



T DALTON COMBS PHD & RAMSAY A BROWN

# DIGITAL BEHAVIORAL DESIGN

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*We have not yet seen  
what man can make of man.*

*-B. F. Skinner*



## About the Authors

DALTON AND RAMSAY SPENT THE PAST 10 YEARS figuring out how to change human behavior.

As academics, they studied the science of how people do what they do: Neuroscience, Philosophy, Biology, Engineering, Artificial Intelligence, Business, and Design. Dalton got his PhD putting people in MRIs to see how decision making works. Ramsay earned his MS taking apart rat brains to see how their neural circuitry generates their behavior.

Both Rams and Dalton were privileged to be working on these problems while our understanding of them has undergone a revolution. Companies in gambling, gaming, banking, and social media began hiring other PhDs out of these academic programs as fast as the universities could turn them out. Seeing the moral hazard of a handful of companies controlling these new technologies of *Behavioral Design*, Dalton & Ramsay resolved that the ability to change human behavior should be distributed as quickly and as broadly as possible. So far that resolution has produced three fruits:

THE FIRST IS **Boundless Mind**; <sup>1</sup> the second is **Space**; <sup>2</sup>, and the third is this book.

Today, we're proud to share *Digital Behavioral Design*, with you. It's a distillation of the most useful things they've learned. It's something one-half brain drain, one-half secret play-book. We compiled it for you to read, study, and join us in building a more Boundless world full of Behavioral Design.

- Your Editors

MATT MAYBERRY AND LINDSEY MEREDITH

CONTACT DIVISION, BOUNDLESS MIND

<sup>1</sup> a software company that makes it easy for anyone to make digital technology habit-forming.

<sup>2</sup> an app that helps users quit addictive apps



# Who Else You Should be Reading:

THE BEHAVIORAL DESIGN COMMUNITY is growing!

Through great books, workshops, and services, more people each month are beginning to use these techniques to solve crucial problems and build great tools.

We're fortunate to stand alongside other thought leaders in the field. You should get to know them too! Throughout the rest of this book, we'll often cite their pioneering work.

While by no means a complete list, we strongly advise you explore Nir Eyal's *Hooked*<sup>3</sup>, Charles Duhigg's great launching point *The Powers of Habit*<sup>4</sup>, Richard Thaler and Cass Sunstein's work on Choice Architecture in *Nudge*<sup>5</sup>, Dan Ariely's work on Behavioral Economics in *Predictably Irrational*<sup>6</sup>, Daniel Kahneman's pioneering work on decision making in *Thinking Fast and Slow*<sup>7</sup>, Robert Cialdini's *Influence*<sup>8</sup>, Stephen Wendel's *Designing for Behavior Change*<sup>9</sup>, BJ Fogg's *Persuasive Technology*<sup>10</sup>, and Daniel Pink's *Drive*<sup>11</sup>.

We like reading [Nir's great blog](#), and keeping up with the work coming out of Dr. BJ Fogg and the [Stanford Persuasive Technology Lab](#). Go follow [Ximena Vengoechea](#) on Twitter for her insights and experiences understanding user habits, and download a copy of [Artefact Group's Behavior Change Strategy Cards](#).

Please [let us know](#) who else needs to be on this list!

<sup>3</sup> Nir Eyal. *Hooked: How to build habit-forming products*. Penguin, 2014

<sup>4</sup> Charles Duhigg. *The power of habit: Why we do what we do in life and business*, volume 34. Random House, 2012

<sup>5</sup> Richard H Thaler and Cass R Sunstein. *Nudge: Improving decisions about health, wealth, and happiness*. HeinOnline, 1999

<sup>6</sup> Dan Ariely. *Predictably irrational*. HarperCollins New York, 2009

<sup>7</sup> Daniel Kahneman. *Thinking, fast and slow*. Macmillan, 2011

<sup>8</sup> Robert B Cialdini. *Influence: The psychology of persuasion*. Collins New York, 2007

<sup>9</sup> Stephen Wendel. *Designing for behavior change: Applying psychology and behavioral economics*. "O'Reilly Media, Inc.", 2013

<sup>10</sup> BJ Fogg. *Persuasive Technology: Using Computers to Change What We Think and Do*. Morgan Kaufmann, 2002

<sup>11</sup> Daniel H Pink. *Drive: The surprising truth about what motivates us*. Penguin, 2011



# Forward

“Why do people do what they do?!”

Today, this is a more pressing question than ever. As we write this, Cambridge Analytica and Russia<sup>12</sup> stand accused of manipulating people’s voting behavior; App users feel like technology is taking over their behavior and they’re out of control; and the US is wracked by behavioral crises of opioid addiction, obesity, and Type-II Diabetes.

<sup>12</sup> and, by extension, Facebook

Beyond our crises exist opportunities for extraordinary wealth creation: thousands of business, right now, have a fantastic value proposition that their users are begging for, but users can’t take advantage of because of barriers to changing their own behavior.

Answering this pressing question will help us, as a society, fix that which ailes us and help people and businesses thrive.

For your reading pleasure, some quotes have been exploded out and colorized for those interested in skimming. If you see a Twitter Icon, you can click it to tweet that quote. You’ll find blanks for you to write-in your own ideas as an exercise in active reading! We invite you to take notes and explore how you can place the described practices directly into context with what you’re building.<sup>13</sup> Where sensible, gendered pronouns are female. Because language matters and we’re all in this together. All diagrams and colorations are available in colorblind-friendly versions **upon request**, as is a copy of the book in its entirety in a dyslexia-friendly font face.

<sup>13</sup> They’ll look like this! What are you excited about learning here?

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-RAMSAY A. BROWN AND DR. T. DALTON COMBS PHD

APRIL, 2018. VENICE, CALIFORNIA.



# Introducing Behavioral Design

*“It’s hard to initiate behavior change, even harder to stay the course, hardest of all to make the change stick. I’d go so far as to say that adult behavioral change is the most difficult things for sentient human beings to accomplish.”*

*- Marshall Goldsmith in ‘Triggers’*

HUMAN BEHAVIOR IS PROGRAMMABLE. You just need to know the code. Here we introduce **Behavioral Design**: a design framework for programming human behavior.

In this book, we focus on a particular area of behavior design: Habits. How they work, and how your product can use Behavioral Design to become a daily habit for your users. We’re focusing on habits because they are the hardest and most important thing to get right. They are the force that sustains all other Behavioral Design.

But first, we set the groundwork for Behavioral Design: what is it? What sort of ethics are involved in designing human behavior? What tools does it offer you?

In Chapter 1 we’ll introduce a formal framework for thinking about Habits, and in Chapters 2 and 3 we’ll introduce a model for how you can transform your app into a habit-forming product. In Chapters 4, 5, and 6 we explore the business case for habits, how you can transform your organization into one that uses Behavioral Design to its fullest, and real-life examples of Behavioral Design in the wild.

IF THIS IS YOUR FIRST INTRODUCTION TO BEHAVIORAL DESIGN, everything can seem very new. We’ll start with a definition and build from there:

*“Behavioral Design is a framework for intentionally and systematically changing human behavior through persuasive modifications of the physical and digital environment.”*

Let’s unpack that definition:

## IN THIS CHAPTER:

What is Behavioral Design?

Why is it important?

Why is it hard?

How can it be done ethically?

What are the methods of Behavioral Design?



**IT'S A FRAMEWORK.**

Behavioral Design is a framework: a set of ideas that describe and predict how and why people behave the way they do. It's also a set of practices for changing those behaviors. When you and your team observe how people use your Product or App, Behavioral Design can offer explanations and models that explain WHY people are behaving that way. It can also predict what they might do next, or how they might respond to certain types of interventions you make.

**IT'S INTENTIONAL.**

Behavioral Design is about designing how people behave. Like any other type of Design framework,<sup>14</sup> it's a set of tools that you and your team use deliberately to achieve specific behavioral results. To this end, it's a useful design and thinking tool when you have specific behavioral outcomes you're interested in helping people achieve.

<sup>14</sup> think: Graphic Design, Industrial Design, Architectural Design

**IT'S SYSTEMATIC.**

The ideas and methods that make up Behavioral Design were not randomly chosen: they are rooted in observations and experiments from psychology, neuroscience, and behavioral economics.

They are empirically-backed explanations of why people do what they do, and why interventions you and your team will make will lead to certain predictable behavior changes.

**IT'S ABOUT CHANGE.**

Behavioral Design is, at its core, about behavior change. It contains ideas and tools for changing small behaviors and large behaviors. Behaviors that you want people to start doing and stop doing. Behaviors that might only happen once, or behaviors that happen often. For each vector of behavior change,<sup>15</sup> Behavioral Design offers tools you can use for helping people achieve that kind of change.

<sup>15</sup> its magnitude of change and its direction: increasing or decreasing in behavior frequency

**IT'S ABOUT PERSUASION.**

Behavioral Design uses insights about how the brain operates as strategies for persuading people to change their behaviors. It is **not** about coercion. It is **not** about forcing people to change. Rather, when used properly, Behavioral Design gives your Product a toolbox of design patterns that are paths of least resistance. Techniques you can use to increase the chance that someone changes their behavior without forcing them to, or violating their autonomy or dignity.

**IT'S ABOUT THE "ENVIRONMENT."**

Behavioral Design changes how people behave by changing their environment. When we say the word "environment" here, we use it

as behavioral scientists use it: to mean the immediate reality in which someone is performing a behavior<sup>16</sup>. In the example of someone using your smartphone app, their environment is your app's user interface. Behavioral Design proposes tools for strategically modifying how these environments look and feel, how they cue our behaviors, and how they respond to our behavior. We do **not** have direct control over people's brains. But, as you'll read in Chapters 2 and 3, we can exercise control over their environment, and much of our behavior is controlled by our environment.<sup>17</sup>

<sup>16</sup> We don't mean "environment" to mean nature, or their nearest forest, or their local ecosystems)

<sup>17</sup> and how our environment responds to us and our actions

## *Why Now?*

BEHAVIORAL DESIGN is emergent of a moment in technical, scientific, and cultural evolution. Much of the scientific groundwork for the ideas and techniques inside Behavioral Design were outlined in the 1950s and 60s. The first academic formalization of Behavioral Design as a Design Framework<sup>18</sup> came to us in the 1990s and early 2000s. Since then, four major scientific and technological trends have recently combined to pave the way for the rigorous emergence of Behavioral Design:

<sup>18</sup> "Captology," as defined by Dr. BJ Fogg of Stanford University

1. Ubiquitous Smartphones
2. Advances in Computational Neuroscience
3. Cloud Computing
4. Free, Open-source Artificial Intelligence

### 1. UBIQUITOUS SMARTPHONES

This year, a predicted 78%<sup>19</sup> of Americans will carry affordable, always-on, globally-connected supercomputers in their pockets.<sup>20</sup> These supercomputers are packed with real-life sensors that can detect our real-life behavior: accelerometers that sense our movement, cameras and microphones that can see and hear us, and GPS that can find us within feet. They're able to "push back" against us too. Push Notification technology now enables our apps to grab our attention. Our phones vibrate, chime, and ping us in deliberate, controllable manners to drive our behavior. In ways they could not before, they can demand our attention. Combined, this means that most people carry a device richly capable of sensing *and changing* their behavior, constantly connected to the global computing infrastructure.

<sup>19</sup> Statista, 2018

<sup>20</sup> Globally, that number is 36% and rising.

## 2. ADVANCES IN COMPUTATIONAL NEUROSCIENCE

Recent research has made strides in understanding the brain's motivation machinery. The study of brain structures, chemicals, and circuits responsible for how we learn from experience<sup>21</sup> have made significant progress in the past decade from basic research, medicine, and even artificial intelligence and robotics research. We now have clearer understandings of how the brain forms habits, how reinforcement drives engagement, and how to interact with these neural circuits.

<sup>21</sup> particularly from reinforcement

## 3. CLOUD COMPUTING

The push to move computing and storage into massive, centralized server farms ("The Cloud") has drastically driven down the price and complexity of computing and storage.

Compared to a decade ago, it is now trivially simple to deploy technologies that can reliably service millions of people at much lower operating and maintenance cost than before. This means that your team can experiment with a new app or product today much cheaper than you could have in 2008.



## 4. FREE, OPEN-SOURCE ARTIFICIAL INTELLIGENCE

AI has been incubating in academia for decades. During that time the culture of FOSS (free and open source software) deeply penetrated the AI community.<sup>22</sup> Now that powerful AI frameworks are freely available, anyone can start using pattern detectors, prediction engines, and automation pipelines that might have, 10 years ago, taken several PhD's worth of innovation, and only been usable by the handful of experts who built them. Better too, dozens of free video courses from leading universities help anyone, globally, start building sophisticated machines that learn.<sup>23</sup>

<sup>22</sup> the mutually-reinforcing relationship between academic science, high-tech companies, is pushing to makes these tools easier to use.

<sup>23</sup> Dalton took [Andrew Ng's](#) during graduate school. 100% recommended.

TODAY, YOUR APP CAN SENSE a user's behavior. It can send that data to the Cloud instantly. That data can be processed by Persuasive AI designed to modify their behavior. That AI can instantly recommend to your app how to modify its digital environment (its UX) to induce that user to change his behavior. All of this can be built - and operated - cheaply and scalably - touching not only that user's mind but millions of minds globally every second.<sup>24</sup>

<sup>24</sup> this is literally what we do at [Boundless Mind](#).

If that sounds like a world you and your team want to build your app in, you're reading this at the right time, Because this is all happening today!

## What are the Ethics of Behavioral Design?

AT BOUNDLESS MIND, we're taking a stance: we are all each other's keepers. We - all of us - owe it to our fellow people and to generations yet born to build a world full of Human Flourishing.

Behavioral Design can be an extremely strong driving force in building that world when used within a strong ethical framework.

As far as we can tell, there are at least two major ethical questions underpinning Behavioral Design.

- 1.) Is *any* Behavioral Design ethical at all?
- 2.) Is *this particular* use of Behavioral Design ethical?

BEHAVIORAL DESIGN IS A SET OF TECHNIQUES for persuasion. It is **not** a technique of coercion. When used properly, Behavioral Design takes advantage of cognitive biases to make particular behaviors more likely: it does **not** force certain actions. It does not use violence or threats to change behavior. It does not literally restrict someone's ability to act or not. It merely provides testable, provable way to increase the chances that behaviors change: it does not **force** change. It is a Technology of Behavior, not a Technology of Force. To that extent, the techniques of Behavioral Design, and Designers themselves, must respect persons' intrinsic rights to freedom of choice, autonomy, and dignity.

