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Positive Technology

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Abstract

Since the founding of positive psychology, the scientific study of well-being, in 1998 we have a much better understanding of how to define, measure, and cultivate well-being. For the first time, this means the field of technology can move forward with science on its side, designing and developing technology based on its actual impact on well-being. Through the lens of social relationships, this paper explores the current state of technology and well-being (part 1), ways in which we can improve existing technology (part 2), and how we can create new technology to systematically cultivate well-being (part 3). Recent research suggests that much of the fastest growing technology today has a negative effect on our social relationships and psychological well-being. To mitigate these negative outcomes, this paper calls for a foundational shift towards positive technology, defined as technology that uses principles from positive psychology to systematically cultivate well-being. To do this, positive psychology should dedicate more resources towards testing and validating well-being hypotheses as they relate to the latest technology applications. At the same time, technology companies should improve on their existing platforms by leveraging positive psychology research. Moreover, we should use the foundational principles of positive psychology to design new applications of technology that drive each of the core elements of well-being: positive emotion, engagement, relationships, meaning, and achievement (Seligman, 2011).

Keywords

psychology, positive psychology, technology, positive technology, well-being, flourishing

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Since the founding of positive psychology, the scientific study of well-being, in 1998 we have a much better understanding of how to define, measure, and cultivate well-being. For the first time, this means the field of technology can move forward with science on its side, designing and developing technology based on its actual impact on well-being. Through the lens of social relationships, this paper explores the current state of technology and well-being (part 1), ways in which we can improve existing technology (part 2), and how we can create new technology to systematically cultivate well-being (part 3). Recent research suggests that much of the fastest growing technology today has a negative effect on our social relationships and psychological well-being. To mitigate these negative outcomes, this paper calls for a foundational shift towards *positive technology*, defined as technology that uses principles from positive psychology to systematically cultivate well-being. To do this, positive psychology should dedicate more resources towards testing and validating well-being hypotheses as they relate to the latest technology applications. At the same time, technology companies should improve on their existing platforms by leveraging positive psychology research. Moreover, we should use the foundational principles of positive psychology to design new applications of technology that drive each of the core elements of well-being: positive emotion, engagement, relationships, meaning, and achievement (Seligman, 2011).

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Introduction – Positive Technology

Positive technology is a relatively nascent concept, defined in this paper as technology that uses the principles of positive psychology, the new scientific field of well-being, to systematically cultivate more well-being in the world. Over the past few years, preliminary research has been published on various foundational components of positive technology. Positive computing, part of a wider renaissance to promote more well-being in the world, has been defined as "the design and development of technology to support psychological well-being and human potential" (Calvo & Peters, 2014, p. 2). In the field of cyberpsychology, it is believed that one of the next fundamental objectives is the creation of "technologies that contribute to enhancement of happiness and psychological well-being" (Riva, Banos, Botella, Wiederhold, & Gaggioli, 2012, p. 69). Ideally, this movement towards increased research and awareness of positive technology does not only change the way we design and develop technology, but also influences the wider discourse on how technology impacts society (Pawlowski, 2015). Accordingly, this paper expands on many of the foundational aspects of positive technology in a concentrated effort to present a compelling call to action for both technology companies and consumers. By connecting the latest research from the field of positive psychology with new studies documenting the negative effects of smartphones and social media on well-being, we identify and recommend immediate opportunities to improve the current intersection of technology platforms, social relationships, and overall psychological well-being. Finally, we explore theory-based opportunities to design and develop new technology that can intentionally and effectively drive towards more well-being in the world.

This notion of deliberately designing technology to cultivate well-being becomes increasingly important as the rate of technology adoption continues to grow at a faster pace than ever before (Molla, 2018). It took the telephone 35 years to reach 25% adoption in the US, the

television 26 years, the PC 15 years, and the internet just 7 years (Desilver, 2014). Thanks to an increase in smartphone penetration, new technology companies like Instagram and Snapchat are able to reach consumers around the world at unprecedented scale. This is not a trivial change in the world of technology. The software created today has the power to impact billions of lives around the world, regardless of whether or not it has a positive or negative impact on its consumers. Unfortunately, research is starting to catch up with some of the latest technology that has achieved this level of unprecedented scale, namely smartphones and social media, and the impact on well-being is generally negative. In some cases, frequent usage of smartphones and social media has been shown to be extremely harmful for both social connection and mental health (Verduyn et al., 2015; Turkle, 2016; McCarthy et al., 2018).

Nonetheless, technology and well-being are not *inherently* antagonistic constructs. In fact, technology represents one of the greatest opportunities to apply empirically-backed well-being research to billions of people around the world. However, this does not happen without deliberate action and a fundamental understanding of well-being principles. The current state of technology and well-being clearly demonstrates the risks of disregarding well-being science when developing technology (explored in Part 1 of this paper). Fortunately, the field of positive psychology has made significant progress over the last few decades on how to empirically measure and cultivate well-being, and the research is now being applied in business, education, and personal coaching (Seligman, Steen, Park, & Peterson, 2005). Working together, the fields of technology and positive psychology can also utilize well-being research to redesign existing technology platforms to foster well-being (explored in Part 2), and design and develop new positive technology that systematically cultivates well-being at an unprecedented scale (explored in Part 3).

What is Positive Psychology?

To better understand positive psychology, the scientific study of well-being, it's important to start with the big picture and acknowledge that we live at a time in which the world is objectively getting better. Over the past 30 years alone, the percentage of people in extreme poverty, living on less than $1.90 per day, has decreased from over 35% of the population to 10% (Diamandis & Kotler, 2012). 30 years ago, 12 million children under the age of five were dying every year, but thanks to vaccines and work in public health, that number is down to around 5 million today (Garfield, 2018). We've eradicated entire diseases that were killing millions of people every year thanks to advancements in medical technology. Infant mortality is down; crime rates are down; and child labor is down. All incredible things, and yet humanity isn't flourishing. Flourishing, defined as a combination of feeling good and functioning effectively, is synonymous with a high level of mental well-being (Huppert & So, 2013). According to a European research study in 2013, only 10-41% of people are flourishing today. With all of these objective improvements in the world, how can that be?

In recent years, psychologists have come to realize the absence of illness alone does not equate a life of well-being and flourishing (Keyes, 2005). The field of psychology has historically focused on addressing problems in clinical populations, resulting in some significant advancements in our ability to better understand life altering ailments, like depression and anxiety. On the other hand, the field contributed much less in way of advancing our understanding of how to cultivate well-being and build lives full of positive emotion, meaning, love, and accomplishment. As Seligman and Csikszentmihalyi (2000) put it, "the exclusive focus on pathology that has dominated so much of our discipline results in a model of the human being lacking the positive features that make life worth living" (p. 5). In 1998, Martin Seligman was

elected President of the American Psychological Association, and the direction of psychological research took a turn northward. The central theme of Seligman's presidential term was positive psychology. In this new era of psychology, the absence of illness was not going to be the end of the story. Psychology was going to begin researching and understanding what it means to flourish and how to systematically cultivate more well-being. In the year of the election, now 20 years ago, there were 53 publications according to Google Scholar that mentioned 'positive psychology' and just over 1,000 that mentioned 'subjective well-being.' In the year 2017, the same searches on Google Scholar reveal over 16,000 and 20,000 publications related to each topic respectively. The era of positive psychology has officially begun.

