# An Intertwined Perspective on Technology and Digitized Individuals: Linkages, Needs and Outcomes

## 1. The Rise of the Digitized Individual: Contextual Specificities

Information technology (IT) has changed dramatically over the last several decades. Although, in its early days IT has been mostly employed as a tool for conducting business or running complex governmental and organizational operations, it has shifted to also become a productivity and hedonic tool for individual users (Matt, Trenz, Cheung, & Turel, 2019). Readers can reflect on how many technologies surround them now, as they read this article. These can include a range of mixed-use technologies that cater to both hedonic and utilitarian objectives. Examples include, but are not limited to, the device through which this article is read (desktop, laptop, tablet, or smartphone), a smart TV, smart kitchen appliances, smart watches, wearable fitness trackers, and autonomous cars that drive the readers while they listen to a text-to-voice generated version of this article.

These changes in the technological landscape have presumably been supported by technological advancements that have made technology more connected and affordable than before, smaller, yet broader in its capabilities, beyond merely being job- or leisure-oriented (Turel et al., 2019). Since many of these technologies are used exclusively in leisure or non-work settings, or in both work and non-work (including leisure) settings, they have created what we call *digitized individuals*, defined as **users who employ at least one digital technology in their non-work life domains**[1]. Note that digitized individuals have existed since the dawn of personalized computers, but we see major growth in the last decade with the vast penetration of smartphones, social media and personal lifestyle and health technologies. We view the collective of digitized individuals as contributing to the phenomenon of the digitization of individuals, defined as the proliferation of digital technologies in the lives of individual users (Matt, Trenz, et al., 2019). Although the bare minimum to qualify as digitized individuals according to this definition is using one technology for non-work including leisure purposes, nowadays, many people use multiple technologies to different extents, being integrated into their lives in many different ways. This creates a large variability in the extent of their digitization. The combination of the significant diffusion of digital technologies used by individuals with the variability in their

[1] This implies that most people can be considered as digitized individuals yet they clearly vary in their degree of being digitized – from very low (e.g., a person who uses a smartphone to check the weather once a day) to very high (e.g., a person who manages most of his or her non-work life via digital technologies). We use this broad concept of the digitized individual to include all types of linkages between individuals and technologies. However, it is worth noting that there is a broad spectrum of degrees of digitization that result from the choices illustrated in our framework below.

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(partly joint) usage leads to the necessity to develop an intertwined perspective that considers technology and the individual at the same time, i.e., a socio-technical perspective.

Several studies have argued for a need to understand digitized individuals, the drivers of the digitization of individuals and the consequences of this digitization, because technologies aimed at the digitization of individuals have unique features that distinguish them from commonly examined business technologies, or that are insufficiently highlighted and understood in studies of non-work technologies (Matt, Trenz, et al., 2019; Turel et al., 2019). These characteristics include: (1) the creation of new application domains (e.g., Internet connectivity in any home device that has not been IT-infused before, see Yashiro, Kobayashi, Koshizuka, & Sakamura, 2013), (2) ubiquitous use, including even embedding IT into human bodies and creating cybernetic organisms, or "cyborgs" (Pelegrín-Borondo, Arias-Oliva, Murata, & Souto-Romero, 2020), (3) user volition in defining technology use settings and portfolios (Liu, Santhanam, & Webster, 2017), (4) a change in user landscape that reflects a shift from digital immigrants to digital natives, and the increased acceptance of digitization technologies by digital immigrants (Kesharwani, 2020), (5) self-determined approaches to usage, and self-learning necessity (Huang, Backman, Backman, McGuire, & Moore, 2019), (6) globalized markets with little and some may say impossible regulation of user and consumer protections (Tanczer, Brass, Elsden, Carr, & Blackstock, 2019), and (7) broad effects, negative, positive and ambivalent, that can relate to usage and non-usage of an IT, and that can last long after the IT use has been discontinued.

