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REVIEW ARTICLE

The regulation of the body by smart wearable devices and their social risk progression

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ABSTRACT

Smart wearable devices, as one of the directions of smart terminal development, show great potential for application and penetrate into all aspects of social life. In the application of smart wearable devices, the features of body discipline such as obtaining body data precisely to complete quantified self, human-computer interaction from explicit interaction to implicit interaction, monitoring of the body from expert dependence to technological dependence and the new human-computer relationship hidden behind them are increasingly highlighted. The social risk concerns of smart wearable device application will also come into play, which will lead to personal privacy leakage and technological risks. The social risks arising from the disclosure of personal privacy and technological risks, the loss of human subjectivity and the degradation of working capacity, the distortion of social life and the difficulties of social interaction, the deepening of the digital divide and the widening gap between the rich and the poor, the formation of a "digital leviathan" and the potential for public safety, etc., should be of sufficient concern to society.

Keywords: smart wearable devices; body regulation; human-computer relationship; social risk

1. Introduction

Intelligent wearable device, also known as a wearable computer device or wearable computer, originated in the 1960s. At present, there is no definitive and very clear definition of a smart wearable device, which is rich in form and function, and most of the research at this stage uses the definition given by the MIT Media Lab. According to the Lab, smart wearable devices are convenient user tools based on computer technology and multimedia wireless communication technology that connect to personal local area networks, detect specific situations or provide personal smart services with non-contrusive foreign body sensing input or output instruments[1]. In layman's terms, smart wearables are new smart terminals developed based on emerging technologies such as the Internet of Things, Wireless Sensors and Big Data. Unlike smart phones and other smart products, smart wearables make comprehensive use of interactive storage technology, which connects the device to the human body in a more convenient form, bringing a more natural and convenient experience to the

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user.

The Spanish thinker Odja Gasset pointed out in the first half of the 20th century that technology does not arise from the basic need of man to "live", but from the "superfluous need" of man to "live well"[2]. People often see what is objectively superfluous things as necessity[3]. This "superfluous need" has given rise to the birth and development of wearable technology, resulting in the high-tech industry of smart wearable devices industry. Smart wearable devices are the technical carrier of wearable technology, which covers many key cutting-edge technologies and is a complex and integrated computing technology system. It is a complex and integrated computing technology system. In addition to traditional technologies, many new technologies have emerged in recent years, including new materials technologies, integrated sensor technologies, sensing actuator interaction technologies, integrated data analysis technologies, lightweight and flexible textile-based solar cell technologies, new data-driven analysis technologies, and machine recognition and modelling technologies for human emotion expression[4]. It can be seen that comprehensive and crossover is the direction of wearable technology development. The application of smart wearable devices relies on the breakthrough of wearable technology principles and the integration and innovation of the whole technology system.

Since the 21st century, wearable technology has made breakthroughs and the wearable device industry has become increasingly mature. 2014 was one of the three themes of the International Consumer Electronics Show (CES), and Forbes also called 2014 the year of wearable technology. In 2019, China's Ministry of Industry and Information Technology officially issued 5G commercial licenses. 5G mobile technology, with its high bandwidth, low energy consumption, low latency, high coverage and interconnection of everything, has a profound impact on the development of smart wearable devices, and will further reshape the development pattern by enabling emerging technologies such as Artificial Intelligence, Internet of Things, Big Data and Cloud Computing.

It is expected that the wearable device industry is about to embark on an era of rapid development. Apart from economic considerations, we must pay sufficient attention to the impact of smart wearables on individuals and society. As an extension of the body's organs and functions, smart wearable devices will enhance the body's disciplinary function and a new human-machine relationship will be created. As the era of smart wearables approaches, it brings new experiences and social risks that cannot be ignored. Therefore, the social risks that smart wearable devices may cause and how to effectively prevent them become issues that we have to think about and study.