Although sometimes colloquially referred to as the study of happiness, the psychology community refers to positive psychology as the scientific study of well-being. It is generally recognized today that happiness is an inadequate term to define the "good life," in part due to its lack of a clear definition (a requirement for effective research) and its close, narrow association with positive emotion and pleasure. However, the construct of well-being has existed throughout history with ever-changing definitions and applications, and there are competing theories today, much like throughout history, on the proper definition. In the fourth century BC, Greek philosopher Aristippus supported the notion of hedonic happiness, suggesting the goal of life was to experience the maximum amount of pleasure (Ryan & Deci, 2001). This hedonic view, equating well-being with pleasure, has a long history and clearly still has some influence today. Aristotle, however, considered hedonic happiness to be an unpolished and crude outlook on life, instead referring to happiness as Eudaimonia, a term that goes beyond pleasure and is centered on the process of living well (Melchert, 2002). Today, Seligman (2011) defines well-being using the PERMA model, suggesting a multi-pronged approach of well-being that encompasses Positive emotion (P),

Engagement (E), Relationships (R), Meaning (M), and Achievement (A). Also a strong proponent of the multi-dimensionality of well-being, Diener (1984) introduced the concept of subjective well-being, defined as people's overall evaluations of their lives and their positive and negative emotional experiences.

Regardless of the precise definition used, the value of scientifically studying well-being is largely tied to its ability to actually drive improved well-being and flourishing in the world. Lyubomirsky et al. (2005) suggests a person's happiness level is determined by three factors: a genetically based happiness set point (roughly 50%), life circumstances that affect happiness (roughly 10%), and intentional activities and practices (roughly 40%). While eating well, physical activity, and getting enough sleep are naturally important components of well-being, positive psychologists have developed new, simple mechanisms to measurably improve human flourishing. These mechanisms are called positive interventions: evidence-based, intentional acts designed to increase well-being by growing a positive element of human flourishing (J. Pawelski, personal communication, October 7). And research suggests they really work. A comprehensive meta-analysis of 51 positive psychology interventions conducted by Lyubomirsky (2009) demonstrated significant well-being enhancement ($r = 0.29$) *and* decreased depressive symptoms ($r = 0.31$) from the application of positive interventions.

To better understand positive interventions, it's valuable to break down its definition into the three defining components: 1) evidence-based, 2) intentional, and 3) designed to increase well-being by growing a positive element of human flourishing. First, positive interventions are evidence-based. There are many ways to increase well-being, and what works for one person might not work for the next. For example, just because Bob or Amy find something that increases their well-being, does not by default make it a recognized positive intervention. To qualify, the positive

intervention must be capable of having its impact measured and be shown to produce an improvement in at least one facet of well-being. This is not to say that non-measured activities are not worthwhile, just that they do not officially qualify as positive interventions. 2) Positive interventions are intentional. To be counted as a positive intervention, the activity must be completed with internal agency. For example, although experiencing a sunny day may lead to empirically improved well-being, sunny days themselves do not qualify as a positive intervention. 3) Positive interventions are designed to increase well-being by growing a positive element of human flourishing. There are many psychological interventions that are not designed to specifically increase well-being; these interventions tend to focus on lessening the negative, as opposed to growing the positive. For example, cognitive-behavioral therapy (CBT) is designed to treat problems by modifying dysfunctional emotions, behaviors, and thoughts. While this can drive a positive impact on well-being, it is primarily designed to decrease the negative as opposed to specifically grow a positive element of human flourishing.

The positive psychology community has methodologically developed many positive interventions to cultivate well-being since the founding of the field. For example, in the *Three Good Things* intervention, participants are asked to write down three things that went well and why every night for two weeks, shown to improve well-being by shifting one's focus to the positive and fostering a mindset of gratitude (Seligman et al., 2005). In the *Best Possible Selves* intervention, participants are asked to write about what their ideal future would look like, shown to improve well-being through increased optimism and positive emotion (Peters, Flink, Boersma, & Linton, 2010). Positive interventions even have the capacity to improve marital quality, a major contributor to well-being and physical health (Finkel, Slotter, Luchies, Walton, & Gross, 2013). A 21-minute reappraisal writing intervention for couples, in which participants think about conflict

from the perspective of a neutral third party, protected the participants against declines in marital quality over time. There are positive interventions that help foster each of the various dimensions of well-being, ranging from gratitude and positive emotion to resilience and optimism to love and transcendence (Fredrickson, 2009).

This sounds great in theory, but is positive psychology really worth this dedicated focus? If you ask a group of people what they want most in life, a common response is some version of "happiness." Well-being in of itself is a goal many of us have for ourselves and those around us. But evidence suggests that high well-being also results in a variety of additional beneficial outcomes that people value. First and foremost, people with higher well-being tend to be healthier and live longer (Diener et al., 2017). High well-being has also been shown to improve social relationships, result in more pro-social behavior, and improve job productivity and earning potential (Diener et al., 2017). Barbara Frederickson's (2009) broaden-and-build theory posits that positive emotion alone broadens people's ideas about possible actions they can take, while also helping people discover and build new skills to help them thrive. Ultimately, cultivating well-being can help us, and those around us, experience better psychological and physical lives. Accordingly, positive psychology is dedicated to systematically understanding, cultivating, and spreading well-being throughout humanity, with a high-level objective of creating a world in which humanity truly flourishes. However, the field itself is still nascent (only 20 years old) and has not yet reached mainstream popularity, inhibiting its ability to positively influence the world at true scale. *And that is where technology enters the discussion.*

Part 1 – Technology and Well-Being: The Current State

First, it is important to acknowledge that technology is an incredibly powerful field, responsible for a significant percentage of the objective improvements our world has experienced.

At the same time, the rapid development of technology has significantly altered the way we live in a very short period of time. It can be easy to forget that the first iPhone was only released by Apple in 2007. Today, just over a decade later, there are more than 2.3 billion smartphone users in the world (eMarketer report, 2017) and 94% of Americans between the ages of 18 and 29 own a smartphone ("Mobile Fact Sheet", 2018). With smartphones so prevalent, we are more connected than ever before. We can look up information and learn new skills without leaving the house. We can communicate around the world with immediacy, spreading messages and ideas faster than ever before. And the smartphone is just one of numerous impactful technological improvements over the past few decades. We have seen incredible technological advancements in just about every domain, including health care, energy consumption, robotics, transportation, business, artificial intelligence, and virtual reality.

However, we're now learning that these wide-ranging benefits of technology come at a cost. As part of the Global Wellness Institute, McCarthy et al. (2018) found substantial evidence supporting adverse effects of technology on a) social relationships and loneliness; b) sleep; c) inactivity, obesity and physiological health; d) mental wellness; e) distraction and safety; and f) productivity. Cheng & Li (2014) report that global internet addiction, defined as excessive use to the extent that time spent on devices impacts relationships, work, daily activities, and physical and mental health, has reached an estimated global prevalence of 6%. Unsurprisingly, they found that internet addiction is inversely associated with quality of life, as reflected by both subjective (life satisfaction) and objective (quality of environmental conditions) indicators. As the internet continues to be further ingrained in our lives, the rate of internet addiction, as defined in this way, and the associated negative outcomes on our well-being will only continue to increase.