The abovementioned aspects clearly show the diversity of this phenomenon. Here, we build on these scattered aspects and provide an integrated framework to better understand the *digitized individual.* Our framework links different arrangements between technology and the individuals with the multitude of possible outcomes through the lens of self-determination theory, or SDT (Deci & Ryan, 1985; Ryan & Deci, 2000). This is a viable and important way for comprehending the digitized individual, because the adoption of, use of, and post-use behaviors pertaining to many of the abovementioned technologies is self-determined, and is aimed at serving key human needs. SDT highlights the importance of three basic human needs: autonomy, competence, and relatedness – all of which can be satisfied or restricted through interactions with technology. Autonomy reflects the volition people have in taking action and having the freedom to do what they want, competence refers to progression in attaining goals and new achievements, and relatedness reflects a need to socialize and connect with others. As such, SDT has been applied in various information systems context to show that people will employ technologies (Menard, Bott, & Crossler, 2017; Venkatesh, Thong, Chan, Hu, & Brown, 2011) that promise the support of such goals and showcase how individuals act in such a way that the support of these needs is maintained (Gagné & Deci, 2005).

Extending these views, we argue here that (1) people become digitized by allowing technology to interact (sometimes physically) with particular life domains to reach their goals, (2) technology that affords the digitization of individuals is developed to either implicitly or explicitly address needs dictated by SDT, but can, in this context, also be a double-edged sword in that it affords the attainment of SDT needs while diminishing others, and (3) the way in which arrangements between the digitized individuals and technology interact with their needs can impose a wide range of outcomes at different levels. We elaborate on this perspective in the next section.

## 2. A Framework for Studying the Interactions between Individuals and Technology

Using the abovementioned SDT framework and the current understanding of the digitization of individuals (Matt, Trenz, et al., 2019; Turel et al., 2019), we propose the framework below as a means to understand and classify current works that focus on technologies that digitize individuals, as well as the digitized society, and as a way to plan future work in this domain. The framework (see Figure 1) includes three layers, the interaction among which can influence the outcomes (psychological and behavioral, at the micro (e.g., for individuals) and macro (e.g., for societies) levels of digitization decisions and actions. We explain the layers and relevant research questions pertaining to them in the next sub-sections.

