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Human Enhancement Technologies and the Future of Consumer Well-Being

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Abstract

Purpose: To propose a conceptual framework that highlights transhumanism's ideals of achieving superintelligence, super longevity, and super well-being through human enhancement technologies (HET) and their relations with services marketing principles.

Design/methodology/approach: Framed by the transformative service research (TSR), this conceptual work articulates the 7Ps of the marketing mix with four macro-factors that create tensions at both the marketplace and consumer levels.

Findings: HET has potential for doing good but also tremendous bad; greater attention is needed from services marketing researchers especially in one proprietary research area: bioethics.

Originality: This is one of the first papers in services marketing research to explore the promises and perils of transhumanism ideals and human enhancement technologies.

Research limitations/implications: We contribute to the growing work on TSR investigating how the interplay between service providers and consumers affects the well-being of both. Additionally, we call for novel interdisciplinary work in transhuman services research.

Keywords: transhumanism; human enhancement technologies; bioethics; superintelligence; super longevity; super well-being; transformative service research

Introduction

Work it
Make it
Do it
Makes us

Harder
Better
Faster
Stronger

Daft Punk's Grammy Award-winning song "Harder, Better, Faster, Stronger" is a contemporary ode to becoming an improved version of us—human beings—by working relentlessly, diligently, and objectively. An interpretation of their dancing song lies in its direct connection to the ideas further developed in this conceptual paper. An introduction to these ideas can be found in their cyberpunk video clip (https://youtu.be/gAjR4_CbPpQ) and in the robot heads of the duo, who is Daft Punk.

In a futuristic lab, machines work on human-like bodies, perfecting them by creating memories, biochemically forming their preferences, desires, hopes, and goals, giving them bodily endurance, gifting them with creative aptitudes, and implanting digital devices in their heads to process information. These hard-working machines create what seems to be "better humans," "more-than-humans," or, as Fuller (2020) explains, transhumans. Such a supposedly improved being is the existential goal of transhumanism—a philosophical and technophilic social movement (Fuller, 2020). The transhumanist proposition is to drastically redesign human biology by means of human enhancement technologies (HET), such as genetic engineering (e.g., CRISPR) (Mercer and Trothen, 2021). In doing so, the idea is to create superintelligence, super longevity, and, consequently, super well-being for those partaking in HET (Human Enhancement Technologies), to overcome current human biological fragility

(Pearce, 2012). Or, as in Daft Punk's song, a "harder, better, faster, stronger" human. Much of this introduction sounds like a science fiction plot, but it is quickly becoming a reality, especially because of the interest and funding coming from Silicon Valley billionaires, such as Sergey Brin, Google's cofounder, and Elon Musk, Tesla's CEO (Regalado, 2021).

As seen in recent marketing research, the phenomena of offering and consuming HET solutions have been modestly suggested as an urgent topic for investigation (e.g., Belk, 2021; Grewal *et al.*, 2020; Schmitt, 2019). This comes as a shocking and concerning surprise for HET's possible impacts on consumer and societal well-being, such as, on the one hand, promoting dangerous eugenicist discourses and, on the other hand, eliminating life-threatening diseases (Fuller, 2020). Although many of these challenges are well documented in other areas, such as philosophy and medicine (e.g., Vaage, 2017), the absence of discussions in services marketing is a pressing issue. As Fisk *et al.* (2018) argue, both services marketing researchers and managers have a role in tackling the challenges brought up by new technologies from forward-looking, imaginative, and practical perspectives. Failing to do so widens the gap between those who have and who have not access to and consume services aiming at resulting well-being.

In this vein, framed by the transformative service research (TSR) (Anderson *et al.*, 2013), which focuses on improving consumer and societal well-being through services, the objective here is to propose a conceptual framework that highlights transhumanism's ideals of becoming "superhumans" through HET ins relationship with services marketing principles. To do that, we draw on the 7Ps of the marketing mix (i.e., product, price, place, promotion, processes, people, and physical evidence) (Booms and Bitner, 1981) and articulate it with four macro-factors (i.e., political, economic, sociocultural, technological) that create tensions at both the marketplace and consumer levels. On this classic framework, Kuester, Konya-

Baumbach and Schuhmacher (2018) argue that such a well-known and accessible framework enables the use of a broadly recognized structure to capture the marketing consequences of novel and innovative technologies, like HET. In this sense, for the potential of HET in doing great good or great bad, greater attention from services marketing researchers concerning well-being and HET is needed, especially in one proprietary research area: bioethics (Beauchamp and Childress, 2019).

In presenting the consumption of HET as a means to achieve a "harder, better, faster, stronger" human biological condition and, therefore, supposedly super well-being, we directly engage with and contribute to Rosenbaum and Russell-Bennett's (2021) call for research on the intersection of technologies and human experiences in service contexts. We do this by offering a unique perspective that is thus far largely unexplored in services marketing research. Additionally, this conceptual work may help services marketing managers in outlining ethical research, development, and marketization of their HET solutions.

The remainder of our paper is organized as follows: First, we present transhumanism and the HET literature linked to marketing and consumer research. Then, the macro-factors and related tensions are detailed and linked to the 7Ps marketing mix. This is followed by the conceptual framework and discussion sections. Finally, we offer our conclusions and suggestions for future research.

Transhumanism and HET

Transhumanists argue that the current biological condition of *Homo Sapiens* has not reached its full potential and that such a faulty condition must be overcome by means of emerging and speculative technologies (Fuller, 2020). Some of these cutting-edge

technologies are organized under the umbrella called HET. Mercer and Trothen (2021) explain that HET aims at pushing the boundaries of the human body beyond its inherent limits, creating new capacities "necessary for life or well-being" (Hogle, 2005, p. 695). In other words, these cutting-edge technologies challenge what it means to be normal/abnormal, organic/inorganic, artificial/natural, healthy/unhealthy, strong/weak, extreme/minimal, and, ultimately, human/nonhuman (Belk, Humayun and Gopaldas, 2020). Setting aside the philosophical roots of transhumanism, it should be kept in mind that this technophilic movement has a strong pragmatic orientation. To overcome the current human biological condition, humanity must embrace technology not as a symbolic or cognitive extension tool, as in the case of smartphones, but as part of our biology (More, 1998). The speculative designing of babies from "scratch" using gene-editing techniques (e.g., CRISPR) to eliminate life-threatening conditions, cybernetically enhancing the body of those already born to achieve machine-like capacities , and infusing psychopharmaceuticals into the human body to increase cognition, happiness, and even morality are all technological possibilities to become "better" (Mercer and Trothen, 2021).