Like other addictions, however, fault does not reside exclusively within the individual. Technology companies have seemingly neglected the impact on well-being when designing, launching, and scaling new features. In fact, their incentives are often completely misaligned with well-being. Consider Facebook, a company that makes more than 98% of its revenue through advertising (Facebook, 2018). Facebook is responsible to its shareholders to steadily increase revenue, and steadily increasing advertising revenue equates with finding ways to get people to spend more time on their platform to see more advertisements. This does not bode well for human flourishing based on the now better understood association between social media usage and decreased well-being (Primack et al., 2017). Of course, it's not just Facebook, it's all social and digital media companies. Twitter, Instagram, Snapchat, and YouTube all operate under similar business models and are equally focused on innovating to capture more of people's finite time and attention. To truly understand how these leading technology decision makers think, consider the sentiment expressed by Reed Hastings, CEO of Netflix, stating that one of Netflix's biggest competitors is sleep itself (Snider, 2017).

This poses a serious threat to our well-being, especially considering the significant reach these leading technology companies have in today's connected world. That being said, it's important to acknowledge that technology itself is neither entirely good or bad; rather, it's how we design and consume technology that ultimately influences in which direction our well-being moves. Unfortunately, the way we continue to design and consume technology is associated with a significantly negative impact on our well-being, particularly on our social relationships.

The Value of Close Social Relationships

To fully comprehend the scale of this problem, it is beneficial to highlight the critical importance of positive social relationships. The wide-array of well-being benefits derived from

social connection has been well documented in psychology. At the highest level, close social relationships are strongly associated with psychical health and psychological well-being, while social isolation is associated with an increased likelihood of mortality (Gable & Gosnell, 2011). To put the physical risk of loneliness in perspective, research suggests that social isolation has comparable effects on mortality rates as smoking 15 cigarettes a day or dealing with obesity (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015). While the risks of social isolation can be detrimental, the *positive* benefits derived from close social relationships can be immensely powerful. Research has shown that humans have an innate need for love and connection, manifesting itself as early as infancy (Haidt, 2006). This holds from an evolutionary standpoint, as our ancestors' probability of survival greatly increased when they shared benevolent social ties with those around them (Beckes & Coan, 2011). Perhaps it's not surprising that children introduce the word *friend* into their vocabulary as early as three or four years old, as many as 75% of nursery school students have reciprocated friendships, and teenagers have historically spent almost a third of their waking hours in the company of friends (Peterson, 2006).

How exactly do close social relationships drive well-being? Research suggests both a direct association, through an increased sense of belonging and social support, and an indirect association through slightly more complicated mechanisms like self-expansion and capitalization (Gable & Gosnell, 2011). The self-expansion theory claims that individuals are motivated to increase the bounds of their selves by incorporating features of others into their lives, and the closer the relationship, the more overlap between the individuals (Gable & Gosnell, 2011). This is essentially the empirical backdrop supporting the popular sentiment of the importance of who you surround yourself with. Indeed, empirical evidence suggests that in close relationships, mental models of the self and others begin to overlap. Along these lines, social relationships can also serve as a

source of learning and development, in some cases beyond standard friendships or loving relationships, and rather through a lineage of mentors and apprenticeships, enhancing both individual well-being and accomplishment (Peterson, 2006).

People also inherently engage in *capitalization*, the psychological term coined to represent the sharing of positive results with others (Langston, 1994; Gable & Gosnell, 2011), arguably playing a role in the evidence that happiness is contagious (Fowler & Christakis, 2008). When things are not going well, and we experience negative or stressful events, we often rely on our social support network, turning to others for comfort and advice (Gable, Gonzaga, & Strachman 2006). But, what about when we get good news and experience positive emotions? Research suggests that positive events occur more than three times as often as negative events (Gable & Haidt, 2005), though we may not reflect on them as much due to our inherent negativity bias. Nonetheless, it is estimated that between 60-80% of the time, people share the best thing that happened to them in a given day, typically relating to the following domains: social relationships, school or work, and health and body (Gable & Haidt, 2005). Importantly, capitalizing is associated with increases in well-being, life satisfaction, and positive emotion *above and beyond* the positive events themselves (Gable et al., 2006). However, this positive effect is conditional, dependent on how the recipient of the positive news responds. Specifically, evidence suggests that the benefits of positive news are generated only from when the recipient responds in an active and constructive manner (Gable, Reis, Impett, & Asher, 2004).

When dealing with less positive situations, research suggests there may be no better coping mechanism in times of stress and trauma than confiding in a friend or loved one (Lyubomirsky, 2007). Social support comes in various forms, including emotional (e.g., listening and reassuring), physical (e.g., driving to the hospital or picking up medicine), and informational (e.g. sharing

advice). Perhaps it's not surprising that studies routinely find positive social relationships to be among the best predictors of life satisfaction and longevity, ultimately accounting for more of an effect than all other domains of human activity (Gable, 2018).

While there are many ways to cultivate close social relationships, kindness and compassion have been shown to play a critical role (Lyubomirsky, 2007). It's intuitive that our acts of kindness and compassion improve our relationships and the well-being of the people *receiving* the acts. However, positive psychology recently contributed additional understanding to this interaction, demonstrating that acts of compassion and kindness also improve the individual well-being of the *provider* (Lyubomirsky, 2007). Of course, this notion in of itself is not new or original. Consider the Dalai Lama's words: "Too much self-centered thinking is the source of suffering. A compassionate concern for others' well-being is the source of happiness" (Lama, Tutu, & Abrams, 2016, p. 251). Or similarly, the words of Archbishop Tutu: "I mean simply to say that ultimately our greatest joy is when we seek to do good for others. It's how we are made. I mean we're wired to be compassionate" (p. 59). Like with many well-being principals, positive psychology takes this notion a step further by explaining *how* this works. It turns out there are multiple mechanisms contributing to this bilateral effect (Lyubomirsky, 2007). Evidence suggests that being kind and generous can: 1) lead you to perceive others more positively; 2) foster a heightened sense of interdependence within your community; 3) relieve guilt, distress, and discomfort over others' suffering; 4) encourage a sense of appreciate for your own good fortune; 5) shift your focus away from yourself and onto others; 6) improve your perception of yourself and provide a sense of meaning; and 7) lead other people to like and appreciate you.

The Impact of Technology on Social Relationships

Clearly, the value of positive social relationships is extraordinary, and the process of developing and nurturing them deserves dedicated time and effort. This brings us back to technology, and specifically to the question of how technology impacts our ability to foster positive social relationships. As technology and media companies get better at commandeering peoples' finite attention in line with their internal objectives, any focus on meaningful social relationships seems to be habitually neglected. The result? A combination of diminishing well-being, declining capacity for empathy and reflection, and deteriorating social connection (Turkle, 2016). Somehow, in a time when we're more connected than ever before, countries around the world are declaring epidemics of loneliness and social isolation as people interact with each other through screens and struggle to create meaningful connections (Hafner, 2016). In America, when people were asked, "how many people do you have to discuss important issues with," the most popular answer was zero (McPherson, Smith-Lovin, & Brashears, 2006). Zero. How did we let technology intended to improve our lives and better connect us to each other have the exact opposite effect?

When comparing those who report being lonelier to those who are less lonely, clear trends begin to emerge that aid in answering this question (Cigna, 2018). Lonelier people are much less likely to have frequent in-person interactions, resulting in decreased well-being and inadequate social skills and relationship statuses. According to Turkle (2016), those who frequently use social media have the most difficulty reading human emotions, including their own. Conversely, having real-life conversations leads to greater self-esteem and improved ability to interact with others. Additional research supports this idea, demonstrating that online life is associated with a loss of empathy and a diminished capacity for self-reflection (Twenge, Joiner, Rogers, & Martin, 2017).

