

# **Towards Responsible Research and Innovation**

**AN EXPLORATION OF  
WELL-BEING AND TECHNOLOGY**

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# FOREWORD

**A**s technology becomes increasingly integrated into people's lives, questions about its effects on our individual and collective well-being continue to grow. This inquiry, focused on the intersection of the human condition and advancing technology, brings to bear the complexity of emotions, social good, and responsible technological innovation.

Building on our efforts centered on the relationship between humanity and technology, Aspen Digital narrowed in on the intersection of digital technologies, well-being, and responsibility. We brought together experts from various disciplines and domains — including technology, sociology, psychology, and ethics — to engage in an open discussion with representatives from across the tech industry.

The resulting report, written by Dr. Kristine Gloria, Director of AI for Aspen Digital, is a synthesis of research, workshops, and one-on-one discussions. It highlights the challenges and opportunities for various stakeholders, especially the tech sector, in pursuing responsible research and innovation centered around achieving a better understanding of the influence technology has on our well-being. Specifically, it outlines potential next steps for how industry can and should come together to address the public's growing concerns around technology's impact, positive or negative, on our mental health and well-being.

The report begins by examining the complex and highly subjective domain of well-being, which encompasses a variety of factors ranging from individual health, the environment, and society. Its definitions can consist of simple indicators, such as access to proper and supportive living conditions, or can include more complex indicators such as subjective emotions, and there is significant variability across scales used to measure and evaluate well-being. *This variability in its definition, evaluation, and interpretation has ripple effects on how research and innovation in well-being related technologies can be done responsibly.* Section I also surfaces the various roles and responsibilities of different stakeholders, including academics,

policymakers, civil society, and caregivers. *While much can be gained by tech companies working together, well-being is a holistic pursuit and will require the attention and work of a variety of stakeholders.*

Section II of the report focuses on how to conduct responsible research and product development related to well-being and technology. This section surfaces a variety of tensions, including how to measure a concept as variably defined as well-being, limitations of current indicators (e.g., screen time), and the ethics of conducting A/B testing and psychological experiments on online platforms. It also highlights the difficulty of interpreting such research for product design and development, underscoring that scientific knowledge in this space is complex and continues to evolve. The section also explores system-level concerns about the commodification and gamification of well-being and the need to align business incentives with promoting well-being. Overall, responsible research and innovation is a complex and nuanced endeavor, and it requires alignment within teams, across companies, and throughout the ecosystem.

In the end, one critical takeaway is that well-being is a holistic framework, and thus, requires a holistic approach.

**For our purposes, this means that in order to truly understand the potential role and impact of technology on our well-being, it is imperative that the tech sector come together to share in the development of principles for responsible research and innovation.**

This includes working with leading researchers across disciplines and from a diverse range of institutions as well as civil society and public policymakers. What this looks like and how it can be done are open questions. We recommend, at the very least, increased cross-pollination of research and ideas, as well as a shared repository of frameworks and practices from industry and external partners. These steps are essential to identifying and articulating how to develop technologies in support of our individual and collective well-being.

## Acknowledgements

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# SECTION I

**D**igital technologies, such as social media platforms and virtual assistants, affect human connection, emotion, agency, and identity in various ways. While there is a growing body of research on the impact of such technologies, the findings are mixed. Some scientific evidence suggests there are correlations between social media usage and negative subjective well-being; other research shows that positive effects are also possible. Because the data generated on platforms is not accessible, researchers have been limited in their ability to generate robust answers and conduct more rigorous studies. The big questions that remain unanswered include: 1) the degree to which digital technologies impact well-being; 2) the scale (or volume) of the impact; and 3) the populations most vulnerable to this impact. While research may not be definitive, two years of a global pandemic have made us all acutely more aware of how deeply intertwined technology can be with our lives. Now, as many continue to navigate daily life through a screen or via voice command, there is an urgent need to understand the relationship between technology and human well-being.

To address this evolving landscape, Aspen Digital hosted a series of workshops in late 2021 that brought together experts from various disciplines and domains with representatives from across the tech industry to critically examine responsible research and innovation in the context of well-being. Over several months, the group met virtually with academic researchers, clinicians, ethicists, designers, and engineers to focus first on overarching definitions and then to dive further into research and product development. Each session was two hours long and included approximately 10-15 partners from outside the tech industry as well as up to nine representatives from various tech companies. The goal was to elevate the many different work streams across research and product development already in play, to create a space for knowledge-sharing, and to drive collaborative efforts between the tech sector and academia. The following is a synthesis of these discussions coupled with learnings from 1:1 interviews and a comprehensive literature review.