As Pearce (2012) details, such an improved human being can be measured by observing three controversial transhumanist outcomes: *superintelligence* and *super longevity,* which would lead to *super well-being*. In the case of becoming smarter, the idea is to radically outperform the highest standard of intelligence in every field, including the development of creativity, general wisdom, and social abilities. For example, Hotze *et al.* (2011) show that some physicians occasionally prescribe enhancements for healthy individuals in upholding the moral principles of equity and liberty. However, Ma *et al.* (2015) argue that such a prescription occurs, in part, not necessarily for the outcome of the patient's well-being but to avoid potentially detrimental reviews to the healthcare service.

To achieve super longevity, for example, the supplement NAD+, which theoretically kills aged cells, combined with injections of plasma from umbilical cords, has the potential to delay the natural degeneration of the human body, thus allowing us to live longer (Greenfield, 2020). This is different from going to a dermatologist and undergoing a procedure with Botox injections to "delay" the passage of time and symbolically "stretching" the youth once displayed on the physical self (Giesler, 2012). Here, the core idea is to achieve more than 150 years, as recently seen in many discussions about Altos Labs, a novel antiaging startup funded by Jeff Bezos, Amazon's former CEO (Regalado, 2021). Once a number of these biological transformations happen, Pearce (2012) argues that super well-being is a possibility. His idea encompasses, among other solutions, the elimination of suffering for humans and nonhumans and a state of super happiness by means of genetic engineering and intracranial stimulations (Pearce, 2020). On this, but not necessarily considering Pearce's (2012) proposals for super well-being, Pelegrín-Borondo *et al.* (2020) show that consumers will likely adopt HET, such as intracranial implants to overcome their current human biological conditions. Ethics would moderate not only the consumption to achieve super well-being but also the extent to which the state of the super happiness and abilities of others may pose threats to our own personal goals. This is likely to split along socioeconomic fault lines and will certainly have an impact on how services are designed, delivered, and experienced (Fisk *et al.*, 2018; Grewal *et al.*, 2020).

Table 1 shows examples of emerging and speculative technologies and desirable transhumanist outcomes (i.e., superintelligence, super longevity, and consequent super well-being) providing an integrative taxonomy of HET. These elements are purposefully selected based on an extensive literature review and the first author's personal reflections (Holbrook,

2006) as an active consumer (user) of an implanted biocompatible microchip for approximately three years.

Continuum of Body Intervention	Examples of HET	Descriptions and Examples	To know more
+ Extreme	Brain–Computer Interface (BCI)	Neuralink will offer a human–AI interface by implanting an ultrathin microchip in consumers' brains to supposedly merge with AI	https://youtu.be/kPGa_FuGPIc
	Gene Editing	Doudnalab offers services of genetic manipulation using CRISPR/Cas9	https://youtu.be/TdBAHexVYzc
	Brain Hacking	Subscriptions of guided meditations and instructions on increasing well-being by using wearable devices, like the headband Muse.	https://youtu.be/ErFRQMARExA
	Nootropics	HVMN, previously known as Nootrobox sells "smart drugs" to boost and improve consumer's cognitive ability and intelligence	https://youtu.be/7XsviBxbLvI
- Extreme	Supplements and Pharmaceuticals	Upgrade Labs offers several solutions, such as hyperbaric oxygen therapy mixed with bulletproof supplements	https://youtu.be/xPgbThPhMtA
	Magnetic Senses	KSEC Solutions commercializes implantable magnets so the consumer can sense magnetic fields and lift objects.	https://youtu.be/0FxxBff4bN4
	Grinding	Dangerous Things offers implantable near-field communication (NFC) microchips for keys, tokens, business cards, and credit card replacements	https://youtu.be/7DxVWhFLI6E
	3D Bioprinting	Organovo is a pioneer company in printing tissues that mimics human biology	https://youtu.be/h_Sdu5pfUTI
	Nanotechnology	Xenobots, a living programmable organism, is able not only to deliver drugs inside the body but also detox it when needed	https://youtu.be/js6uTRT8KO4
+ Extreme	Cryonics	Alcor offers the service of cryopreservation of the body after death	https://youtu.be/DmWV_ongVeI

Table 1. Examples of HET

Specifically in services marketing research, De Keyser *et al.* (2019) and Čaić, Mahr and Oderkerken-Schröder (2019), show that some emerging technologies, such as robots and wearable devices, directly impact the servicescape and, thereby, consumer well-being. These

ideas resonate with Rosenbaum and Russell-Bennett's (2021) work by emphasizing the role of HET in promoting better human experiences in the context of services. However, most of the technologies portrayed in their study work as wearable tools and not as part of human biology, as preconized by transhumanism principles. Adding to the current discussion, therefore, in the next section, we outline four major macro-factors to consider when engaging with HET from the services marketing perspective.

HET and the Impacts on Services Marketing

The complex political, economic, sociocultural, and technological settings in which HET has been researched, developed, and commercialized influence different marketing actors and their activities. When considering a political factor, emerging and speculative technologies engender regulatory tensions between individual rights over one's body and collective responsibility (Fuller, 2020). On the economic front, we must consider financial fairness in accessing technological resources and knowledge (Hughes, 2004). Sociocultural factors include cultural meanings and ideological beliefs toward technology that play a key role at the marketplace and consumer levels (Belk, Weijo and Kozinets, 2021). These factors have a direct connection with the extent to which technological developments—the fourth factor—have been reshaping current notions of humanity (Umbrello and Baum, 2018). These four macro-factors influence consumer super longevity, superintelligence, and super well-being, creating friction with service marketing efforts. Figure 1 illustrates the conceptual framework upon which the remainder of the present paper is detailed.