Essentially, as technology companies have gotten better at hijacking our attention, the critical benefits of regular, in real life social connection are falling to the wayside.

That being said, it's important to remember that technology is neither entirely good or bad, including when it comes to social relationships. Consider for a moment the various ways in which we can connect with others through technology. At the touch of a button, we can spend 20 minutes on Apple FaceTime or Google Hangouts with close friends or family around the world to share positive life updates over video chat. Similarly, we can scroll through our Facebook newsfeeds, idly monitoring the curated online lives of our extended network for hours on end. While both activities include technology and forms of social connection, they can have drastically different effects on our lives, only the latter of which is associated with increased envy, perceived social isolation, and decreased well-being (Verduyn et al., 2015).

Social Connection: Online vs. Offline

What exactly happens to humanity when the underlying nature of social relationships shifts towards increased online activity, more interactions with social media, and a default mode of texting as a primary form of conversation? Are these online interactions at least somewhat similar to connecting in real life? The hopeful answer would be yes, but science tells us the answer is no. We are quickly learning that not all connection is created equal, and the result of losing substantive connections for superficial ones can be devastating, both in terms of physical health and psychological well-being (Gable & Gosnell, 2011).

Understanding the underlying differences between online and offline social connection is a critical first step in guiding companies towards the creation of positive technology that mitigates these risks of negative well-being effects. To that end, what actually happens when we connect with others in real life and why don't we get the same benefits from online interactions? Recent

neuroscience research analyzing *real* social connection suggests that face to face conversations release a significant volume of neurotransmitters (Pinker, 2015). For example, during positive, physical social experiences, oxytocin is released within the central nervous system resulting in increased trust, and cortisol levers decrease resulting in lower stress levels (Pinker, 2015; Grippo, Trahanas, Zimmerman II, Porges, & Carter, 2009). Physical touch in of itself has been shown to increase trust, promote cooperation, and reduce feelings of threat (Redcay et al., 2010). Because this largely occurs at a subconscious level, it is easy to believe that we are getting the same benefits from online social interactions. However, it turns out that our brain activity is noticeably different depending on the type of social interaction we have (Rice, Moraczewski, & Redcay, 2016). During real life interactions, the parts of our brain associated with attention, social intelligence, and emotional reward are much more active compared to similar online experiences. This research is not surprising when comparing the wide-reaching benefits of real life social connection with the abundance of new research demonstrating the detrimental effects derived from spending too much time interacting with online social platforms.

Smartphones and our Children

This leads to another, perhaps more important question: what happens to social relationships and well-being when entire generations grow up never knowing what a disconnected life looks like? How can they learn to have difficult conversations? To read the body language associated with words? To truly develop love and empathy for others? Gen Z, referring to people born after 1995, are the first generation to have their entire lives hyperconnected via technology, spending more time on new media screen activities and less time on non-screen activities than any previous generation (Twenge, 2017). Unfortunately, new studies suggest that teenagers who spend more time with new technology, like social media and smartphones, are more likely to report

mental health issues compared to their less device-usage counterparts. The general consensus in the science community is this uptick in media screen activities accounts for some of the significant corresponding increases in depression and suicides amongst adolescents (Twenge et al., 2017). Additionally, the participants with the most severe internet and smartphone usage patterns have problems with not only depression, but also stress, anxiety, impulsive behavior, and sleeplessness, leading to a negative spiral of well-being.

By their very nature, smartphones introduce immediate access to the internet, texting, games, email, and social media, resulting in nearly continuous streams of activity, content-switching, and multi-tasking. Although it may feel efficient, frequent multi-tasking is associated with depression, anxiety, and difficulty reading human emotions (Turkle, 2016). Moreover, with phones always at the ready, Gen Z can bypass the uncomfortable construct previously known as boredom. Although using the phone as a distraction may be more enjoyable at the time, it mitigates the positive effects stemming from boredom, like self-reflection, creativity and innovation (Turkle, 2016). Based on these effects of hyper-connectivity, it makes sense that we've seen a 40% decline in the markers for empathy among college students in the past 20 years, most of it within the past 10 years. In addition to these actual changes, young adults with high social media usage also tend to experience more *perceived* social isolation than their counterparts with lower social media usage (Primack et al., 2017). This in of itself is a problem. Social isolation, both perceived and actual, is associated with increased risk of early mortality, and scaled technology that increases this perceived notion is detrimental to the objective of global human flourishing (Holt-Lunstad et al., 2015).

There is clearly a wide-array of issues our children have to deal with when it comes to smartphones and our new world of hyper-connectivity. And this is not a small scale problem. Of

the 95% of teenagers between the ages of 13-17 in the US that report having a smartphone or access to one, 45% report being online on a near-constant basis (Anderson & JingJing, 2018). This is unlikely to be news for most parents, 94% of which report taking at least one action to manage their child's technology usage (Bethune & Lewan, 2017). Around half of parents say that regulating their child's screen time is a constant battle, feel like their child is attached to their devices, and feel disconnected from their families as a result of technology even when they are together (Bethune & Lewan, 2017). Of course, the kids alone aren't to blame. Consider this 2nd grader asked to write about an invention they wish had never been created: *"If I had to tell you what invention I don't like I would say that I don't like the phone. I don't like the phone because my parent[s] are on their phone every day. A phone is sometimes a really bad [habit]. I hate my mom's phone and I wish she never had one. That is [an] invention that I don't like"* (Torres, 2018).

Regardless of whether we grew up in a pre- or post- smartphone era, we all have a responsibility to think about how we design and consume technology. Similarly, we should all be thinking about how to solve this massive problem we have unintentionally created. The answer to these issues is not simply the removal of smartphones from our lives. And certainly, we would not benefit from halting the rapid advancement of technology, much of which is objectively making the world a better place. However, we need to change something, and we need to do it quickly.

Part 2 – Technology and Well-Being: Righting the Ship

Before diving into how we can improve existing technology, it's important to ground ourselves in the remarkable capabilities technology has brought to the table, including the detecting and curing of diseases, leveling the information playing field around the world, and helping solve some of humanity's biggest problems. Nonetheless, at a time when the world is objectively improving, we also need to acknowledge the aforementioned, wide-spread social

isolation epidemic and increased rates of depression, anxiety, sleep deprivation, and suicides the world is experiencing (Hafner, 2016; American College Health Association, 2016; Twenge et al., 2017).

Fortunately, as demonstrated in Part 1 of this paper, we are starting to wake up to the empirical downsides of some of the latest scaled technology. And understanding we have a problem is the first step in figuring out how to redesign technology to right the ship. It may be early days, with psychology and neuroscience research just starting to make headway, but at the rate technology is moving every day counts. For perspective, Facebook was founded in 2004 and now has 1.45 billion people using the platform every day (Statista, 2018a). Snapchat was founded in 2011 and already has nearly 200 million people using the platform every day (Statista, 2018b). This is incredible scale and happened at an incredibly fast pace. We're living in a time when the technology we create has the potential to reach millions of people within just a few months, making its impact on well-being exceedingly important. We cannot maintain status quo knowing that a lot of existing technology reaching more than a billion people every day is empirically detracting from humanity's social relationships and overall well-being. Accordingly, the next two sub-sections focus on immediate actions we can take to improve smartphone and social media technology.

Redesigning Smartphones

We can leverage what we know about the current effects of technology, combined with the latest scientific research on well-being, to iterate how we design and consume smartphone technology to systematically create more well-being in the world. This may seem like a great concept, but what would it actually look like in practice? Let's consider three key decision points you likely face on a regular basis: 1) what apps to download and prioritize; 2) what to do right when you wake up; and 3) how to spend your day.

