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Theoretical Roots and Practical Implications of Transhumanism

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ABSTRACT

Transhumanism is an intellectual and philosophical movement that aims to advance human existence beyond current biological and cognitive constraints through the strategic application of science and technology. At its core, it engages with speculative and practical questions concerning the enhancement, transformation, and potential transcendence of the human condition, including proposals such as the digitization of consciousness and various forms of technological immortality. The movement draws extensively on developments in biotechnology, nanotechnology, artificial intelligence, and virtual reality as foundational domains for its theoretical and practical orientations. Within this framework, biotechnology and genetic engineering, encompassing gene editing, cloning, and neuropharmacological interventions, are regarded as essential instruments for overcoming inherent biological limitations and optimizing both somatic and cognitive capacities. In parallel, nanotechnology is conceptualized as an enabling intervention at the molecular level of biological systems, with nanorobotic applications envisioned for disease eradication, deceleration of aging processes, and potential informational mapping of neural states. Artificial intelligence occupies a central epistemic and functional role in transhumanist discourse, particularly in relation to the simulation, augmentation, and possible replication of human cognition, thereby underpinning claims regarding digital forms of continuity or "immortality." Similarly, virtual reality technologies are interpreted as mechanisms for expanding perceptual frameworks and facilitating the construction of alternative experiential and identity-based realities. Furthermore, cyborg technologies exemplify the material dimension of transhumanist aspirations by integrating artificial components into human organisms. In this regard, transhumanism constitutes a comprehensive intellectual paradigm that raises significant ethical, ontological, and socio-philosophical questions concerning the future configuration of human existence.

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1. Introduction

Transhumanism sees technology as the fundamental basis for achieving its goals. Scientific and technological advances in the modern era have attracted the attention of many transhumanists. Believing that technology can accomplish almost anything, transhumanists argue that all the problems facing humanity can be overcome through technological solutions. The basic idea of this movement is to utilize technology to help human beings transcend their biological limits and become more advanced[1–4]. If humans use technology rationally, life has the potential to go beyond the impossible dreams of their ancestors for billions of years to come on Earth, and far beyond this is one of the most fundamental promises of transhumanists[5] (p. 320). Transhumanists believe that with the proper use of technology, humanity can accelerate its biological evolution and develop human potential without limit. Thinkers, such as Nick Bostrom and Max More, pioneers of the transhumanist movement, strongly believed in the transformative power of technology in the future of humanity. According to these thinkers, technology is the most effective tool for achieving goals, such as the development of physical and mental capacities and the fight against aging and disease. Bostrom and Max More argue that technology will not only transcend human biological limits but also profoundly affect societies' social, political, cultural, and economic structures. Technological developments are predicted to lead to radical changes in almost every aspect of human life from educational systems to healthcare, economic production, and political governance.

Transhumanists also emphasize the potential of technology to enrich human experience. By enhancing their physical and mental capabilities, they aim for people to live happier, healthier, and more productive lives. In this context, transhumanists challenge the traditional understanding of human nature and its potential, claiming that technology can lead to a new evolution[6] (p. 142). Thinkers such as Ray Kurzweil and Hans Moravec, prominent figures in the transhumanist movement, argue that human biological limits can be overcome through technological advances, and even mortality can be eliminated[7] (p. 256).

Transhumanism, a movement that aims to transcend the physical, mental, and emotional capacity of human beings and reach a new level of existence, takes science and technology as the main reference points to realize its ideals, vision, and goals. In this context, transhumanist thought advocates making efforts to overcome the current limitations of human beings through scientific knowledge and technological advances and that these tools are the most important catalysts in realizing the future potential of human beings (Sandberg[8], pp. 14–15; Tirosh-Samuelson[9], p. 161). In the transhumanist vision, scientific and technological advances occupy a central position, and all of these advances are considered important achievements in achieving transhumanist goals. However, while transhumanist thought accepts all technological innovations as positive developments, it prioritizes certain areas and emphasizes that these areas play a critical role in realizing their vision. Max More and Ray Kurzweil, two leading proponents of transhumanists, have attempted to outline these technological priorities. Kurzweil, in particular, has made it clear that robotics, nanotechnology, and genetics are the main pillars of the transhumanist vision and that developments in these fields are crucial for the future of humanity (Blackford[10], p. 67; Cordeiro[11], p. 67; Kurzweil[1], p. 295). Max More, on the other hand, discusses the technological references of the transhumanist vision in a very broad perspective and emphasizes various scientific and technological fields of study in this context. These fields, which form the basis of transhumanists, include information technology, biotechnology, cognitive science, gene engineering, nanotechnology, regenerative medicine, life extension, artificial intelligence, materials science, neurobiology, and quantum biology. These disciplines play a critical role in realizing the transhumanist goals of expanding human potential, overcoming vital limitations, and achieving a higher plane of existence. More emphasis on these fields shows that the transhumanist movement is interdisciplinary in nature, and has the vision of using different branches of science in an integrated manner (Bostrom[12], p. 493; Sandberg[8], pp. 4–5; Vita-More[13], p. 74).