2. Smart wearable devices for body regulation

2.1. Access to body data for accurate completion of the quantified self

Unlike the smart mobile products of the past, smart wearables as extensions of body organs and extensions of body functions enable the visualisation and externalisation of bodily cognitive processes, satisfying the modern need to understand the self with precision. Wiener[5], the father of cybernetics, pointed out that the use of the body as an integral part of afferent and efferent information systems was an important shift in communication cybernetics in the 20th century. In the 21st century, we can already feel changes in the body and external environmental factors at any time through wearable sensors and access relevant body data autonomously without disturbing the individual and the environment in which he or she lives. The idea of dataism embodies a broad belief in the objective quantification and potential tracking of various human behaviours and social phenomena through online media technologies[6]. The quantification of natural phenomena through natural science and quantification characterises the 'quantification of nature', which, in the context of the increasing maturity of wearable

technology and the upgrading and widespread use of the wearable device industry, is being upgraded to "Quantified Self". The concept of "Quantified Self" was introduced by Gary Wolfe and Kevin Kelly of *Wired* magazine in 2007, advocating people to track and explore their own bodies through digital and devices, and to shape it into a movement of self-knowledge and self-measurement, making it a way of life for ordinary people. At present, the most important of the wide range of Quantified Self tools is the smart wearable device, which has become the authoritative provider of data to monitor the body, so that people can accurately measure their bodies based on data instead of feelings, reflecting the "body data" feature and the trend towards self-tracking. People can use the technology of Quantified Self to self-monitor sleep time, miles walked, calories burned, and medical visit management. As a social and cultural phenomenon, the Quantified Self is not only a mirror to understand oneself, but also a way to connect and share data with others. Quantified Self technology for smart wearables is a new way of life, creating a world of continuous quantification where people can generate a range of data during leisure, entertainment and exercise, making their daily lives more visual and measurable, thus completing the Quantified Self.

2.2. The shift from explicit to implicit human-computer interaction

Smart wearable devices can constantly monitor and record people's daily body data by connecting to mobile smart devices, presenting an interplay between "body—technology—data" and breaking the boundaries between people and devices, a phenomenon that Donna Havila[7] calls "cyborgs". People are driven by body data to self-construct their own bodies, and in the process, individuals gain satisfaction and enhanced individual responsibility by having access to body data to understand their own physical condition. In 1996, Nicole Kayan further explored the implicit theory of human-computer interaction and proposed an implicit theoretical framework. Due to the limitation of the device wearing position and the surrounding interaction space, explicit interaction based on multiple points for touching the screen needs to open up a new path, namely implicit interaction, which is a form of interaction where the smart wearable device itself senses the context of use and actively infers the user's intent as its system input. For example, in the context of a user raising their arm to look at a watch, the difference between implicit and explicit interaction is clear: In a wrist-worn product designed with implicit interaction, the screen automatically wakes up to display the time and other information after the user has made a motion to raise their arm, reflecting the implicit interaction design concept of the device actively inferring the user's intentions. In contrast, explicitly designed wearable products require the user to shake their wrist to light up the screen, making the implicit interaction more natural and effective. The shift from traditional explicit interaction to implicit interaction for smart wearable devices will expand the dimension of interaction with smart wearable devices and bring a better interaction experience to users.

2.3. Body monitoring shifts from specialist dependence to technology dependence

Canadian sociologist Zwir Frank has classified the body into four ideal types of bodies: The body of interaction, the body of mirroring, the body of domination, and the body of regulation, based on the body's self-control, degree of desire, and the body's relationship with the self and others[8]. In this framework, smart wearables are also highlighted as a medium of communication between self and data, and their function of self-tracking and discipline. As a practice for managing the body, smart wearables help users create a "self-lab" of the body, assisting and guiding individuals to observe their physical responses, daily activities and environmental experiences[9]. Smart wearables not only monitor people's daily physical rhythms, motor behavioural trajectories and psycho-emotional conditions, but also view the body as a sophisticated instrument that can be augmented and expanded. Individuals use sensors and data systems to monitor, collect and accumulate bodily responses and to en-

gage in self-reflection and regulate the practical activities of the body. By monitoring people's physiological conditions and movement data, smart wearables enable the body's desire for energetic perception and control, moving people from expert dependence to technology dependence. For example, Eyra, a Swiss smart wearable development company, has released Horus, a smart wearable that helps visually impaired people to "see". Horus can recognise text, objects, faces and scenes, and when a blind person reads a book or magazine, he or she can listen to it instead of seeing it by aligning the device to the right position according to voice prompts, giving the visually impaired the ability to live their own lives. This means that visually impaired people can no longer rely on medical specialists for their daily lives, and technology is in a sense becoming a substitute for specialists, with technology being given the title of "expert". When viewed from the perspective of "vision restoration", there is no fundamental difference between smart wearables and medical specialists. As the intelligent, automated, data-driven and visualised nature of wearable technology lowers the barrier to entry for interpreting physical signs and recording data. Are we moving away from reliance on specialists and towards reliance on technology? This is the hidden implication of smart wearables for bodily regulation. While we are fully aware of the appearance of smart wearables for body discipline, we should also be fully aware of the human-machine relationship that lies behind it.