## Definition Setting

We started our process by exploring various notions of well-being and attempting to align on these definitions. Well-being, as noted above, does not share one definition. Instead, the concept is generally understood to be the integration of various factors such as mental health, physical health, satisfaction with life, social connection, purpose, and meaning. Some experts define it as “an evaluation of the general quality of life of an individual and the state of external circumstances [around them].” This accounts for “[a] person’s happiness, success in their goals, and their overall positive functioning in their environment,” among other elements. Drilling down and defining well-being as it relates to human interaction with technology is equally subjective. For example, one expert described this intersection as, “When your interactions with technology align [with] and serve your health, character, personality, and morality.” Other expert descriptions of how technology impacts well-being included “preventing the worst human impulses” and “achieving self-actualization.” Consensus on a single definition of well-being in technology did not emerge among the group.

**Instead, several key themes surfaced: individual outcomes (e.g., emotional and social health); processes (e.g., self-reflection); system features (e.g., user agency and control); and social outcomes (e.g., values, quality of connections).**

Moreover, the group grappled with tensions in aligning corporate objectives with individual and societal values. This includes a significant discussion around data governance issues and online consumer privacy rights.

**What is your definition of well-being through the lens of technology?**

Emotional and social health

Promoting health and work-life balance

Enabling personal, professional growth

Positive sense of self, others and connections

Supporting balanced diet, exercise, sleep, and mood

creative fulfillment; personal growth

*An example of responses from a collaborative learning exercise during the first workshop.*

## Well-being and Emotion

It should be noted that the many stakeholders, including experts and the public, often frame the concept of well-being using terms that describe emotion. Yet, emotion is just one factor that informs the composite of an individual's well-being, and the science of emotion is complicated. A few examples of this include recent critiques around correlations and interpretations between physiological signals and emotions. For some researchers, physiological signals, such as facial expression or heart-rate variance, indicate emotional responses. We see these signals now being incorporated in a variety of technical systems, from social media to recommendation engines, customer service, therapy, education, and advertising.

To other researchers, the use of biological signals and behaviors do little to illuminate the numerous contextual components that may characterize an emotional response. Notably, Lisa Feldman Barrett posits that not every expression has a corresponding emotion and that emotion arises as a function of the “conceptual structure that is afforded by language.” This includes recognizing that emotions can be inconsistently described by the individual experiencing them.

With such inconsistent and evolving definitions of well-being and emotion, it comes as no surprise that an agreed upon set of methodologies and measures are also lacking. Despite the fact that there are no shared underlying theoretical frameworks and measurements, well-being and emotion are critical concepts to explore as part of the human experience. For example, it is through well-being research that we have come to better appreciate the relationships between emotions and outcomes such as mental health, moral decision-making, and memory, all of which represent real-world effects that manifest in all aspects of our lives, including work and relationships.

However, the use of such emotion research, coupled with privacy concerns over big data, algorithmic bias, and conflicting scientific theories, give rise to several challenges, as seen in critiques of “empathic technologies,” which leverage biological signals and translate them into emotional categories. The key question is: if the study of emotions as they relate to well-being — its underlying theoretical frameworks and resulting methods — is in flux, then how confident can we be in the power, fairness, and usefulness of any technology built on this research? Spoiler alert: not very confident.

The above merely scratches the surface of a multitude of risks and challenges related to emotion and technology. Yet, there is substantial market interest in pursuing technologies that detect, recognize, and seek to translate emotions, particularly within the wellness industry, with forecasts projecting growth to over \$37 billion by 2026. The allure is that machine learning and other AI techniques may help finally tackle the complexity of emotion and, in turn, well-being in general. However, as we've highlighted above, emotion and well-being are highly complex frameworks with many facets, including environmental and physical factors. Thus, while research and product development in this space are happening, there are inherent risks that require that this work be carried out thoughtfully and responsibly.

## Stakeholder Roles and Responsibilities

After working on these definitions, we identified key stakeholders. Given the complexity of well-being, the group pinpointed numerous entities that are and/or should be part of a holistic approach to research and product development in this space. These stakeholders include academics, researchers, clinicians, ethicists, designers, parents and guardians, developers, and policymakers. The roles and responsibilities of each of these groups vary widely. For example, some experts highlighted the need for parents, guardians, and educators to participate in design projects to improve youth experiences with digital technology.

Simultaneously, several group members advocated for increased industry responsibility in facilitating and engaging in community-driven design initiatives. Furthermore, academics were urged to accurately report and acknowledge limitations of research and to "stay true to the data to avoid feeding into moral panics." For governments and regulators, who are often identified as institutions of accountability, the group recommended increased oversight of industry, as well as a rethinking of funding streams to support education for digital skills and mental health.