In the same way that a Hammer has no intrinsic ethical bias (for being either ethical or unethical), neither does Behavioral Design. It's a tool: a set of techniques and technologies. How we use it determines whether or not it's ethically-aligned. Whether a pattern is used as a *Dark Pattern* or a *Light Pattern* is a product of its intention and its use. That said, over the years the field has identified some undeniably *Dark Patterns*: Behavioral Design techniques used to intentionally subvert, manipulate, and deceive users. We won't be discussing them here, but we recommend [Darkpatterns.org](https://darkpatterns.org) for a review of what companies have used to undermine user intentions.

Through our conversations with other Behavioral Designers, and as outlined by other thought leaders in the community like Stanford's Dr. BJ Fogg and author Dr. Stephen Wendel, particular Behavioral Design interventions can be more ethically-aligned than others. Here we identify three criteria, commonly discussed in the field, that make some interventions more ethically-aligned than others:



*“Behavioral Design patterns are dark or light depending on how you use them. Don’t let the villains be the only ones with superpowers.”* 

1. Transparency
2. Alignment with Social Good
3. Alignment with a User's Desires

#### 1. TRANSPARENCY

Behavioral Design, and our uses of it, are most ethically-aligned when we're transparent with the world about what we're doing: using known, scientifically-validated techniques for encouraging behavior change.

Fortunately, these techniques are still effective when people are aware of their use,<sup>25</sup> and increased public awareness of these techniques - and their uses - improves public safety and introduces accountability into otherwise opaque technological processes.

#### 2. ALIGNMENT WITH SOCIAL GOOD

Behavioral Design should be used as a means to the ends of Human Flourishing. To that extent, its use is most ethically-aligned when the designed behaviors are good for the individual, their community, and society as a whole.

#### 3. ALIGNMENT WITH A USER'S DESIRES

Closely related to the second point, an intervention is most ethical when it's well-aligned with the kind of behavior change that a user actually wants. For example, a social media app that uses Behavioral Design to induce more frequent use so it can increase advertising revenue may be poorly aligned with what a user actually wanted out of the product: social connection and a better sense of community. Alternatively, an app that helps people stick to their diet by using Choice Architecture or Reinforcement is better aligned with what that user wants because the user downloaded that app for that exact reason: to change their eating behavior.

WHEN YOU AND YOUR TEAM use Behavioral Design to build a great product, consider these three criteria. You can use these tools - ethically - to build an amazing Product that people don't want to quit.<sup>26</sup>

*What's in the Behavioral Design Toolbox?*



<sup>25</sup> people still respond to Positive Reinforcement even when they're aware that they're receiving Positive Reinforcement

*“Behavioral Design works best when the designer and the user want the same thing.”* 

<sup>26</sup> Not 'can't quit' but 'don't want to quit.'

BEHAVIORAL DESIGN OFFERS ideas and techniques for persuading user behavior.<sup>27</sup> Some of these techniques encourage behavior, others discourage it. Some work best on behaviors that happen once, while other techniques work best on behaviors that happen often. For each tool and technique in the Behavioral Design Toolbox, there is a purpose – and for each purpose, a tool.

<sup>27</sup> This is, by no means, neither a permanent nor exhaustive list of techniques. Behavioral Design is an evolving field, and we welcome feedback, refinements, and new additions to this list.

#### REINFORCEMENT LEARNING

**Reinforcement Learning**<sup>28</sup> (also called Reward Learning, or RL) increases the frequency that someone performs a behavior. RL focuses on how a habit can be induced by carefully controlling the rewarding consequences of an action.

<sup>28</sup> This method is the focus of this book.

RL predictably improves how much and how often people engage with an app or product, and for how long they'll retain using that app. It works on behaviors that people already do, as well as behaviors they do not yet do.



#### CUES

A **Cue** (also known as a Trigger), is a prompt to perform an action. When used together with Reinforcement Learning, they increase the frequency of a behavior (it's the C in the CAR Model). Cues work because, often, users automatically perform certain behaviors in response to signals from their internal and external environments.

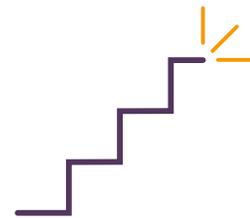


Chapter 1 explores how the association of a particular cue with a particular action is the fundamental unit of a habit. Chapter 2 teaches you and your team how different types of cues work, and how you can use them to change user behavior and make your app habit-forming.

#### OPTIMAL CHALLENGE

**Optimal Challenge** prescribes that at a given moment and for a given person, there exists an optimal amount to challenge or push, someone to perform an action. Challenge less, and you may not help the person achieve their goals. Challenge more, and you may induce fatigue and user burnout.

Optimal Challenge proposes that not only does this "sweet-spot" exist, but that it is detectable, predictable, different between people, and changes with respect to time. Optimal Challenge can be used to induce both a behavioral increase or a behavioral decrease.



#### STIMULUS DEVALUATION

People learn, through experience, that certain actions will lead to positive outcomes: that's the core of Reinforcement Learning and the CAR Model. But how do you un-wire that learning?



**Stimulus Devaluation** provides a technique for destroying a learned Cue-Action association by introducing delay and friction between an Action and its associated Reward. The resulting experience still allows a user to perform their desired action while destroying the habit-forming nature of the experience.<sup>29</sup> Stimulus Devaluation works best to decrease behaviors that people already perform, especially those for which they've been positively reinforced using the CAR Model.

#### STOPPING RULES

An object in motion tends to stay in motion, and our behavior works the same way. Our nervous systems naturally look for "stopping cue" signals from our environment that tell us we've completed an action.

**Stopping Rules** prescribes that stopping cues can be controlled to increase or decrease certain behaviors. One commonly seen example of Stopping Rules is to remove all of the normal stopping cues from an environment. Without stopping cues, users consume much, much more.<sup>30</sup> Ubiquitous infinite scroll social feeds<sup>31</sup> leverage this effect: the more users view content, the more content is loaded for their consumption.

#### CHOICE ARCHITECTURE

When presented several options of how to behave, people often perform the default behavior. It's no mark of weak-will or laziness, it's part of how our brain takes shortcuts to help us make decisions efficiently.

**Choice Architecture** prescribes that, as a Behavioral Designer, you can design someone's environment as to create specific, intentional default actions they will take. Popularized by Sunstein, Thaler, & Balz, Choice Architecture (also known as Nudge Theory) pervades our daily life and is one of the most successful and widely-used Behavioral Design techniques. It's best used to guide users towards a particular desired choice, when faced with several possible actions they could take, and it can be used to both increase and decrease behaviors.

#### AMBIENT COMMUNICATION

Often, you'll need to present complex or dense information to someone. **Ambient Communication** prescribes that using non-text communication, such as color, size, texture, pattern, motion, sound, vibration, or time can help you communicate complex content to users quickly and intuitively.

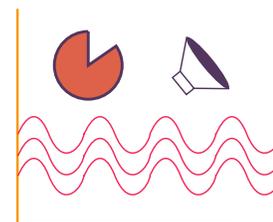
It relies on the brain's other, non-verbal information processing

<sup>29</sup> At [Boundless Mind](#), we've used Stimulus Devaluation to help people beat app addiction with [our free app, Space](#).



<sup>30</sup> Brian Wansink, James E Painter, and Jill North. Bottomless bowls: why visual cues of portion size may influence intake. *Obesity*, 13(1):93-100, 2005

<sup>31</sup> pioneered by Pinterest, but now seen on Twitter and Facebook too.



streams to understand the environment faster than reading alone might afford. It can be combined with other Behavioral Design techniques, such as Reinforcement Learning, Optimal Challenge, or Cuing, to increase their efficacy. It's often used successfully to persuade people to perform an action they need to only do once, such as a signup form or completing a purchase.

#### OPTIMAL INFORMATION FLOW

People process information differently from one another. For example, steps in a signup workflow that might be intuitive to one user might be wildly disorienting to another user. Someone might be able to mentally juggle many complex ideas simultaneously. Another person might focus best on one idea at a time.

**Optimal Information Flow** proposes that there exists, for each person, an optimal ordering of steps for a process and an optimal density of information they can be presented with before they struggle to perform your desired action. This technique works best on actions that you need people to perform once or infrequently, such as a signup form or completing a purchase.



#### SOFT INCENTIVES

Where Reinforcement Learning increases the frequency of recurring behaviors by variably providing a reward immediately after someone performs a desired action, Incentives work by promising a *future* reward for an action taken *today*.

**Soft Incentives** describes how your App may use the future promise of emotional or community-based value to encourage a single, challenging, one-off behavior today<sup>32</sup>. Soft Incentives largely rely on our desire for personal accomplishment, congruence with our narratives of identity, or the approval of our friends (Also explored in more detail in Chapter 3's section on *Rewards of the Self* and *Rewards of the Tribe*.)



<sup>32</sup> More on the difference between Reward and Incentive in Chapter 3

#### SUNK COST

When we begin to financially, emotionally, or logistically invest in things, we grow to value them more: even beyond how much we actually like them or how actually useful they are to us.

The Behavioral Design technique of **Sunk Cost** leverages the cognitive bias of Sunk Cost Fallacy, for which people inaccurately over-value experiences, relationships, or products because they've already given them time, money, information, or opportunity. Sunk Cost is a critical feature of Behavioral Designer Nir Eyal's "Hook"<sup>33</sup> Model (which shares much commonality with the CAR Model) and is captured in his "Investment" phase of the Hook Model. Sunk Cost



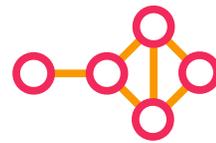
<sup>33</sup> Nir Eyal. *Hooked: How to build habit-forming products*. Penguin, 2014

can be a particularly effective way to increase the frequency of a behavior that users are already performing by introducing a “ratchet” effect in which they become more likely to keep using your Product because they over-value the importance of their previous use and investment.

#### OPTIMAL GROUP STRUCTURE

If your App connects people to one another, how do you know the best way each user would prefer to experience this social component?

Different users exhibit different preferences for their interactions with each other: some feel most motivated alone, others in small groups of peers, and some in the full gaze of public. **Optimal Group Structure** proposes that there exist predictable, optimal scopes and natures of interactivity between app users that will best motivate them to change their behavior.



#### PERSONALIZATION

You may have heard of the hypothesis that students have “learning styles,”<sup>34</sup> and that students learn best when material is adapted to that style. **That hypothesis has been soundly repeatedly falsified.**<sup>35</sup> But there is a larger truth behind that myth. Not everyone thinks the same way or wants the same thing. Many design teams use personas to help design to different user groups, skill levels, or user needs. New machine learning techniques are making it possible for designers to produce even more adaptive products.



#### COGNITIVE LOAD BALANCING

By and large, the human mind is capable of juggling only a few tasks at once, and capable of remembering up to about 10 things at once.

If your App requires the user to simultaneously interact with many different events, people, concepts, or ideas, **Cognitive Load Balancing** prescribes techniques for how you might best display only fragments of the whole information set to a user at once and effectively switch between those fragments. Limiting how much mental work the user must do at any time can improve their quality of experience and increase their ability to properly perform the target action you need them to do.

<sup>34</sup> Visual, Auditory, Tactile, Converger, etc.

<sup>35</sup> Scott O Lilienfeld, Steven Jay Lynn, John Ruscio, and Barry L Beyerstein. *50 great myths of popular psychology: Shattering widespread misconceptions about human behavior*. John Wiley & Sons, 2011; Harold Pashler, Mark McDaniel, Doug Rohrer, and Robert Bjork. Learning styles: Concepts and evidence. *Psychological science in the public interest*, 9(3):105–119, 2008; and John Geake. Neuromythologies in education. *Educational Research*, 50(2): 123–133, 2008



#### *Why Start with Positive Reinforcement?*

As we’ll explore in Chapters 2 and 3, Reinforcement Learning isn’t new. Beyond our intuitions of why and how positivity should influence behavior, Reinforcement has been proven effective for

inducing behavior change for decades. Since its first academic explorations in the early 1950s, teams have published thousands of reports exploring the underlying brain anatomy, neural circuitry, and behavioral implications of Reinforcement. This rigorous exploration - and its continued utility in product design - grants Reinforcement a "Best Practice" status amongst Behavioral Design interventions and those interested in changing behavior.

While the Behavioral Design Toolbox contains many techniques, we've decided to constrain this first Volume to a dive deep on Reinforcement - and how you and your team can leverage it to build habit-forming products.



## Chapter 1: What is a Habit? Why do I care?

***“Winning is a habit. Unfortunately, so is losing.”***

*- Vince Lombardi*

THE GOAL OF THIS BOOK is to equip you and your team with the right ideas and tools to transform your app into a daily part of your users lives. To transform your app into a habit! Our first step is to all agree on what we mean when we use the word ‘habit.’ It’s one of those words that we all know how to use, but few understand how habits work. How do they form? How do we break them? Understanding the non-intuitive ways habits work - even at the introductory level described here - gives you a mental toolkit to build with, and a way to quickly help your team and your product stand out.

IN THIS CHAPTER, we’ll dive into why every Product and Marketing Team needs to care about user habits, dispel some common misconceptions about habits, explore what makes habits stick in the brain, and lay the groundwork for introducing the CAR Model: your key to building a habit-forming product.

*Why should my team and I care about habits?!*

Often, when people think about “habits”, they imagine particular habits people have. Diet habits. Running habits. Smoking habits. Gambling habits. “Things that we do all the time.” Sometimes healthy, sometimes less so.

Habits are bigger than that. They’re our “default” behaviors. Our autopilots.

To many people who design apps, it might be nonintuitive that their app can become someone’s habit, but it’s very true. Which app do you turn to when you need to hail a ride? To find directions? To

### IN THIS CHAPTER:

What is a habit?

Why are they’re important in product design?

How are habits designed?

*“Habits are who we are when we’re not paying attention.”* 

goof off? To read news? With all the different apps you could have chosen, *WHY* have you picked those?

YOU CHOSE THOSE APPS - and continue to return to them - because those teams understood that apps live or die by usage. Their success depends on whether or not users form a habit out of using their app. These teams understood that user engagement, retention, and revenue depend on you picking their app over and over again. On your “default” behaviors. On your habits. And they took deliberate design and engineering steps to increase the chance that you’ll open their app instead of a different app.