3. Human-machine relationships in smart wearables

In *The Quest for Technology*, Martin Heidegger points out that technology exists before man, and that the essence of technology is a natural way of unmasking, i.e. a "seat", a kind of placement that forces man. When technology becomes the "seat" of human society, the body naturally escapes the fate of being "inscribed" by it[10]. Martin Heidegger repeatedly mentions that the threat of the "seat" has touched man at his very essence, forcing him and the world into the path of the "seat" of technology. In a sense, the "seat" he called is technology and the complex set of cultures and institutions behind it[11]. As a high-tech application that makes people's lives more convenient, the emergence of smart wearable devices reveals not only the most sophisticated machines created by technology, but also the various cultures and institutions associated with this technology. In other words, the commercialisation and popularisation of smart wearables has led people, without exception, to a state of "regulated" existence, governed by the powerful will of technical reason behind the technology itself. Conversely, smart wearables control everything according to the technical rationality inherent in the technology itself, and people do not voluntarily ask to enter the path obscured by the machines. This technically rational will of power dictates social reality, thus obscuring the true nature of people and things, and destroying, distorting or even losing the very nature of what makes people human[12]. On the surface, it is true that people are using smart wearables to achieve various purposes on a practical level, but at a deeper level, they are replacing them with smart wearables that coerce people to acknowledge and adapt to their one-dimensional conceptions, logic and culture of technological rationality. In modern technology, human manipulation of the external world has reached unprecedented levels, and through technology humans have not only caused the external world to change course, but they have also been conditioned in the process to lose themselves and their human essence in various technological devices. The relationship between man and machine therefore needs to be re-examined.

The development of technology lies in exploration and research, which implies the manipulation and domination of its object by the researcher. Technology dominates nature through premeditation and calculation. At the same time, in this rational planning and calculation, humans themselves are placed at the mercy of it. In this way, there is a "host and guest heterogeneity" between the machine, nature and humans, and the machine is root-

ed in the demands of a compelling logic[2]. This means that smart wearables also "seat" humans according to their own needs, such as posing norms of behaviour for their controllers, and posing educational institutions accordingly. The use of wearable technology is rapidly spreading to all areas of human society, bringing about a number of significant changes to the human condition, as well as a quiet shift in what people talk about and how they perceive the world. Using wearable technology, humans have created smart wearable devices and their ancillary items that form a rich picture of the world. In an era of new technologies, the vast array of images created by technology has overwhelmed the human presence, making the original harmony between heaven and earth and man fade away. The "ride" of technology has deprived both people and things of their self-contained state, becoming a picture of the world that can be contrived by technology. The power of the machine has forced us to abandon the pursuit of humanism and to dismantle the subjectivity and sociality of the human being. We do not deny and reject the rich world picture that smart wearable devices bring to people, but we must maintain a more urgent inquiry and contemplation on the human-machine relationship in the development of wearable technology from the point of view of the self-sufficiency of existence.

For human beings, the body is the self-contained basis and medium through which we perceive things, and it is through the perception of the body that we establish some kind of connection with the outside world. When we talk about the body, what are we talking about? The contemporary philosopher of technology Ihde[13] distinguishes between "body" as "body one" and "body two", with the former referring to a phenomenologically understood "living body" that "exists in the world" and the latter referring to the "body of rights" that we construct in politics, society and culture. He presents that what links "body one" and "body two" is the relation of embodiment as a technology. The embodied relationship is the transformation and enhancement of the body's perception through technology, and is the most fundamental relationship between human beings and technology. In other words, in addition to the connection between "body one" and "body two" through the real perception of the body, the connection between the two can also be achieved in a technological dimension through scientific perception, or, the materialized "virtual body" is used as a mediator for the unification of the two bodily levels[14]. Ihde[13] summarises the diverse relations between man, technology and the world in the relational formula "man—technology—world" in order to formulate an embodied theory of technology. It focuses on the intentionality inherent in the interaction between humans and technology, i.e., technology as a mediator regulates the relationship between humans and the world, and technological intentionality makes embodiment possible, a theory that reflects the human-computer relationship of intentional interaction. As Martin Heidegger's hammer, Maurice Merleau-Ponty's cane and Don Eade's spectacles illustrate how technology expands the range of human perception, the hammer, the cane and the spectacles all embody the intrinsic intentionality of technology and are contextually integrated into the human perceptual landscape, becoming an extension of the human body's functions. In the "man—technology—world" relationship, the technology mediates the way in which the person perceives and experiences the world, acting as a means of "bridging" between the person and the world, in contrast to the person as the subject and the smart wearable device as the mediator, linking the two in the embodiment. In contrast, the human being as a subject and the smart wearable device as a mediator connect the human being and the world as a whole, with the boundaries between the two gradually "dissolving". The action of the human is the action of the body, the action of the technology is the action of the human, and the world is the context in which the action of the human and the technology is generated, and these three form a stable interaction[15]. In human-computer interaction, embodiment theory focuses on the interaction between the body and technology, and on how human bodily functions are "transformed" by technology, i.e., the

