On the Problem of Technological Alienation in the Digital Age

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Abstract: As we step into the digital age, technology has deeply penetrated into human production and life, enveloping people in a state of digital existence. In this process, the dissolution of individual subjectivity, the profit-driven logic of capital, and the duality of technology have given rise to the negative effects and alienation of technology. Consequently, human society has become overly dependent on technology and trapped in the dilemmas of digital survival. To address the problem of technological alienation, the key lies in carefully examining its various manifestations in the digital era. Practical approaches include cultivating a sense of autonomy and reconstructing critical thinking; transcending capital logic and improving social institutions; strengthening reflection on technology and promoting tech for good. In this way, technology can truly serve the fundamental goal of human emancipation and the free and all-round development of individuals.

Keywords: Digital Age, Technological Alienation, Capital Logic, Technology for Good.

1. Introduction

As digital technology sweeps across the world with irresistible momentum, penetrating daily life through intelligent terminals and extending from industrial innovation to social governance, human society has officially entered a digital age characterized by data as its core and interconnectivity as its prominent feature. Technology, which was supposed to liberate productive forces and expand the boundaries of human capabilities, has gradually shown an alienating tendency that deviates from its original purpose in the process of deeply embedding itself into the social fabric. It may be alienated into an instrument that dominates labor and narrows the autonomous space of individuals; it may also turn into a force that creates false needs and manipulates consumer cognition; furthermore, it may weaken real emotional bonds and blur the boundary between reality and virtuality amid the expansion of virtual interaction. These phenomena of technological alienation are not only quietly changing individual existence and behavioral patterns, but also exerting a profound influence on social structure and value systems. Therefore, analyzing the causes behind them and exploring paths to eliminate alienation and realize the harmonious coexistence of technology and humanity has become an important issue with both theoretical value and practical significance in the present era.

2. Theoretical Overview of Technological Alienation in the Digital Age

When algorithms determine the delivery routes of food delivery riders, when data tags define the social value of individuals, and when short-video algorithms harvest public attention, digital technology, while reshaping human civilization, is revealing its alienated face in a more concealed and profound manner. As an unavoidable proposition in the digital age, technological alienation not only continues humanity's eternal speculation on tools and domination, but also assumes complex forms distinct from those of the industrial age. Therefore, clarifying its conceptual definition, tracing its theoretical context, and analyzing its multi-dimensional manifestations constitute the ideological premise for rebalancing the relationship between technology and human beings.

2.1. Conceptual Definition of Technological Alienation in the Digital Age

The concept of alienation derives from the Latin word alienatio, whose original meaning includes multiple connotations such as transfer, assignment, separation, estrangement, difference, and mental disorder. Historically, the earliest use of the term alienation can be traced back to the Bible. According to its records, Adam fell into mortality after disobeying God's warning and eating the forbidden fruit—a process described as alienation from the innocent divinity bestowed by God, that is, separation from the original sacred state. In modern times, Thomas Hobbes, the 17th-century British philosopher, and Jean-Jacques Rousseau, the 18th-century French Enlightenment thinker, mainly employed the concept of alienation in the context of the transformation of rights, focusing on issues concerning the transfer and conversion of rights among different subjects. Generally speaking, alienation is understood as a process in which the subject, through its own activities in the course of development, produces an existence opposite to itself, which then turns into an external and alien force that restricts or confronts the subject in turn.

As an extension of the concept of alienation, although scholars have not yet reached a consensus on the definition of technological alienation, domestic and foreign researchers generally examine it from two perspectives: the negative impacts of technology on human beings and the value neutrality of technology [1]. Hans-Georg Gadamer, the famous contemporary German philosopher, noted: "The twentieth century is the first age redefined in a technologically determining manner, and it begins to expand technical knowledge from mastering natural forces to mastering social life. All this is a sign of maturity, or, one might also say, a sign of the crisis of our civilization [2]." Technology is originally a creation of human beings, intended to serve humanity. Yet in the process of using technology to

transform and control nature to satisfy human needs, technology in turn dominates humanity with corresponding power and brings harm to human beings themselves. This crisis is not unilateral, but a comprehensive crisis involving politics, economy, belief, morality, ecological environment, and other fields—all of which can be referred to as technological alienation [3].

The essence of technological alienation in the digital age is that digital technology, in its development and application, gradually deviates from its original human design and forms a reverse domination over the human subject. Digital technology, originally created by humans to improve efficiency, expand cognition, and optimize life, has evolved in practice into an alien force independent of human will, causing humanity to decline from the controller of technology to its dependent or disciplined subject.