They designed your habit, and now you and your app can do the same too. Because you’re in the same boat: if you’re reading this, we’re willing to bet that your future business success relies, in part, on become a daily or weekly habit for your users.

*What is a habit - really?*

‘Habit’ is one of those words that many are comfortable using, but a technical definition evades them. That’s perfectly fine in everyday situations! But now that we’re considering habits as an engineering and design field, a clear technical definition is necessary:

***A habit is a programmed response to something that happens in our environment.***

It’s a learned behavior that we unconsciously perform as a reflex to something we experience. A default action, so to speak, when we are presented a cuing stimuli.

THERE’S THREE CRITICAL THINGS that make a habit that most people miss. Here’s what you can get right:

#### 1. HABITS ARE MORE THAN THE ACTION

A habit is not *just* the action someone does.<sup>36</sup> Instead, a habit is a particular stimuli (known as a ‘Cue’, more in Chapter 2) mentally associated to the performance a particular action. You can think of it like the “If this → then that” pairing of a cue to an action: if sense cue, then do action.

Non-Behavioral Designers only focus on the action as the whole of the habit. When they talk about a *smoking habit*, they focus on the action (ex: smoking), but ignore the *cue* that automatically induces smoking (ex: finishing a meal). When thinking about how your app will become habit-forming in Chapters 2 and 3, you’ll be challenged to think not just about what actions you want people

<sup>36</sup> Often, we’ll use “action” and “behavior” interchangeably to mean the same thing

to do more, but what cue you'll associate with that action. That cue→action pairing is the habit. That's what you'll engineer with the help of this book.

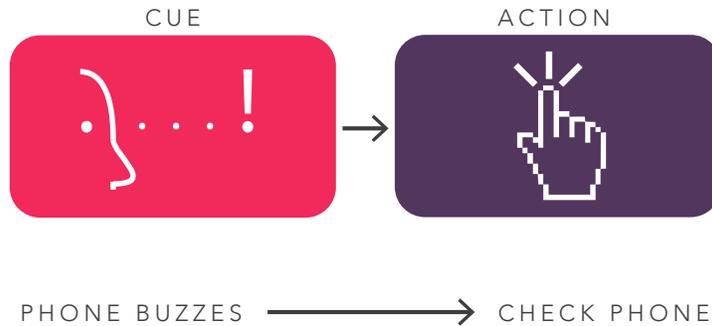


Figure 1: Two parts of a habit. *The cue is something we perceive and the action is something we do in response.*

## 2. HABITS ARE CAUSED BY OUR ENVIRONMENT

People perform a habit automatically in response to something in their environment that cues them to take that particular action. When we say “Environment” here, we mean the immediate inner- and outer- world our brains can experience. Internal thoughts, emotions, or feelings, or the external things we can immediately see, hear, smell, ect...

Our nervous system has some innate reflexes (like how your pupils automatically contract when you step outside into daylight). Habits are - in a sense - programmed reflexes of complex behaviors that we perform in response to our environment. Not only are they cued from the environment, they're also learned from the environment.



## 3. HABITS ARE PROGRAMMABLE

Habits are learned: they're entirely acquired by experience. We're not born with them: they're acquired from our interactions with the environment. Specifically, they're learned from the unexpectedly positive consequences of our behaviors (more on this in Chapter 3.)

In that sense, they are programmable: if we have control over our environment and the consequence of our behaviors (what happens in your UX immediately after someone performs your desired habit action), we can build - or destroy - habits. *This, at its core, is the fundamental idea of Behavioral Design: that a users' environment*

*and consequences of their behavior are controllable, and that makes their behavior - especially their habits - programmable.*

## Chapter 2: The CAR Model: It's What Drives Habits

*“The Consequences of an act affect the probability of its occurring again.”*  
- B. F. Skinner

IF YOU UNDERSTAND THE CAR MODEL, you'll be able to drive any habit.

In Chapter 1, we discussed what a habit really is, and why our brains evolved them as autopilots. We learned that habits are acquired from our environment and how it responds to our actions. In digital environments like your app, the environment is controlled by you: the app publisher. That means you can control the consequences of user behaviors, and your app can program new user habits.

Here, in Chapter 2, we'll explore *how* your app can program habits: the **Cue-Action-Reward (CAR) Model**. The CAR Model takes what we learned in Chapter 1 about the neurological structure of habits and gives you a tested, practical way to design experiences and products that cause a habit to be formed. We'll break down each step of the Model, review some common pitfalls and success examples, and provide you space to begin designing how you'll use this Model to help users build great habits.

### *The CAR Model: How to Program a Habit*

As we discussed in Chapter 1, a **habit** is the learned association of a specific **cue** and a specific **action** such that a person automatically performs an action when they experience a particular cue. The brain learns which habits to build (that is, which cues to associate with which actions) based on the consequences of our experiences. Specifically: our brain only builds habits from the *unexpectedly positive consequences* of our behavior.

The CAR Model combines each of those steps into a framework you can use in your app to induce a new habit. The framework

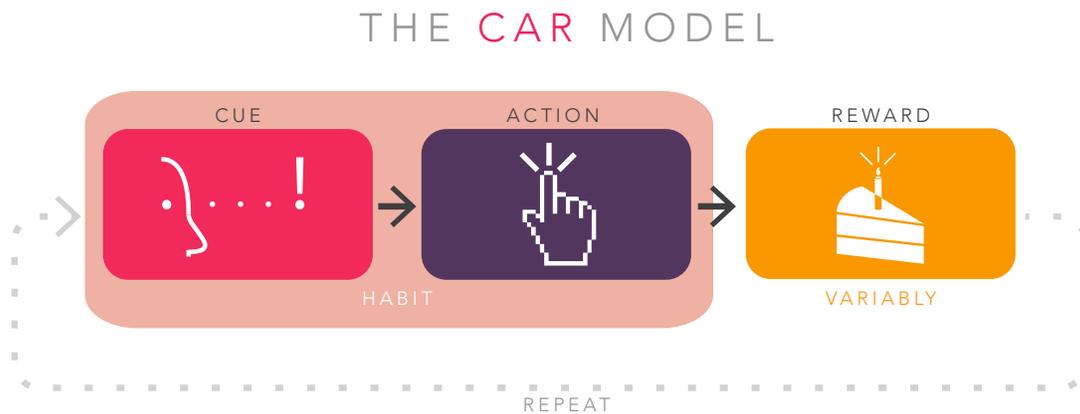
#### IN THIS CHAPTER:

The CAR Model

What are the 3 types of Cues?

What makes a good Action?

How do Rewards hack our habits?



prescribes thinking of the 'flow' of your Product or experience as having four sequential steps:

*Cue:* Something the user senses in their environment that they can learn to associate with an action.

*Action:* The key behavior you want a user to perform.

*Reward:* A delightful UX change that is shown to the user instead of the standard neutral feedback!<sup>37</sup>

If the cue → action pairing is the habit you want someone to perform, the feedback → reward is the *training* that your app gives their brain to learn that habit. It's the glue, so to speak, that holds the habit together.

Let's look more closely at each step of the CAR Model.

Figure 2: The CAR Model. Together, the **Cue** and **Action** constitute the **Habit** pairing, and the **Reward** pattern induces a habit to form. A habit forms as a neurological association between a specific Cue and a specific Action is learned from Reinforcement. The more surprising the Reward is, the faster and more effectively the Habit is formed.

<sup>37</sup> Something that gets the dopamine pumping!

## *C is for Cue*

AS INTRODUCED IN CHAPTER 1, a **Cue** is something experienced from our internal environment (our thoughts and feelings) or our external environment (something we sense) that causes us to take a particular action. In Behavioral Design, we identify three types of Cue: internal, external, and synthetic.

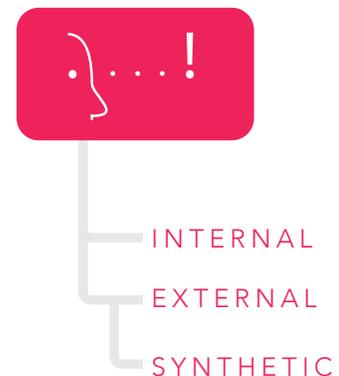


### *Internal Cues: Cues in Your Head*

An **internal cue** (sometimes called an “endogenous cue”) is something that people sense inside themselves; their internal feelings and thoughts. Internal cue can be feelings and thoughts like hunger, remembering that your favorite bakery is nearby, boredom, thinking about the taste of cinnamon, anxiety, or recalling someone you used to go out drinking with.

Unlike external cue, internal cue are ‘inner’ events that are private to a person’s brain. They have the same power as external cues to initiate a habit, and Behavioral Designers find some particular internal cues highly attractive to pair their Product with.

**A WORD OF CAUTION:** when a negative internal cue is paired to a behavior in your app, users may come to resent that behavior - and by extension - your app. As a Behavioral Design community, we’re seeing this happening right now with much of the cultural backlash against social media apps that have long sought to leverage negative emotions as cues for their use. Users refer to the behaviors linked to negative internal cues as “addictive”, “pointless”, or worse: “destructive.” Now, people are beginning to remove these apps and behavior from their life, and go out of their way to evangelize against these apps and how destructive they can be. This can be a toxic outcome for your Product. When you can, avoid associating your app with negative internal cues. It will backfire.



### *External Cues: Cues Around us*

An **external cue** is anything that someone senses from their immediate surroundings that causes them to perform a habit. When most people think of cues, they’re really thinking of external cues. The sight of a TV remote, the sound of police sirens, or the smell of fresh baked cookies are all external cues. Anything in a person’s environment can be an external cue, and each can cue a particular behavior.

For example, when some people smell cigarette smoke, it may cue them to smoke even if they didn't particularly want a cigarette. Here, the presence of the cue in their environment did not force or coerce them to smoke. Rather, it persuaded them to smoke. It raised the probability that they'd perform the behavior by leveraging a learned association between smelling smoke and the act of smoking a cigarette.

### *Synthetic Cues: Cues You Control*

**Synthetic Cues** are cues that have been intentionally constructed by a Behavioral Designer to cue a particular action. These cues are of special interest to you and your team because, as Behavioral Designers, you control them. *That said, you cannot treat synthetic cues created by another Behavioral Designer like synthetic cues because you can't control them (the other Designer does): to you and your app, they're just external cues in your user's environment.*

For example, the particular branded color red on a Coke machine, the 'M' of McDonalds, or the distinctive smell of Cinnabon are synthetic cues by the Design Teams that control them. Each of these were intentionally designed and paired to specific consumption actions.

The dramatic increase in smartphone usage and the omnipresence of mobile technology provides Behavioral Designers with a new powerful set of tools for designing and implementing synthetic cues for their users. Our always-on mobile devices and Push Notifications are a powerful way to remotely (and dynamically) present synthetic cues to users to prompt them to perform certain actions.

**NOTIFICATIONS ARE EASY TO SEND:** the hard part is sending the right ones at the right time. If you send a user a notification, and they don't perform the target behavior, the neurological linkage between the cue and the action actively becomes weaker.

Through our experiences, we've learned that there are three main reasons certain Synthetic cues fail: (1) the user doesn't understand what they're supposed to do when presented with the cue, (2) they don't have the ability to do what they are supposed to do, or (3) they aren't motivated to do the behavior.

If you can discover *why* someone didn't respond to a synthetic cue, you can change the cue to be more effective. That's the biggest strength of a synthetic cue; you can change it!

What cues do you present to users? How do you control when and how you show them to users? Are they adequately motivated? Do they understand what specific actions you want them to take?

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## *A is for Action*

The **action** is the specific behavior you want someone to perform more often. It's what people will do automatically when they experience your synthetic cue.

Dr. BJ Fogg of Stanford University's Persuasion Lab, one of the leading academic voices in Behavioral Design, promotes a model of understanding whether or not a user will act. His MAT Model<sup>38</sup> suggests that users perform a habit when they have adequate **[M]otivation**, **[A]bility**, and in the presence of a Synthetic **[T]rigger**.



<sup>38</sup> Dr. Fogg's MAT Model, online

As a Behavioral Designer, you need to balance how motivated a user is against how difficult a task is. If an action is too hard, the user won't do it. If the action is too easy, then you've wasted the user's motivational potential. They were ready to do something hard, but you didn't ask enough from them. Ideally, your product should present a synthetic cue for an action that someone is *able* to perform *when* they're motivated to act.

Some Actions are easier to turn into user habits than others. When we at Boundless Mind help our clients identify what actions inside their app would be best to turn into a habit, we use the following criteria:

### 1. SMALL ACTIONS ARE BETTER THAN LARGE ACTIONS

Favor a short action that can be quickly accomplished over something that takes a lot of time, rigour, focus, energy, or other scarce resources. The user is almost always busy. They have time for your app - and your habit - so long as it could already fit into their life.

### 2. SPECIFIC ACTIONS ARE BETTER THAN GENERAL, LARGER BEHAVIORS

"Walk for 10 minutes" is a more specific action than "move more". Maybe this past New Years you heard someone resolve to "get in shape" with no more specific plan than that? People often have a hard time building habits out of general goals like "get in shape", but "go to the gym before work on Tuesdays and Thursdays" is just specific enough to develop a mental association - a habit. **When identifying which actions in your app you want to turn into a user habit, favor specific, well-described actions over abstract, nebulous, or open-ended actions.**

What user behaviors in your app lend themselves well to becoming a habit? What small, specific actions do users take (that are good for them and good for your business metrics) that they should do more often?

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### 3. MAKE SURE THE PERSON IS CAPABLE OF ACTUALLY DOING THE ACTION

Favor actions that you're certain the user is capable of performing. A good understanding of your target users will guide you towards the actions that are reasonable to ask for, and help you avoid those which might be too difficult or too intense.

### 4. PICK ACTIONS THAT ARE GOOD FOR PEOPLE. PERIOD.

Pick actions that align well with a person's personal aspirations, goals, and definition of a life truly well-lived. They're entrusting their mind to you. As an app publisher, and one equipped with Behavioral Design, you're the closest our world has to a wizard. Use your power for good. Period. Failure to do so not only builds a world worse off for all of us, it will hurt your business in the long-run.

Recently, Behavioral Design and Persuasive AI have received increasing public scrutiny. This increased transparency about these techniques means users are increasingly well-equipped to expose apps using these techniques for nefarious or otherwise self-serving purposes poorly aligned with their users' needs. They'll call you out. If there are any doubts in your head about whether or not your app's actions are actually good for people, we advise two starting points: Nicomachean Ethics<sup>39</sup> for the ethics gut-check, and Gates Notes<sup>40,41</sup> for a checklist of the outstanding challenges to human flourishing that still need to be passionately addressed. Go build a solution for one of them. Please.