improvement and expansion of human behaviour by technology. For example, e-skins in wearable technology devices are ultra-thin electronic devices with skin-like soft hardware that can produce a sense of touch, with built-in smart wearable technology that connects the human to the outside world and becomes an "extender" of the natural tool of the "human" to compensate for the human tool itself has structural deficiencies. It can be attached to the surface of a device to act as a coat, and can also be used in human repair surgery for severe skin trauma, where the human body is technologically "customised" and the technological device is constantly interfering with the range of perceptions and senses. This new artificial skin senses changes in external pressure, temperature, etc., and sends signals to the human brain to create an almost realistic sense of touch, and the technology completes the body's extension function. The various elements of the electronic skin act as intermediaries for the transmission, enabling the reception, conversion and transmission of tactile signals, thus allowing the human body to better feel the forces of the outside world.

In contrast to the embodied relationship, the disembodied relationship examines the ways in which technology maps out the body, with technological disembodiment objectifying, marginalising and picturing the body through technology. In the virtual reality game scenario of head-mounted AR devices, the player wears this device and interacts with the "virtual opponent" presented in the device, and the device terminal appears as a "third party" forming an "alien relationship" with the person. Moreover, the player can switch his or her identity in this field at will, and the relationship between the person and the technology is disembodied. In distance online education interaction, the application of virtual reality in wearable technology makes the mode of operation "move" from offline education to online education, and virtual reality creates a spatial field of "presence" learning for online learning, with the user sitting in front of the device as an "electronic person" , communicating and interacting online in an "immersive" manner on behalf of his or her object. Although the virtual field can recreate a simulated environment and reveal holographic dynamic content, it is in fact disembodied, according to Don Eade's logic. Hubert Dreyfus holds a similar view, arguing that any form of online education is disembodied because it lacks the "atmosphere" of face-to-face communication between teacher and student[16]. Clearly, Don Eade's view of the relationship between the body and technology is at an empirical level, considering the two to be separate and external to each other and categorising them as "embodied" and "disembodied", without seeing a symbiotic relationship between the body and technology. In fact, the relationship between body and technology should be understood in a broader sense, which should be not limited to the impact of machines and devices on the body, but also realize the formation of a new human-machine relationship in the application of wearable technology.

The relationship between the body and technology reveals that material technology is a part of the technology of the body. In terms of the relationship between body and technology, the body is the technology of "nature" and partly the ontology of material technology, the body constructing itself as a technological being in a long natural evolution. Indeed, Martin Heidegger's perspective can be described as an implicit philosophy of the body, identifying the possession of human intelligence with the possession of the self-body. As the relationship between technology and the body is questioned, the relationship between technology and the body must be reconceptualised. In the case of smart wearables, bodily skills are not only seen as a fundamental technology where technology and the body can no longer be distinguished, but external tools can also intervene in the self-body as an intrinsic functional element. In the field of phenomenology, the scientific world and the real world are essentially a confrontation between material technology and bodily technology. Before the advent of the Smart Era, digitisation and symbolisation were often understood as "de-bodied". However, since the advent of internet and artificial intelligence technologies, especially smart wearable devices that track, measure and visualise body data,

have changed the traditional perception of digitisation and people tend to understand the characteristics of digitisation as "digitisation of the body", resulting in body technology. Body technology is the embodiment of the embodied relationship between the body and technology[17]. Maurice Merleau-Ponty argues that "all technology is bodily technology", and if we accept that technology can be divided into materialised technology and bodily technology, this means that bodily technology or bodily skills will become an important part of the category of technology. The act of immersion of the subject in the world leads to the fact that tools are no longer external objects of the self-body, but can be classified as an intrinsic element of the self-body. This external relationship is broken, meaning not only that the external technology enters the body internally, but also that the body itself will enter the realm of technology that previously remained external. The self-construction of the human being is first and foremost the self-construction of the body, and usually when we talk about technology, we are always referring to some tool, device or apparatus. In fact, the most basic tool, the most basic technology of the human being is our body technology[18]. This provides theoretical support for body technology as a basic category of technology and a theoretical perspective for understanding the human-computer relationship in smart wearable devices, as well as the implication of smart wearable devices as body technology.