Transhumanism sees science and technology not as an end but as a means to improve the human condition and

transcending its limits. In this context, transhumanists have argued that scientific and technological advances should be boldly and creatively used to expand the potential of humanity[8] (p. 5). The central starting point of the transhumanist vision is the central role of science and technology in this process. Therefore, it is important to outline the scientific and technological fields in which this movement is based to understand the methodology of transhumanist thought.

Transhumanists have structured scientific and technological fields of study in line with their vision and classified them using letter combinations such as NBIC. This classification refers to core disciplines such as nanotechnology (N), biotechnology (B), information technology (I), and cognitive science (C). The NBIC classification reveals the multidisciplinary nature of transhumanist thought and points out that these four fields play a central role in the development of human biological, cognitive, and technological capacity. We have tried to examine these practices in detail and how they can be used to fulfill the goals and ideals of transhumanists (Rueda[14], pp. 529–538; Serra[15], pp. 169–175).

In this study, we aim to analyze the technological applications that can be considered the primary reference points within the framework of transhumanist philosophy, and to examine the potential ethical problems these applications pose to human nature as well as the negative social effects they may generate. Unlike purely descriptive studies in the literature, this paper shifts the focus toward a critical philosophical and theological inquiry. This is because the core technological pillars of transhumanism—namely, biotechnology, nanotechnology, artificial intelligence, and virtual reality—present various ethical challenges and possess the potential to cause undesirable consequences at the societal level alongside efforts to overcome the limitations of human nature. In this context, the impact of transhumanism on the future of humanity cannot be fully understood without a holistic assessment of how these advancements challenge, redefine, or complement traditional understandings of human nature, existence, and ultimate destiny. In line with this objective, the study seeks to answer the following central research questions:

1. How does the transhumanist pursuit of biological and cognitive transcendence, particularly through the ideas of technological immortality and the digitization of consciousness, impact the ontological integrity of human nature from a philosophical and theological perspective?
2. To what extent do emerging technologies create a conceptual bridge or a fundamental rupture between speculative transhumanist expectations and currently existing technological realities?
3. What are the profound ethical, anthropological, and political implications of these technological shifts regarding human dignity, personal identity, and social equality?

To address these research questions, this study employs a methodological framework grounded in conceptual analysis and critical philosophical inquiry. Rather than relying on empirical data, the methodology focuses on the systematic evaluation and logical deconstruction of core transhumanist claims and their foundational literature. The analytical framework is divided into two primary dimensions: first, a descriptive and conceptual reconstruction of the specific technological pathways (such as biotechnology, nanotechnology, artificial intelligence, and virtual reality) through which transhumanism envisions post-human evolution; and second, a critical normative analysis that evaluates these socio-technological projections against traditional philosophical and theological accounts of human nature, ontological integrity, and existential purpose. Through this multi-layered qualitative approach, the study contextualizes the speculative expectations of transhumanist ideology within current technological constraints and uncovers the underlying ethical and anthropological tensions.

Rather than merely offering a descriptive synthesis or a baseline compilation of transhumanist practical origins, this study provides an original scholarly contribution by building complex analytical and conceptual links between disparate technological domains. While existing literature often treats biotechnology, nanotechnology, cybernetics, and virtual reality as isolated subjects, this paper bridges these fields through a unified philosophical and theological critique. In doing so, it addresses a prominent gap in the current literature by shifting from a passive examination of technological capabilities to an active normative investigation of how their convergence reconfigures traditional ontological frameworks, human dignity, and personal identity. Consequently, this research offers a novel integrated framework that enables scholars to critically analyze both the speculative rhetoric and the concrete

existential impacts of the transhumanist movement.

Having established the conceptual background of transhumanism, the following discussion examines the principal technological domains through which the transhumanist project seeks to transform human nature. Accordingly, the study analyzes biotechnology, nanotechnology, information technology and virtual reality, cyborg technologies, and artificial intelligence within the NBIC framework. Each section first outlines the role assigned to these technologies in transhumanist thought and then critically evaluates their philosophical, theological, and ethical implications. By examining these technological domains both individually and as interconnected components of the NBIC convergence, the study aims to provide a comprehensive assessment of the practical foundations of transhumanism and their potential consequences for the future of humanity.

2. Transhumanism

We can say that transhumanists were first conceptually used by Julian Huxley in a sense relevant to today[16] (p. 3). In his work "New Bottles for New Wine," Huxley defined transhumanists as preserving the current status of man, preserving his humanity, and realizing new possibilities, his own nature, and potential. Although Huxley' s definition largely overlaps with the modern meaning of transhumanists, it does not fully reflect the scope of the concept today because transhumanists are movements with multidimensional ideals and goals[17] (pp. 71–98).

Transhumanism is a system of thought shaped by the contributions of various thinkers and scientists. Historically, the main names that have advocated and pioneered transhumanists in this field include Julian Huxley and J.B.S. Haldane, John Desmond Bernal, Hans Moravec, Eric Drexler, Nick Bostrom, Ray Kurzweil, and Max More.