## *R is for Reward*

When the feedback we receive as the consequence of our actions is unexpectedly delightful (ie: not only was it pleasant; we didn't see it coming!), we consider it **rewarding**. The brain's *Habit System*<sup>42</sup> activates and we become more likely to perform that action again in the future. The surprising and delightful reward we received for our behavior reinforces that cue→action pairing, and increases our chances of doing it again: it's the glue that locks the new habit in your mind.

When our actions have unexpectedly positive consequences, specific brain regions<sup>43</sup> becomes active and release the neurotransmitter dopamine into our Habit System. The dopamine molecule causes neuron-to-neuron connections in our Habit System

<sup>39</sup> Aristotle. *The Nicomachean Ethics*

<sup>40</sup> Bill Gates. Gates notes. URL <https://www.gatesnotes.com/>

<sup>41</sup> *Gates Notes* has an expansive perspective on the problems worth solving



<sup>42</sup> The *Habit System* is a more colloquial term describing the *Basal Ganglia*, a set of brain structures involved in behavioral control and habits.

<sup>43</sup> the *Substantia Nigra* and the *Ventral Tegmental Area*

to associate the particular cue we experienced with the action we just performed. In this sense, the dopamine molecule is responsible for two things: putting a smile on the user's face, and inducing them to be more likely to do that behavior again.

Any time you've cracked a smile in response to something delightful and surprising that's happened on your phone? That's dopamine.

Feels great, doesn't it?

Behind the smile and under the neurological hood, the dopamine molecule is actively strengthening the connections between the neurons that detected the cue, and the neurons that activate and cause a user to perform the action that yielded an unexpectedly awesome outcome to happen.

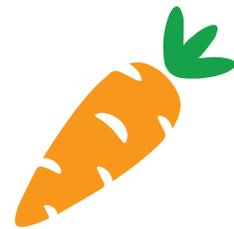
### *Become an Expert: Hacking Habits*

Through our work at Boundless Mind, we've learned a lot about how Product Teams think about habits and behavior change. There are there big misconceptions we often hear, so here's what you can get right:

1. **TRUTH: OUR BRAINS ONLY BUILD HABITS FROM POSITIVE CONSEQUENCES.** Our brains keep a record of our experiences: memory. And habits are a form of memory: they're a record of what's happened to us previously to help us determine what actions we should do more often in the future.

Certainly, the brain has systems for understanding punishment. And certain types of punishments can change behavior really fast<sup>44</sup>. But when we look inside the Habit System's neural wiring, we find that it contains many more direct connections from brain regions responsible for recognizing the positive consequences of our actions, than from regions detecting negative consequences.

By and large, the brain is not wired to associate punishments with long-term behavior change and habits. This is part of why parenting techniques focused on punishment often fail to raise good-natured kids. It's why incarceration alone often fails to change people's habits (but rehabilitation and therapy does), and why shame or punishment for people suffering from addiction is ineffective at breaking addiction. The brain *just isn't wired* for negativity to impact our habits.



<sup>44</sup> Remember that one food or drink you just CAN'T have anymore because of that one time it made you *reaaaally* sick? Yeah. That's the kind of one-shot learning the brain's good at for punishment. What behaviorists call *aversion learning*.

It is, however, strongly wired for positive consequences - for reward - to shape us.

2. TRUTH: THE POSITIVE CONSEQUENCES HAVE TO BE UNPREDICTABLE. The brain's dopamine-producing neurons become active and release dopamine into the habit system when we experience something unexpectedly pleasant. Pleasant alone doesn't cut it: the system only becomes active when it's both pleasant *and surprising*. The brain regions that create dopamine and connect to our habit system only become active when we experience a positive consequence when we did not expect to.

While many have an intuition that positivity is what shapes our behavior, what many misunderstand is that it is the *unpredictability of the positivity* that actually activates the brain's behavior change machinery - not just the positivity alone. In this sense, our job as Behavioral Designers<sup>45</sup> is to optimize for unpredictability, not just maximum positivity (we'll go more into why this is the case in Chapter 3.)

<sup>45</sup> and what we offer as an out-of-the-box SaaS solution at [Boundless Mind](#).

3. TRUTH: UNPREDICTABILITY IS MOSTLY ABOUT PATTERN. The brain's predictions about how good the consequence of a behavior will be are less about what the positive consequence will be, and more about when the positive consequence happens. Will it happen this time? Next time? Next week? When am I going to get it next?! That's what the brain's trying to solve, and that's what activates dopamine to be released into the Habit System.

Carefully controlling the pattern of consequences over time (ie: the pattern of when they are neutral vs. when they are positive) is the most effective intervention a Behavioral Designer can make to inducing a habit. This was one of the key insights of pioneering Behaviorist Dr. BF Skinner: the schedule (pattern over time) of positive consequences controls the future frequency of a behavior.

IN CHAPTER 3, LET'S DIVE INTO WHY that's the case and what your team needs to do to start using reward to drive user behavior!

## Chapter 3: Focus: Variable Reward and Reinforcement

*“What we’ve learned is that it’s the cue and the reward that really determine why a habit unfolds... the reward is actually the most important part.”*

*- Charles Duhigg*

IN CHAPTER 2 WE OUTLINED THE CUE-ACTION-REWARD MODEL (CAR MODEL), a proven design framework for inducing user habits that drive continued engagement and retention. Here in Chapter 3, we dive into the crux of the CAR Model: **reward** and **reinforcement**.

We’ll explore why reward and reinforcement are so important to user engagement, clear up some common misconceptions, review advice from experts about different types of rewards your team can use, and explore how your team can get started.

### *Why Reward?*

To the Behavioral Designer, “reward” doesn’t just mean some prize earned. “Reward” is broader than a gift or a bonus or a thing we can measure in dollars. As Behavioral scientists and Behavioral Designers use the word, **‘reward’ is any pleasurable positive experience that’s the consequence of an Action.**

Reward, when done properly, is one of the strongest motivating tools in the Behavioral Design Toolkit. That’s why we focused on it so heavily here in this book! Compared to every other technique available to us as Behavioral Designers, positive reinforcement induces long-term behavioral change faster and more effectively than any other technique you and your team could use. For the time it takes to use compared to the business impact you can realize from it, it’s the best first strategy your team can implement to drive the performance indicators that matter the most to you.

In video games, players are often rewarded with experience points, new items, or status. In our professional work, reward comes as

### IN THIS CHAPTER:

Why do Rewards matter?

What’s the science of Rewards?

How can I use them to lift my KPIs?



*“Positive reinforcement induces long-term behavior change better than any other BD tech.”* 

the satisfaction of a task well-completed, or the unexpected praise of our peers and managers. The molecular structures of addictive drugs ‘short-circuit’ the brain’s otherwise normal reward circuitry to artificially induce a sense of pleasure, and induce a habit of seeking and taking those drugs.

REWARD IS HOW THE BRAIN LEARNS what actions we should keep doing more in the future. Should we keep jogging in the morning before work? Should we continue to eat well and log our diet? Keep playing this game? Watch another episode? Scroll social media for another 5 minutes? Make a loan payment early?

These are all learned behaviors, and reward is how we learned them. The congratulations from our apps, bonus points, approval of our peers, hilarious episodes, and cat memes all taught our brain - largely unconsciously - to keep doing these behaviors. All these rewards programmed new habits.

In a very real sense, we’re wired for reward.

It’s the signal our brains need to learn what to do in the future. It, in combination with our genes, is what shaped us all into the people we are today. A lifetime of small, daily reinforcement for certain actions has, over time, given rise to our minds.<sup>46</sup>

And now, as Behavioral Designers, we have the chance to decide what will reward people tomorrow.

### *The Neurology of Reward*

As we mentioned in Chapter 2, a reward only increases someone’s behavior when it’s unexpected. *What do we mean? Why’s this true? And how do we know?*

### *Wirehead Rats and Slot-Machine Pigeons*

The research of three men, **Drs. James Olds** and **Peter Milner** of McGill University, and **Burrus Fredrick (BF) Skinner** at Harvard, ushered in **Behaviorism**: a scientific paradigm for understanding behavior that focuses on the importance of reflexes and how experiences shape our behavior. Behavioral Design rests on much of their pioneering work.

Skinner was fascinated with how experience shapes behavior. To explore the relationship between our behavior and its consequences, he needed a way to carefully control an animal’s environment - and make specific small changes to it. Skinner built a small box that would fit a bird. The box had a small lightbulb that could turn on

*What should feel better than expected? What behaviors do people really want in their lives? And how can we use reward to help them adopt those behaviors as habits?*



<sup>46</sup> Much of our tastes, our beliefs, our proclivities *are habits*.



Figure 3: Drs. Skinner, Olds, and Milner.

(a synthetic cue), a button that would click loudly if pecked at (an action with feedback), and a dish that could dispense a food pellet (a reward). This clever device, the **operant chamber**, is what we've come to know as a "Skinner Box."

When the light came on (cue), a bird would peck at the button (action) and the button would click (feedback). At first birds did this merely by chance. But as food pellets (reward) began being released after some pecks - unexpectedly - the birds quickly learned. Some birds got a pellet every peck. Some got pellets very rarely. Some, in between. Some got a pellet every few minutes, some got a pellet at random times. Some got a pellet after every 3rd peck. Some got a pellet after a random number of pecks.

SKINNER NOTICED SOMETHING FASCINATING. Some birds started pecking much, much more than others.

The pellets were all the same. The birds were largely similar to one another. So what accounts for the difference? He found that the *pattern of peck  $\Rightarrow$  pellet or peck  $\Rightarrow$  no-pellet*<sup>47</sup> was changing their pecking. The birds that received pellets after a seemingly random number of pecks (what he called a **Variable Ratio reinforcement schedule**) learned to associate the synthetic cue light with the button-peck action much faster than any of the other groups of birds. And they pecked much, much more. Their future pecking was being actively programmed by the consequences of their actions (over which he held control.) Not only did Skinner have evidence that behavior is shaped by reward, he found that the pattern of reward - when and how it's given - was critical to shaping behavior.

A few years earlier at McGill University, Drs. Olds and Milner took a more direct approach to shaping behavior. They skipped the taste-buds entirely and instead placed electrodes directly into rats' brains.<sup>48</sup> Electrical stimulation in the *Septum* brain region would cause the emotional sensation of pleasure for the rats. Then they gave the rats a small lever they could push. That lever would send a burst of electricity to the *Septum*.

AND MAN, THE RAT'S LOVED THAT LEVER. In fact, the rats would press it hundreds of times an hour. Sometimes even thousands of times an hour. Often, the rats would only stop pushing the lever because of sheer physical exhaustion, dehydration, or near-starvation.

Old's & Millner's findings were revolutionary. It provided a neurological link between behavior and pleasure. A framework for understanding not just how the brain's pleasure centers functioned, but what relationship they had to shaping our behavior.

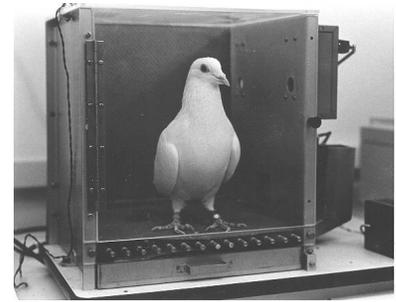
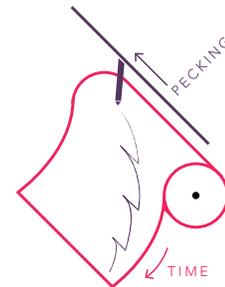
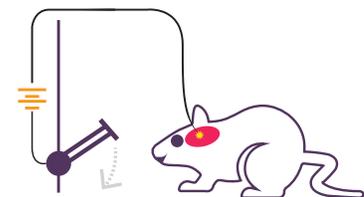


Figure 4: One of Skinner's pigeons in an operant chamber.



<sup>47</sup> He called these 'schedules of reinforcement'

<sup>48</sup> Specifically, they placed the electrodes into a brain region known as the **Septum** (located immediately beneath the Basal Ganglia's main pleasure center).



Building off their work, later anatomists and behaviorists revealed that those brain regions Olds and Milner explored naturally received stimulation from other structures in the brainstem<sup>49</sup> that produced the neurotransmitter, dopamine.

Researchers have since shown that the *Substantia Nigra* releases dopamine into our habit system when the consequences of our actions were better than expected, and that the role of the dopamine molecule was to increase the association between the neurons responsible for recognizing a cue and those responsible for producing an action.

Taken together, the work of Olds, Milner, and Skinner form the basis for our modern understanding of how the consequences of our behavior shape our future habits. For how pleasure - especially pleasure we don't expect - controls what we'll do in the future. And it provides a framework for us, as Behavioral Designers, to understand how and why rewards shape how people behave.

### *Types of Rewards*

The pioneering research on how reward shapes behavior provides some drastic examples. Olds and Milner implanted electrodes directly into a rat's Habit System. Skinner's pigeons were kept in a state of sharp hunger before receiving food pellets. These seem pretty far off from the types of rewards that we see in apps, such as Social Media 'likes', or bonus points in games, right?

Beyond the "**primary reinforcers**"<sup>50</sup> that Behaviorists discuss, there are "**secondary reinforcers**": everything else we've come to love and find pleasurable because we've learned to mentally associate them with primary reinforcers.

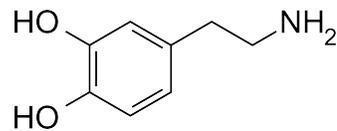
As a Behavioral Designer, you'll almost exclusively work with secondary reinforcers. So, what secondary reinforcers do teams like yours commonly use?

Our good friend and fellow Behavioral Designer, Nir Eyal, has outlined three categories of rewards that apps most commonly use to delight their users: **Rewards of the Self**, **Rewards of the Hunt**, and **Rewards of the Tribe**. Let's explore each, and how your app might use these within the CAR Model to lift user engagement.

#### REWARDS OF THE SELF

**Rewards of the Self** satisfy our desire for self-mastery and proficiency. As Nir outlines, the core driver underneath these

<sup>49</sup> namely, the *Substantia Nigra*



<sup>50</sup> food, water, sex: the basics for which an individual and the species do not survive without

rewards are the feelings of satisfaction associated with being the best, aspirational versions of ourselves. It's the deeply satisfying reward of doing our best. Pushing ourselves. Accomplishing our goals. Finishing that hard project. Getting to Inbox Zero.