2.2. Theoretical Origin of Technological Alienation in the Digital Age

"We have been simplified by technological manipulation. Once we enter the stage of digital manipulation, this process of simplification becomes frenzied [4]." In the application of technology, the technologies created by human beings gradually slip out of human control. Their internal logics—such as the principle of efficiency supremacy, the orientation of data-drivenness, and the rules set by algorithms—begin to replace human value rationality, reducing human beings from the subject of technology to its object, and ultimately to beings dominated, restricted, and even oppressed by technology. Its theoretical origin did not emerge out of thin air after the birth of digital technology, but is the inheritance and extension of modern and contemporary Western critical theories of technology.

Marx's theory of alienated labor, put forward in the Economic and Philosophical Manuscripts of 1844, constitutes the logical starting point for the study of technological alienation. Although Marx's era was marked by industrial technology, the reversal of the relationship between tools and human beings that he revealed provides a core analytical paradigm for technological alienation in the digital age. Marx argued that alienated labor under industrial capitalism manifests itself in four dimensions. First, the most direct expression of alienated labor is the ubiquitous alienation of the products of labor: the more products and wealth the worker produces, the poorer he becomes. Moreover, his products of labor turn into a power that dominates him in return. Second, the root cause of the alienation of the products of labor lies in the alienation of the labor activity itself: labor is transformed from human beings' free, conscious, and creative activity into an external, coercive, self-tormenting, and self-sacrificing activity for subsistence. Third, since human beings' species-being is free and conscious objectifying labor, the alienation of labor activity is at the same time the alienation of human essence. The direct consequence of the above three forms of alienation is the alienation between human beings, namely, conflict and estrangement among people [5]. Therefore, Marx wrote: "The externalization of the worker in his product means not only that his labor becomes an object, an external existence, but also that it exists outside him, independently, as something alien to him, and that it becomes a power on its own confronting him; it means that the life which he has conferred on the object confronts him as something hostile and alien [6]." Although digital technology has transformed the forms of

labor from physical labor to data labor and cognitive labor, the logic of alienation remains highly consistent. In the digital age, firstly, digital workers are alienated from the products of their digital labor: the data created by workers becomes the core asset of platforms, which in turn is used to establish rules and dominate workers' time and behavior. Secondly, there is alienation in the labor process: the flexibility of digital labor is alienated into boundless exploitation; labor is no longer a path to self-realization, but a survival task to avoid being eliminated by algorithms. Finally, there is alienation of species-being: digital technology was supposed to expand human free time, yet instant responsiveness has permeated labor into every moment of life. The inherent requirement of capitalist production—to occupy labor twenty-four hours a day—has become a reality in the digital age [7]. The boundary between work and life disappears, and human beings lose their species-being of freely disposing over time.

In The Question Concerning Technology, Heidegger departed from Marx's perspective of labor and analyzed technological alienation from the standpoint of ontology, providing a deep philosophical explanation for the domination of algorithms in the digital age. Heidegger shifted the critical focus from the capitalist system to the logic of technology itself. He argued that in the age of modern technology, human beings are reduced to material for higher purposes; the artistic element in technology vanishes, the capacity for thinking declines, and human essence is lost. He therefore warned people not to regard anything in technology as natural. The essence of modern technology is not a tool, but a Ge-stell (enframing). Through a specific revealing, technology regards nature as energy reserve and human beings as human resources, enclosing the world and humanity within a calculable and controllable framework. Eventually, human beings are dominated by the logic of technology and lose their understanding of Being itself.

The Frankfurt School inherited Marx's critical theory and Heidegger's ontology of technology, extending the analysis of technological alienation from labor and Being to the fields of social culture and ideology. It revealed how technology, through the alienation of instrumental rationality, becomes an ideology that sustains domination, offering a social critical perspective for understanding technological hegemony in the digital age.

2.3. Multi-dimensional Representations of Technological Alienation in the Digital Age

The essence of things is necessarily manifested through one or more phenomena. From industrial capitalist society to digital capitalist society, digital technology, with its characteristics of digitization, intelligence, virtualization, refinement, and personalization, has systematically restructured traditional modes of material labor. The historical transformation of labor modes has induced a digital shift in the forms of alienation [8].