1) What apps to download and prioritize? Put another way, what new technology do you want to be accessible to at the touch of a few taps on the device you carry around with you all day? Today, app stores are ordered primarily by volume and frequency of app downloads. This is not inherently a bad way to organize a list of apps; it helps people easily identify and download the most popular apps at any given time. But what if there is a better way to promote technology than a popularity contest? What if you could see a ranking of apps based on how much people enjoy using them, how much it positively impacts their lives, or how much they actually value the time they spend on the apps? It turns out that many of the most popular apps in the app stores are also the most addicting *and* are reported by its own users to result in unhappiness (Center for Humane Technology, 2018a). If you want to use technology to guide you towards living a subjectively positive life, selecting apps based on utility, value, and enjoyment would naturally be a good place to start. App stores can rank apps accordingly, making it that much easier to deliberately shape your phone, and hence life, in a more positive manner. Perhaps this small change would simultaneously encourage tech companies to consider their impact on well-being more, realigning technology development incentives with actual human values. While this may seem like a minor change in the smartphone ecosystem, it's important to acknowledge the power of environment and proximity, whether physical or virtual, on our behavior and the choices we make. Having smartphones set up to promote technology usage that cultivates well-being, as opposed to mindless scrolling through addicting content, could be a significant step in the right direction.

2) What to do right when you wake up? Research shows that we're now more likely to think about our phones in the morning than our significant others (*Consumer Mobility Report*, 2015). This is pretty disturbing. I don't want to live in a world where technology comes first, I want to live in a world where technology helps me cultivate stronger human connection. It is

relatively easy for me to explain the type of mornings I would like to have: wake up after a good night's sleep, meditate, go for a run, shower, have a healthy breakfast, and then make my way into the office to start the workday. It is also relatively easy for me to explain the type of mornings I often have: wake up, check my texts and emails, and scramble into the office already preoccupied with someone else's problems. What if our phones encouraged us to have the mornings we want, and maybe need, as opposed to how they operate today? We can program our phones to serve up a meditation app first thing in the morning after we wake up, removing the opportunity to skip that morning (another example of creating an environment that sets us up for success). We can hide email and social apps for the first hour after we wake up, unless something truly urgent comes through. We can lock certain apps until we've hit a certain mileage or step count. Or maybe as a simpler, more digestible first step, we can monitor our morning consumption patterns and note how we feel each day, better understanding how the technology decisions we make in the morning influence our ability to start the day on a positive note.

3) How to spend your day? It sometimes feels like we can make it through entire days, even weeks, on autopilot. Many of the apps we use today originated from a notion of helping us live more productive, enjoyable, and connected lives. However, we have entered into a world in which these same technology companies have shifted their focus towards competing for our finite attention to generate more revenue. What if instead of trying to simply capture our attention, our smartphones helped us live more deliberate, positively oriented lives? We can program daily time limits for certain apps, limiting the risk of mindless scrolling and over-usage. We can use notifications to encourage us to stay active and connect with friends, as opposed to draw us in to one of our many addicting apps. We can set up reminders to message or call loved ones on a regular basis. We can hide or bucket less positive-oriented apps, surfacing instead the apps shown to be

more useful and happy-inducing, like Skype, Google Maps, and Pandora (Center for Humane Technology, 2018a). We can even create physical spaces that use technology to automatically turn our phones into sleep mode, helping us focus on real social connections and engagement.

Simply better understanding the negative effects from over-usage, our own consumption patterns, and the psychological tricks used to compete for our attention is critical to drive improvement. It's this knowledge that can be leveraged to drive change at scale. And that is exactly what has been happening over the last couple years. In the last few months, both Google (2018) and Apple (2018) launched digital well-being initiatives to help drive more informed consumption and improved relationships with devices. Here are some of the key changes made by Google and Apple, reflecting the importance, and ease, of redesigning technology to actually improve our lives:

- ***Consumption patterns:*** the ability to easily see how much time we spend on our phones, what apps we spend the most time in, and how many notifications we get.
- ***Time consciousness:*** the ability to turn on automatic reminders to take a break in certain apps (e.g. after watching too much YouTube) and set time limits for apps.
- ***Reclaiming our lives:*** the ability to snooze alerts, hide notifications, and personalize updates to help us more easily disconnect and overcome attention hijacking.

These changes reflect a shift in the direction towards positive technology, reflecting many of the original concepts proposed by the Center for Humane Technology, an organization focused on realigning technology with human values. Having a respected organization dedicated to righting the ship, in addition to an increase in academic research and early signs of technology companies iterating their products accordingly, are all positive indicators that we can effectively shift the smartphone industry towards a focus on positive technology and well-being at scale.

To maximize the chance of an effective shift, the field of positive psychology should dedicate more resources to this type of positive technology research. The more readily the field tests and validates well-being hypotheses as they relate to the latest, most scaled technology, the more quickly we can accurately understand the nuanced causal impact of technology usage on well-being. While the field has already started to publish research now being used to drive high-level technology design improvements, there is much more to test and learn. With a focus on immediate, real-world applications, we have an opportunity to create a new repository of research that both leading technology companies and up-and-coming technology startups can utilize to systematically cultivate more well-being in the world.

To demonstrate with one of the hypotheses above as an example, the following experiment design seeks to evaluate the well-being impact of smartphone usage in the 30 minutes immediately after waking up. This can be accomplished through a randomized control trial of young adults over a month-long period, randomly assigning the young adults into three groups: a night smartphone group, a morning smartphone group, and a control group. The young adults in the night smartphone group can be instructed to leave their smartphones charging in a room other than their bedroom at night, and to avoid looking at their smartphone for the first 30 minutes after waking up. The young adults in the morning smartphone group can be instructed not to look at their smartphones for the first 30 minutes after waking up (without the additional bedroom instruction). And the control group can be asked to operate as they normally would.

For each day of the month, we can measure two things: 1) smartphone technology consumption, including how quickly smartphones are used after waking up and for how long; and 2) well-being levels in the late morning. We can use a combination of an activity tracker and a data monitoring app to collect the morning smartphone usage data and the validated 8-point

Flourishing Scale (Diener et al., 2010) to measure well-being. We would predict that both the night and morning smartphone groups would use their smartphones *less* and *later* in the morning than the control group, and as a result report higher levels of well-being in the late morning (it would also be interesting to determine if this change was moderated by certain types of smartphone behavior). Between the night group and the morning group, the night group may demonstrate less smartphone usage in the morning as a result of the phone being less accessible and hence less tempting to use. As a result, the night group may score marginally better than the morning group in terms of well-being ratings if this effect is meaningful.

This is just one high-level example of an experiment design that could help both technology companies and consumers better understand the causal effects of smartphone usage on well-being. This type of real-world, applicable research has the potential to play a significant role in guiding companies to effectively shift towards positive technology.

Redesigning Social Media

Similarly, let's revisit the example of Facebook and its impact on well-being. As discussed, we know that Facebook is designed to maximize time on site and advertising revenue. For years, Facebook has had thousands of engineers focused on developing mechanisms to draw their customers in for hours on end, resulting in the enticing world of endless newsfeed scrolling we often find ourselves in today. Unfortunately, it's exactly this type of *passive* Facebook usage that seems to lead to decreased well-being (Verduyn et al., 2015). On the other hand, evidence suggests that *actively* interacting with others on Facebook, i.e. through direct messaging and reminiscing about past interactions, is actually linked to improvements in well-being. There is a significant body of research beginning to emerge supporting the notion that privately engaging with others on

Facebook can cultivate well-being through increased perception of online social support and stronger social connections (Frison & Eggermont, 2015; Verduyn et al., 2015).