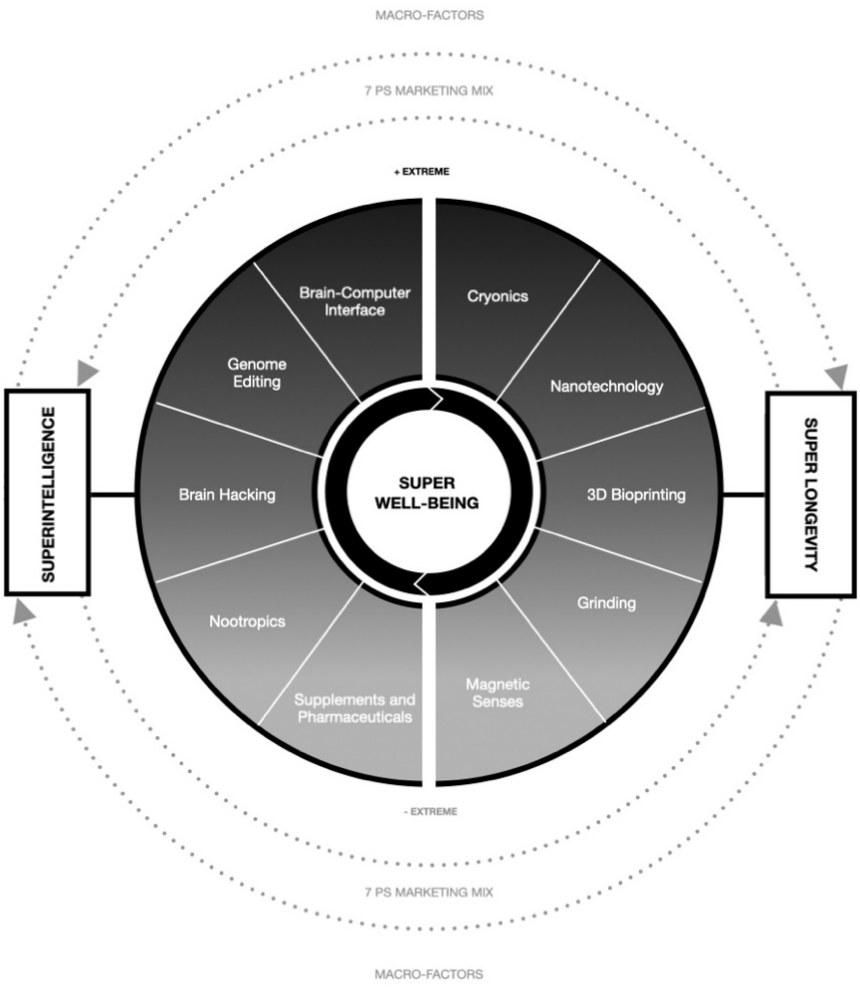

Figure 1. HET conceptual framework.

Political factors: Individual freedom and collective responsibility

The main argument coming from transhumanists and HET enthusiasts is that everyone should be free to exercise the right and ability to alter the human body at will through emerging and speculative technologies (More, 1998). A practical objection is that some of these technologies are not clearly regulated by governmental authorities, which suggests that possible unintended consequences, such as being injured or even dying, may emerge. Zettler,

Guerrini and Sherkow (2019) highlight the absence of an all-encompassing regulation that reduces the friction between those providing solutions for human enhancement and protecting those consuming them, even in a well-structured marketplace such as the U.S. They note the challenge faced by the U.S. Food and Drug Administration (FDA) in tackling some activities at the marketplace level, especially in the case of the "unintended use" of some solutions.

For example, it is easy to enroll in online classes and purchase do-it-yourself (DIY) CRISPR kits to create genetic modifications of animals and even to work on human cell cultures (Zayner, 2020). The tricky aspect of this consumption phenomenon is that, according to the FDA, any use of CRISPR in humans is considered gene therapy and is thereby only authorized for professional use (Smalley, 2018). However, many HET businesses follow the principles of the biohacking community—HET enthusiasts who conduct healthcare self-experiments outside institutional scientific settings, such as universities, regardless of regulatory efforts (Lima, Pessôa and Belk, forthcoming).

Economic factor: Financial inequality in acquiring technologies

"Any sufficiently advanced technology is indistinguishable from magic," says Clarke (1984, p. 76). Because there is no such thing as a free lunch in contemporary capitalist societies, all this magic comes at a price; a big one. Given their expensive pricing and eventual post-regulatory difficulty in acquiring them, some HET are developed and commercialized in a way that targets those who are financially favored. On this structural issue, it is well known that rich countries are privileged in receiving novelties, which makes the social gaps even bigger. However, the gap that may emerge from economic disparities is not only the one linked to social class. This scenario extends to the dystopic vision of having

society divided between enhanced rich humans and nonenhanced poor humans. Aldous Huxley's famous novel *Brave New World*, newer novels such as Bing's *Immortal Life*, films such as *Gattaca*, and Netflix's series *Altered Carbon* give us a hint of catastrophic possibilities in which societies are divided based on the unenhanced poor and the wealthy with transhumanist body enhancements. Certainly, this unequal scenario is an impediment to a more inclusive approach when it comes to services initiatives based on new technological solutions (Fisk *et al.*, 2018).

Many HET enthusiasts admire entrepreneurial capitalism and the neoliberal notion of economic libertarianism, which is grounded in the belief that the market should regulate itself (More, 1998). This is a controversial ideal for the characteristic allocation of goods and services that follow effective demand, which, in turn, would favor those who have the financial capacity to afford what is desired. Such a scenario should not be taken for granted, though. Many transhumanists, like Hughes (2004), argue that HET has a massive impact on the greater good and, therefore, that the state must intervene to safeguard universal allocation and access of them. The consumption of services to achieve superintelligence, super longevity, and super well-being has a strong financial component that cannot be disregarded. After all, not everyone can afford approximately US$200,000 to undergo a cryonics procedure and theoretically be resurrected in a future "harder, better, faster, and stronger" body (Guzman, 2016).

Sociocultural factors: Cultural meanings of technology

There is nothing new in the observation that technological innovations are often enchanting. Part of this enchantment comes from the admiration of these not easily

understandable “black boxes” (Callon and Latour, 1981) coupled with the great effort of marketing campaigns rooted in specific cultural meanings (Belk et al., 2021). As seen in ancient philosophy and cultural myths, some of these meanings are connected to the idea of acquiring capacities beyond human biological nature through the use of technology. In Greek mythology, for example, Icarus had gigantic wings made of bird feathers and wax so he could fly and escape the Labyrinth. In a typical demonstration of overconfidence, he ignored his father’s warnings not to fly too close to the sun and had his wings melted by the heat. He then fell from the skies in the sea and drowned. In Greek mythology, Hamilton (2017) explains, Icarus’ divine punishment for such technology-enabled hubris is justified because flying was only for the gods, and no one should emulate the gods.

When it comes to HET, hubris and punishment are also part of several ideological systems that influence the adoption and consumption of technologies (Belk, Humayun and Gopaldas, 2020). In the case of NFC microchip implants, Lima et al. (2020) identify the dysphoric consumer discourses around the profanation of the sacred human body for its association with the Christian belief of the *Imago Dei*, or the human body as an “image of God” (Peters, 2018). For Peters, those pursuing services to change “God’s work,” as offered by body modification studios, should be punished. Here, when the organic flesh merges with the inorganic metal, there is the controversial emergence of a human–machine hybrid, or a cyborg (Hables-Gray, Figueroa-Sarriera and Mentor, 2020). Over human history, hybrid creatures have paradoxically been a blessing (e.g., angels) and a curse (e.g., Nephilim), much like technology generally (Mick and Fournier, 1998). This means that the pursuit of becoming “more-than-human,” or transhuman, using HET may challenge what it means to be human and, ultimately, what it means to be gods.