Max More provided the most contemporary and clear definition of transhumanists. In his article titled "Toward a Futurist Philosophy", Max More defined transhumanists in a way that would meet today' s transhumanist philosophy. In this context, Max More was the first person to represent the historical background of transhumanists in a modern sense. More defined transhumanists are the transformation of human beings in biological, mental, and physical dimensions, in line with technological developments. Following Max More, many scientists and philosophers have developed and redefined transhumanists in different ways. This shows that transhumanists were an intellectual movement that emerged in its infancy and shaped the future. Transhumanism has continuously evolved with new meanings and ideas since it first emerged conceptually. This is primarily because constant changes in science and technology have transformed the conceptual framework of the transhumanists. In this context, it is important to emphasize that transhumanists do not fit a narrow and fixed conceptual framework[18] (pp. 121–142).

Following this information, we move on to the theoretical roots and practical applications of nanotechnology (N), biotechnology (B), information technology (I), and cognitive science (C), which have theoretical roots and practical applications in terms of transhumanist philosophy[19].

3. Nanotechnology

Nanotechnology is one of the most important applications for transhumanists. Nanotechnology, a scientific field that has recently attracted considerable attention for physical and cognitive development and the improvement of humanity, challenges impossibility. Nanotechnology is a branch of science that aims to develop new materials, devices, and systems by controlling and manipulating the levels of atoms and molecules—the most basic building blocks of matter. In the biomedical field, it has great potential for the diagnosis and treatment of diseases, drug transportation, and tissue engineering, by intervening at the molecular level in humans. Nanotechnology is a multidisciplinary field involving diverse disciplines such as biology, physics, chemistry, and engineering (Ajaz et al.[20], pp. 12–18; Di Sia[21]; Durgam and Oroszi[22]). The greatest importance of nanotechnology lies in the possibility of transforming and reconstructing the body, which is a part of the material world, at molecular and atomic levels (Freitas Jr.[23], pp. 68–69). This technology enables the development of scientific and technological tools that can completely redesign not only the body, but also every part of the body, including the brain.

Transhumanists are looking forward to nanotechnology with great hope for the future design of humans. When the desired level is reached, it can be used to eliminate all weaknesses and defects. Nanotechnology can create structures on a scale that can manage chemical reactions and reverse aging

processes. According to the transhumanists, certain materials and pathogens in the human body can lead to aging. If we can eliminate the materials and pathogens that cause aging in our bodies, we will have the opportunity to live healthier and longer lives (Akpan[24], pp. 2357–2365; Di Sia[21], pp. 367–390). Transhumanists say that nanotechnology can give us the opportunity to live long, healthy lives. Engineering to be carried out on atoms and molecules is aimed at achieving immortality by preventing aging at the cellular level[25] (p. 38). In addition, thanks to nanobots, it will be possible to upload the human mind to computers through the feedback received from the body. Owing to nanotechnology, the distinction between the real and virtual worlds is blurred because of the routing of signals through neural networks in the human brain[1] (p. 469). In other words, nanobots are expected to play a major role in increasing the human mental capacity.

Technological singularity, which has been the subject of most discussions in today' s scientific and technological worlds, also holds a critical position in nanotechnology. Nanotechnology is predicted to play a major role in the realization of singularity, which is expressed as the equalization of human intelligence and artificial intelligence or even artificial intelligence, surpassing human intelligence. Many scientists believe that super-AI can improve nanotechnology and contribute to its well-being[25] (p. 38). Consequently, nanotechnology is accepted as an important reference point for transhumanists to realize all desired changes and transformations in the human body at a minimal level.

The ethical critique of nanotechnology focuses heavily on the issues of social distributive justice and political inequality. Michael Sandel emphasizes that technological enhancements are rarely distributed equitably, suggesting that advanced nanomedicine and cellular repair would inevitably become privileges exclusive to the socioeconomic elite. This unequal access could crystallize social stratification into a biological divide, separating humanity into enhanced and unenhanced classes. Politically, the utilization of nanorobotics for continuous life-extension challenges traditional social contracts, as societal structures, retirement systems, and resource allocation models are unprepared for a radically extended human lifespan. Thus, rather than liberating humanity from suffering, nanotechnology risks exacerbating global disparities and creating a dystopian socio-political hierarchy.

Furthermore, the precise molecular manipulation offered by nanotechnology requires advanced computational power and autonomous decision-making systems to manage complex biological networks. This computational necessity shifts the transhumanist trajectory from physical matter to cognitive architecture, establishing a direct evolutionary link between molecular engineering and artificial intelligence.

4. Biotechnology

Biotechnology involves the creation or improvement of products and processes for technological applications, using biological systems, living organisms, and their derivatives. Biotechnology, which studies organisms in a manner similar to biology, covers the order, function, working rules, technologies, and technological tools developed for the use of organisms at the molecular level[12] (pp. 5–6). Biotechnology has enabled cloning, bypassing evolutionary genetic processes and approaches that can alter the genetic code of humans. Advances in molecular biology and medicine have not only significantly expanded the field of medical diagnosis and treatment but have also raised the question of manipulating human genetic inheritance in ways that can have a direct impact on human identity and nature[26] (p. 72). Transhumanists have a keen interest in biotechnology because they can have a positive impact on the development of the human body in a non-invasive manner.