The path of technological development is fraught with uncertainty, with new technological developments creating new machines and devices and forming new human-machine relationships. In the era of Artificial Intelligence technology, with the paradigm of smart technology development evolving, the autonomy of technology increasing, and the human-machine relationship more complex, smart wearable devices may unwittingly become devices that manipulate individual humans and human society as a whole. Due to this existence of possibility, the development and application of this revolutionary and evolving AI technology in large numbers will create more uncertainty and the risk of machine alienation in society. In a sense, the human-machine relationship formed by the intermingling of humans and machines does not involve the realm of social risk, but in the process of applying smart wearable devices, it is often intertwined with multiple types of social risk, creating an inextricable link. As human-machine collaboration becomes a norm and expands beyond humans themselves, penetrating deeper into the realms of personal privacy, social life and public safety, the human-machine relationship evolves into a threatening condition that poses unprecedented risks to the application of smart wearables. These risks could change the direction of smart wearables, and it is important that these risk paths are identified and prevented as early as possible.

4. The social risk progression of smart wearables

Smart wearables act as a "paradox" for humanity itself. The more they develop and penetrate into everyday life, the more the threats and risks become increasingly clear. Will the "technological leviathan" created by technological innovation lead to a greater of the dilemma? The German techno-sociologist Ulrich Beck[19] has conducted a comprehensive study of the social risks posed by technology, arguing that contemporary society is a risk-ridden society. By considering and interpreting the social risk path of smart wearables from the perspective of risk society, we can improve our ability to reflect on social risks, which is important for us to recognise and prevent the social risks that smart wearables may bring in their development.

4.1. Unclear attribution of responsibility for personal privacy breaches and technology risks

Privacy is the "foundation of human rights" and the emerging technologies of modern society, represented by Big Data, pose an unprecedented threat to personal privacy, which has intensified wide-

spread privacy concerns and lack of privacy protection. Wearable technology uses big data as a means of analysis, and the prying and exposure of Big Data to privacy is inherent. There is a risk that personal body data information will be made public, either intentionally or unintentionally, under the erosion of Big Data, putting personal privacy under serious threat. In other words, data collection facilities of all kinds and various expert systems can easily, exhaustively and meticulously access personal privacy. Massive amounts of data are constantly being mined and utilised as the core of technology and personal information, constantly supplying information value when interacting with it, putting the security of personal privacy at risk. Clearly, the use of smart wearables has exacerbated the risk of personal privacy breaches. The use of Google Glass, a smart wearable device, has revealed itself to be a troubling issue for personal privacy, and some public places have introduced bans on wearing Google Glass inside due to the protection of personal privacy. Google Glass' first face recognition application, NameTag, allows users to obtain information such as a person's name and occupation by simply looking at a person nearby. With NameTag, Google Glass users can read data from various social networks and shopping platforms, and people's identities, behavioural habits, life paths and shopping history are easily accessible. This group is vulnerable to discrimination if sensitive personal data, past medical history and criminal convictions are leaked and "shared" by those with an ulterior motive. Body "datafication" and "glass man" is not only a medical gaze, but also a daily life in what Foucault calls "surveillance society". This raises the question of whether the right to privacy, as a fundamental right of the individual, is still the basis of individual freedom in the age of intelligence. Clearly, it is worth considering how to strike a balance between the use of smart wearable devices and the protection of personal privacy.