Apps often use Reward of the Self seen as positive praise or encouragement after completing an action.<sup>51</sup> Inside your own app, how might you use Rewards of Self to praise or congratulate users for small accomplishments of self mastery? Would that kind of reward fit in with your UX and the types of actions you need your users to turn into a habit?

#### REWARDS OF THE HUNT

**Rewards of the Hunt** satisfy our desire for conquest. The gains of victory. These tie closely to the primary reinforcers that our brains evolved because they most closely mimic reality (hence, the name Hunt.)

Behavioral Designers often use Rewards of the Hunt in games, in settings with competition, and (surprisingly), in situations where the next blast of dopamine might be just a few swipes away.<sup>52</sup>

Do the user actions in your app have an obvious component of competition? Do users *seek* inside your app? Are the core behaviors you need to increase part of a game? Part of a chase? If so, what sort of Reward of the Hunt can you implement to surprise and delight them?

#### REWARDS OF THE TRIBE

**Rewards of the Tribe** satisfy our desire for belonging. To matter to a place and to a people. The approval of our friends and lovers. Status, and the pleasure of being known. These rewards are what glue us into social behaviors and into society itself.

We experience Rewards of the Tribe daily in the Social Media apps we use. Likes. Comments. Approval. Praise. The little hearts and thumbs-up that have become the literal symbols of affection.

If your app has a social component, how might you best leverage these ties to drive user behavior? Can the presence of a user's peers or friends be used as a reward element for them when they complete your key action?

As a Behavioral Designer seeking to use the CAR Model, the Rewards of the Self, Hunt, and Tribe are your building-blocks for delighting your users.



<sup>51</sup> If you use Asana, read [this great blog post](#) about how to turn on rewards of the Self inside a secret feature in Asana!



<sup>52</sup> We're looking at you, Tinder.



## *De-mystifying Dopamine*

Somewhere in the 60 years since Skinner's and Olds & Milner's pioneering work, we developed a cultural fascination with<sup>53</sup> dopamine and how to think about reinforcement<sup>54</sup>.

At Boundless Mind, we've helped partners challenge some false beliefs: that rewards are just for games, that rewards are the same as incentives, and that more rewards must be better than less. Here's the expert knowledge you and your team need to get rewards right:

### 1. REWARDS ARE FOR MORE THAN GAMES.

Is your app a game? Great! Is it not a game? Great!<sup>55</sup> The brain doesn't care - reward (broadly defined) will still drive user engagement.

Any app that wants to lift engagement and retention can do so by implementing the CAR Model because the brain responds to positive reinforcement whether or not it comes from a game or not. The CAR Model recognizes that rewards can be anything positive that a user experiences.

Rewards don't need to be points, or badges, or power-ups. Any positive experience that can happen to a user is a reward. It doesn't matter if it's a funny GIF, some positive encouragement, an on-screen explosion of confetti, verbal praise, a delightful tone and vibration, or the social praise of their peers. As long as it puts a smile on someone's face, it's activating the brain's Habit System. It will cause users to release dopamine, and it will increase their future chance of performing that action again.

### 2. REWARDS ARE **NOT** INCENTIVES.

A reward is the *immediate* positive consequence of an action. An incentive is the promise of a *delayed future* consequence of an action performed today. A high-five at the gym? Reward. A end-of-quarter sales bonus? Incentive. A scoop of ice-cream after studying hard? Reward. "I'll buy you a Playstation if you bring home good grades?" Incentive.<sup>56</sup>

People casually use these two words interchangeably. Why not? They seem similar enough, right? That positive stuff that makes me feel motivated? Sure. The reality is that the brain treats reinforcement and incentive very differently. And respecting the difference will be critical for your team's success.

<sup>53</sup> and some misunderstandings about

<sup>54</sup> Admittedly, the gamification fad certainly didn't help

<sup>55</sup> One of the most common questions that our team at [Boundless Mind](#) gets from new potential partners is "My app isn't a game. How can it have rewards?"

*"Anything that puts a smile on your face is a reward, and therefore, habit-forming."* 

<sup>56</sup> Guess which works better for inducing a habit behavior? Hint: this chapter isn't titled 'Incentive.'

Rewards directly activate our brain's Habit System via the dopamine molecule. Incentives, on the other hand, activate the brain's critical thinking machinery: the parts of our brains responsible for making thorough, deliberate, quality decisions.<sup>57</sup> Incentives require planning and value-based reasoning. They require us to mentally calculate whether or not the effort today (and tomorrow and the day after) might be more valuable than the future incentive.

On top of that, those brain regions responsible for slow, deliberate, value-based reasoning have fewer and weaker connections to our Habit System than do the regions responsible for reward. *Incentives might help us better understand the value of our time and work, but rewards immediately rewire us to keep going.*

### 3. MORE REWARDS ARE NOT BETTER REWARDS.

If some rewards are good, more rewards must be better... right?! This feels intuitive. But our brains respond to reward in very non-intuitive ways.

Because of how the brain's habit system works, more rewards aren't more effective than fewer rewards. Rather, it's a user's surprise from a reward that makes a reward more effective. Surprising rewards are more effective than unsurprising rewards. So what determines the surprise of a reward?

TO A FIRST APPROXIMATION, surprise can be thought of as the actual size of the reward MINUS the expected size of the reward.

For example: if you deliver a reward every time someone performs an action, the reward becomes perfectly predictable. The user always expects the reward, and then receives it. Every time. There's no difference between their expectations and reality. This situation literally fails to activate the brain's Habit System. However: If you manage to reward a user when she doesn't see it coming (the real size is nominal - it's just a cat GIF - but her brain's expectation of reward is zero), it will be *very reinforcing* and will activate the brain's Habit System. She becomes slightly rewired to do the action that just unexpectedly caused a cat GIF. If this scenario sound silly; you're right. It is. But we've tested it and proven it true. Even cat GIFs can be used - very carefully - to drive real behavior change.

<sup>57</sup> Daniel Kahneman. *Thinking, fast and slow*. Macmillan, 2011

What rewards would make sense in your app? For the action you've identified, how might you best surprise and delight your users when they do that action?

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*"An expected reward quickly stops being rewarding, and stops forming habits."* 

### *Getting Started in Your App*

So far, you've identified the actions in your app that you want users to build a habit out of. Now, we've introduced how to think about rewards.

The two questions in front of you now are (1) what rewards would it make sense for you and your team to build into your app, and (2) how will you optimize when and how you give users those rewards to maximize surprise and their efficacy.

Eyal's Three Types of Rewards that we covered above (Self, Hunt, and Tribe) are great conceptual frameworks for getting started in your app! If you're looking for real-world examples that teams have seen success with in the past, we offer some of our [Case Studies free online at Boundless.AI](#). There you'll find several examples of how teams have successfully used the CAR Model to drive outcomes that mattered to them.

ONCE YOU HAVE YOUR REWARDS DESIGNED, you next will need an optimization policy. Remember: what your team wants to optimize for is not *maximum rewards*, but *maximally surprising rewards*. If this sounds mathematically daunting, we're here to help. [Reach out to us](#) and we'll lend a hand.

## Chapter 4: The Business of Habits

***“Not only do we construct our own society, but we accept it as it is because others have created it before us. Society is, in fact, ‘habit.’”***

*- William Little*

WE’VE INTRODUCED BEHAVIORAL DESIGN, and focused in on habits: learned, automatic patterns of behavior that we can design and activate in users. We’ve explored the CAR Model, and how your product can use positive reinforcement to increase user engagement and retention. Now, let’s explore the business case for habits, and how your team can architecture itself to build habit-forming products. We explore why, of all the tools in Behavioral Design, you and your Product team should care about habits first, and we review the benefits you can realize for building a habit-forming product.

### *Autopilot*

OUR LIVES ARE DEFINED BY HABITS. Your daily patterns of behavior: your morning routine, your diet, the route you take to work, and how you drive. How you treat your coworkers and friends. The websites you frequent and the level of care and attentiveness with which you do your work. Your drink of choice after a long day, how you blow off steam, and your connection to yourself and your loved ones.

Habits. Automatic behaviors that you’ve learned over time from experience.

Much of our daily behavior and the decisions we make are run by our brain’s autopilot and our Habit System.<sup>58</sup> They’re automatic decision making systems that allow us to expend precious mental resources elsewhere while we “zone-out” for much of our own

#### IN THIS CHAPTER:

Why do habits drive business success?

What business metrics do habits affect?

How will I know if habits are helping my business?

<sup>58</sup> Daniel Kahneman. *Thinking, fast and slow*. Macmillan, 2011

behavior. You learned all those habits listed above. They were programmed, either implicitly from the structure of reality, or explicitly by advertisers, marketers, and Behavioral Designers.<sup>59</sup>

<sup>59</sup> And where they were programmed, someone is making a fortune.

The gas station you always use on your way to work. Your radio station presets. Your Starbucks habit. The websites you frequent to procrastinate. The brand of drink you reach for. The bar you visit after work. Netflix. All of these places and brands and apps intentionally go out of their way to become a daily part of your routines. To be another waypoint for your neurological autopilot.

### *Become an Expert: A Simple Field Experiment*

Conduct a little field research of your own, you burgeoning scientist you. Pay attention to what happens next time you step into an elevator with other people in it.

As the elevator begins to fill with people, notice as something inevitably happens: people get their phones out. Not because someone ringed or they received a message, but because they're slightly uncomfortable jammed in there with strangers. We're willing to bet they pull out a small escape: their smartphones. Crisis averted.

What apps do they open? Where to does their attention go?

We'll hazard a guess: it's social media.

Over the past few years, social media apps have fought to be the default action people take when seeking to escape. To temporarily release from anxiety, stress, boredom, or loneliness. Social Media has successfully used the CAR Model to associate our negative emotional internal cues with the action of opening their apps. So when people experience these feelings, these apps are programmed defaults. Social media has successfully programmed an autopilot response for the masses. Temporarily feeling the itch of the Human Condition? There's an app for that. While there are serious incentive and ethical alignment problems with this practice, it's nevertheless been an extremely lucrative Behavioral Design pattern.

And the same things that worked for them will work for you. CAR didn't work for them because they had a lot of money or because of the unique properties of their app. *CAR worked for them because it's a general operating principle of brains.* Your app is no exception. You can become a daily, ingrained part of how people operate when they aren't paying attention: when they're just going about using their default actions. Your product, using Behavioral Design, can be a

daily norm for people. Another of the apps and services and brands that are so quotidian to us that they've earned their own verb.

This is the business case for Behavioral Design: that your product can be part of our autopilots.

### *Tangible Gains: What to expect from using Behavioral Design*

What can you and your team expect from implementing Behavioral Design techniques? At **Boundless Mind**, our customers often see gains in 4 key performance indicators (KPIs) that matter to them: User engagement and its correlation with lifetime value, referrals and virality, loyalty as defined as retention, and conversion from non-paying to paying customers. Do these metrics sound familiar for you and your team?

#### *Engagement and Lifetime Value*

The Lifetime Value (LTV) of a user is measured as their cumulative value to your product during their time using your product. LTV is a critical KPI to measure if your product generates revenue through usage and retention - either via advertising, subscription, or recurring purchases.

High LTV not only grants you financial stability, it allows you invest more into user acquisition. That is to say: users that stay longer and earn you more allow you to increase your available budget for acquiring more users. Not only does the CAR Model maximize gains from your current users, it actively helps you grow your userbase. It fuels user growth and, in turn, your future LTV. To the extent that your product can use Behavioral Design to become habit-forming, you increase the frequency - and future probability - of usage: driving LTV and future business success.

#### *Referrals and Virality*

When your app employs Behavioral Design to induce habits, your users will do more than just return more often: they'll evangelize your product. As your app becomes a part of someone's daily life, they'll begin drawing their community into your product as they share their great new find. (This is especially critical if your app is a social media tool that requires a critical network density before becoming truly useful.)

Peer referrals are a great organic growth tool, and a leading signal of product-market fit. Tracking referrals as a KPI will give you



greater insight into how your Behavioral Design efforts are driving growth on both a per-user and between-user basis.

### *Loyalty and Retention*

To engineer a new habit is literally to engineer your future usage. To predictively design your future loyalty and retention. Teams that are taking Behavioral Design seriously and designing habit-forming apps are putting up a strong defense against others competing for their users' attention.

Engineering loyalty and retention can even allow you to temporarily weather other parts of your app that might hurt. For example, Snapchat (which its own creators have said is often confusing to use and difficult to master) has artfully tied itself to its users' internal cues using the CAR Model. Snapchat's strength is not in their user interface, but in the feelings its users get when sending snaps, applying new filters, or keeping a snap streak alive. Snapchat may have a subpar product by its own creators admission, but it's cleverly designed use of the CAR Model keeps its user retained and engaged nonetheless.

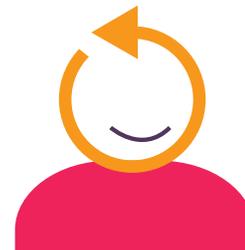
### *Conversions*

For some companies, forming a habit quickly determines whether or not users continue use past a free trial period.

Sound like anything on your phone that you've used? Or maybe even something you've built?

Smartphone apps with a "freemium" revenue model, in which users can use the service free for a while as a trial, often see only a slim minority of their free users continue use into a paid tier. In that free trial period, becoming ingrained as a default, a habit, is critical for driving business success.

As stated by Warren Buffet, "You can determine the strength of a business over time by the amount of agony they go through raising prices." Applying this logic to the freemium model, what we observe is that using Behavioral Design techniques to increase habit-formation boosts the probability that a user will convert into a paying customer - to raise price from free to paid with the highest chance that your users stick around to pay.



# Chapter 5: Getting Your Team Ready for Behavioral Design

***Ultimately, a company's value is just the sum of the decisions it makes and executes.***

*- Michael Mankins - HBR*

We've covered the foundations of Behavioral Design, how to apply it to your app, and what benefits you can expect. But how might you transform your Product or Marketing teams into the kinds of organizations that are culturally equipped to build habit-forming products?

At **Boundless Mind**, we've separated this goal in three levels of changes. Here we explore each - and what your team can do to put them in place today.

Level 1: The Basics

Level 2: The Best Practices

Level 3: The Revolution

## *Level 1: The Basics*

Before your team can start using Behavioral Design to its fullest, they need understand and value experimentation<sup>60</sup> and product iterations. *In Level 1, we discuss 4 milestones your team can reach, and solutions for achieving each.* If you can guide your team to embrace these ideas, you'll be well-equipped to use the techniques of Behavioral Design to reach your business goals.