Transhumanists closely follow developments in biotechnology and related engineering disciplines to determine their potential to enhance human biological capacity. They believe that advances in this field, particularly in neuroscience and neuropharmaceuticals, offer new possibilities for improving cognitive abilities and mental states[27] (p. 336). Transhumanist thought aims to transcend the biological limits of human beings and develop their biological, mental, and psychological capacities through technological developments[28] (p. 57). The concept of "morphological freedom," which comes to the fore in this framework, emphasizes the right to change one' s body and mind as desired through technological means[29] (p. 303). Technological developments such as genetic engineering, bionic implants, and brain-computer interfaces are seen as the means by which this freedom can be embodied. Transhumanists believe that this will make it possible to eradicate diseases, extend life

spans, and increase mental capacities.

5. The Convergence of Biotechnology and Nanotechnology: Nanomedicine and Nanobots

The transhumanist movement aims to achieve immortality by halting the biological and physical aging processes. Therefore, they believed that the greatest potential for preventing natural aging and death is in the field of nanomedicine. Nanomedicine is a branch of science that emerges at the intersection of nanotechnology and biotechnology and involves medical interventions at the molecular level[23] (p. 68). Nanomedicine is a scientific discipline that utilizes molecular tools and data to understand the molecular structure and functions of the human body, and to use this knowledge to protect, develop, and improve human health[30] (p. 77).

Owing to nanomedicine, it may be possible to halt or even reverse the biological aging processes. This may open doors to a future that will enable individuals to stabilize or rejuvenate their biological age to a desired level. With the elimination of age-related diseases and physical decline, individuals can live longer and become healthier than before. From a transhumanist perspective, nanomedicine not only targets biological aging but also serves broader goals, such as improving cognitive abilities, enhancing physical performance, and even redesigning the genetic makeup of humans. Thus, it is possible for human biological limits to be overcome, making it possible for new types of human beings to emerge.

Nanobot technology is a groundbreaking development in the field of biotechnology. Nanobots are extremely small robots that can travel inside the human body and perform tasks at a molecular level. These miniature devices can shape the future of medicine, revolutionize the treatment of many diseases, and prolong human life[1] (p. 375). Owing to their small size, nanobots can reach capillaries in the body and targeted areas. Thus, they offer a more effective way to combat diseases in areas that traditional treatment methods cannot reach. For example, it is possible to use nanobots in many areas, such as targeting and destroying cancer cells, treating genetic diseases and fighting infections[23] (p. 69). In this way, nanobots can be programmed to create desired changes in the body. For example, tasks such as repairing damaged tissues, creating new vessels, or transporting drugs to targeted cells can be assigned to nanobots.

Nanobots will allow for a better quality of life by improving every aspect of human health. These small robots can instantly cure all types of permanent and fatal diseases in the human body and instantly repair the physical injuries and impacts that our bodies face. Nanobots also play a major role in maintaining health by eliminating all types of bacteria, germs, viruses, and cancer cells, creating a negative health situation in the human body and eliminating elements that threaten the immune system[1] (p. 378). They repair genetic errors that are effective for congenital physical or mental disabilities and enable people to live in a healthy manner. Thus, owing to nanobots that protect our physical health, we have the opportunity to live for a long time without aging. Nanobots placed inside the human brain increase the mental capacity of humans in terms of neurobiology. This increase in human mental capacity may provide them with an opportunity to experience virtual reality. The blurred connection between human biological natural intelligence and artificial intelligence will contribute significantly to the development of human intelligence[1] (p. 448). It seems possible for nanobots to perform all the activities mentioned in the human body in terms of physical science[23] (p. 69). Therefore, quantum physics that examines the subatomic world is worth considering. In addition, quantum biology, which was recently developed as a multidisciplinary field in science and has been emphasized by scientists led by British theoretical physicist Jim Al-Khali, seems to have had a significant impact on the application of nanomedicine technology.

In conclusion, biotechnology is extremely important for transhumanists to realize desired changes in human beings. Biotechnology, which is directly related to many fields, such as gene therapy and gene engineering, can be considered an outstanding transformation technology for transhumanist ideals in the 21st century. From a critical ethical perspective, these biotechnological advancements raise profound ontological concerns regarding human dignity and autonomy. Prominent bioethicists like Leon Kass and Jürgen Habermas argue that genetic engineering threatens the foundational equality of human beings by turning children into manufactured products rather than autonomous agents. When human traits are pre-selected, the moral autonomy of the individual

is compromised, as they are bound to the designs and expectations of their creators. Furthermore, Francis Fukuyama warns that altering the biological substrate of human nature risks destroying the 'Factor X'—the essential human essence that grounds universal human rights. Consequently, the transhumanist push for genetic enhancement threatens to fragment our shared evolutionary heritage and introduce unprecedented forms of existential discrimination.

However, within the framework of NBIC convergence, these biotechnological interventions cannot achieve their full transformative potential in isolation; rather, they heavily rely on precise modifications at the molecular scale. This critical intersection bridges macro-biological enhancements with nanotechnology, which provides the foundational engineering tools required for cellular repair and direct molecular interventions.

6. Information Technology and Virtual Reality

One technology considered an important reference point in transhumanist vision is information technology and virtual reality. Information technology and virtual reality primarily cover the mental and cognitive aspects of humans, respectively. Information is data that brings the masses of information into a form that people can use and understand, representing the organization of information and data in a form that people can use and understand. Information shapes, molds, instructions, and transformation of the human mind through data. All software and hardware can be used to realize process-information technology. Information technology has the potential to realize many goals, such as the regeneration or replacement of tissues and organs in the human body, and the transfer of the human mind to computers. It is predicted that people will move toward immortality because of a technological revolution called mind transfer. This is because mind transfers enable humans to live in a virtual reality[31–34] (p. 13 onward). Therefore, we can state that information technology is an area in which transhumanists are most interested in developing virtual reality for humans. In this framework, it is useful to focus on virtual reality, which brings human beings' immortality and creates an independent world.