The kaleidoscope of wearable technology is becoming increasingly colourful, making it easy for users to immerse themselves in an optimistic and peaceful atmosphere. Some developers use the technical advantages of smart wearable devices to package them as portable tools that can do anything, and people's blind admiration for wearable smart products makes users ignore its hidden technical risks, and once there are technical risks, it is difficult to clarify the subject of responsibility. Smart wearable devices have unavoidable technical risks in terms of their own technical characteristics, the most direct of which is the risk of technical safety liability. Due to the complexity of wearable technology, it becomes a problem to divide the responsibility. When it comes to assigning responsibility, smart wearable devices face a dilemma in terms of safety. Due to the technology's own defects and safety hazard identification errors prone to human hazards and safety accidents, whether the technology will cause safety accidents should be the primary consideration of R & D personnel. Smart wearables themselves cannot be the subject of liability; they are simply "imbued with codes written by programmers for specific purposes[20]". And even if they have the ability of self-updating and upgrading, they are only the codes and algorithms written by programmers to achieve it. In traditional ethical codes of responsibility, the subjects of responsibility are undoubtedly the designer, manufacturer and seller. Whereas in the development and application of smart wearable devices, there is a single subject of responsibility at each step of the process, and because of the complexity and systemic nature of the technology, it is impossible to clarify the subject of responsibility once the issue of attribution arises. Caught by value bias, interest pursuit and misconceptions, developers may weaken their willingness to take responsibility, or even defy and deny social ethics and legal norms, which is bound to disrupt the economic and social order and cause greater social harm. Therefore, the question of to what extent developers of smart wearable devices should take responsibility for society and how to conduct responsible technological innovation needs to be addressed.

4.2. Loss of human subjectivity and degradation of labor capacity

The commercialisation of smart wearables has led to the increasing invasion of machines into human life, bringing humans into an intelligent state of being. The development of smart wearable devices has created more and more "organic" intelligent machines, which are fed with human knowledge and intelligent algorithms, and are no longer in a simple mechanical human-machine relationship with each other, but with an intelligent interaction context. As inorganic beings, smart wearable devices intervene in the human state of being, which may lead to the social behaviour of human beings being subordinated to technology, the value of human beings themselves being devalued, the status of human subjects being shaken, and their "ontological issues" being affected to a greater or lesser extent[21]. Human beings are being reshaped by intelligent machines, and the definition of "human" may be different as a result. In an era where everything is computable, if the algorithms of technology have more supremacy than human beings, the "seat" of technology over human beings can lead to a crisis in the perception of human identity. It raises the danger that we no longer see ourselves as ends in themselves. Instead, we begin to see ourselves as devices to be used by people and as tools to be used by people[22]. The push and "seat of the pants" of wearable technology gradually deprives humans of the ability to perceive and judge the world around them, and due to the complexity of the limited rationality model and human cognitive processes, there is a risk that human perceptions will gradually become blurred and one-sided. In addition to obedience to technology, humans no longer possess judgement and negativity, and know themselves and become "one-way people" who transcend reality[23], and they endow machines with their own unique intentionality from the superficial to the profound, from the superficial to the profound, so that they can take on human subjectivity and values. In this way, the natural human body is being mended and modified, and the unique emotional creativity of humans is being "stolen" by intelligent machines. Technology is manipulating the way in which man understands society, transforming "Man is the highest essence of man", and defining the historical destiny of humanity. The "logic of the machine" deviates from the expected development pattern and the anti-subjective effect becomes stronger. The expansion of technology in all fields gradually marginalises the human being, and the constant development of technology becomes an integral part of the human body or social regulation, forcing the human being into an era of digital existence. Are machines the "liberation" or the "replacement" of man? The new relationship between man and machine and the risk of the loss of human subjectivity due to the blurring of the human-machine boundary should be a matter of concern.

The substitution of human labour is the origin and the ultimate destination of technological development. The principle that labours creates man tells us that it is labour that creates mankind, and if mankind stops working, mankind will gradually degenerate. In the era of smart wearable devices, if humans no longer focus on improving their creative capacity, but rely on technology, the evolution and development of human society will fall into the trap of technology. It is true that the replacement of human labour by smart wearables is only a partial replacement, but the human choice of smart wearables is itself the result of an inertia-driven approach. Odja Gasset once gave an interesting description when talking about technology and human desire: "Technology is what people go through to save energy!"[3]. When people are freed from the drudgery of labour, technology becomes a human "agent". At the same time controlled and dominated by computer algorithms, smart wearables can also lead to a degradation of human cognitive and mobility abilities. The development of smart wearables is substantially changing people, and they are unwittingly becoming dependent on technology. Human beings will become increasingly dependent on technology and devices, and thus in some areas their ability to work independently will become weaker and weaker. In the context of a burgeoning smart economy, the trend

is for productivity to soar and economies to expand. In the long run, in an intelligent economy and society, people with little technical skills are the weakest in the era of artificial intelligence. As production becomes more intelligent, industrial structures are upgraded and profit is driven, intelligent machines take over human jobs and are more capable of doing the tedious and heavy work. Under the logic of technology human labour is constantly suppressed or replaced by intelligent machines, labour opportunities and values are gradually lost, the labour division system is subject to unprecedented impact, technological unemployment becomes an inescapable social problem, and the risk of social stratification and social exclusion is thus constantly expanding. Therefore, the choice of smart wearable devices needs to be re-examined in a calm and rational manner.