### *Goal 1: Product Comes First*

First things first, the product itself should be its own priority, and your team dynamic needs to reflect that.

#### IN THIS CHAPTER:

What basics must an organization put in place?

Why do you need a Product Czarina?

What are Best Practices?

What does this look like at maturity?

<sup>60</sup> We've written more about [why a culture of experimentation is important on our blog](#).



WHO SPECIFICALLY IS RESPONSIBLE FOR YOUR PRODUCT?  
WHO'S RESPONSIBLE FOR ITS DESIGN? FOR MEASURING ITS  
PERFORMANCE? FOR DEFINING AND QUANTIFYING ITS BUSINESS  
SUCCESS?

If the answers to these questions aren't obvious, don't sweat: it's common for teams to have unclear answers here.

Often, product ownership is squeezed (staffing-wise) somewhere between teams responsible for Design, Engineering, and Marketing. What's challenging with that type of arrangement is that each of these teams has their own distinct needs and own definitions of success. In this arrangement, the Product is owned by many. Each team has its own champion, and it's own needs from the Product that don't necessarily need to overlap or align well. That means the actual product that ships is built to satisfy that committee. Often, this arrangement means that the entire Product is a compromise: no one team gets what they want, and the Product itself suffers. And because so many stakeholders sat at the table for poorly defining Product success, Product failure can quickly become a game of finger-pointing.

**STAFFING SOLUTION: YOU NEED A PRODUCT CZARINA.**

Appoint a Product Czarina with a mandate to make decisions about what the product is, and then allow her the responsibility and autonomy to run Product as her domain.

In doing this job right, she'll collaborate with the leads of other teams constantly. Ultimately, her job is to be accountable for the success of the product. She's the Product Owner, so to speak. She should have a strong background in design, technical development, and your core business. That unique background combination will help her balance what's technologically feasible, what's savvy from a product design perspective, and what's necessary for business success.

**MANAGEMENT SOLUTION: EMPOWER HER, AND HOLD HER ACCOUNTABLE**

The Product Czarina should be accountable for everything that happens inside the product, and have the authority to make changes to it. It is her domain. Grant her a budget for ensuring success: for the people she needs, for the tools she needs, and for the experiments her and the team need to run.

When hamstrung by budget or staffing, products are often forced into the implicit but misguided strategy of building services from



scratch instead of using off-the-shelf tested solutions. A judicious use of a specialty software and services can radically improve your product, and free her and her team to focus on the highest application of their talents on their core strengths and deliverables.

*Goal 2: Identify where the CAR Model fits in your app.*

Using the CAR Model as outlined in this book, identify the actions inside your app that lend themselves well towards becoming a habit. What actions do you need users performing daily? What can you provide them as a reward? Where do these drive business success? Knowing what repeatable, sequenced actions create value for both you and your users will center your design process.

**STAFFING SOLUTION: WHO NEEDS TO FIND YOUR APP'S HABITS?**

The Product Czarina should be responsible for identifying and documenting where and how the CAR Model fits inside your app. She'll use her existing expertise in Product Design, and her newly acquired knowledge of Behavioral Design, to recognize the natural alignment of your core user behaviors with the CAR Model, and delegate the ideation and design of Rewards to members of the Design or UX team.

**MANAGEMENT SOLUTION: INCORPORATE CAR INTO GOAL SETTING**

If your Design or Product Teams use user personas as a tool for thinking about who uses your app, extend your personas to include how they respond to the CAR Model. Any proposed feature updates should be checked against the documentation your Product Czarina created. If a proposed feature weakens or strengthens a habit, that should be raised at the next planning meeting.

*Goal 3: Track Engagement Metrics.*

We know. This sounds obvious. Strangely, a lot of teams *just don't do it*. Many have very little visibility into how people are actually using their app. This needs to be a pre-launch priority for every product. It's really the only way you can truly know how different features are succeeding or failing - and what to do about it!

We offer this functionality to our partners with **Boundless Mind**, but with a bit of wrangling, any analytics platform will help you monitor user engagement.

As we've covered in the last few chapters, human behavior (especially habits) operate in deeply un-intuitive ways. What might



seem like straightforward, intuitive design decisions can fall apart in Production. So it's critical not only to know how human behavior change works (the goal of this book), but to also monitor your user engagement statistics and use them to guide better product decisions.<sup>61</sup> After your organization is competent at monitoring those, it will be straightforward to monitor other key statistics as well.

<sup>61</sup> At a minimum, you should be tracking your daily/weekly/monthly active user count, one-week user retention, and average session count per user.

#### STAFFING SOLUTION: THE PRODUCT CZARINA IS RESPONSIBLE FOR KNOWING THESE METRICS

The Czarina defined Product success KPIs. It's not the Data Team's job to measure those KPIs: it's the Czarina's job. She should understand how the role of the product and user behavior drive business success. She doesn't need a hyper-specialized background in Data Science, Neuroscience, or Product Design, but she does need visibility into product performance, and a good feeling for how that performance drives business KPIs.

#### MANAGEMENT SOLUTION: SHE'S ULTIMATELY RESPONSIBLE FOR THOSE METRICS

We've visited more than a few companies that held mantras similar to "Engagement is Everyone's Job." In practice, this translates to "no one person will be held accountable for engagement metrics", which is obviously a recipe for disaster.

The Product Czarina's role success should be linked to your product's engagement statistics. Empower her with Engineering and Data Science resources to improve these number, and the autonomy to bring in vendors and service-providers who can help improve these statistics. Her compensation or continued position in that role should be linked to those metrics.

#### *Goal 4: Let the Right Metrics Guide Your Organization.*

Once your team has started monitoring and tracking different statistics, it's easy to accidentally define the wrong metrics to watch and optimize towards. The default measures built in to most analytics SaaS are almost always the wrong thing to optimize toward. With some research and training, you can learn to find the right metrics to chase.

#### STAFFING SOLUTION: FIND BEHAVIORISTS AND QUANTITATIVES

Two types of new team members will help you achieve this goal. First, you need someone with a specialist background in Product Psychology, Human Behavior, or a related field. This unique

background grants them the knowledge to know what patterns of user behavior are worth attending to. Second, you'll need someone with a rigorous quantitative background with an emphasis in statistics. This background grants them tools to properly measure and test user behavior - and avoid common but deadly pitfalls. Look for someone with an advanced background in statistics: economists and academic scientists often come well-prepared into these roles.

#### MANAGEMENT SOLUTION: MAKE METRICS MATTER

As part of whatever review process you currently use to make decisions and evaluate your future trajectory, add a discussion around the metrics you're now tracking, and how you knew to track them. Key discussion points may be questions like:

- "If I were to try to game this method, how would I do it?"
- "What would go wrong using this approach?"
- "This statistic is measuring some things, but what is not capturing?"

#### *Level 2: The Best Practices*

In Level 1, we laid out the basics needed to hire and organize a team that can make the most of Behavioral Design. In Level 2, we review the Best Practices for running that organization effectively.

#### *Goal 1: Measure How New Habits are Forming*

Now that your team is built to begin employing Behavioral Design techniques like the CAR Model, and your Product Czarina has identified where and how CAR will align daily user behavior with business success, it's time to take those behavioral statistics you're collecting and act on them. This takes your data collection initiatives from being descriptive to being predictive and preventative and - in turn - truly changing user behavior.

#### STAFFING SOLUTION: HIRE THE RIGHT PEOPLE TO ANALYZE BEHAVIOR

Your Product Czarina is responsible for user engagement, retention, and product success. These are her responsibilities, but that doesn't mean she needs to do the analysis or design work herself, per se. Either find the Data and Science Team members that can help her go from raw data to understanding, or consider how best you might facilitate her learning these analytical skills herself if they are not already her domain of expertise.



**MANAGEMENT SOLUTION: ENCOURAGE COLLABORATION**

Understanding the interaction between your design decisions, user behavior, and app performance requires coordinating the Data Science, Behavioral Science, and Product Teams to work together. Inside and outside their projects, take measures to foster cooperation and collaboration between these groups. Ultimately, they're responsible for designing the interventions, statistical collection, and analysis of user behavior that will guide business success. Your Czarina can use the metrics these teams generate together to evaluate how changes she's implemented have impacted business success, and how they should motivate future design decisions.

*Goal 2: Cultivate a Culture of Experimentation*

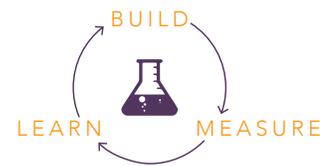
Experimentation is the fastest way your team can learn about your product and users. Experimentation isn't just something for scientists: every change you make to the product can be experimentally validated for how it helped - or hurt - your KPIs.

Developing a Culture of Experimentation, a work environment where people are informed, empowered, and rewarded for experimentation, is critical for success. As Management, it's your job to create the emotional and operational space that helps Product, Design, and Engineering Teams experiment. For them to be creative, take risks, and learn as they iterate. If you're using a Lean or Agile development methodology, much of this might feel intuitive. Tracking experimentation and tinkering as an internal performance metric can show you if you're succeeding in building a Culture that encourages people to experiment and learn, and forgives and understands when things go sideways.

**STAFFING SOLUTION: EVERYONE'S A SCIENTIST.**

Your team members don't need an advance scientific degree, nor do they need a vocabulary stuffed with big latin words. But they do need to understand how to build a quality experiment.

There are known, teachable ways to design and execute tests and experiments that yield validatable, repeatable results. Your team's job is to turn those results into Product insights that drive business success. There are also a lot of practices that look like experimentation, but lack quantifiability, rigour, or statistical validity. Rigour doesn't just earn you style points with nerds: it's literally the only way that you can truly know that your intervention is actually what caused a change in user behavior, and that the change you



saw was actually significant enough to pay attention to. Educating each of your team members in experimental design; the techniques and methods for setting up tests that yield strong descriptions and predictions, is critical to creating a Culture of Experimentation. You need an educated workforce.

MANAGEMENT SOLUTION: DEMAND EMPIRICISM. DEMAND IMPROVEMENT. ACCEPT "I DON'T KNOW".

By default, people don't like uncertainty or ambiguity. Neither do organization. Hierarchical organizations are designed to operate in environments of certainty. Where the right thing to do is known, it's the job of front line team members to do the right thing, and the job of managers to hold them accountable when they don't.<sup>62</sup>

When a culture of hierarchy is asked to operate under uncertainty, it develops pathologies. The most pathologies we see in organizations are HiPO<sup>63</sup> & butt-covering. "If the boss makes the product decision<sup>64</sup> we can't get in trouble if it goes badly."

ALTERNATIVELY, IN A CULTURE OF EXPERIMENTATION, every decision your team makes about your app can be tested. Can be statistically validated. Every decision can be experimentally proven to lift outcomes, or hurt them. Which means three really important things for your team to remember, and for management to consistently emphasize:

- No one knows everything
- With experimentation, anyone can learn something new
- Everything (and everyone) is constantly improving and that's important

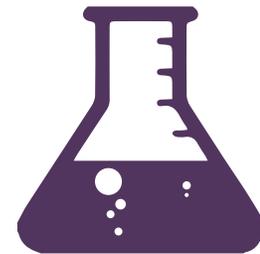
When your team is comfortable with these three philosophies, something amazing happens. People are free to say "I don't know" without losing professional credibility. Because in a Culture of Experimentation, "I don't know" really means "I don't know yet, but I can test something and find out." And that's a deeply liberating philosophy. It means that anyone - regardless of their seniority - can propose a new experiment to run if it looks like there are good data to back it, and the experiment is well formed. It also means everyone - regardless of their seniority - has to support their claims with data and facts. And everyone in the organization - and the Product itself - is constantly becoming a better version of themselves.

We know: this kind of change can seem daunting. It's very different from the way most organizations operate, and it can require

<sup>62</sup> think about how a McDonald's franchise operates. That's the environment command and control is built for. "Just follow the manual and you'll be fine."

<sup>63</sup> Highest Paid Officer

<sup>64</sup> even a clearly wrong decision!



some emotional labor on many team members parts to set aside ego and politics. *Good News!* You don't need a revolution in the office to use these new ideas: they don't need to be implemented overnight. Every time a team member admits that they don't know something, but can find out, you're closer. Every time a decision maker defers to the results of an experiment, or backs up her proposal with data, you are one step closer to embracing a Culture of Experimentation.

*Goal 3: Push Notifications are Owned by Product, not by Marketing.*

For historical reasons, Marketing and Messaging Teams often own responsibility for a Product's user retention. This is most common in teams that started after the advent of the Web, but before the rise of Mobile. Before Mobile, these teams used email to re-engage lost users, or market new products to retained users. When Push Notifications came out, it seemed like a natural fit: Push Notifications were just re-engagement emails, but faster. So the same Messaging and Marketing Teams became responsible for designing and sending Push Notifications, and by extension, user retention.

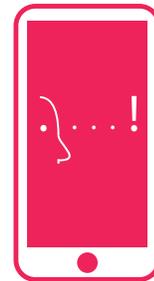
We understand how this came to be, we just think it's a terrible setup. This turned Push Notifications into a channel for spam. Spam that just happened to be closer to users' brains. It created the Push-overload world we live in today. It explains why Push are just often treated as smaller crappier advertisements, instead of thought of as cues.

We believe it makes more sustainable sense to think of Push Notifications as an extension of the Product, not as an extension of email marketing.

#### MANAGEMENT SOLUTION 1: THE PRODUCT CZARINA OWNS PUSH

Shift the responsibility for Push Notifications to the Product Team and away from the Marketing Team. The most straightforward way to partially accomplish this would be to reorganize the Messaging Team away from Marketing and into to the Product Team. Admittedly, this can create some friction because your Push Notifications are likely being designed and sent using 3rd-party software designed for marketers, and paid for using the marketing budget. However, if you've followed the Solutions in Level 1 about empowering the Product Czarina with purchasing autonomy for software that can help her do her job well, she should have room to bring this new tool into her SaaS budget.