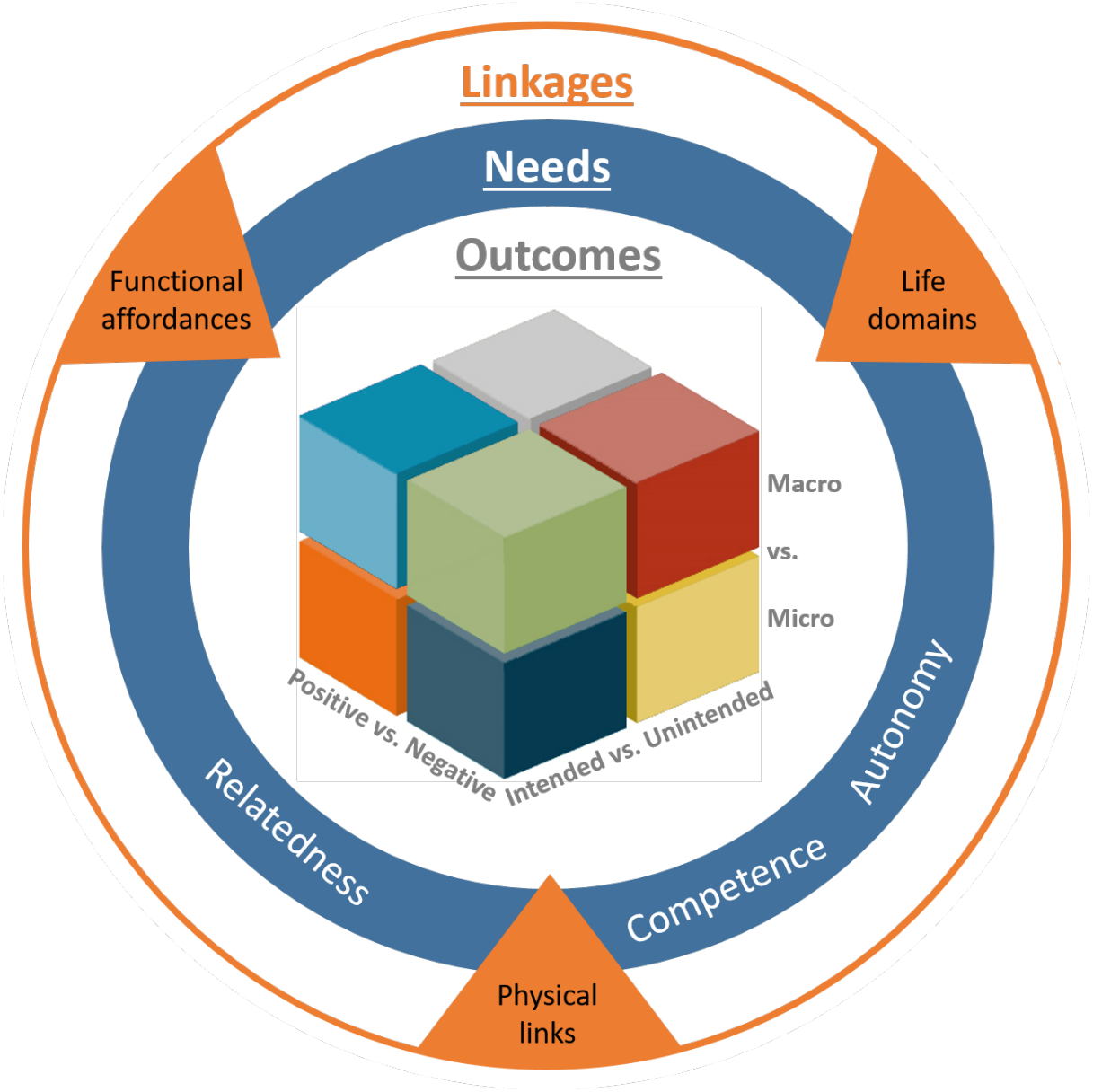


**Figure 1:** The Intertwined Three-Layer Framework of Technology and Digitized Individuals

### 2.1. Layer one: Arrangements and links between individuals and technology

This layer encapsulates the domains through which the technology is integrated into users' lives. These include: (1) the functional affordances domain that captures the things the technology affords users to do (e.g. social media affords connecting with friends (Karahanna, Xu, Xu, & Zhang, 2018), and a fitness tracker that affords collecting health information (Henriksen et al., 2018)), (2) the life domains' links that capture the areas of life that are

affected by digitization (e.g., social media may affect the social, work and family domains (Tarafdar, Gupta, & Turel, 2015), and fitness trackers that may collect data on and influence the health domain but that can also be a means to interact with others (Best, Manktelow, & Taylor, 2014)); and (3) the physical links, which capture the extent to which the technology is physically integrated into individuals, ranging on a continuum from being physically distant from the user (e.g., sensors, remotely parked autonomous vehicle) to being physically embedded into the user and always moving with the user (e.g., digital implants) (Akturk & Brackett, 2020; Seeber et al., 2020). This layer is external because the functional, life domain and physical links afforded by various technologies serve as a basis that define the extent to which the digitization technology (technology designed to digitize individuals) caters to user needs, as dictated by SDT. Research on elements of this layer can require design science (Pascal & Renaud, 2020) or other technology design means (Brosens, Adebesin, & Kruger, 2020) that focus on designing IT artifacts that can digitize desired aspects in user lives in efficient and ethical ways (Wessel & Helmer, 2020).

***Functional affordances.*** The functional affordances aspect of this layer captures what the technology is supposed to do for the individual, and the functions the individual is going to allow to interfere and interface with their lives. A simple classification that comes to mind is guide vs. enable vs. facilitate. That is a person can allow technology, if it affords so, to guide them by providing recommendations (e.g., best restaurant in town recommendations on YELP), enable the use of recommendations (e.g., provide directions to the restaurant on Waze) or facilitate making reservations online (e.g., via the restaurant's website) and even reaching the restaurant (e.g., via sending the link to one's autonomous car and having the car self-drive there).

***Physical links.*** We posit that there can be four broad categories of physical links. The first category is "physically distant" (e.g., public surveillance camera, network supervision (Venkatesh, 2008; Zuboff, 2015), where the person is away from the technology) and where exposure to the technology is inherent in specific actions e.g., going to public places or using the Internet. The second and third categories include technologies that people voluntarily decide to bring with them, either "carried along" (e.g. smartphones and other mobile devices (Jung, 2014)) or "worn" (e.g., wearable devices (Mettler & Wulf, 2019)). As opposed to the "carry along" situation, wearing a device has a much stronger connection to the body, often with access to more personal data (e.g., pulse, movements) and cannot always and easily be removed (Mettler & Wulf, 2019). Lastly, the technology may be integrated into the body (e.g. implants, see Pelegrin-Borondo, Reinares-Lara, & Olarte-Pascual, 2017). Although still mostly a voluntary decision, this decision has significant consequences as this technology is certainly difficult to remove and always present, leading to a much more profound and lasting connection between the technology and the individual.