The particular manifestations of technological alienation in the digital age are, first of all, reflected in the virtuality of its technological carrier. It no longer relies on physical machines, but is realized through virtual forms such as algorithms, data, and codes. Because in the process of virtual interaction, "real individuals must depend on a digital virtual entity to exist at the level of social relations [9]," which is essentially the intangible control of human relations by virtual rules. Second is the universality of its scope of operation: digital technology permeates all scenarios of production and life, extending

alienation from specific fields to the entirety of human existence. Third is the concealment of its power structure: alienation no longer appears as explicit technological violence, but is realized through implicit mechanisms such as algorithmic hegemony. For instance, platforms build monopolistic advantages by accumulating user data, while users often ignore the essence of their own exploitation under the appearance of free services. Technological alienation thus takes on the character of "self-fulfillment fulfilled to death; self-perfection perfected to demise [10]." From a realistic perspective, such alienation is embodied in multiple dimensions. At the level of subjectivity, human beings gradually lose dominance over their own actions. Algorithmic recommendations determine the scope of information users access, platform rules govern the way workers labor, and the system-assigned orders that strictly control delivery riders serve as a typical example—human capacity for autonomous choice is constantly being dissolved. At the relational level, human relations with the self, with others, and with society are distorted by digital technology. Likes on social media have replaced genuine emotional connection; big data labels individuals, reducing people to cold data symbols and resulting in the alienation of real relationships. At the value level, instrumental rationality suppresses value rationality. The logic of efficiency supremacy and data priority upheld by digital technology erodes human value judgment. Phenomena such as the excessive pursuit of online duration data in education at the expense of the essence of learning, and the overreliance on algorithmic diagnosis in healthcare that weakens humanistic care all indicate that human value is being defined by technical indicators. False freedom and self-fulfillment also eliminate all resistance from workers, while capital covertly expands and reproduces the alienated, unfree, and unequal production-labor relations [11].

Philosophically speaking, the essence of technological alienation in the digital age is the alienation of human essential powers. Human beings are reduced to objects disciplined by technological rules, ultimately leading to a comprehensive distortion of human relations with the self, society, and technology. In a sense, "if human beings still play the role of inventors, they are like actors, following the lines provided by objects themselves and obeying the enunciation of matter [12]."

3. Analysis of the Causes of Technological Alienation in the Digital Age

Today, as digital technology penetrates into all fields of social production and life at an unprecedented speed and scale, the shadow of technological alienation is also spreading quietly. To resolve this contradiction and explore the path for the sound development of technology in the digital age, the primary task is to analyze the complex causes of technological alienation. Only in this way can we accurately grasp its internal mechanism and lay a solid foundation for putting forward targeted coping strategies in the follow-up.

3.1. The Dissolution of Individual Subjectivity: Alienation of Individual Psychology and Cognition

In the digital age, technology disciplines and dominates individuals in reverse. One of the core problems lies in the dissolution of individual subjectivity, which is centrally reflected in the alienation of individual psychology and cognition. From this perspective, the emergence of technological alienation can be attributed to the following three interwoven factors, which jointly undermine the individual's dominant position in interaction with technology.

Firstly, one of the core supports of digital technology is the algorithm, whose central logic is the prediction of user preferences. "Every click and every search is stored. Every move online is monitored and recorded. People's lives are completely copied on the internet. Digital behavioral habits accurately portray both the external and inner images of people, more comprehensively and accurately than I can portray myself [13]." This actually results in individuals browsing mostly news with a single standpoint, homogeneous entertainment videos, and fixed types of products. This mechanism seems to precisely satisfy needs, but in fact constructs a closed information cocoons. The information cocoon confines people to a closed and narrow information environment, deepens the one-sidedness and monotony of their thinking and cognition, causes the loss of human subjectivity, reifies human free will, and turns people into one-dimensional beings [14]. Individuals seem to browse actively, but the content they see is actually pre-selected by algorithms. Information that might challenge their existing cognition and expand their horizons is long excluded from recommendation lists. This false choice makes individuals mistakenly believe that they are still dominating the cognitive process, while in reality they have become data puppets of algorithms. The direction of cognition is set by algorithms, and the content of cognition is supplied by algorithms. Individual subjectivity is reduced to a provider of data feedback, rather than an active constructor of cognition. "In a world controlled by algorithms, people increasingly lose their agency and autonomy. They confront a world that stands against them and escapes their understanding [15]." This gradually separates them from cognition of other fields and eventually deprives them of a complete cognitive picture of the world.

Secondly, social media have reconstructed human ways of socializing, but they have also given rise to a performative mentality, shifting individual self-cognition from inward exploration to outward conformity, leading to the alienation of self-subjectivity. Individuals no longer live for their true selves, but are trapped by virtual personas. The core logic of social media is display and evaluation: individuals gain attention, likes, and recognition from others by posting carefully polished content. Under this interactive model, individual self-worth judgment gradually relies on the feedback of others. In the long run, to maintain this model, individuals must continuously invest time, energy, and even money in managing social accounts, and gradually internalize virtual performance as a normal way of life.