One additional suggestion for self-regulation within industry included expanding who from industry is involved and leveraging system-level operators (e.g., Apple iOS or Google Chrome). These operators, as the group pointed out, have a unique, comprehensive view of a user's total digital footprint and can provide a much richer understanding of a person's entire set of digital interactions than any report by one individual digital platform. ○

# SECTION II

The following section provides insights on two key questions raised by the group. The first is how to conduct responsible research on well-being, which includes examining questions about ethics and methodology, as well as data representation and inclusion. The second question focuses on what it means to build technology that best supports individual and collective well-being.

## Responsible Research

Defining responsible research in well-being technologies underscores many of the concerns discussed in Section I. For example, the fact that there are so many definitions of well-being makes measuring it all more complicated, as each definition suggest its own set of metrics. Two of the most common measures that are particularly echoed in the public sphere include “time spent” and “level of addiction” to digital technologies. Several experts voiced their concerns with the utility of either construct. For example, some argued that using the time spent measurement unnecessarily oversimplifies a digital experience by removing the context in which someone may be engaged online. Yet, several others noted that overuse of technology, regardless of the type of engagement, may negatively impact a person’s well-being. “Sitting on my phone or at my desk for hours at a time is not exactly promoting a healthy outcome, regardless of whether I’m passively scrolling or engaged in [online] conversation,” shared one expert. From this discussion, two overarching needs in industry research emerged: 1) an understanding and evaluation of the various services and products that support well-being; and 2) a repository of the effect each platform has on both individual and collective well-being. In both cases, this research requires cross-collaboration among tech companies and between industry and academia.

One participant summed this up by noting that, “In discussions like these, we often operate under the assumption that we understand and have solved for well-being outside of the technology space. But in reality, we are so far behind in our understanding of human well-being that it makes it even more difficult from a product development sense and requires so much more for us to learn.”

### **Need 1. Understanding and Evaluating Services and Products that Impact Well-being**

For the first need, which seeks to understand and evaluate current products that impact well-being, the group generated various examples currently available to consumers. This included suggestions such as examining “coercive design patterns” across platforms and how to move away from Eurocentric values in design, among other examples. Additional suggestions included lengthening the timelines of experiments and setting each user as their own control within the experiment. For example, a researcher may choose to observe and follow a single subject's own technology patterns to see if this influences and changes the subject's own well-being over a period of time. One of the more contested strategies offered in discussion was to integrate well-being indicators in experimental A/B testing, a strategy that researchers use where they compare two versions of a product to assess performance. Several members voiced concerns about how the results of such experiments might be interpreted, particularly because scientific frameworks are in flux. Take for example work around “happiness” and “anger.” In A/B testing, one may choose to compare whether a certain condition results in a positive (happy) or negative (anger) emotion. Public perception often views emotions as falling within a dichotomy of either “good”/“pleasant” or “bad”/“unpleasant” and values minimizing “bad” emotions.

**Yet, many experts argue that all emotions are useful, even those that may feel unpleasant.**

For example, research has shown that anger, which is generally considered an unpleasant experience, can be an indicator of high emotional intelligence.

In a multi-faceted, longitudinal study examining the role that social acceptance plays in negative emotional responses to stressors, researchers found that individuals who accepted rather than judged their feelings experienced fewer negative emotions overall. These study participants were also less depressed and anxious and more satisfied with life. This example illustrates the complexities involved in interpreting everyday emotions, which can have a notable influence on product design and development.

In addition to research approaches, the group raised numerous concerns around issues related to third-party data access, user consent, production timelines, consumer trust, and corporate transparency (some of which are expanded on below). Specifically, the group discussed tensions in preserving online privacy as it relates to data access by third-party researchers. This became even more complicated as the group thought through potential cross-industry collaborations that bumped up against IP considerations and data governance concerns. These considerations were echoed in comments from Mary Gray, principal researcher at Microsoft Research, during her keynote at the 2021 AAAS Annual Meeting. Gray spoke of the “collisions” between Big Tech, research ethics, and human rights, noting that researchers will contend with new challenges and methods that will strain research ethics, like real-time modification of users’ engagement with a digital technology. She suggests, “[Researchers] studying online behavior or gathering data from the internet should strive to be more people-centric and less data-centric,” recognizing that the people included in such studies are key stakeholders with rights.

## **Need 2. Documenting Platform Effects on Individual and Collective Well-being**

The second need, which focuses on documenting industry impacts on well-being, surfaced tensions that arise in attempting to align business interests with societal good. As one participant in our discussions noted, the problem is not companies’ inability to identify whether a metric may be harmful to well-being but, rather, acceptance or recognition of that metric within the business. One participant said,

**“If it [the metric] competes with revenue, it will often lose.”**

One recommended mitigation strategy is to ensure that well-being is reflected within corporate values and mission.