***Life domains.*** Based on prior research, we suggest that technologies that afford the digitization of individuals can be integrated into at least four life domains: personal/familial (Cornejo, Tentori, & Favela, 2013), work (Ollier-Malaterre, Rothbard, & Berg, 2013), health (Giddens, Gonzalez, & Leidner, 2016), and social (Davison, Ou, & Martinsons, 2018). While the primary purpose of technologies may lie in one domain (e.g., health improvements through fitness trackers or higher effectiveness through using personal assistants), they may well interface with other domains, positively, neutrally, or negatively, possibly leading to a combination of domains to be investigated. This creates a very broad set of contexts across life domains in which digitization technologies should be studied, as well as a broad set of affordances, motivations and human-technology interactions that serves as a fertile ground for future research.

Research on how technology can afford and cater to SDT-based needs is in its embryonic stage, and therefore there is much room and need for exploring the questions: *how can or could technology best serve user needs in various life domains and via various levels of physical links to users? How do affordances differ across life domains and types of physical links?*

**2.2. Layer Two: Human Needs and Technology**

The functionalities and impacts afforded by Layer 1 Inflate or deflate the fulfillment of the abovementioned SDT needs of users (i.e., varying needs in terms of competence, relatedness, and autonomy). For example, users of a wearable fitness tracker may encounter an increase in relatedness owing to jointly used fitness applications (Kluwer, Karremans, Riedijk, & Knee, 2020; Stragier, Vanden Abeele, & De Marez, 2018). At the same time they might have an increase of autonomy (through higher control of their health data) and competence (by learning encounter stress from excessive tracking)(Owens & Cribb, 2019), which is counterbalanced by an increase in stress owing to excessive tracking (Schlomann, von Storch, Rasche, & Rietz, 2016). This is the mediating layer, because the ability of the affordances and links described in Layer 1 to drive outcomes, as described in Layer 3, is mediated by changes in SDT needs and their fulfilment, as captured by Layer 2. Research on elements of this layer requires reliance on motivation (Deci, 1975; Deci, Koestner, & Ryan, 1999), human-computer-interaction (Card, 2018) and IT affordances (Mettler, Sprenger, & Winter, 2017) theories, among other theoretical streams that can explain how and when technologies cater to user needs.

In a nutshell, ***competence*** refers to progression in attaining goals and new achievements. It captures the extent to which people seek to control the outcome and experience mastery. While many technologies engage users through provoking their need for increased mastery (Yee, 2006), there is still a lingering question regarding whether technology reduces the ability of people to solve problems on their own, or whether it just reduces the necessity to

do so (Graaf, 2018). ***Relatedness*** reflects a need to interact with, be connected to, and experience caring for others. An important question here is whether the use of technology removes necessity to interact and/or substitutes the normal face-to-face interactions with technology-mediated interactions (Turel, 2019). Lastly, ***autonomy*** reflects the volition people have in taking action and having the freedom to do what they want. It basically captures the desire to be causal agents of one's own life and act in harmony with one's integrated self. This is an area that is seriously threatened by new technologies (e.g., robots, autonomous cars, and service bots), that can replace people and decide for them (Ågerfalk, 2020). Thus, there are opportunities to examine important research questions regarding: when and how does digitization technology replaces people? When will people be willing to give up their autonomy? Moreover, which link will they use to do so (e.g., the physical link or functional affordances)? Integrating these important questions, we suggest that future research focus on the important question of: *How is technology design affected by and how does it affect the attainment of SDT-based needs, in various life domains and via various levels of physical links to users?*

### 2.3. Layer Three: Outcomes of Technology for the Individual

This layer captures the downstream outcomes, intended or not, of the extent to which technology caters to human needs, as prescribed by SDT. When SDT needs are met, people in general feel happier, satisfied, and have increased wellbeing (Ryan & Martela, 2016). For IS users, this often results in increased (Rezvani, Khosravi, & Dong, 2017) and more engaged (Liu et al., 2017) use of technologies. When the needs dictated by SDT are not met, people rebel and try to change the situation. For example, when they feel they lose agency over technology use (i.e., they sense reduced volition and feel that the technology does not meet their agency needs) they may quit using the technology, reduce its use, or find work-arounds (Ilie & Turel, 2020) that may represent psychological reactance toward the technology (Brehm, 1966). This is the inner layer as it is influenced by the dynamic interaction between the middle and outer layers (Layers 1 and 2). Research on elements of this layer often requires reliance on various social science and psychology theories (Müller, Junglas, Brocke, & Debortoli, 2016), with specific emphasis on SDT components such as agency (Raddatz, Marett, & Trinkle, 2018), as well as other theoretical streams that can explain the outcomes of technology being able to meet, or failing to meet, user needs (Karahanna et al., 2018).