Technological factor: Technology development reshaping notions of humanity

The current exponential growth of technological innovations worldwide is unquestionable. From small ventures in basements, such as biohackers streaming online classes on how to develop homemade COVID-19 vaccines (Zayner, 2020), to big companies' projects, like Samsung's division of human augmentation technologies (Samsung, 2021), the idea is to push the boundaries of what is currently known as a cutting-edge solution. This scenario is also exemplified by Gartner's (2021) latest technological report, in which they detail 25 breakthrough technologies that will have a significant impact on society and businesses over the next ten years. Directly or indirectly, all of them will enable the research, development, and commercialization of HET, hence aiming at superintelligence, super longevity, and super well-being.

Some of these breakthrough technologies are AI-driven innovations that may or may not go inside the human body. For example, as largely publicized, Neuralink has been developing a brain–computer interface (BCI) that will allow its users to merge with AI. After a procedure is done by a surgical robot, their solution will connect the user's brain with the internet and perform tasks, such as looking for information on Google, without the need for a smartphone or desktop (Kay, 2021). There will be no technological mediation between the person and the social world. In other words, the person will "become" the technology itself. Such cutting-edge technology is likely to reshape contemporary service contexts and, certainly, our understanding of consumer well-being.

HET's 7Ps marketing mix

Each macro-factor has distinct impacts on the services marketing mix, which, in this work, comprises Booms and Bitner's (1981) 7Ps: product, price, place, promotion, processes, people, and physical evidence. In what follows, we articulate each of the 7Ps using the macro-factors and meaningfulness aspects of HET regarding consumer well-being.

Product. Booms and Bitner (1981) state that products are well-defined offers targeted at specific markets. Although HET may have clear targets (e.g., transhumanists), most are experimental and even speculative by nature (Mercer and Trothen, 2021). This means that a number of known and unknown challenges are expected on the way to achieving the desired transhumanist biological condition or, in other words, one that is supposedly "harder, better, faster, and stronger."

A tricky aspect here relates to consumer expectations of well-being that must meet products' specifications and benefits, which are the key dimensions of services marketing (Anderson, Nasr and Rayburn, 2017). In the case of super longevity, for instance, consumers may purchase biohacking services for revitalizing and rejuvenating their bodies. However, for the innovative, experimental, and idiosyncratic characteristics of these services, their well-being outcomes in a large group of people are yet unknown. This, in turn, reflects the future claims of the successful fulfillment of the company's promise of a super-longevous life for its consumers. It should be kept in mind that properly designing HET services grounded in scientific evidence, whether biochemically-based (e.g., supplement infusion) or hardware-based (e.g., infrared sauna therapy), is mandatory and should not be underestimated.

Price. It is safe to assume that a company's pricing strategy is responsible for communicating several meaningful aspects to consumers and other marketplace actors, such as competitors (Booms and Bitner, 1981). When it comes to selling superintelligence, super longevity, and super well-being, defining the right price is truly challenging. For example,

consider genetic engineering and the “designer babies” transhumanist possibility. Hughes (2004) notes that once safe, gene editing will be adopted by parents for their sense of moral obligation to provide for their children the best possible life. This will lead to a demand for genetic engineering of “harder, better, faster, and stronger” babies. As of today, in the U.S., an attempt at in vitro fertilization (IVF) is priced at around US$25,000, which may take into account the choice of a higher probability of having black or green eyes, brown or white skin, height, and so forth (Marcus, 2018). As with IVF, prospective parents are often willing to spend exorbitant amounts in order to have the children they desire (Fischer, Otnes and Tuncay, 2007). For the high price of such technology, the emergence of a niche of wealthy consumers and highly capitalized suppliers is expected, which, in turn, will lead to serious ethical and societal issues that may deny the idea of collective super well-being.

Place. In the context of service marketing, place refers to the physical setting where the service itself occurs (Booms and Bitner, 1981). It is true that for the continuous digitalization of businesses over the past two decades, services have also happened through e-commerce, mobile apps, at-home procedures, and so forth. Nevertheless, although many HET can be acquired online (e.g., vitamins), the focus in the current paper is on those face-to-face solutions. Here, two elements of the place that must be considered for its capacity to influence consumer experience are infrastructure and visual cues. These two elements are essential to the meaningful and memorable experiences in servicescapes—the place where the service is experienced (Bitner, 1992). For example, the service providers of grinding solutions, such as implantations of biocompatible microchips, have no clear regulations anywhere in the world, which usually leads them to follow the same norms as those performing body modifications for their sanitation infrastructure (Nagel and Jensen, 2019). At these places, the infectious risks associated with such HET can be controlled by observing the same good hygiene

practices as tattooing and piercing procedures. This aligns with Vilnai-Yavetz and Gilboa's (2010) findings on visual cues of cleanliness in servicescapes. As detailed in their work, pleasure and happiness—which are parts of consumer well-being (Anderson, Nasr and Rayburn, 2017)—are impacted by the perceived cleanliness of a servicescape.

Promotion. As Booms and Bitner (1981) define it, promotion is comprised of communicational efforts aimed at creating favorable attitudes toward brands, products, ideas, and so forth. This communicational work is especially important in the case of HET for its innovative nature and, eventually, scientific status. Here, the difficult aspect of elevating such emerging and speculative technologies is the consumer perception that they are something out of science fiction; that they are unrealistic, impossible, false, and even profane (Belk, 2020; forthcoming). Thus, HET service providers need well-tailored marketing communications plans to become knowable, relatable, acceptable, and desirable.

One traditional promotional tool often explored is the sponsorship of healthcare events (e.g., Biohacking Summit) and specialized conferences (e.g., TransVision). In both situations, companies can clarify, educate, and stimulate consumers to acquire services aimed at super well-being. This possibility is especially relevant because face-to-face interactions may help in materializing the company's promise and the consequent consumer deliberation. Another meaningful choice as a marketing communication tool is social media. Upgrade Labs, one of the leading HET companies in the U.S. and Canada, for example, has a consistent social media presence on Twitter, Facebook, YouTube, and Instagram, in which they have more than 38,000 followers. The company seems to manage its online presence by creating instrumental and emotional content, which, as Hollebeek and Belk (2021) emphasize, is an essential strategy for eliciting consumer engagement with the brand.