When the concepts of reality and virtuality are considered together, it is evident that one reflects the other. In this context, reality refers to the tangible world, whereas virtuality represents an imitation or replica of the world that we identify as reality. Reality is an existential domain that continues to exist independently even if it is not perceived through our senses. By contrast, virtuality denotes entities that exist only insofar as they are perceived through our senses, lacking any existential basis beyond this perceptual experience. In summary, virtual reality refers to artificial environments that are perceived by our senses as real and devoid of an inherent reality[35].

In today' s world, significant advancements have been made in virtual reality technology. These developments are progressing toward a highly advanced level, bringing virtual reality technologies closer to reality. This progress has led to the emergence of definitions such as virtual and augmented reality. Moreover, it is anticipated that augmented reality and virtual reality technologies will become among the most advanced sectors of the technology industry in the near future. The connection between the human body and technological computers is expected to dissolve the boundaries between the virtual and the real[36] (p. 20). The distinction between virtual and real will become increasingly blurred, ultimately enhancing the human cognitive capacity to its maximum potential.

Transhumanists, starting from the premise that the brain plays a primary role in the formation and perception of sensory experiences, do not perceive the virtual world as far away from reality. Considering the biological structure of humans, transhumanists emphasize that the body serves as a vehicle for receiving perceptions, whereas the brain is the center of sensory data processing. For instance, when a sharp object pricks on any part of the body, the brain directly perceives the pain. This is because the brain is a complex network of neural pathways that receives and transmits signals. Consequently, transhumanists argue that there is little distinction between the signals received in virtual and real contexts. They claimed that through virtual reality, humans can potentially achieve various possibilities, including immortality[1] (pp. 292–293). According to transhumanists, with the dissolution of the boundary between virtual reality in the future, nanotechnology will play a pivotal role in enabling the experiences we encounter in the virtual world to materialize[31–34] (pp. 19–21).

Nanobot technology is expected to play a pivotal role in virtual reality. Transhumanists base their ideas on the ability of nanotechnology and nanobots to deliver functional virtual reality based on the foundational principles of the brain' s operational system. Nanobots are positioned at necessary locations within the human body, enabling individuals to transmit neurological commands to these nanobots at will. In response, nanobots fulfill these commands, allowing individuals to transition between various domains of reality, including virtual and physical reality. Through nanobots embedded in the human body, users can send neural signals to the brain, facilitating access to virtual and augmented reality. This empowers individuals to modify their realms according to their preferences, thereby effectively shaping their experiential realities [37–39].

Ray Kurzweil, one of the leading advocates of the transhumanist movement, highlighted the neural and sensory interactions between the human brain and nanobots in his work Humanity 2.0, suggesting that individuals could find themselves entirely immersed in a completely different virtual reality world [1] (pp. 469–470). To illustrate Kurzweil' s idea with a concrete example, consider a sexual experience that involves the body. In such a scenario, it is not the body itself that generates a sensation of pleasure. In this context, if nanobots implanted in the body send signals that indicate sexual pleasure to the brain, the brain perceives these signals as real and responds accordingly. This is because the human brain prioritizes the content of incoming signals rather than focusing on their sources, thereby producing responses based on the perceived information. This suggests that, even in the absence of biological bodies, nanobots could enable individuals to experience sensations such as sexual pleasure, among many others, by transmitting appropriate signals to the brain [1] (pp. 476–477).

Recent advances in neurobiology have clearly demonstrated that all functions performed by the human body result from signal activity within the brain' s internal mechanisms. In this context, transhumanists highlight the intricate brain structure and argue that it is possible to create a virtual world that is almost indistinguishable from the real world [40] (p. 130). It is evident that this newly constructed virtual reality, developed by humans, fundamentally transforms individuals' perceptions of reality. Transhumanists contend that humans will rapidly adapt to this new conceptualization of reality, dismissing concerns about this transition as unfounded. According to them, there is no significant distinction in terms of reality between the virtual world to be created and existing real world [41] (p. 193). To support this argument, researchers have pointed out that taste and pleasure derived from consuming food and drinks in the physical world are the result of signals that reach the brain. If the same signals can be transmitted to the brain via digital means, it is equally possible to experience the tastes and pleasures of the virtual world. Consequently, the transhumanist movement asserts that the transition between existing and virtual reality will not radically alter individuals' perceptions of reality. They foresee a situation in which the distinction between the two forms of reality becomes negligible, creating an experience in which the boundaries between physical and virtual are effectively dissolved.