4.3. Social life distortion and social interaction dilemmas

Neither the invention nor the application of technology can be separated from the practice of human social life, and without the application it is not a technology in the complete sense or a realistic technology[24]. On the one hand, the rational application of smart wearable devices has brought many conveniences to social life. In the smart elderly service based on medical health, the advantages of combining smart wearable devices can ease the pressure of elderly people and strengthen the health management of elderly groups. In the smart urban metro transportation service based on wearable technology, the innovation of wearable technology has changed the way people travel. On the other hand, we find that dependence on smart wearable devices is also inevitable in social life and social interactions. People are addicted to the fully intelligent experience and unprecedented convenience brought by smart wearable devices, and at the same time, to a certain extent, they begin to rely on machines and become technologically alienated by machine control. The essence of technological alienation is the alienation of the level of human cognition rather than the change of human status as a subject, which we can examine in terms of the excessive intervention of physical technology in the social life of human beings. In the context of the application of smart wearable devices, man's excessive attachment and dependence on the virtual world has caused human relationships to become alienated and distant. The various relationships between people and themselves are manifested through human relationships, and the realisation of relationships with others is corroborated through relationships of interaction[25]. Smart wearable devices open the door to real-world interactions and bring great convenience to human interactions. For example, the ability to identify a future partner with the help of a smart wearable device and to determine whether the "person in front of you" is the right person for you by wearing a pair of special glasses may seem efficient, but it seems to take away the fun of relationships. According to Alex Pentland, the father of smart wearables, the joy of falling in love cannot be taken away, and the art of falling in love lies in finding those interesting points that can be shared with the other person. One judges the other person by what they wear, where they grew up or their degree, etc. When choosing a life partner, does a person leave the decision to an intelligent machine or is he or she in the presence of a social interaction? It is clear that with the combined development of biotechnology and smart technology, smart devices with autonomous consciousness are "replacing human choice" and breaking the social logic of human social interaction. Smart wearables as a resource should serve people, not interfere with them, which must be guarded against. The original intention of man to create machines and devices was to make them tools that we could tame to our full technological advantage and creative capacity. However, in practice, it is becoming clear that the effectiveness of "intelligence" and "empowerment" is underpinned by a lot of uncertainty and uncertainty, blurring social life. Smart wearables are smart machines that "proxy" for real-world partners, friends and children, creating a distortion of social life and a crisis of social interaction. With the popularization and further application of smart wearable devices,

we should think about how to dissolve the phenomena of the virtualization of human interaction, the virtualization of interaction objects and the destruction of interaction norms.