People. In Booms and Bitner's (1981) 7Ps framework, this P refers to personnel, commitment, interpersonal relationships, and engagement with consumers. Here, Patrício *et al.* (2020) note that a well-trained and empathic staff is a key element for designing people-centered healthcare services, as in the case of HET. However, eventually, this will not be enough for achieving success. One sensitive aspect that arises in this transhumanist context relates to the level of education and specialization of the staff, as governed by local laws.

For example, working on neural interfaces is truly a multidisciplinary challenge. In the case of Neuralink and their futuristic brain implants, it is necessary to have a team of designers, mechanical, software, and neural engineers, physicians, nurses, lawyers, quality assurance specialists, lab managers, business managers, and even veterinarians for animal care (research) to produce these implants. In 2020, Neuralink received the Breakthrough Device Designation from the FDA, which signals a high level of compliance with governmental guidelines and allows the company to skip several bureaucratic processes for final approval of human implantation (Kay, 2021). This means that only professionals with the proper credentials perform surgeries and assist consumers during their consumption journeys. This scenario will become even more important once such a procedure becomes available outside of therapeutic contexts and targets those desiring superintelligence.

Process. This P involves procedures, systematization, the flow of activities, and consumer participation during the service performance (Booms and Bitner, 1981). Frow *et al.* (2019) explain that although service ecosystems are fundamentally dynamic, a stable and sustainable service ecosystem depends on both company and consumer activities that share the norms, rituals, and an understanding of the desired goal.

For example, Alcor (2021) sells the promise of super longevity by pausing "the dying process in a way that allows for potentially restoring good health with medical technology in

the future." Despite all the uncertainty around a future revival, to do this, a series of procedures must be followed. First, a cryonics standby team will have to wait near a dying person up to one week in advance. Second, the cryopreservation process begins as soon as a dying person is declared legally dead. Third, the person is cooled in an iced water bath, and the blood is replaced with an organ preservation solution. Fourth, the cooled body is carefully transported to Alcor's installations. Fifth, cryoprotectants are injected into the bloodstream to avoid damage to the body in subsequent stages. Sixth, the person is cooled down to -196°C, which cryopreserves the person in a solid-state. Finally, in a procedure that may last for decades, the person is kept in a vacuum-insulated metal container at subfreezing temperatures using liquid nitrogen. In this transhumanist context, service processes gain a unique temporal dimension not yet experienced by both companies and consumers, especially in the case of healthcare and older adult care services (Kabadayi *et al.*, 2020).

Physical evidence. Booms and Bitner (1981) define this P as a set of material and observable proofs that ensure the offering's quality. On the consumer side, evaluating the experienced service frequently depends on evaluating the service encounter, which, as Bitner, Booms and Tetreault (1990) explain, is the period when the direct interaction between consumers and the company happens. For example, in the search for a "harder, better, faster, and stronger" biological condition, consumers subscribe to periodic procedures for intravenous (IV) therapy. This is the case with Ivee, a startup that offers at-home health services (e.g., the supplement NAD+ for antiaging). On their website, it shows not only logos of business partners but also consumer testimonials. Moreover, for nurses interested in partnering with them, all that may be taken as a materialization of their services' quality is detailed in their rigorous interviewing, documents for background checking, onboarding process, and uniforms used during at-home procedures.

Contributions and Future Research Areas

Insights from the preceding examination of the 7Ps of HET make novel contributions to services marketing research. More specifically, to the growing TSR work on how the interplay between service providers and consumers affects the well-being outcomes of both (e.g., Nasr and Fisk, 2018; Anderson, Nasr and Rayburn, 2017; Anderson *et al.*, 2013). We do it by, first, highlighting the four macro-factors (i.e., political, economic, sociocultural, and technological) influencing the market dynamics of HET services and their subsequent consumption. Given the growing curiosity and continuous funding of such technologies, this area is expected to see greater public and private interest in the coming years, which suggests the need for more research like that proposed in the current study. Second, by relying on the seminal 7Ps framework, we provide a comprehensive but not definitive perspective on several consumer behaviors and marketing consequences of HET and their relations to achieving superintelligence, super longevity, and super well-being. Table 2 presents some key research questions for future research.

Macro-factors	7Ps	Research Questions
Political	Product	What would be a proper way to regulate the HET marketplace while allowing entrepreneurs to pursue their innovative ideas?
Economic		To what extent and why do consumers accept becoming "superhumans" despite others' financial incapacity to do the same?
Economic	Price	How should marketing managers establish a fair price for superintelligence, super longevity, and super well-being?
Cultural		How does the perception of becoming "god-like" influence price sensitivity?
Political	Place	Can HET companies be allowed to commercialize their solutions on the internet and provide at-home services?
Technological		How will HET influence omnichannel strategies and the design of physical environments?
Cultural	Promotion	What will be the long-term perception of a "harder, better, faster, and stronger" life?

Technological		Should HET service providers be allowed to advertise solutions that are speculative?
Technological	People	Can new technologies tools, such as robots and AI, replace in-person interactions for HET services?
Cultural		Should consumers be assisted by a staff that consumes the same technology in order to achieve greater rapport?
Cultural	Process	Given the speculative nature of many HET, will consumers take more time in their consumption journeys to make decisions?
Political		Should HET companies be allowed to manipulate and transport biological material without proper regulation?
Cultural	Physical Evidence	What are the material elements that better communicate quality for companies offering superintelligence, super longevity, and super well-being?
Economic		What should the role of government be in ameliorating economic differences in who can afford access to such technologies?

Table 2. Suggestive research questions

We agree with Anderson *et al.* (2013) that measures such as profits and consumer satisfaction are not captured by issues central to TSR and are important to our research. Future research on HET and services marketing must focus on both the eudaimonic and hedonic (e.g., happiness and joy) measures of well-being and juxtapose them with the promises and perils of achieving superintelligence, super longevity, and super well-being. A contribution of this paper is the specification of these two types of well-being as well as the key issues of bioethics. Although exceptional examples may be identified (e.g., Fischer, Otnes and Tuncay, 2007), ethical considerations at the intersection of services marketing and biological and medical research are still missing (see Belk, 2020; Ostrom, Mathras and Anderson, 2014; Anderson and Ostrom, 2015).

Beauchamp and Childress' (2019) classic work, in which they propose the four principles of bioethics. The first principle in this framework, beneficence, is the obligation of healthcare professionals—the key service providers in this case—to act for the benefit of a person and support the moral rules to protect the rights of others, prevent injury, help those

with disabilities, and rescue persons in situations of vulnerability (Beauchamp and Childress, 2019). Here, consider Peter Scott-Morgan's (2021) fight against motor neuro disease, a condition that affects the brain and nerves and for which there is no cure.