The most revolutionary potential offered by humanity is its vision to liberate humans from the confines of their biological bodies. These technologies allow individuals to move freely within the virtual realm without restrictions. In this context, a critical issue that requires attention is the possibility that individuals change their bodies and possess a body of their preferred gender. By using the same mental mechanisms, individuals can transition between different bodies and experience a new reality. In contemporary reality, individuals may feel dissatisfied with their current bodies, identities, or gender, leading to discomfort. Virtual reality technology offers individuals the opportunity to overcome this dissatisfaction and embody the body or identity of their choice. For instance, assuming that you are a woman with a male partner, it is conceivable that questions such as "How would the dynamics of our relationship change if I were male and my partner were female?" or "Would my partner understand me better?" may arise. Virtual reality technology allows individuals to concretely experience such thoughts, providing the opportunity to shift gender roles and approach relationships from different perspectives. This technology enables individuals to develop deeper empathy for their gender and identity roles, thereby enriching their experiences associated with these roles (Kurzweil [1], p. 476; Vita-More [28]; Kundu et al. [42], pp. 565–568; Reyes and Fisher [43]; Seinfeld et al. [44]). At this point, the fear of losing our essential self may also arise because of entering different identities, bodies, and genders into virtual reality.

In the future, to prevent such negative outcomes, new legal regulations will be required and bodies specifically designed for virtual persons will need to be created [41] (p. 192).

In conclusion, transhumanists view virtual reality technology as pivotal to achieving their goals and ideals. They believe that virtual reality technology has the potential to allow individuals to enter the bodies of their choosing; simulate themselves in desired environments, touch those they long for, love, or have lost; tolerate their physical deficiencies; and bring to life many possibilities that, although once imagined in the realm of fantasy, could now become a reality. Although the current scientific technology has not yet reached this point, the rapid pace of technological development suggests that the future may not be far off when transhumanist predictions could come true. Thinkers and scientists, such as Michio Kaku, Ray Kurzweil, Jim Al-Khalili, and Yuval Noah Harari, believe that this technology will eventually have a place in human history.

Philosophically, the transhumanist embrace of virtual reality poses severe threats to personal identity and the authenticity of human experience. Critics from the phenomenological tradition argue that human consciousness is fundamentally embodied; decoupling experience from the biological body destroys the groundedness necessary for authentic moral and emotional development. Immersive digital domains create a fragmented sense of self, where personal identity becomes fluid, unstable, and untethered from physical reality. Moreover, this shift introduces political vulnerabilities regarding data sovereignty and corporate surveillance. When human presence is entirely digitized, the self becomes commodified, subject to algorithmic control and manipulation by corporate entities, thereby eroding the very basis of individual political agency.

While virtual reality and information technologies simulate alternatives to physical embodiment by creating immersive digital realms, the transhumanist trajectory does not remain confined to purely simulated spaces. Instead, this digital reconfiguration of consciousness naturally transitions into tangible physical integration. This theoretical bridge leads directly to cyborg technologies, which seek to physically merge advanced cybernetic systems, neural interfaces, and synthetic enhancements with the organic human body, thereby translating virtual cognitive expansion into permanent post-biological reality.

7. Cyborg Technologies

The concept of cyborgs, which refers to making various additions and modifications to a specific living organism, was introduced in the intellectual sphere in 1960. At the time of its inception, the term was used to describe a being that possesses both organic and cybernetic characteristics. Within this framework, it refers to the process of enhancing and perfecting the human body in preparation for a potential extra-terrestrial experience, thereby making it capable of such an experience [45] (p. 303). The goal of cyborgization is to incorporate the electronic components and prostheses into the human body. Consequently, they cannot be completely classified as machines or living organisms [46] (p. 2). At this point, it is akin to an organism enhanced by an electronic device [45] (p. 304). As cyborg technology enhances and perfects the human body from a physical perspective, it is considered an indispensable reference and a foundation for transhumanists.

Transhumanists argue that the human body inherently contains certain flaws and deficiencies, and is characterized by a fragile nature. Within this framework, they asserted that these deficiencies and weaknesses could be overcome through cyclization processes. According to transhumanist thought, the body' s inherent physical deficiencies can be remedied with mechanical or nonorganic artificial materials, and it has been emphasized that the human body should be entirely open to mechanization and artificial interventions. Furthermore, transhumanists claim that cyborg technologies not only address innate physical deficiencies, but can also compensate for injuries and losses that occur later in life. For example, if an individual loses a limb, such as an arm or leg, this deficiency can be remedied with a synthetic arm or leg, thus improving the individual' s quality of life and eliminating the challenges caused by the loss. This situation provides significant evidence from the transhumanist perspective that the current limitations of the human body can be overcome through robotic or cyborg technologies. This situation provides significant evidence from the transhumanist perspective that the current limitations of the human body can be overcome through robotic or cyborg technologies (Dragomir [47]; Earle [48], pp. 1–19; Willmott [49]).

Transhumanists argue that the process of cyborgization will ultimately lead to evolution of the human body, transforming its current biological structure into a biosynthetic

structure (Harari [40], p. 58; Peters [50], p. 65). According to them, biomechanical bodies constructed using technological engineering and nanotechnology are far more robust and durable than the traditional biological human bodies [1] (p. 52). This approach transforms the human body into a biomechanical system that is more resilient to external factors and damages, particularly under extreme conditions. The human body, as it has evolved through classical evolutionary processes, is considered insufficient for surviving in today' s complex and rapidly changing world, and is believed to be open to improvement. Moreover, when the limitations of the biological body are surpassed and individuals transition to protected biomechanical bodies, they argue that, through mind transfer technologies, a person can preserve their identity [51] (p. 317). In this context, the transhumanist ideal of immortality is crucial. Mind-transfer technology can potentially free individuals from being confined to their biological bodies, enabling the possibility of changing bodies. As a result, both physical and cognitive continuity can be maintained, radically extending human lives.