New research suggests that the impact of social media on well-being may be even more nuanced than just private vs. public usage, suggesting that adolescents who experience loneliness may also experience improvements in well-being through *publicly* engaging on social media (Frison & Eggermont, 2015). Although there is still limited research to support this, it appears that public posts from lonely adolescents, if accompanied by positive public feedback, can lead to increased well-being. Similar to how capitalizing, the sharing of positive news to others, only has a positive effect if accompanied by active and constructive responses, publicly posting on Facebook for lonely adolescents may fall under the same constraint.

This reinforces the notion that technology companies, Facebook included, are neither entirely good or bad, but how one consumes the technology makes all the difference. This gives me a spark of optimism. If we are able to truly shift our focus towards positive technology, operating under the assumption that well-being should be a primary objective of technology, we can start to redesign technology products with a deliberate focus on increasing well-being. Encouragingly, in Facebook's (2018) most recent investor report, founder and CEO, Mark Zuckerburg, noted "we are taking a broader view of our responsibility and investing to make sure our services are used for good." Will this actually translate into Facebook updating their product and design to encourage more well-being inducing usage even if it comes at the cost of less passive consumption and advertising revenue? It's difficult to say, but here are two examples of Facebook's early attempts in 2017 to shift towards operating in the land of positive technology:

- ***Newsfeed Quality:*** updating algorithms to demote click bait and headlines and instead prioritize posts – photos, videos, status updates, and links – from friends.

- ***Snooze:*** an option for customers to hide a person, page, or group for 30 days, providing more control to customers over the content they see every day.

It may not be a lot, or even drive any real significant change, but it's a start in the right direction. With the backing of positive psychology research, social media companies have a legitimate opportunity to realign their technology with their proclaimed missions of *real* social connectedness and self-expression. Based on the principles of positive psychology and the latest well-being research, a renewed focus on prioritizing meaningful interactions can play a meaningful role in a shift towards a world of positive technology. To help achieve this, social media companies can start to prioritize key business metrics associated with actions demonstrated to increase well-being, like the number of times people interact with close connections or the number of times people respond positively to friend's public posts. They can encourage people to call or video chat with each other to drive more meaningful and personal interactions. They can encourage their consumers to actually engage in real life interactions. For example, if two friends interact online often and live in the same city, they can be prompted to meet up in real life to benefit from face to face interactions. Similar to the smartphone experiment design example in the previous section, these are all hypotheses that can be tested through randomized controlled trials to provide reliable information to technology companies on how to maximize their positive impact in the world.

Moreover, from a consumer standpoint we can and should start to better understand the effects social media usage has on our well-being, and adjust our consumption patterns accordingly. We can be mindful of the significant risks of envy and perceived social isolation. We can attempt to avoid social media apps for extended periods of time to see if our well-being improves, whether through increased real life connections or decreased negative effects. And we can be much more thoughtful about which pictures we upload, which posts we click on, how we respond to others,

and how we present ourselves on social media, knowing that we have the power to influence others' well-being in both positive and negative ways, as much as our own. The field of positive psychology can play a pivotal role in cultivating well-being at scale by arming technology companies with insights into which improvements may drive the most influential increases on well-being and how to test their effectiveness.

Part 3 – Technology and Well-Being: The Future

In addition to redesigning existing technology to create more well-being in the world, we are in an exciting position to deliberately create new forms of positive technology. For years we have designed technology with good intentions, but with limited means to validate its actual impact on well-being. That has now changed. In the years since the founding of positive psychology, we have developed a much better understanding of what well-being is actually comprised of and how to systematically cultivate more of it. Specifically, we can integrate Seligman's PERMA model into the process of technology development, considering each of the five core elements of well-being: Positive emotion (P), Engagement (E), Relationships (R), Meaning (M), and Accomplishment (A) (Seligman, 2011). People who flourish, a descriptor and measurement for well-being and mental health, tend to have all of these elements, or at least a lot of some of them (Huppert & So, 2013). For years now, positive psychologists have used the PERMA model, and other similar well-being models, to effectively study the drivers of well-being and how to cultivate more flourishing in the world. And these principles can similarly be leveraged by the technology field to systematically drive well-being at scale.

Creating Positive Technology

This means the field of technology can move forward with decades of well-being science on its side, designing and iterating according to actual well-being measurement and impact. What

does look like in practice? Let's break down each core element of well-being (PERMA) in terms of the latest psychology research and potential technological applications.

Positive emotion (P)

The psychology: Positive emotion contributes both directly to well-being, by nature of representing the enjoyment of positive experiences, and indirectly through the creation of resources that enable positive growth and flourishing (Fredrickson, 2009). In addition to experiencing happiness and feeling good, Fredrickson (2013) posits that positive emotions have been shaped by evolution and played an important role in survival. This is well explained by the broaden-and-build theory which explains how positive emotions broaden people's ideas about possible actions, while also helping people discover and build new skills, relationships, and ways of being (Fredrickson, 2009). In terms of broadening, positive emotion has been shown to increase creativity, improve solution-finding, and enable better future prospecting. In terms of building, positive emotion has been shown to cultivate psychological strengths, good mental habits, social connections, and various aspects of physical health.

The technology: To design technology for positive emotion, we need to consider how we can help people have positive experiences, both during and after consumption. To do this effectively, it's important think about the technology itself, but also how the design influences consumption patterns. For example, people may experience *positive* emotion after catching up on their favorite show on Netflix, but experience *negative* emotion after hours of binge watching as a result of auto play functionality. Research suggests that on average, comparing the "happiness" levels of people using the exact same apps, unhappy people tend to use the apps 2.4 times longer than their happy counterparts (Center for Humane Technology, 2018a). This nuance is extremely important in considering the design of technology and needs to be factored into the development

process of new technology to ensure a focus on maximizing both experiential (during usage) and reflective (after usage) positive emotion.

Moment, software that helps people track their app usage, partnered with the Center for Humane Technology to determine which apps results in feelings of positive emotion after consumption. Some of the highest rated apps, all of which received "happiness feedback" of 95% or higher, include Audible, Amazon Music, Podcasts, Kindle, and Spotify. On the other hand, the apps that received "unhappiness feedback" of 50% or higher include Facebook, Instagram, and Snapchat. This research suggests that new technology focused on helping people consume books, music, and podcasts are moving in the right direction of cultivating well-being through positive emotion. Perhaps it's not surprising that positive psychology research suggests reading books, listening to music, and personal development all have the power to improve well-being (Västfjäll, Juslin, & Hartig, 2012; Kidd, Ongis, & Castano, 2016). The more we can develop technology that leverages existing well-being research on how to cultivate experiential and reflective positive emotion in this way, the more we can move towards a world of wide-spread well-being.