4.4. The deepening digital divide and the widening gap between rich and poor

The digital divide is the fourth major dichotomy after the urban-rural divide, the industrial-agricultural divide and the brain-body divide, and refers to the deep class divide in terms of effective use of the Internet and the skills needed to do so. The digital divide is also a technological divide, where the advantages of emerging technologies represented by the Internet are not shared equitably across regions and populations, potentially raising certain human rights issues and equity concerns. On the one hand, the application of wearable technology inevitably raises new issues of the digital divide, where the unconditioned are excluded from smart wearables due to varying levels of scientific literacy, technical ability and economic status, and inconsistent proficiency in mastering smart wearables across groups and countries, giving rise to asymmetries in individual rights. For example, organisations that rely on wearable technology and have a technological advantage can use the resulting data to judge and master the characteristics, interests and behaviours of their members by empowering them with vast data tags, even to the point where the onlooker knows more about the self than the self. In empowering users with data tags, technological asymmetries are created between the organisation and the user, thus creating a huge asymmetry of power. On the other hand, as technological systems and social structures become more and more highly complex, with vast amounts of information resources capable of being recognised and processed by intelligent computer software, the field of smart wearables is being reduced to a privileged playground for the economically and technologically powerful, and a digital economy emerges in the era of smart wearable technology where everything is connected. In many cases, smart wearables are used preferentially by those with higher social status, economic resources and good education, thus further widening the gap in access to social resources, wealth distribution and education levels. In the environment of the new wearables industry, digital possesses some economic value and dominates the appropriation of social wealth, with the digital elite monopolising key data resources to gain economic benefits, rather than relying on hard work. Wealth and power may be concentrated in the hands of a tiny elite with powerful algorithms, creating unprecedented social and political inequalities[26]. The digital divide has created a large group of "Digital Poor", contributing to social stratification and economic disparity between rich and poor. In fact, the data and algorithm-related applications involved in smart wearables may trigger a "horse-trading effect" where the poor get poorer and the rich get richer, thereby increasing social inequality and leading to social stratification and polarisation between rich and poor. While wearable technology provides consumers with humanised technological systems, it also makes the disadvantaged more vulnerable. As Mary Shelley[27] metaphorically stated in *Frankenstein*, Frankenstein's ability to help the masses with his extraordinary abilities shows the warm side of science and technology; he may also develop into a disruptor of the social order. Therefore, the future development of smart wearable devices should be humanistic enough to bridge the digital divide and the gap between the rich and the poor, so as to achieve the perfect leap from "wearable" for a few to "wearable" for all.

4.5. "Digital Leviathan" formation and public safety hazards

According to the British philosopher Thomas Hobbes[28], the "State Leviathan" is a behemoth that exists to protect the interests of the people and make their lives safer and better. In the context of a smart society, the state can use smart wearable devices to enhance its social surveillance capabilities and create a highly efficient "State Leviathan", but at the same time the function of these smart technologies in safeguarding the legitimate rights of citizens is more

likely to be marginalised. The symbiotic structure of the state's surveillance system and civil rights protection mechanism is broken by the paradox of data technology brought about by the "digital leviathan"[29]. Therefore, the negative function of the "State Leviathan" should be curbed in time. With the use of new technologies such as Big Data, Artificial Intelligence and the Internet of Things, people are enjoying data as a key factor of production in society, while at the same time feeling a sense of "digital bondage" is also emerging. Digital technology as a means of restraint for the "State Leviathan" begins its alienation process and evolves into a new kind of leviathan–the "Digital Leviathan", which brings together the combined forces of technology and state power, thus generating effects and risks. The momentum of the formation of the "Digital Leviathan" has given rise to questions of information protection and public security. The "invasion" and "theft" of data by "out-of-body nature" wearable technology inevitably raises the question of public security in such technology. Data security is the foundation of national security, and as data is a core element of smart wearables and the Big Data era, its quality and computing power continues to increase, and how it is managed and used becomes an issue that cannot be ignored in the development of wearable technology. The rate of technological advancement in computing continues to increase and has been seen as a force unto itself[30]. This independent power will continue to "expand", but only in the context of public safety. In the era of intelligence, a hegemonic monopoly on technology will bring new threats to other countries and lead to the development of smart wearables in the wrong direction. The momentum, if not effectively controlled, will pose a threat to public security. The modern concept of public security is more focused on the human-centred dimension, which encompasses aspects from human physical health to psychological stability, from social security to national security. In the era of wearable technology, massive amounts of data and personal information are constantly being mined and utilised, and people are constantly providing information value when interacting with information. While information security is also under threat, it is particularly important that public safety risks in society are avoided.

5. Conclusions

Technology has always been a mixed blessing "gives us both creativity and destruction"[31]. The social risks resulting from the misuse of smart wearables go far beyond the above, as Anthony Giddens[32] argues that technological progress manifests itself as a positive force, but it does not always do so. The development of science and technology and the issue of risk are closely linked. In the long run, while smart wearables fulfil certain aspects of human needs, the security threats hidden within them also weigh on a person's ability to cope. While wearable technology brings us many positive values, it inevitably brings corresponding social risks. If smart wearables based on Big Data and algorithm-enabled devices are used illegally or maliciously, they can create unpredictable social risks and even lead to more serious risks of social fragmentation. There is no limit to the development of smart wearables that can be "used for good", but there should be a defined "threshold" of technological capabilities that can be "used for evil". The risk of alienation of smart wearables is not in itself terrible, but the question is whether we are aware of the risk that has crept up on us. The question is whether we are aware of the risk that has crept up on us. Further discussion is needed on how to further clarify the direction of wearable technology and its industry.

Conflict of interest

The authors declare no conflict of interest.

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