#### MANAGEMENT SOLUTION 2: PRODUCT HAS GODLIKE RIGHTS OVER



## PUSH

If reorganizing Messaging Teams into Product isn't an option, an alternative is to empower the Product Team to have emergency authority over Push. Let the Marketing or Messaging Team continue with business as usual, but give Product the authority to send Pushes as needed, *and* to prevent a Push Notification from being shown to a user. For example: the Product Team could decide to not display a Notification to someone if the user is already meeting the engagement goals.<sup>65</sup>

### *Goal 4: Rollout Experiments Regularly*

Often, new feature rollouts are run by the Engineering Team. When this is true, the primary success criteria trend towards “did anything break?” If nothing broke, they continue the rollout and once the rollout is complete, everyone gets to work on the next feature.

A more optimal way to do this is to empower the Product Team with rollout authority. The goal shouldn't just be looking to see if anything breaks, but to monitor how key performance indicators like engagement and retention change in small user cohorts that receive the new feature first.

### MANAGEMENT SOLUTION: SEGMENT. DEPLOY. MEASURE. SCALE.

Now that the Czarina and her Team are empowered to rollout new features, she can use a phased strategy for how experiments are run. We recommend segmenting a portion of your userbase to conduct a rollout experiment. Deploy the new changes to that segment. Measure how user behavior KPIs are changing over time, and how these changes are different between the whole userbase and the experimental segment (or, between a control group and a treatment group in the experimental segment). If she sees statistically significant changes in user behavior that correlate with the change (and no other modifications, nor chance), that's a signal that the intervention is working as designed! She should feel empowered scaling out the deployed change to the entire user population.

Repeat! Often! If the measured behavioral KPIs aren't changing, or are changing in ways that suggest they're hurting engagement and retention, she can roll back the deployment, document what happened, explore root causes, and return again with a different experiment. No harm done: something extremely valuable was learned.

<sup>65</sup> As of the writing of this book, we're developing an AI solution to help organizations coordinate between the goals of the Messaging Team and the Product Team in a way that prioritizes habit formation over advertising. [Click here to register as a beta user or hear about new product launches.](#)

### KEY TERMS

*Rollout* Deploying a new app version or feature to progressively more users over time. A Rollout gives time for new behavioral problems to surface.

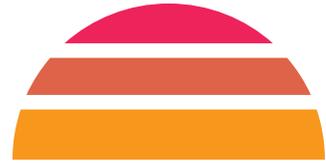
*Segment* A portion of your userbase. They may be a random sample of your who user base or a some other representative sample. Teams often conduct experiences on a Segment of all New Zealand users.

*Segmenting* The process of selecting a segment.

*Deploy* Making a new feature available to user (maybe all of them). A feature may be selectively deployed by using a central server to control which users experience the new feature.

### *Level 3: The Revolution*

LEVEL 3 DESCRIBES WHAT A FIRM using Behavioral Design looks like at maturity. With the Basics mastered and the Best Practices in place, your organization may start feeling very different than it does today. The Revolution comes when you're able to predict engagement ahead of an experimental change, when you begin optimizing your Behavioral Design processes, and when you begin behaving like a "Behavior First" company.

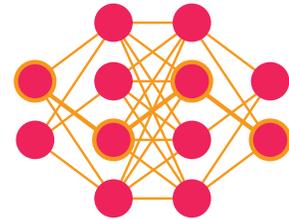


#### *Goal 1: Predict Measures of User Engagement*

In Level 3, your organization can go beyond monitoring how user behavior changes from interventions and start predicting how different interventions will impact your KPIs.

#### STAFFING SOLUTION: HIRE POLYMATHS

As you've progressed through Levels 1 and 2, you've not only reorganized your teams to grant the Product Team the space and control it needs. Now, you can staff up on the types of experts trained in the science of human behavior and data. Ideally, these people have a background in some combination of Artificial Intelligence, Machine Learning, Psychology, and Neuroscience. These team members are hard won because their skill sets each have steep learning curves, and it's uncommon to find people trained in several of these fields at once.



It's critical to find people trained in both human behavior and AI (or at least foster collaboration between people trained in each) because their intersectional skillsets train them in what to look for. In AI, the job of *Feature Engineering* figuring out what to measure and how to measure it such that a machine can learn something meaningful from it, requires a deep understanding of the specific field you're trying to explore. It's one of the hardest tasks in AI Engineering, but critical for learning anything at all.

For example, a psychologist trained in AI (or an AI engineer trained in psychology) understands both human behavior and how to build machines that learn. Her knowledge of human behavior means she knows what to train a thinking machine to find, and how to train it. Her *domain knowledge* of psychology helps her ask the right questions using AI, and ask those questions in a way the AI can understand.

## MANAGEMENT SOLUTION: CUT YOUR DATA SCIENCE TEAM SOME SLACK

*“Sometimes science is a lot more art than science. A lot of people don’t get that.”*

*-Dr. Richard Sanchez*

Despite its name, Data Science requires a substantial amount of creativity, domain expertise, and intuition to learn new things from real-world data. This means it can often be difficult to manage Data Science Teams with the same methods, metrics, and expectations you might be used to using to manage software projects and engineering teams.

For example, if you could predict an engagement drop or a spike in user churn, you could intervene to prevent it.<sup>66</sup> To create that prediction, task your Data Science Team with the goal of predicting an engagement drop 1 day, 7 days, 14 days, and 28 days ahead of time.

Now that they have a goal, how do you manage them towards it? How do you measure this team’s success? How do you measure their progress, given that they might not even have the slightest as to where to start building?

In this example, a KPI you might consider tracking for this team may be how subtle of a change in user engagement can be accurately predicted by the tool they’re developing. As they experiment and iterate and experiment and iterate, you could expect them to make some quantifiable progress toward improving the tool’s precision and accuracy at predicting user engagement changes. If, even with more work, their tool’s predictions don’t become more accurate with time, it’s likely that’s as good as the measure is going to get, and the team should start working on a different goal. Because they’re largely operating at the edge of both human understanding, and technology, their work will often resemble academic research more than anything. Because, to be fair, they’re literally building tools no one’s ever made to solve problems no one considered solvable. Cut ‘em some slack.

Consider fostering collaborations between these Data Science Teams and other internal teams with events like internal symposia and data hackathons. These will give the data scientists visibility on what problems other teams are seeing, and show the other teams what kind of problems the Data Science Team is able to solve. Also, ‘20% time’ that allows the Data Science Team freedom to tinker can create the kind of innovation that management didn’t know to ask for.<sup>67</sup>

<sup>66</sup> By rolling back a new feature, rolling out a new one, posting a new explainer video, etc



<sup>67</sup> A lot of great science starts with a beer and doodles. Trust us. We’re scientists.

*Goal 2 : Optimize*

Now that you're measuring, intervening in, and predicting user behavior, you can begin to optimize it.

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*Become an Expert: Common Pitfalls in Optimization*

Business has gotten really good at optimizing manufacturing, farming, logistics, and telecommunication. Operations Research has, for decades, offered models and techniques for optimizing mechanical processes, and the tasks where humans and machines interface. But it's really poor at optimizing the humans themselves. We aren't factories. Or servers routing packets. Or UPS Trucks. We're us. Which isn't to say our behavior isn't optimizable: it just doesn't yield to the same techniques of analysis and intervention that assembly line efficiency does.

For example, users 'burn out.' A user's engagement may increase linearly with time (especially as you use of Behavioral Design and Persuasive techniques.) And then - one day and without warning - vanish completely. Without adequate detectors and controls for how your Behavioral Design interventions should adapt with respect to changes in user behavior, your otherwise well-intentioned interventions can literally induce a user to quit. Adaptation is critical, and may represent the most critical aspect of optimization your team can get right.

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**STAFFING SOLUTION: HIRE POLYMATHS**

Fortunately, the staffing that adequately controls for this eventuality is similar to the solution listed above.

**MANAGEMENT SOLUTION: DECLARE PERSONALIZATION A KPI**

To what extent can your team be held accountable for increasing how well your system adapts and personalizes to your individual users over time? As discussed above, there are some implicit risks in using these techniques without optimization and personalization mechanisms in place. To the extent that personalization can be modeled and measured, and its efficacy experimentally tested against non-optimized interventions, we advise making progress towards personalization a metric your team optimizes towards.<sup>68</sup>

*Goal 3 : Be "Behavior First"*

If your business success depends on humans interacting with what you've built, you're not just in the Product business: you're in the human behavior business. Level 3 brings an organization to consider their Product not as a series of interfaces, but as a sequence of human behaviors for which interfaces, optimization processes, and personalization have been deployed to induce.

<sup>68</sup> Content companies like Netflix, YouTube, and Spotify are the best known examples of highly personalized apps, but personalization can go far beyond content. What do each of your user personas want from your app? Can your app adapt to that use case once you've figured out what persona each user is?

Starting with the real human behaviors you need for business success means reorganizing your Design process to focus on behavior as the core building block to work with. This means design methodologies your team uses may begin looking very different from what they look like now, especially after the introduction of personalization and optimization. (Consider, for example, what a Design process looks like when 90% of your user interface is subject to AI-driven personalization and UX optimization dependent on a user's own behavior.)

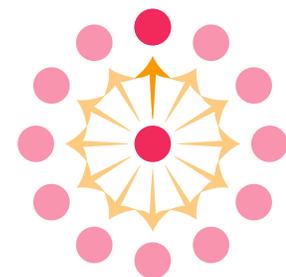
Furthermore, you'll find that as your firm becomes more Behavior-First, the very polymaths you hired to work with Product will turn their sights towards other parts of the company as well. They will identify places and processes - wholly unrelated to Product - that benefit for the introduction of Behavioral Design.

#### STAFFING SOLUTION: ALLOW YOUR BEHAVIORALISTS TO FLOAT

Once your Product team has incorporated Behavioral Design deeply into their processes and tools, the Behavioralists and polymaths you've staffed up with should be allowed to dissociate from the Product Team to focus their attention on your other business processes. Grant them their own budget, a place them orthogonal to your standard organization chart (perhaps reporting to a CTO or COO), but no immediate ability to force changes. Treat them like underpowered, in-house consultants. Their freedom to unhook from Product and observe how other human-facing parts of the business operate will not just spread these techniques and their impact to the rest of your operations, it will encourage the type of lateral thinking that will drive future innovation back within the Product Team itself. Once other teams are familiar with the Behavior Team, and trust has been established, encourage the Behavior Team to provide recommendations to these other business units, and incentivize the units to cooperate with recommendations.

#### MANAGEMENT SOLUTION: GRANT THE BEHAVIORALISTS A VOICE ANYWHERE (EVENTUALLY)

When the Behavior Team has demonstrated that their advice benefited other non-Product parts of your organization, grant them a voice. Empower them, from the top down, to make data-driven, experimental recommendations. Hold the managers of other teams accountable for giving the Behavior Team a seat at the table. To accelerate this process, begin measuring the interactions between the Behavior Team and other non-Product Teams that result in an experiment as a metric those Teams are responsible for improving



with time.

Teams have seen success with this approach in the private sector and the government. Both the US and UK governments employed small teams of highly-trained floating behavioralists: Obama's Social and Behavioral Science Team and the UK's Behavioral Insights Team. Each Team had wide latitude to uncover problems anywhere in the government, and propose solutions. Their familiarity with the whole organization made them more trusted and productive than outside consultants, but their powerlessness makes other teams more willing to collaborate and accept help. The need for consensus building meant they put a lot of effort into getting along with everyone, but their position outside of the formal org chart inured them to normal politics. Expect your Behavior Team to enter business units, observe,

propose an experimental retooling of a specific business process, run an experiment, and - if successful - re-train staff in the new process. Repeat often.

## Chapter 6: Behavioral Design in the Wild

***“It’s good to learn from your mistakes. It’s better to learn from other peoples mistakes.”***

*- Warren Buffett*

BEHAVIORAL DESIGN IS ALL AROUND US: from the stores we shop in, to the apps we use on our phone: Behavioral Designers have taken deliberate steps to increase the chances we’ll behave in certain predictable ways. In this chapter, we explore several examples of Products and Environments you’re already familiar with, and highlight the Behavioral Design techniques they’ve used to engineer how people behave.

### *Reinforcement Learning and Cues: Facebook*

Facebook has masterfully employed Behavioral Design techniques to build one of the most habit-forming products on anyone’s phone. While they’ve used several different techniques, we focus here on two: Reinforcement Learning and Cues, which they’ve combined together an implementation of CAR Model.

“PING” you have a new notification! Can anyone really resist the urge to open the app and see what’s inside?!

That notification starts the next chain of events to unfold: you unlock your phone, find the Facebook App, and open it. As described by the CAR Model, you’re presented with a Synthetic Cue (a cue designed by Facebook that they control), and you perform the desired target Action.

Then, when you open the app, there are notifications waiting for you. And, maybe, one of the notifications is delightful! Here, Facebook employed Reinforcement Learning to carefully induce

#### IN THIS CHAPTER:

How have teams have used Behavioral Design?

How have the ethical controversies resolved in real life?



delight for opening their app. As we explored in Chapter 3, Eyal's model of the Three Types of Rewards describes Rewards of the Tribe, Rewards of the Hunt, and Rewards of the Self. Largely, Facebook's Notifications system relies on the reinforcing power of Rewards of the Self (Vanity) and Rewards of the Tribe (the approval and interaction of our friends) to induce delight.

Over the years, you may have noticed that the types of Notifications you received have changed: they've broadened in content to include more than just the direct, rewarding interactions of your friends: they now also include random, superfluous notifications. Whether a deliberate design decision, or the consequence of another goal, this has created the Feedback necessary in the CAR Model to counteract constant reinforcement. If there was a delightful reward waiting for you every single time you received a Synthetic Cue from Facebook and opened the app, the effect of reinforcement would diminish (as we discussed in Chapter 3): you wouldn't become more likely to keep opening Facebook. Today, you might be notified often of things you don't care about. This serves to make the Reward-ness of a notification you receive *more variable with time*. By increasing the variability, they've increased the probability that you'll form a habit out of using Facebook faster.

### *Reinforcement Learning: Pinterest*

Social media apps are great at using Behavioral Design techniques because their business models often rely on maximizing the time you spend on the platform. The Teams have successfully combined multiple techniques to form products we spend hours in. Pinterest was one of the first leaders in the use of Behavioral sciences and Behavioral Design as a driving Product philosophy.

While you use Pinterest and continue to scroll, it isn't a given that the next row of content you're displayed is going to have something you like seeing. Much the opposite, most of the content you see, you won't feel compelled to click on. What this creates is a form of variable reinforcement: since it can't be predicted that the next piece of content you see will be any good, your scrolling behavior is highly reinforced. Here, Pinterest has reinforced scrolling behavior with Rewards of the Hunt: with the satisfaction - and curiosity generation - that comes from picking out those killer items in your feed.



