and neutral changes. This is where data visualization perhaps becomes a high priority. If you see progress from a seven-mile-high perspective, then even though there is a slip, you see it as a blip on an upward-sloping vector.

Feedback (systemics/ethics/temporality). Not all people view stimuli in the same way; each must be functionally defined according to

the individual. One person's reward is another person's punishment. The default style of external feedback is a mix of quantitative and qualitative, with a heavy emphasis on quantitative. What happens to those users for whom numbers are ineffective? We cannot afford to write them off. How will we incorporate embodied, intrinsic, qualitative feedback into our design solutions?

Accountability (ethics/systemics). We need to consider external and internal accountability mechanisms. We hold ourselves accountable some of the time, but at other times it is easy to rationalize avoiding change. We can create for ourselves paths of least resistance. If we are the sole arbiters of accountability, this is one perspective to take. If there are other mechanisms holding us accountable—a group, a device, a spiritual force—then designers must consider several important questions: What is the most effective means to hold this user accountable? Is it appropriate to leverage different modes of accountability?

Consistency (temporality). In *Outliers*, Malcolm Gladwell repeatedly makes mention of the “10,000-hour rule” [8]. The gist is this: To achieve mastery in any domain, one has to amass 10,000 hours of experience. Although his thesis targets an array of practitioners, there is a parallel in how designers need to think about slow change processes. What if in order to succeed in any slow change, users need to “practice” for 10,000 hours? What would that mean for our design approach? What do we do differently at hour 9,000 versus hour 100? It's insufficient for users to log a few hours here and a few minutes there—to sneak in changes before bed or in the car on the way to work. They must be consistent.

Holism (ethics/systemics). Changing an attitude means changing the way people think about a particular behavior. But changing an attitude does not necessarily translate to changing a behavior. We can know things are good for us and not do them. We can know how important exercise is while spending most of our time sitting on the couch. The reverse is also true. Changing a behavior does not translate to changing an attitude.

We can exercise and resent all the time we spend exercising. In the case of the former, the right attitude yields no improved quality of life. In the latter, the improvements may be minimal. Changing both attitude and behavior is essential to slow change.

CONCLUDING REMARKS AND A CALL TO ACTION

The Long Now Foundation is an organization dedicated to inculcating long-term thinking on a very large scale: at cultural and global levels. Toward this end, one of its projects is the building of a massive 10,000-year clock inside a mountain in Nevada. The Foundation describes the clock as follows:

“...if sufficiently impressive and well-engineered, [it] would embody deep time for people. It should be charismatic to visit, interesting to think about, and famous enough to become iconic in the public discourse. Ideally, it would do for thinking about time what the photographs of Earth from space have done for thinking about the environment. Such icons reframe the way people think” [9].

The objective is not to reframe the way people think in five, 10, or 100 years. The objective is to reframe the way we think now because, as the Long Now Foundation is aware, change takes time. Slow change interaction design shares in this awareness. We have already cited Paul Graham's augury that “the world will get more addictive in the next 40 years than it did in the last 40” [6]. He made this prediction three years ago. If we are to believe him, then we are starting late.

We offer the preceding lenses and themes as a sketch of a new body of theory within interaction design. When we say we offer it as a sketch, we mean that we intend for it to be tested and critiqued. We intend for it to be dismantled and redrawn. We intend to iterate on it. John Platt, in his seminal 1964 paper on “strong inference,” wrote, “A theory which cannot be mortally endangered cannot be alive” [10]. We are aware of our theory's “aliveness,” and it is in the spirit of this awareness that we call on our readers to endanger its mortality. For only through this

endangerment can we hope to develop theoretical bedrock that will stand for 10,000 years ... or at least a few.

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