One of Peter's ideas is to overcome this condition by being embodied in a machine and thereby achieving super longevity. He has many service providers researching and developing different parts of the solution (e.g., AI-enable avatar, audio voice-cloning, data servers), which are essentially based on speculative mind uploading (Farman, 2020). On the one hand, Peter has a serious and life-threatening condition that, from a moral perspective (Hables-Gray et al., 2020), could justify such an extreme attempt to become "more-than-human" by leaving the human flesh behind and existing as data. For his new type of embodiment, this software-based existence will not be influenced by the survival of a biological body or brain. This scenario, although still hypothetical, poses some questions: Where should we draw the line that separates treating from cheating? How far is too far when it comes to researching, developing, and commercializing HET solutions, such as services for mind uploading (e.g., Nectome)? How can service providers better incorporate different cultural values about life/death (and well-being) into their services to increase healthful behaviors (Anderson, Nasr and Rayburn, 2017)?

The second principle of bioethics is nonmaleficence. Beauchamp and Childress (2019) explain that this principle comprises the obligation of a healthcare professional not to harm the patient or, here, the consumer. This straightforward principle has moral supporting rules: do not kill, do not instigate suffering, do not disable, do not offend, and do not deny others the benefits of life.

In the case of 3D bioprinting to achieve a "harder, better, faster, and stronger" biological condition, we, as a society, face concerning challenges. This is especially critical

for human tissue and organ replacement. Considering the current shortage of organs that are suitable for transplantation, some companies (e.g., Techshot and NScrypt) have been researching 3D bioprinting these body parts in outer space to solve the supply issue (Sims, 2021). Such a unique approach is necessary since 3D bioprinting on Earth suffers interference from gravity and leads to a slow process and lower quality of the tissue. This proposal suggests a health-related goal that, if achieved, would make printed organs easily acquired commodities. On the one hand, 3D bioprinting of these body parts and replacing damaged organs may be the best course of action for patients with organ failure. On the other hand, this opens the possibility that marketplaces may emerge for services offering replacement of an organic soft skin for inorganic harder skin. For example, replacing healthy organic slow legs for inorganic faster legs, and, ultimately, replacing organic weak bodies with inorganic stronger bodies. For this possibility, Habermas (2003) argues that the manufacturing of human life in any form leads to the commodification of humans and the emptying of meaningful existence, and the loss of one's uniqueness. This, in turn, would lead not to the desired super well-being but instead to undesired super misery. Here, we ask: How can we prevent doing good utilizing HET solutions from becoming bad? What is the role of marketing managers, consumers, and regulatory agencies in establishing preventive boundaries?

Beauchamp and Childress' (2019) third principle of bioethics is autonomy. This principle insists that every person has the right to self-governance. As Walker (2020) explains, autonomy is arguably the most important bioethical principle and, as such, has received accolades, as well as strident criticism and strong defense. Previously, physicians invoked an individualistic and paternalistic model, which commanded that their assumptions about the patient's treatment desires and needs were the main consideration. Now, bioethicists

seem to move toward a more relational and inclusive model in which the patient's autonomy, social surroundings, and consent play a greater role in the decision-making process (Walker, 2020).

Such a principle resonates with the transhumanist belief of extreme agency and one's rights over their body to do whatever it takes to achieve superintelligence, super longevity, and super well-being (More, 1998). In some cases, consumer autonomy assumes a debatable contour due to the absence of providers' responsibility for unintended consequences. It is common to find warnings like "have in mind that our solutions do not have FDA approval, although we have been working on it, and should be used at your own risk" on websites and other marketing communications material. In the context of HET solutions, autonomy, thus, can be materialized in the form of a consumer's bold but controversial healthcare self-experiments or biohackings (Lima, Pessôa and Belk, forthcoming). Serge Faguet (2017), a Silicon Valley tech multi-millionaire, for example, hired the services of a team of physicians to help him achieve super well-being mainly through a combination of drugs (e.g., Modafinil, SSRI microdoses, MDMA). In his case, autonomy is shared between a 24/7 on-call therapeutic advice service and his insights from personal biohackings (e.g., intermittent fasting). However, for such a commercial relationship, we should reflect on the outdated but still followed popular saying, "The client is always right." If this is true in the case of HET, then there is little autonomy on the professional side, which would put the consumer in a dangerous situation and infringe on another principle of bioethics, that of nonmaleficence. Future research may thus consider a more relational autonomy than an individualistic one and ask: How can HET service providers establish and communicate clear processes safeguarding autonomy? How will HET service providers contribute to disparities in well-being experienced by poor consumers and ethnic minorities (Fisk *et al.*, 2018)?

The fourth principle of bioethics is justice. Beauchamp and Childress (2019) define it as the fair, equitable, and adequate distribution of health resources in the form of benefits and norms. Such a complex task must be executed by healthcare professionals, especially those associated with public services and public policymaking. Specifically, when it comes to HET, fairness in distributing and accessing technological solutions is influenced by society's views about morality (Hughes, 2004). Here, the question is whether consuming HET affect others, as in the case of avoiding COVID-19 vaccination—something that greatly affects others.

In certain contexts, society's techno-optimism achieves undesired extremes that may enable possible catastrophic consequences and existential risks posed to humanity by advanced technologies. For better or worse, for example, militarized transhumanism and B2B service providers that create "super soldiers" for warfare are already a concerning reality (Mercer and Trothen, 2021). To tackle the moral issue of dangerous selective human enhancement, democracies should provide the enhancement of moral dispositions for all citizens. This, in turn, would presumably extend moral concerns about others' well-being beyond the immediate social circle and include those existing in the future (Mercer and Trothen, 2021). Such moral enhancement can be ideally achieved by becoming more altruistic, peaceful, kind, friendly, and so forth by means of consuming drugs (e.g., psilocybin) and undergoing genetic engineering procedures (e.g., introducing the MAOA gene) (Earp and Savulescu, 2020). A complex scenario like the ones considered here poses many challenges and questions: Who should pay for HET—citizens' taxes or private funding? Who can fairly define the meanings of "less," "more," "better," "worse," "enhanced," "unenhanced," and other transhumanist polemic labels? Who should be targeted and contemplated as consumers of enhancement drugs?

Conclusion

"Harder, better, faster, stronger" is the dream of some consumers suffering from debilitating diseases. This is also the dream for those only desiring to achieve a transhuman enhanced biological condition. Despite the objective, technologically enhanced humans are already among us. The opportunities and issues for service companies offering solutions to achieve superintelligence, super longevity, and super well-being will increase insofar as different grammars connecting past-present-future temporalities and live-die-revive continuums are socially created. We, researchers, have just started questioning the social, bioethical, legal, and behavioral implications of HET and other transhumanist facets.