**The challenges become how we operationalize and redefine well-being in the language of business to align, or prioritize amongst, the goals of growth and well-being.**

Pamela Pavliscak and Andrew McStay offer a helpful resource in the Emotional Artificial Intelligence (EAI) guidelines, which they argue enables companies to innovate ethically.

## Responsible Innovation

There is also a need to explore well-being by identifying current “best-in-class” products. This proved to be a difficult exercise among participants and was filled with numerous caveats. As one participant described, one person’s positive well-being experience on a mobile mental health app may be a stressful or negative experience for another.

One definition of “best-in-class” focuses on whether a solution provides support for an individual to navigate their current lived experiences. Image 2 illustrates how this can widen the umbrella to include a range of apps, from mental health to fitness to mobile transport. Other participants reframed the question to examine how to bring well-being into current technologies. Some workshop participants discussed the potential of forming partnerships with established well-being apps. Would that approach be productive, or would it delegate responsibility to another entity, thereby creating more harm than good? This sentiment was underscored by comments around first-movers in the market being equated to “best-in-class” solutions.

## What are critical product ideas that have not been leveraged, but tech companies should consider?

Design for healthy sleep

Move away from time spent as the primary measure of well-being

Design for healthy discussion of mental health

Giving people access to their own data while maintaining boundaries

Empowering users to access screen time management features

*An example of responses from a collaborative learning exercise during the second workshop.*

Another concern is with the “commodification of well-being.” This is particularly fraught when it involves attempts to gamify the human experience, examples of which include Fitocracy and Starbucks. For some participants, gamification undermined well-being, emphasizing behaviors such as addiction. A similar unease was expressed by some participants related to technologies that are viewed as paternalistic in their interventions (e.g., behavioral nudging of users). In the group’s discussions, an alternative intervention was cited: boosting interventions, which target competencies rather than behavioral outcomes.

Technologies that attempt to serve large populations also run the risk of oversimplifying well-being for the sake of scale. “The crux of the challenge is, how do we make space and innovate in a way that prioritizes an authentically first-person design?” asked one participant. Examples include providing more user controls, re-establishing agency, and supporting personal growth, among others.

## What Comes Next

Much of the final discussion focused on what to do next. Specifically, the experts we convened reflected on the role that industry can and should play in this space as well as strategies for mitigating various risks. For some, subsequent steps must include an increase in funding models for collaborative research with equitable compensation for academic research projects. Beyond capital and earlier concerns expressed around data access and trust, the group emphasized several different steps such as increasing co-creation and community-informed design and the democratization of computing power to third-party researchers. Moreover, well-being needs to be considered across various levels (from design to final product and user experience to

social norms) and throughout a technology's life cycle. As one participant noted, technology and its implementation will always exist in tension across several dimensions, whether it be progress versus stability or cutting-edge technology versus fairness.

One promising prompt offered by industry participants is for external researchers to identify: "What would you do if you had access to cross-platform data, such as log data? What kind of questions could that help you answer?"

For this group, however, most poignant was the call to surface and attempt to define a "North Star" for the entire tech sector. This includes engaging in a systematic process to examine whether a shared set of definitions and frameworks around empathic and well-being technologies could be useful. To get there, the sector must first engage in additional cross-discipline discussions, workshop existing frameworks, and discuss industry-wide benchmarks. Moreover, tech professionals must continue to work in collaboration with each other in order to better understand technology's impact on well-being. In addition to the challenge of defining a shared north star, a second (and arguably thornier issue) is the tension that a shared definition may not align with current market incentives for tech companies. ○

# CONCLUSION

**W**ell-being is a useful theoretical framework for illuminating multiple factors that make up the human condition. It gives language to how these various elements flow into one another, impact each other, and inform our humanity. Intuitively, we have some sense of what contributes to our overall well-being and the need to strive for positive health outcomes. This may include concepts like positive and negative emotions, a sense of purpose, and personal connections. Yet, in trying to triangulate discrete causes, both science and technology fall short. As this report discusses, what we understand of human emotion and well-being (outside of technology) is in flux because research in this field continues to evolve. What we understand of technology's role and impact in this space is also an open question. But, neither the unclear science of well-being nor our lack of understanding in technology's role, should suggest that we completely abandon the pursuit.

It is imperative to iterate on and build for a future where well-being and technology synergistically coincide. Will this require a total rearchitecting of systems (technical, legal, and social)? Perhaps, but unlikely. Will it require taking on the growing tension between market and social norms? Probably. Will this require taking stock of current solutions, frameworks, theories, and mission statements? At the very least. What comes next will require an effort that prioritizes well-being, however it is defined, above many of today's considerations. We need the sector to come together in this way to reduce harms and promote healthy outcomes, for both individuals and society as a whole. ○



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