Engagement (E)

The psychology: Flow is defined as a state of optimal experience, often characterized by effortless attention in which time is distorted and the sense of self is lost (Csikszentmihalyi, 1990). The association between engagement and flow is so strong that flow is often represented as the primary form of engagement. According to Peterson (2006), "flow is the term for the psychological state that accompanies highly engaging activities" (p. 66). Similarly, Seligman (2011) discusses engagement and flow in unison: "engagement, is about flow: being one with the music, time stopping, and the loss of self-consciousness during an absorbing activity" (p. 11). While it is possible for flow to occur by chance, it is much more likely to occur either from a structured

activity or from an individual's ability to make flow occur (Csikszentmihalyi, 1990). Accordingly, it's important for adults to explore and find activities that result in engagement and flow, ultimately increasing their well-being while simultaneously learning and growing. Finding flow in of itself is important, but it's also important to acknowledge that flow requires a careful alignment of challenge and skill over time to maintain. Too much challenge and not enough skill can result in anxiety; too much skill and not enough challenge can result in boredom (Csikszentmihalyi, 1990).

The technology: To design technology for engagement and flow, we need to consider how we can help people find their interests, improve their skills, and provide time and space to enable flow like states. Providing the time and space required to experience flow has not clearly been technology's strong suit over the past few years. As discussed, many of the largest scale technology companies are actively engaged in the attention economy war, fighting to grab your finite attention which more often than not involves frequent and distracting notifications. In creating positive technology, it is important to deliberately minimize these types of distractions and purposefully design technology to empower people to maximize flow and engagement.

DIY, a new online community designed for kids to discover new passions and improve their skills is a great example of technology aligning itself with engagement and overall well-being. DIY is set up to help children identify new skills and opportunities, offer hundreds of difficult but attainable challenges to work through, and provide a chance for kids to offer and receive peer feedback on projects. Clearly, DIY has aligned its technology platform with the core principles of engagement and flow, setting itself up to create a positive impact for children around the world at a significant scale.

Another, newer form of technology has also shown positive potential to facilitate engagement and flow at scale. Riva et al. (2012) posit that virtual reality (VR) holds significant

promise in terms of positive technology applications to drive the type of flow states that result in the development of well-being. Key characteristics of VR include the opportunity for action and goal seeking behavior, real time ability to increase the challenge of tasks based on skill level, and immediate feedback based on behavior (Riva et al., 2012). In other words, VR technology provides a new, immersive experience that can utilize the foundational principles of engagement to induce flow-like states and ultimately scale well-being throughout the world.

Relationships (R)

The psychology: As discussed in depth in Parts 1 and 2 of this paper, social relationships are critical to physical health and psychological well-being (Gable & Gosnell, 2011). However, the abundance of research on social relationships is based primarily on real life, meaningful connections and does *not* inherently translate to online social connection.

The technology: To design technology to foster strong social relationships, we need to consider how we can cultivate more positive close relationships online, if not focus on creating more *in real life* interaction. Creating technology to get people off of technology goes significantly against the grain of the large social media companies of the past few years. Designing technology with a primary focus on positive psychology principles in mind, however, would likely lead to a very different state of the world.

Meetup is one of a few technology companies designing software to truly cultivate meaningful social connection today. Meetup is a platform designed to help people discover local Meetups, encouraging people to do the things they love with others. Unlike many technological products built around online connection, Meetup is focused on creating meaningful connections *in real life*. Although more difficult to scale than traditional online social platforms, this focus on real social connections aligns with a vision of technology supported by the wide-array of positive social

relationship research. For this type of technology to scale, consumers need to be aware of the difference between online and offline social platforms and be willing to spend money to create and attend more Meetups throughout the world.

Dating apps represent another category of technology that focuses on cultivating in real life connection. In recent years, online dating has seemingly lost its negative stigma with nearly 60% of adults agreeing that that online dating is a good way to meet people, and 66% of online dating consumers report actually going on a date with someone they met online (Smith, 2016). Not only does this type of technology facilitate real social connection, it is directly focused on romantic relationships. In fact, 5% of people in marriages or committed relationships report meeting their significant other online, and this percentage is likely to increase alongside the prevalence of online dating apps, especially with younger generations (Smith, 2016). This is proving to be an important technology to drive social connection and well-being, especially considering that married adults tend to be both emotionally and physically healthier than their single counterparts (Peterson, 2006).

Meaning (M)

The psychology: According to Baumeister and Vohs (2002), people tend to derive meaning from multiple sources that can span family, work, religion, and personal projects. Smith (2017) suggests that meaning arises from transcending the self, and the more one connects with and contributes to something beyond themselves, the more meaning they derive. Moreover, according to Smith (2017), "living purposefully requires self-reflection and self-knowledge" (p. 84). The process through which people revise or appraise past events, often finding positive aspects of negative events, is called meaning-making (Baumeister & Vohs, 2002). In this vein, writing about past events has been shown to help organize thoughts, reframe negative events to something positive, and reflect on meaning as a whole. As a core element of well-being, the experience of

meaning and purpose has been shown to be an important contributor both to psychological and physical well-being (Martela & Steger, 2016; Smith, 2017).

The technology: To design technology for meaning and purpose, we need to consider how we can help people find meaningful activities to pursue, connect to something beyond themselves, and cultivate self-reflection and awareness. Research suggests that mindfulness mediation is an effective driver of self-reflection and awareness and is an effective lever to cultivate meaning and purpose. Mindfulness is defined as paying attention, non-judgmentally, in the present moment (Kabat-Zinn & Hanh, 2009). The practice has been shown to increase individual well-being (Carmody & Baer, 2008), enhance contexts for effective social relationship development, (Jain et al., 2007), and simultaneously help individuals lose their sense of self and feel a part of a much wider group. Headspace, and other mindfulness meditation apps, are great examples of positive technology with a focus on awareness, meaning, and purpose, playing a key role in taking an effective practice that can be traced back to over twenty-five hundred years and making it mainstream in western cultures trough technology (Kaufman & Gregoire, 2016). The more that technology can utilize existing positive psychology research to spread the ability for people to cultivate meaning and purpose, and hence well-being, the better off the world will be.

Another more direct mechanism through which technology can help cultivate meaning and purpose is the facilitation of prosocial activities. Referring back to Smith (2017), the more that technology can connect people with something outside of themselves, the more meaning people will experience. Consider the catastrophic Haiti earthquake in 2010. In just 48 hours after the disaster, the Red Cross received eight million dollars in donations from people simply texting to contribute to help the cause (Gao, Barbier, & Goolsby, 2011). In a similar vein, the app GiveGab is designed to serve as social volunteering network that helps people find local volunteering

opportunities, communicate with other volunteers, and set personal objectives (Schönböck, 2016). Designing technology to encourage prosocial behavior can help people more readily find meaning and purpose, ultimately leading to improved psychological and physical well-being.

Accomplishment (A)

The psychology: To maximize the likelihood of feeling a sense of accomplishment, it is important to utilize grit, create effective goals that align with intrinsic motivations, and reflect on past achievements. In a wide array of studies, from children spelling bee participants to undergraduate students to West Point enrollees, grit has been shown to be a significant driver of achievement (Duckworth, Peterson, Matthews & Kelly, 2007). It's crucially important for children and adults alike to apply grit to well thought-out goals. Locke (1996) explains that goal-setting theory is based on final causality, a term coined by Aristotle to signal that action is the result of purpose. Albeit stemming from a goal-oriented focus, goal-setting theory highlights the importance of process in the setting of goals and enabling the pathways towards high levels of achievement. For instance, the more difficult the goal, the greater the level of achievement (Locke, 1996). However, this linear function is built on the assumption that the individual is committed to the goal and possesses the capacity to achieve it. Without these process-oriented prerequisites, performance drops at high goal levels.