More research is needed to help gauge public awareness of and attitudes toward HET and services aiming at transforming humans into "superhumans." Anderson and Ostrom (2015) stress that interdisciplinary research is conducive to pushing the boundaries of current knowledge on services and their impact on well-being. This is certainly true, especially when it comes to transhumanism and emerging technologies. We believe that service is a key area in which the bioethical debate and scrutiny will play out. As illustrated in this work, we suggest further interdisciplinary research relying on medicine, philosophy, cultural studies, and so forth. We hope this conceptual paper sparks future interest in the potential of HET to do tremendous good or to potentially truly bad.

References

Alcor (2021) *Alcor.* Available at: https://www.alcor.org (Accessed: December 09).

Anderson, L. and Ostrom, A.L. (2015) 'Transformative Service Research'. *Journal of Service Research,* 18 (3), pp. 243-249.

Anderson, L. *et al.* (2013) 'Transformative service research: An agenda for the future'. *Journal of Business Research,* 66 (8), pp. 1203-1210.

Anderson, S., Nasr, L. and Rayburn, S.W. (2017) 'Transformative service research and service design: synergistic effects in healthcare'. *The Service Industries Journal,* 38 (1-2), pp. 99-113.

Beauchamp, T. and Childress, J. (2019) *Principles of Biomedical Ethics.* 8 edn. Oxford: Oxford University Press.

Belk, R.W. (2020) 'Ethical issues in service robotics and artificial intelligence'. *The Service Industries Journal,* 41 (13-14), pp. 860-876.

Belk, R.W. (2021) 'Transhumanism in speculative fiction'. *Journal of Marketing Management,* https://doi.org/10.1080/0267257X.2021.1900894 1-20.

Belk, R.W. (forthcoming) 'Artificial Emotions and Love and Sex Doll Service Workers'. *Journal of Service Research*.

Belk, R.W., Humayun, M. and Gopaldas, A. (2020) 'Artificial Life'. *Journal of Macromarketing,* 40 (2), pp. 221-236.

Belk, R.W., Weijo, H. and Kozinets, R.V. (2021) 'Enchantment and perpetual desire: Theorizing disenchanted enchantment and technology adoption'. *Marketing Theory,* 21 (1), pp. 25-52.

Bitner, M.J. (1992) 'Servicescapes: The Impact of Physical Surroundings on Customers and Employees'. *Journal of Marketing,* 56 (2), pp. 57-57.

Bitner, M.J., Booms, B.H. and Tetreault, M.S. (1990) 'The Service Encounter: Diagnosing Favorable and Unfavorable Incidents'. *Journal of Marketing,* 54 (1), pp. 71-84.

Booms, B.H. and Bitner, M.J. (1981) 'Marketing strategies and organization structures for service firms'. In: Donnelly, J.H. and George, W.R. (eds.) *Marketing of Services.* Chicago: American Marketing Association, pp.

Čaić, M., Mahr, D. and Oderkerken-Schröder, G. (2019) 'Value of social robots in services: social cognition perspective'. *Journal of Services Marketing,* 33 (4), pp. 463-478.

Callon, M. and Latour, B. (1981) 'Unscrewing the Big Leviathan: how actors macrostructure reality and how sociologists help them to do so'. In: Knorr, K. and Cicourel, A.V. (eds.) *Advances in social theory and methodology: toward an integration of micro- and macro-sociologies.* Boston: Routledge and Kegan Paul, pp. 277-303.

Clarke, A.C. (1984) *Profiles of the Future: An Inquiry into the Limits of the Possible.* Toronto: Popular Library.

De Keyser, A. *et al.* (2019) 'Frontline Service Technology infusion: conceptual archetypes and future research directions'. *Journal of Service Management,* 30 (1), pp. 156-183.

Earp, B. and Savulescu, J. (2020) *Love is the Drug The Chemical Future of Our Relationships.* Manchester: Manchester University Press.

Faguet, S. (2017) *I'm 32 and spent $200k on biohacking. Became calmer, thinner, extroverted, healthier & happier.* Available at: https://medium.com/hackernoon/im-32-and-spent-200k-on-biohacking-became-calmer-thinner-extroverted-healthier-happier-2a2e846ae113 (Accessed: December 09).

Farman, A. (2020) *On Not Dying: Secular Immortality in the Age of Technoscience.* Minneapolis: University of Minnesota Press.

Fischer, E., Otnes, C.C. and Tuncay, L. (2007) 'Pursuing Parenthood: Integrating Cultural and Cognitive Perspectives on Persistent Goal Striving'. *Journal of Consumer Research,* 34 (4), pp. 425-440.

Fisk, R.P. *et al.* (2018) 'Design for service inclusion: creating inclusive service systems by 2050'. *Journal of Service Management,* 29 (5), pp. 834-858.

Frow, P. *et al.* (2019) 'Service ecosystem well-being: conceptualization and implications for theory and practice'. *European Journal of Marketing,* 53 (12), pp. 2657-2691.

Fuller, S. (2020) *Nietzschean Meditations, Untimely Thoughts at the Dawn of the Transhuman Era.* Basel: Schwabe Verlag.

Gartner (2021) *3 Themes Surface in the 2021 Hype Cycle for Emerging Technologies.* Available at: https://www.gartner.com/smarterwithgartner/3-themes-surface-in-the-2021-hype-cycle-for-emerging-technologies/ (Accessed: December 09).

Giesler, M. (2012) 'How doppelgänger brand images influence the market creation process: Longitudinal insights from the rise of botox cosmetic'. *Journal of Marketing,* 76 (6), pp. 55-68.

Greenfield, B. (2020) *Boundless: Upgrade Your Brain, Optimize Your Body & Defy Aging.* Nevada: Victory Belt Publishing Inc.

Grewal, D. *et al.* (2020) 'Frontline Cyborgs at Your Service: How Human Enhancement Technologies Affect Customer Experiences in Retail, Sales, and Service Settings'. *Journal of Interactive Marketing,* 51 (August), pp. 9-25.

Guzman, Z. (2016) *This Company Will Freeze Your Dead Body for $200,000.* Available at: https://www.nbcnews.com/tech/innovation/company-will-freeze-your-dead-body-200-000-n562551 (Accessed: December 09).

Habermas, J. (2003) *The Future of Human Nature.* Cambridge, UK: Polity Press.

Hables-Gray, C., Figueroa-Sarriera, H.J. and Mentor, S. (2020) *Modified: Living as a Cyborg.* New York: Routledge.