This layer is argued to be flexible and dynamic, because the interaction between Layers 1 and 2 is dynamic, and consequently the outcomes in Layer 3 can vary. This variation stems from the permeability of prior layers; changes in them can be frequent. For example, the needs of a person for agency can vary from one situation to another (e.g., a person may accept full control of an autonomous car on the freeway but not on side roads (BROWN & OSBORN, 2019)) and the ability of a system to cater to such needs may vary as the needs

change (e.g., a videogame may increase a sense of competence until a user reaches a certain level, and afterwards it can become difficult or almost impossible to master, such that system use no longer supports the competency needs of the user (Baldwin, 2017))

This layer has been studied quite extensively, even though not always formally via the lens of the digitized individual. Studies have shown that digitization technologies can have many positive effects on and outcomes for users. Examples include increase of self-esteem through social media use (Burrow & Rainone, 2017), improved educational outcomes (Mayo, 2009), feelings of happiness and enjoyment during use (hedonic effects) (Bründl, Matt, & Hess, 2017), elevated convenience (Wang, Minor, & Wei, 2011) and support for people with limitations (Pollack, 2005), as well improved health (Wang et al., 2015). Negative effects can include, but are not limited to, cognitive strain (McHugh, Wisniewski, Rosson, & Carroll, 2018), dependence and addiction (especially with social media and online games) (Lee, Cheung, & Chan, 2020) , deception (e.g., fake news) (Lazer et al., 2018; Pennycook & Rand, 2019), reduced academic performance (Adelantado-Renau et al., 2019), sleep loss (Woods & Scott, 2016), consumption of unhealthy foods and drinks (Bradbury, Turel, & Morrison, 2019), aggressive behaviors (Chan, Cheung, & Wong, 2019) , feelings of being observed (Matt, Becker, Kolbeck, & Hess, 2019), and stress (Lim & Choi, 2017). Notwithstanding the contributions of such studies, we suggest that important research question to address in this domain are: *What are the outcomes of successful, partially successful or failed interactions between technology affordances and SDT-based needs? How can positive outcomes be promoted and negative outcomes be reduced or eliminated?*

**2.4. Summary through Example**

Here, we briefly illustrate the way the framework can be applied to the understanding of *digitized individuals and technology.* Taking connected cars as an example of a collection of digitization technologies (technology designed to digitize individuals), we argue that they provide certain functional affordances (e.g., a plurality of online-based infotainment and navigation services). We also suggest that they are physically distant from users in the sense that users do not carry them or wear them everywhere they go. Lastly, we posit that they can be integrated to many life domains, such as personal, social and work (Layer 1, the external layer). The set of digitization technologies in connected cars serves the basic human needs for relatedness, autonomy and competence to different degrees. For example, the car might create a sense of in-group and allow connecting to other car owners through forums, or even while driving (e.g., the crowd information sharing information in Waze), and through these cater to the need for relatedness. Learning to use new features (that are provided frequently in cars like those manufactured by Tesla) can cater to users' need for competence. The car can help and hurt users' sense of agency, as on the one hand it can afford volitional choices between unassisted driving to relying on a higher number of

support features. Nevertheless, drivers may feel that some decisions, such as the suggested route when using navigation support or the selection of suggested restaurants nearby or preventing lane change because there is a nearby car in the other lane, were not fully under their control, and hence experience some loss of agency (Layer 2). Lastly, the interactions between Layer 1 and Layer 2, can generate outcomes manifested in attitudes toward the connected car, productivity gains due to ability to work while the car self-drives (e.g. responding to emails via voice interaction), physical and financial risks of accidents when using such features and potentially being distracted, and enjoyment with the experience of interacting with all the digitization technologies in the car (e.g., games, or karaoke while driving).

## 3. Papers in this Issue

In this section, we describe the three papers in this special issue through the lens of our three intertwined layers framework of technology use and the digitized individual. We further explain how future research can leverage the gaps illuminated by our framework for further advancing our understanding of the digitized individuals.