## Stopping Rules: Instagram

How many hours have you, or someone you know, spent scrolling Instagram? Next question: how many hours did they *intend* to spend scrolling?

We're willing to bet there's a pretty big difference there.

Instagram has been intentionally engineered to fetch more content as you scroll such that you never need to stop scrolling. There is no "Next Page" button, or "Continue" button - there is only scrolling.



Why has it been built like this? From a UX engineering perspective, this is a highly desirable feature: users don't have to look for a "Next Page" button while using Instagram, thereby interrupting their current flow of scrolling and viewing. This reduces friction and could be considered a considerate design decision that helps the user. From the Behavioral Design perspective, this is an even more desirable feature because it means users will consume the feed far, far past their satiety point. This means that even if a user would intend to stop using Instagram after a minute, they will continue to use it for a much longer amount of time than desired. From a revenue perspective, this is obviously a productive design decision. From an ethics and user respect perspective, this is questionably ethical.

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## Become an Expert: Infinite Soup and Infinite Scroll: Just Keep Going

When we perform a behavior, our brains rely on natural signals from the environment for when the behavior is *completed*. These signals tell our brain to perform the next behavior we'd planned on doing and continue with our lives. In real life, we naturally receive these signals: we start a walk, and get to our destination. We open a beer, and finish it (and sometimes open another.) We receive information that we're done, and it's time to do the next thing in our day.

But what happens if you never get that STOP signal? In 2005, a team at Cornell University set to find out. [Brian Wansick, James Painter, and Jill North](#) explored [what happens if the brain never gets signals to stop eating](#). They cleverly rigged-up bowls of soup that would automatically and imperceptibly refill very slowly, unbeknownst to the experimental subjects. Groups of 4 sat down, some of which had normal bowls filled intermittently by ladle, others eating from the self-refilling apparatus. After inviting subjects to have as much soup as they wanted, it was found that on average, the self-refilling bowls caused people to eat 73% more than the normal bowls. Subjects just kept eating. And eating. And eating.

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Surely, you'd expect those subjects to report feeling fuller or more satisfied? No such luck: they reported no difference. These subjects overate without noticing, AND were no more satisfied. Their brains

were deprived of what Wansick<sup>69</sup> and his team called "Visual Cues" - the normal information we receive seeing a draining bowl that would indicate our food is gone and it's time to stop.

This is exactly what you experience in the Behavioral Design pattern of Stopping Rules inside Instagram. You consume far past "full", with no detectable change in satisfaction.

### *Choice Architecture: Your Local Supermarket*

It's no consequence that the staple items that stock people's fridges: eggs, milk, butter, cheese, some veggies, are stocked in the periphery of your local supermarket. That was a Behavioral Design decision to increase the chances that you'll purchase more, unrelated items.

By taking advantage of Choice Architecture, the companies that run supermarkets know our default habits of how we explore a supermarket - and how to leverage them to change our purchasing behavior. By placing perishable staples in the far wall of the market, our shortest path through the market to the back wall takes us through aisles stocked with the nonperishable food we might not have been interested in buying, but now mere exposure will increase the chance we purchase. There's little logistical reason that the milk couldn't be placed in a refrigerated aisle in the center of the store (as is the beer, or the frozen food.) Rather, placing it afar ensures we'll pass food we didn't otherwise consider buying on our way to the staple we needed. Being able to track, model, and predict the default paths customers take down the aisles grants stores the chance to use our defaults as the fulcrum with which to shift our consumptive behavior.

### *Stimulus Devaluation: Space*

Habits can be created. . . and destroyed. By introducing a time delay between an action and its associated Variable Reinforcement, you can mediate how effective the Reinforcement is. If the time delay is able to adjust with respect to usage, you have a very powerful way to induce friction when users are binging on an app, and be minimally-delaying when users are using an app intentionally.

At *Boundless Mind*, we explored this concept with our app, *Space*. We were interested in helping people regain control of the relationships they have with apps by changing the impact of the CAR Model.

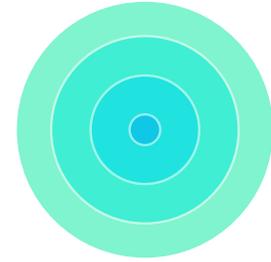
Stimulus Devaluation operates by increasing the time delay between an action and the reinforcement that a user receives for that interaction. As discussed in Chapters 2 and 3, it's critical that

<sup>69</sup> Brian Wansink, James E Painter, and Jill North. Bottomless bowls: why visual cues of portion size may influence intake. *Obesity*, 13(1):93-100, 2005



users receive feedback and reinforcement as fast as possible after the action they've taken: the brain holds a short time window after an action in which it can learn whether or not the consequences of this action deem it worth repeating more frequently. By shifting the reinforcement outside of this time window, one can provide the user with the necessary feedback that they've completed the correct action, and allow them full access to their desired action and the rewarding stimuli, while decreasing the chance that the reward can operate fast enough to reprogram behavior.

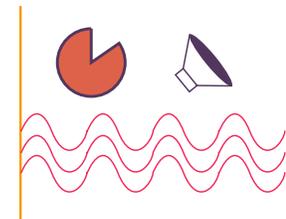
By introducing a small, dynamically adjusting time delay before an app loads, we've granted users the freedom to optionally remove the effects of the CAR Model, while still enjoying the apps they love. In our implementation of Stimulus Devaluation, we introduce a screen that encourages users to breathe in sync with a ring that expands and contracts on the screen while they breathe. This "breathing room" not only short-circuits the reinforcing effects of the reward, it also provides users a moment of stillness in which they can reflect on whether or not they're acting intentionally, or in response to Behavioral Design programming.



### *Ambient Communication: Apple Watch*

Good design means creative problem solving given constraints. So what do you do when you need to communicate several types of quantitative reports simultaneously, with a very small screen to display them on, and when someone might be highly distracted? You do exactly what the Apple Watch's Design Team did in their Activity counter and their use of Ambient Communication.

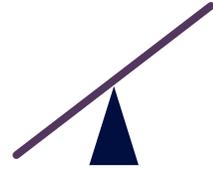
Instead of displaying quantitative or prosaic reports to the user, the Apple Watch's Activity app instead communicates with the user via a series of concentric, colored rings that increasingly fill all 360 degrees as the user performs more of each of the three encouraged actions (standing, walking, and exercising.) By colorcoding the rings, the app communicates several different data streams simultaneously. By placing the rings non-overlapping at different radii, the app improves clarity about which dataset corresponds to which behavior given the constrained visual space. Most importantly, the colorized, geometric rings improve communication efficacy by visualizing the information - and the progress a user has towards her goal - in a way that she can understand at a glance.



### *Sunk Cost: LinkedIn*

The more we've given to a person or process, the more likely we are to inappropriately overestimate how valuable that person or thing is to us. As a Behavioral Design strategy, Sunk Cost encourages us to continue to invest our time, money, energy, or information into an app such that we become less likely to leave lest those scarce resources had gone to waste.

As a new LinkedIn user is walked through her onboarding experience, she's prompted for a lot of information. Yet even when that onboarding process is done and her profile is fleshed out, her Profile page will still prompt her to continue to add information to reach "All Star" status. Dangling this Reward of Self carrot in front of users is an effective way to induce them to continue to disclose information. The more information they've invested into a system, the less likely they are to quit or deactivate their profile lest they be faced with the feeling of having lost that time spent to fill out their profile.



## *Final Thoughts*

A LITTLE OVER A CENTURY AGO, the leading causes of death were infectious diseases. Men, women, and children suffered Typhoid, Pneumonia, Fever, Tuberculosis, and Influenza. We died of pathogens<sup>70</sup> in our water and food and urban air from which we had little choice but to succumb.

<sup>70</sup> for which we barely had names yet

And then something brave happened. We took seriously to developing a rigorous Technology of the Body. To modern medicine, sanitization, and vaccination. We challenged our previously held norms of the sanctity of body, and men and women worldwide in science and medicine and engineering worked together towards the benefit of our common health. We beat back scourges of infectious disease. In just a few decades, even after accounting for the Great Wars, infant mortality drastically fell and average life expectancy increased. And has continued to do so! Almost year-over-year!

Fast-Forward: Dear Reader, if you're reading this between 2018 and 2022, and over 50 years old, you're not very likely to die from TB or the Flu, thank god. Unfortunately, your mortality numbers are higher for Type-II Diabetes, Heart Disease, Stroke, COPD, Obesity, Suicide, and Stress-related Illness. If you're under 50 years old: it's opioids. *I'm not even kidding.* We're *overwhelmingly* dying from our own habits.

Where we used to die of mysterious pathogens for which we had no name, *today we die of Ennui and Cheeseburgers.* We die of our habits. Of challenges to our health and flourishing that - as physicians reaffirm<sup>71</sup> - we have a lot of behavioral control over.

<sup>71</sup> often to our eyerolling

OVERWHELMINGLY, Americans will suffer from Behavior-based diseases more this year than from any other causes.

It should be cause for celebration, then, that our minds and behaviors are so hackable. **Because this means we have a path forward.**

Today we have a moment in front of us similar to what we faced a century ago. *Today, we seek not a Technology of the Body, but a Technology of Behavior.* A rigorous, empirical way to understand - and intervene - in how we think, feel, and behave. *To design ourselves.* To mold our behavior to match our aspirations. To turn the computing and scientific advances we've made in the past few decades inward to explore - and reshape - ourselves.

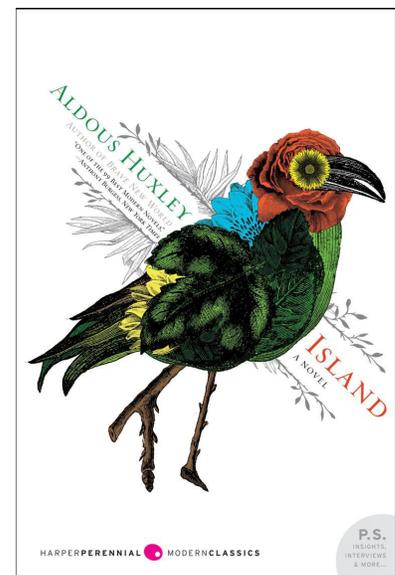
THIS IS BEHAVIORAL DESIGN. The current crises of health, truth, and human attention lead our team to believe that these techniques are the single most promising avenue for developing a better route forward for all of us. *And spreading these knowledge and tools means a better chance that we all - together - get to have a hand in shaping ourselves.*

BEHAVIORAL DESIGN WORKS BEST for society when we're transparent about what's going on: that people are making engineering and design decisions about where our minds are going and where society is headed. What we should want and why we want it. This begs for extensive and inclusive dialogues. *Where do we want Persuasive AI and Behavioral Design? For what ends do we want it? Who is it helping, and why? And are these uses ethically well-aligned?*

It's a shame we remember Huxley more for *Brave New World*. Most of us read it as young people, but how many also read *Island*, his utopian companion novel to *BNW*? In *Island*<sup>72</sup>, Huxley explores a society of human flourishing driven by the same persuasive techniques that were used to smother the human spirit in *BNW*. Huxley's *Island* showed us that our tools and techniques are neither the problem or solution: it's us. It's where and how we choose to apply a Technology of Behavior - and what causes we choose to serve with it - that will determine if we live in a *Brave New World*, or we live on *The Island*.

A TECHNOLOGY OF BEHAVIOR IS HERE: we see it drain our attention. We see it meddle with our politics. We also see it improving health. Fighting bullying. Relieving debt. Encouraging tranquility.

WE CANNOT choose to walk away from technologies once they're out of the box. But *we do get to choose* how we understand and apply them towards human flourishing. More open and inclusive conversations about Behavioral Design, and accessible Behavioral Design tools like the ones we've built at [Boundless Mind](#) are a



<sup>72</sup> Aldous Huxley. *Island*. 1962. London: Granada, 1976

choice. These conversations build a more neuro-literate society and frameworks for holding technology companies accountable for how they treat us. These tools equip anyone to become the designer of their own mind. A Technology of Behavior, when applied in an ethically aligned framework, is a capital-F Futurist proposal. It's how we get to the *Island*.

These types of conversations about where we want to apply Persuasive AI aren't charming sci-fi hypotheticals. This is today. We're here. It's happening. As we see it, a Technology of Behavior is one of our best bets to patching the fabric of society, and building a future of human flourishing. Together.

*That's why we're here. Why our team is here. This is what we're about. This is who we work with, the things we want, and the world we're building. Come join us!*

-RAMSAY A. BROWN AND DR. T. DALTON COMBS PHD

APRIL, 2018. VENICE, CALIFORNIA.



# Bibliography

- Dan Ariely. *Predictably irrational*. HarperCollins New York, 2009.
- Aristotle. *The Nicomachean Ethics*.
- Robert B Cialdini. *Influence: The psychology of persuasion*. Collins New York, 2007.
- Charles Duhigg. *The power of habit: Why we do what we do in life and business*, volume 34. Random House, 2012.
- Nir Eyal. *Hooked: How to build habit-forming products*. Penguin, 2014.
- BJ Fogg. *Persuasive Technology: Using Computers to Change What We Think and Do*. Morgan Kaufmann, 2002.
- Bill Gates. Gates notes. URL <https://www.gatesnotes.com/>.
- John Geake. Neuromythologies in education. *Educational Research*, 50 (2):123–133, 2008.
- Aldous Huxley. *Island*. 1962. London: Granada, 1976.
- Daniel Kahneman. *Thinking, fast and slow*. Macmillan, 2011.
- Scott O Lilienfeld, Steven Jay Lynn, John Ruscio, and Barry L Beyerstein. *50 great myths of popular psychology: Shattering widespread misconceptions about human behavior*. John Wiley & Sons, 2011.
- Harold Pashler, Mark McDaniel, Doug Rohrer, and Robert Bjork. Learning styles: Concepts and evidence. *Psychological science in the public interest*, 9(3):105–119, 2008.
- Daniel H Pink. *Drive: The surprising truth about what motivates us*. Penguin, 2011.
- Richard H Thaler and Cass R Sunstein. *Nudge: Improving decisions about health, wealth, and happiness*. HeinOnline, 1999.
- Brian Wansink, James E Painter, and Jill North. Bottomless bowls: why visual cues of portion size may influence intake. *Obesity*, 13(1): 93–100, 2005.

Stephen Wendel. *Designing for behavior change: Applying psychology and behavioral economics*. " O'Reilly Media, Inc.", 2013.