The technology: To design technology for accomplishment, we need to consider how we can cultivate grit, encourage goal setting, and drive towards intrinsic motivation. Grit is a trait defined as passion and perseverance for long-term goals and is closely associated with the exercise of self-control (Duckworth et al., 2007). Not only does grit drive improved achievement, but it's a trait that can be significantly improved with deliberate practice, creating the potential for an upward spiral of accomplishment (Duckworth et al., 2007). Strides is an app dedicated entirely to

helping people set, track, and attain goals. By guiding customers to set effective goals, view progress in a way that positively motivates through streaks and success rates, and break down big objectives into digestible goals, Strides has created technology that facilitates intrinsic goal-setting and grit cultivation. Of course, this type of goal-setting and grit cultivating is not unique to fitness alone. Other examples include learning a new language (Duolingo), learning how to code (Udacity), becoming happier (Happify), and improving in chess (Chess.com). These apps represent a great start in demonstrating how technology can systematically improve well-being through increased accomplishment by cultivating grit, fostering intrinsic motivation, and encouraging effective goal setting.

Supporting Levers for Positive Technology

These core elements of well-being can guide the field of technology towards an effective movement into positive technology. At the very minimum, we should at least ensure we are designing technology that moves with well-being research and not against it. This is the optimal way to systematically create a world in which humanity truly flourishes. However, in addition to designing technology to deliberately cultivate well-being, there are a few supporting levers that have the ability to make the process much more effective. These levers include measurement and iteration, working with experts, and new business models.

Measurement and iteration: Successfully creating positive technology does not only mean designing technology to drive well-being based on the principles of positive psychology, but also measuring its impact and iterating to improve it. This is not an easy task today, in part because of the language gap between academia and technology. Within positive psychology, well-being is measured through a series of validated self-report questionnaires. While this works on a one-off basis, it is more difficult to introduce into an agile technology environment, especially one that

iterates quickly based on a set of standard key business metrics. It is much easier for technology companies to measure their impact based on widely used and accepted metrics like weekly active users and advertising revenue than impact on positive emotion, meaning, or social relationships.

To bridge this gap, we have an opportunity to 1) iterate and send existing validated questionnaires on a regular cadence in a way that resonates with customers, and 2) introduce new, light touch ways for customers to report on well-being directly after technology consumption. It's common for technology companies to regularly assess customer satisfaction through a regular cadence of surveys. In a similar vein, companies can start to send regular well-being surveys to determine the impact their technology has on the specific aspects of PERMA they are attempting to cultivate. Associating these results back to customer behavior can help companies optimize and iterate to systemically cultivate more well-being. For example, understanding that private messaging with close connections on Facebook drives more positive, social relationships and well-being is an important first step for Facebook to realign its platform into one that prioritizes this type of social interaction. The second measurement approach is the creation of light touch mechanisms for customers to provide well-being data to technology companies in real time. For example, after using an app, customers can be prompted to quickly respond with how that interaction affected their well-being. Insights derived from the correlation of well-being impact and behavior on the app would allow the company to dynamically alter the platform in the same way algorithms automatically update today based on levels of customer engagement.

Working with experts: Some of these well-being measurement deficiencies can be attributed to a significant knowledge gap between leading technology companies and the research coming out of positive psychology. Effectively creating positive technology requires a foundational understanding of what makes something positive. To overcome this deficiency,

technology companies can partner with academic-based organizations, choose to work with expert consultants, or go as far as hiring experts directly into the company (e.g. chief well-being officer). Today, in part because positive psychology is still a nascent field, there are few academic-based organizations set up to partner with fast-moving technology companies. This represents a significant, untapped opportunity and is a construct worth exploring. Even just a few partnerships between researchers and big technology companies could positively influence the way billions of people interact with technological platforms on a daily basis.

While a foundational knowledge of well-being is required to make effective positive technology, there are short cuts that can help move technology companies in the right direction. Simply having informed and conscientious employees can help steer the ship towards positive technology. Technology companies succeed or fail based on the caliber and motivations of their employees, and if talented employees begin advocating for the importance of well-being, or even selectively choosing employers based on their well-being impact, companies will experience significant pressure to move towards the creation of more positive technology.

New business models: As mentioned above, the business models behind many of the leading technology companies rely almost exclusively on the activity level of its consumers and the corresponding advertising revenue. As a result, technology companies, and the thousands of engineers they employ, focus their efforts on maximizing user activity on their platforms as opposed to the cultivation of well-being. But what if companies were actually rewarded for their impact on well-being *in addition* to revenue and profits?

A good example of a similar movement that has recently gained traction is B Corporations. Regardless of initial motivations, most companies have to focus their efforts on short term profits because that is the metric that keeps business afloat and is most often rewarded (Honeyman, 2014).

However, according to the model of B Corporations, this underlying nature of capitalism can be upgraded to encompass a wider focus on the impact businesses have for all of their stakeholders, including shareholders, but also employees, partners, the community, and the environment. Through this model, B Corporations have focused on maximizing their shared impact that goes beyond profitability, and evidence suggests these companies still achieve significant financial success, even compared to their non B Corporation counterparts (Honeyman, 2014). Introducing well-being into this model, or creating a similar recognition process and motivation to cultivate well-being, has the potential to drive a much larger focus on positive technology. Excitingly, this may not be that far away. The Center for Humane Technology organization is currently working with multiple governments, exploring ways to penalize companies for the negative well-being externalities of attention extraction, in addition to creating better protections for consumers to mitigate the downsides of a lack of well-being focus from massive technology companies (Center for Humane Technology, 2018b).

Another business model approach is to better align the real value of technology and its cost structures. The reason many large online platforms are reliant on advertisers for revenue is because they do not charge customers directly for the consumption of their products. This results in a reliance on customer data and advertising revenue that prohibits companies from truly focusing on the principles of positive psychology. However, it is not difficult to envision a world in which consumers of a platform agree to pay a small fee to use the technology on a regular basis, giving the companies more control over how they prioritize the content they deliver. Within this model, technology companies can focus less on attention grabbing and addictive content, and more on directly cultivating positive emotion, strong social connections, and meaning and purpose.

Conclusion – Improving the World

The notion that technology has the power to be both positive and negative is not a new one. It's been an ongoing struggle for balance that requires consistent monitoring and adjustment. However, this time around is different than similar discussion in the past for a few reasons: 1) the scale of technology – with single companies reaching more than a billion people in any given day; 2) the level of connectivity – with people waking up and going to bed with their smartphones; 3) the data – with companies knowing enough about us to show incredibly persuasive and influential content; and 4) the social relevance – with companies like Facebook, Snapchat, and Instagram redefining how we perceive our social lives and interact with others (Center for Humane Technology, 2018b). While these companies may have the best intentions in mind, research demonstrates that using the technology, at least in the way most of us do today, can result in detrimental effects on our social relationships and well-being. Although the research is concerning, having this type of well-being data is the first step in righting the ship and rethinking how we design and consume technology. In addition to improving the existing technology accessed by billions of people every day, we now have the tools to deliberately create more positive technology moving forward. By marrying the fields of positive psychology and technology in a systematic way, we can create technology that measurably improves the well-being of the people who consume it. This is not only an exciting opportunity, but a critical one. While many of us are already connected to technology at an unprecedented scale, younger generations are growing up in a world synonymous with smartphones and social media. We owe it to ourselves, and these younger generations, to use what we now know about well-being and technology to collectively refocus our efforts towards creating more positive technology and ultimately creating a world in which we can truly flourish.

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