Transhumanism' s cyborg human form of transhumanism differs from natural human structure in many ways. Transhumanism envisions a human body formed by mechanical, digital, electronic, and synthetic means, rather than a human body made up of flesh, bone, and blood. It can be seen that the human body has been replaced by a new and different body. Transhumanists transform humans into transcendent beings through cyborgisation. What is meant here is not the transformation of humans into mechanical tools independent of consciousness but rather the transfer of the cognitive power of being like a human to technological bodies that will make them more competent. In this context, transhumanists foresee a future where humans and technological machines can merge. Technological singularity, which has already been discussed in the intellectual framework, has also emerged in this context.

According to transhumanist thought, the body' s inherent physical deficiencies can be remedied with mechanical or nonorganic artificial materials, and it has been emphasized that the human body should be entirely open to mechanization and artificial interventions. These findings suggest that humans can control all limbs and organs through cognitive function in the brain. In this context, it is understood that if human limbs are replaced by artificial and synthetic limbs, they can perform the same functions through signals sent by the brain [52] (p. 84). This is because the brain has the capacity to move and direct human organs in the desired manner. Therefore, it has been argued that biomechanical additions to the human body would not strip the individual of their humanity; rather, they would enable the human body to enter a new evolutionary stage. In this framework, it should also be noted that studies conducted by American neuroscientists and authorities in brain research, David Eagleman, on the brain' s functions align with and support transhumanist vision in the future.

In conclusion, we can assert that cyborg technology holds a significant position in achieving the ideals and goals of transhumanists and that this technology will play a critical role in the process of transforming humans into the "transcendent human." Cyborgization appears to provide a functional parameter for completely eliminating weaknesses and deficiencies related to the human body, which transhumanists emphasize.

The integration of cybernetic enhancements into the biological body blurs the boundary between human and machine, generating critical anxieties about bodily integrity and cognitive autonomy. Philosophers concerned with posthumanism point out that introducing brain-computer interfaces compromises the privacy of the inner mind. If cognitive processes are directly linked to digital networks, the boundary of personal identity becomes porous. This raises the alarming political and ethical prospect of external hacking, ideological manipulation, or direct behavioral control by state or corporate actors. Consequently, cyborgization risks converting the autonomous human subject into an optimized, yet deeply controlled, technological node within a broader industrial network, stripping the individual of genuine free will.

However, the physical and neural integration proposed by cyborg technologies cannot operate efficiently without an underlying cognitive engine capable of processing vast amounts of biological and cybernetic data in real time. This functional necessity demonstrates that the ultimate success of cybernetic enhancement depends not merely on mechanical hardware, but on advanced computational intelligence. Consequently, this hardware-focused integration naturally shifts the transhumanist trajectory toward artificial intelligence, which serves as the foundational cognitive architecture driv-

ing both autonomous decision-making and post-biological evolution.

8. Artificial Intelligence

"Intelligence" is defined as a concept that includes an individual' s ability to understand, use, and produce information independently as well as the ability to solve complex problems and adapt to changing conditions (Haton and Haton[53], p. 7; Kelly[54], p. 176; Wellington[55], p. 504). These abilities allow individuals to adapt to environmental changes using cognitive processes and problem-solving strategies[53–55]. "Artificial intelligence," also known as machine intelligence, is a comprehensive term that encompasses many different sub-disciplines[56] (p. 234). Essentially, it is considered an imitation of human intelligence in a computer environment, to the extent that it can be determined. Essentially, it is considered an imitation of human intelligence in a computer environment, to the extent that it can be determined[55] (p. 234). In other words, it imitates the thinking, understanding, learning, and interpreting abilities that require human intelligence through programming. Along with these definitions, "Computers as machines with thinking or minds"[57] (p. 2), "The study of mental faculties using computational models"[58] (p. 6), "the automation of [activities] that we associate with human thought, such as decision making, problem solving and learning"[59] (p. 2). Kurzweil defines it as "the art of creating machines that perform functions that require intelligence when performed by humans"[1] (p. 3). Computer expert Elaine Rich defines artificial intelligence as an effort to get machines to do some of the jobs that humans are currently good at[60] (p. 392).

Artificial intelligence is a scientific and technological tool that the transhumanist movement uses as a basis for putting its ideas into practice and attributes great importance to it. Artificial intelligence, which is frequently discussed on intellectual grounds and in daily life in today' s context, is an indispensable technology that transhumanists affirm in building the future world.

The primary aim of artificial intelligence (AI) technology is to bring all features of human intelligence to electronic computers and machines. In addition, quantum computers, which are being developed because of quantum physics, will also play a major role in the future of artificial intelligence. They see artificial intelligence technology as an extremely important reference for humanity to achieve desired transhumanist goals[55] (p. 234).