Hamilton, E. (2017) '*Mythology: timeless tales of gods and heroes'*. New York, NY: Black Dog & Leventhal Publishers.

Hogle, L.F. (2005) 'Enhancement Technologies and the Body'. *Annual Review of Anthropology,* 34 (1), pp. 695-716.

Holbrook, M.B. (2006) 'Consumption experience, customer value, and subjective personal introspection: An illustrative photographic essay'. *Journal of Business Research,* 59 (6), pp. 714-725.

Hollebeek, L. and Belk, R. (2021) 'Consumers' technology-facilitated brand engagement and wellbeing: Positivist TAM/PERMA- vs. Consumer Culture Theory perspectives'. *International Journal of Research in Marketing,* 38 (2), pp. 387-401.

Hotze, T.D. *et al.* (2011) '"Doctor, would you prescribe a pill to help me ... ?" a national survey of physicians on using medicine for human enhancement'. *The American Journal of Bioethics,* 11 (1), pp. 3-13.

Kabadayi, S. *et al.* (2020) 'Fostering older adult care experiences to maximize well-being outcomes: A conceptual framework'. *Journal of Service Management,* 31 (5), pp. 953-977.

Kay, G. (2021) *Elon Musk says Neuralink could start planting computer chips in humans brains within the year.* Available at: https://www.businessinsider.com/elon-musk-predicts-neuralink-chip-human-brain-trials-possible-2021-2021-2 (Accessed: December 2021).

Kuester, S., Konya-Baumbach, E. and Schuhmacher, M.C. (2018) 'Get the show on the road: Go-to-market strategies for e-innovations of start-ups'. *Journal of Business Research,* 83 65-81.

Lima, V.M., Pessôa, L.A.G.d.P. and Belk, R.W. (forthcoming) 'The Promethean biohacker: On consumer biohacking as a labour of love'. *Journal of Marketing Management*.

Ma, L. *et al.* (2015) 'A Five-Star Doctor? Online Rating of Physicians by Patients in an Internet Driven World'. *Pain Physician,* 18 (January/February), pp. E15-E17.

Marcus, A.D. (2018) '*Is It Ethical to Choose Your Baby's Eye Color?'. The Wall Street Journal.*

Mercer, C. and Trothen, T.J. (2021) *Religion and the Technological Future.* Cham: Springer International Publishing.

Mick, D.G. and Fournier, S. (1998) 'Paradoxes of Technology : Consumer'. *Journal of Consumer Research,* 25 (September), pp. 123-143.

More, M. (1998) '*Extropian Principles: A Transhumanist Declaration'*.

Nagel, S. and Jensen, S. (2019) 'SIENNA D3.6: Qualitative research exploring public attitudes to human enhancement technologies'.

Nasr, L. and Fisk, R.P. (2018) 'The global refugee crisis: how can transformative service researchers help?'. *The Service Industries Journal,* 39 (9-10), pp. 684-700.

Ostrom, A., Mathras, D. and Anderson, L. (2014) 'Transformative service research: an emerging subfield focused on service and well-being*'*. In*:* Rust, R.T. and Huang, M.-H. (eds.) *Handbook of Service Marketing Research.* Cheltenham: Edward Elgar Publishing Limited, pp.

Patrício, L. *et al.* (2020) 'Leveraging service design for healthcare transformation: toward people-centered, integrated, and technology-enabled healthcare systems'. *Journal of Service Management,* 31 (5), pp. 889-909.

Pearce, D. (2012) 'The Biointelligence Explosion'. In: Eden, A.H. *et al.* (eds.) *Singularity Hypotheses: A Scientific and Philosophical Assessment.* Berlin: Springer-Verlag, pp. 199-236.

Pearce, D. (2020) 'Human and Intelligent Machines: Co-Evolution, Fision, or Replacement'. In: Gouveia, S.S. (ed.) *The Age of Artificial Intelligence: An Exploration.* Delaware: Vernon Press, pp.

Pelegrín-Borondo, J. *et al.* (2020) 'Does Ethical Judgment Determine the Decision to Become a Cyborg?'. *Journal of Business Ethics,* 161 (1), pp. 5-17.

Peters, T. (2018) 'Imago Dei, DNA, and the transhuman way'. *Theology and Science,* 16 (3), pp. 353-362.

Regalado, A. (2021) *Meet Altos Labs, Silicon Valley's latest wild bet on living forever.* Available at: https://www.technologyreview.com/2021/09/04/1034364/altos-labs-silicon-valleys-jeff-bezos-milner-bet-living-forever/ (Accessed: December 10).

Rosenbaum, M.S. and Russell-Bennett, R. (2021) 'Viewpoint: When service technologies and human experiences intersect'. *Journal of Services Marketing,* 35 (3), pp. 261-264.

Samsung (2021) *Human Augmentation.* Available at: https://www.sait.samsung.co.kr/saithome/research/researchArea.do?idx=1 (Accessed: December 09).

Schmitt, B. (2019) 'From Atoms to Bits and Back: A Research Curation on Digital Technology and Agenda for Future Research'. *Journal of Consumer Research,* 46 (4), pp. 825-833.

Scott-Morgan, P. (2021) *Peter 2.0 - The Human Cyborg.* London: Penguin Books.

Sims, J. (2021) *Why astronauts are printing organs in space.* Available at: https://www.bbc.com/future/article/20210601-how-transplant-organs-might-be-printed-in-outer-space (Accessed: December 09).

Smalley, E. (2018) 'FDA warns public of dangers of DIY gene therapy'. *Nature Biotechnology,* 36 (2), pp. 119-120.

Umbrello, S. and Baum, S.D. (2018) 'Evaluating future nanotechnology: The net societal impacts of atomically precise manufacturing'. *Futures,* 100 (May 2017), pp. 63-73.

Vaage, N.S. (2017) 'Fringe biotechnology'. *BioSocieties,* 12 (1), pp. 109-131.

Vilnai-Yavetz, I. and Gilboa, S. (2010) 'The Effect of Servicescape Cleanliness on Customer Reactions'. *Services Marketing Quarterly,* 31 (2), pp. 213-234.

Walker, R.L. (2020) 'The unfinished business of respect for autonomy: Persons, relationships, and nonhuman animals'. *Journal of Medicine and Philosophy (United Kingdom),* 45 (4-5), pp. 521-539.

Zayner, J. (2020) *Science, Art, Beauty.* Available at: http://www.josiahzayner.com (Accessed: December 10).

Zettler, P.J., Guerrini, C.J. and Sherkow, J.S. (2019) 'Regulating genetic biohacking'. *Science,* 364 (6448), pp. 34-36.