It is important to note that a restriction in self-determination factors, such as agency, does not imply that the outcomes are necessarily negative, but instead can be multifaceted and contradictory. For instance, De Moya and Pallud (2020) investigate quantified-self technologies that are worn on the body with the primary goal of improvements to health. Using this technology, individuals voluntarily enter a state of surveillance that particularly intervenes with their autonomy and competence needs. The authors expand upon Foucault's metaphor of the panopticon and conceptualize the heautopticon, a consented micro-surveillance of the individual. They build upon a qualitative study with interviews and a large dataset extracted from online forums and blogs to uncover how this form of agreed-upon surveillance simultaneously empowers and disempowers individuals. The results highlight the complexity of the interplay between the different layers of the framework. As an increasing number technologies used by individuals (e.g., self-driving cars, health tracing apps, smart-home solutions) create similar micro-surveillance settings, this paper presents important groundwork for future research to understand and shape the impacts of those technologies on individuals and societies. For instance, it is interesting to consider what would have happened if the technology is implanted rather than worn, and how, through the SDT lens we use here, it might affect adoption and use patterns. It is also interesting to consider in future research, how this micro-surveillance influences other life domains and produces benefits and risks beyond the individual.

The paper by Ogbanufe and Gerhart (2020) is a great example to illustrate how outcomes of the digitization of individuals emerge on different levels. Focusing on smartwatches as an exemplary technology for the digitized individual, they examine the link between individual

wearers and smartwatches through the IT identity and valence frameworks. Particularly, they theorize on the development of a smartwatch identity as the first outcome of the evaluation of the fulfillment of the need of relatedness (i.e., social interactions and belongingness) and the obstruction of the need of autonomy (i.e., privacy risk). They furthermore link this novel concept to two additional tangible positive outcomes (i.e., deep use and innovative individual performance). Drawing on data from a survey of 216 smartwatch wearers, the authors demonstrate that wearers leverage the benefits and risks of smartwatch use to explain smartwatch identity, deep use, and innovative individual performance. These insights help improve our understanding of digitized individuals' decision behavior on technology use, and they become particularly fruitful for further research given the decreasing physical distance between digitized individuals and some of their technologies. It would also be interesting to consider in future research how such technology-human interactions and effects aggregate from the individual level of theorizing and analysis to macro-levels, such as the group (team) or societal levels.

The nature of smart home assistants (SHA) requires a different perspective to understand the link between technologies and individual users. Benlian, Klumpe, and Hinz (2020) use the person-technology fit model, self-regulation theory, and the literature on anthropomorphism to investigate the intrusive technology features of SHAs and the negative outcomes associated with SHA use. Benlian et al.'s (2020) work aligns well with our framework. They used a multimethod approach with two studies, including a vignette-based online experiment (n=136) and a follow-up field survey (n=214) to show that SHA's intrusive technology features (i.e., unintentional voice activation, low user anonymity, and high presenteeism) increase feelings of privacy invasion, which in turn heighten individual strain and interpersonal conflicts at home. They also demonstrated how SHA's anthropomorphic design features attenuate the harmful effect of privacy invasion on user strain. In this study, the technology features afford the needs of autonomy (i.e., intrusive technology features) and relatedness (i.e., anthropomorphism) and play important roles in explaining SHA users' strain and interpersonal conflicts. Future research leveraging our framework can extend this study by looking more formally at SDT needs, such as need for competence, a broader set of affordances, and the many outcomes that such need-affordance interactions can generate, not only at the micro levels (individuals) but also at a macro level (e.g., society).

## 4. Conclusion

In this editorial, we outlined important perspectives for studying the interactions between technology and the digitized individual. We introduced a framework that spans across three intertwined layers. It begins with the link between the individual and the technology that may be investigated by considering affordances or functionality, by varying physical link or by distinguishing between different aspects of individuals' lives that the technology enters

into and influences. The second layer addresses the human needs that are fulfilled or obstructed by the digitization technologies. The nature of the link between the technology and the individual and its impact on self-determination then manifests in positive and/or negative outcomes at micro- and macro-levels.

Overall, the papers in this special issue illustrate important aspects of what it means to be a digitized individual, and pave the way for important research questions that can be addressed in future studies. We call researchers to further examine this important topic, as we, humans, become increasingly digitized, often without a deep understanding of why we do so, how this might affect us, and the broad implications of this trend for society.

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