Against the background of transhumanism, the emphasis on artificial intelligence technology lies in the gains to be obtained from this technology. Transhumanists believe that they can achieve many goals, such as the idea of immortality, transferring the human mind to computers, increasing human cognitive abilities, mind transfer, having machines perform tasks and operations beyond human beings, and freeing the human mind from a defective body and digital immortality with artificial intelligence technology[1] (p. 392). Transhumanists, who argue that the level to which the evolutionary process has brought about human intelligence is incomplete, state that it is possible to create artificial intelligence that is much more advanced and intelligent than human intelligence (Barrat[25], p. 119; Bostrom[61], p. 44). Nick Bostrom even claims that human intelligence will be surpassed thanks to artificial intelligence and that artificial intelligence technology will reach far beyond human intelligence. Therefore, noting that artificial intelligence can go beyond human capacity and that the helplessness of human intelligence in many subjects can be eliminated in this way, they argue that our civilization can reach the scientific technological accumulation that it will reach with normal human intelligence in a shorter time through artificial intelligence[1] (p. 45).

According to the transhumanist perspective, artificial intelligence plays a critical role in solving many problems that humanity faces and may face in the future. This approach argues that artificial intelligence can produce faster and more effective solutions to complex problems that human intelligence cannot comprehend yet. For example, a possible alien invasion scenario is presented by transhumanists in which humanity can eliminate this threat because of the superior problem-solving abilities of artificial intelligence[1] (p. 85). However, they envision that a new mental capacity that emerges as a result of the integration of human intelligence with artificial intelligence will lead to unlimited possibilities for humanity. This new mental capacity enables direct mental communication between individuals, provides instant access to information, and overcomes biological limitations to establish a more interactive relationship with the physical world.

Transhumanist thought places artificial intelligence

technology at the center of achieving immortality by transcending human biological limits. This approach is based on simulating the human mind in a digital environment to achieve virtual immortality[3] (p. 239). They believe that artificial intelligence will develop human beings biologically and mentally, turn them into superhumans, and provide permanent solutions to problems faced by humanity. From this perspective, artificial intelligence will play a key role in building a perfect future by overcoming all negative aspects of human history.

Finally, the transhumanist project of achieving post-biological existence through artificial intelligence and mind uploading faces severe philosophical and existential skepticism. Critics argue that a computational copy of human neural pathways is merely a simulation, not a continuation of the unique personal identity; it constitutes existential death rather than immortality. Furthermore, as Nick Bostrom and other existential risk theorists argue, the creation of superintelligent autonomous systems introduces uncontrollable risks that could render humanity obsolete. From an anthropological standpoint, stripping human existence of its biological finitude—such as mortality and vulnerability—does not enhance life; instead, it removes the very conditions that give meaning to human morality, compassion, and achievement. Thus, the uncritical pursuit of AI-driven transcendence threatens to result in total anthropological erasure.

9. Conclusions

Rather than viewing the technologies associated with the NBIC framework merely as independent scientific developments, this study argues that they constitute an integrated socio-technological ecosystem capable of reshaping virtually every dimension of human existence. Their significance therefore lies not only in their individual capacities but also in the cumulative effects that emerge from their convergence. Biotechnology, nanotechnology, information technology, cognitive science, artificial intelligence, and cybernetic enhancement collectively offer unprecedented opportunities to address some of humanity's most persistent challenges, including incurable diseases, cognitive decline, physical disability, aging, and limitations in education, communication, and productivity. From this perspective, the transhumanist project should not be dismissed simply as a speculative utopia; rather, it represents an ambitious attempt to redefine the relationship between human beings and technology.

At the same time, the very technologies that promise liberation from biological limitations introduce new forms of philosophical, ethical, and political uncertainty. The transition from therapy to enhancement, from biological embodiment to digital existence, and from natural intelligence to algorithmic cognition raises fundamental questions concerning personal identity, human dignity, autonomy, responsibility, justice, and the meaning of human existence. These questions cannot be adequately answered within the boundaries of engineering or empirical science alone. They require sustained dialogue among philosophy, theology, ethics, law, political theory, and the social sciences.

The future of the transhumanist project will therefore depend not solely on technological feasibility but also on humanity's capacity to establish normative frameworks capable of governing these innovations responsibly. Without globally shared ethical principles, transparent legal regulations, democratic oversight, and equitable access to enhancement technologies, the convergence envisioned by the NBIC framework may deepen existing inequalities and create unprecedented forms of biological and digital stratification. Conversely, if technological innovation is guided by ethical responsibility, respect for human dignity, and social justice, many of the practical benefits envisioned by transhumanism may contribute to improving human well-being without undermining the moral foundations of society.

Ultimately, the central challenge is not whether humanity should reject or embrace transhumanist technologies in their entirety, but how these technologies can be integrated into human civilization without compromising the ontological, moral, and social values that define what it means to be human. Future interdisciplinary research should therefore move beyond technological optimism and technological pessimism alike, focusing instead on developing balanced normative frameworks that allow innovation to serve humanity while preserving the integrity of human existence.

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Conflicts of Interest

The author declares no conflict of interest.

AI Use Statement

During the preparation of this manuscript, the author used ChatGPT (OpenAI) solely for language refinement. No AI tools were used for data analysis, interpretation, or generation of scientific content. All outputs were critically reviewed and edited by the author. The author takes full responsibility for the integrity and accuracy of the work.

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