Thirdly, information in the digital age is characterized by fragmentation, which constantly seizes individual attention and results in the alienation of attention. The design logic of digital products centers on retaining user attention. Through color stimulation, instant feedback, fragmented content, and other means, it continuously interrupts individuals' autonomous activities and forcibly draws attention to technical terminals. The shallow reading and superficial understanding of fragmented information mean that individuals do not need logical sorting, value judgment, or in-depth analysis, but only passively receive conclusive information. Long-term reliance on this cognitive mode

gradually degenerates individuals' ability to think deeply, making it difficult to construct a complete knowledge system, unable to dialectically analyze complex issues, and even lose the capacity for independent judgment.

From the perspective of the alienation of individual psychology and cognition, technological alienation in the digital age is not merely a technical problem, but a process in which technology gradually dissolves individual subjectivity by reshaping people's cognitive patterns, psychological states, and attention resources.

3.2. The Drive of Capital's Profit-seeking Logic: Technology Caters to the Desire for Capital Accumulation

In the digital age, technological alienation is also the result of the deep embedding of capital's profit-seeking logic in the whole process of technological development and application. The cruel economic necessity that Marx regarded as the driving force behind the introduction of machinery and technology into the production process is precisely capital's need to obtain sufficient surplus value to maintain its competitiveness [16]. Capital takes accumulation as its core goal, and the characteristics of digital technology happen to cater to capital's desire for rapid, sustained, and maximized accumulation. By reshaping the design logic, application scenarios, and value orientation of technology, capital turns technology from a tool serving human needs into a vehicle for extracting surplus value, ultimately leading to technology's reverse domination over individuals and the erosion of public interests.

Marx pointed out: "Contradictions and antagonisms do not arise from machinery as such, but from its capitalist application [17]!" The premise of capital accumulation is the acquisition of tradable value carriers, and the most central value carriers in the digital age are user attention and data. By dominating technological design, capital captures user attention, essentially transforming individuals into quantifiable and tradable traffic commodities, paving the way for capital to monetize traffic. Furthermore, capital reduces technological value to efficiency, profit, and traffic, dissolving the humanistic attributes of technology and subordinating it to capital accumulation. This eventual alienation of technology from human needs constitutes the deep-seated cause of technological alienation. In addition, one of the core characteristics of digital technology is that data can be collected, analyzed, and reused. Capital has keenly discovered the accumulation potential of data. By defining user data as a factor of production in the digital age, capital essentially transforms individuals' private information, behavioral tracks, and psychological preferences into low-cost or even cost-free materials for accumulation, realizing excess profits through data processing and reuse — this is the core link of technological alienation. Moreover, capital continuously exploits the value of data. Unlike traditional factors of production, data is infinitely reusable and non-depletable. Once obtained, data can be processed repeatedly and reused in multiple scenarios to achieve sustained accumulation, without any compensation to data producers. This conveniently enables capital to build monopolistic barriers, and ultimately manipulate the market, exploit users and small businesses through its monopoly position to achieve excess accumulation — this is the intensifying link of technological alienation.

From the perspective driven by capital's profit-seeking logic, technological alienation in the digital age is the inevitable outcome of capital using technological characteristics to achieve self-accumulation. Although digital technology provides tremendous momentum for improving productivity and increasing wealth for humanity, its underlying capitalist nature and the imperative of pursuing value accumulation confirm the essence of technological alienation in the era of digital capitalism [18].

3.3. The Duality of Technology: The Inevitability of Technological Alienation

The natural attribute of technology determines the inevitability and ineliminability of technological alienation (mainly referring to the deterioration of the ecological environment), while the social attribute of technology determines the artificiality and controllability of technological alienation [19]. This duality is not unique to the digital age, but has been infinitely amplified by the characteristics of digital technology, making technological alienation no longer an accidental deviation in use, but an inevitable result embedded in the essence of technology.

The core attribute of technology is instrumentality. The original intention of human beings to create technology is to take it as a means to extend their abilities and solve problems. However, technology also possesses autonomy. Once created, it will develop according to its own technological logic. It can be seen that technology is not a neutral entity: "they are biopolitical instruments for specific mechanisms of production that facilitate certain kinds of practices and preclude others [20]." When talking about the inherent potential negative effects of technology on human beings, the Western scholar David Towpert also holds that: on the one hand, technology is our masterpiece; on the other hand, the positive and negative effects of technology react on us, linking us with technology tightly, just like the biological symbiosis, which cannot be escaped [21]. The design logic of technology will unconsciously embed the value orientation of designers, and this value-ladenness is concealed due to the abstractness of digital technology. Eventually, in the name of neutrality, technology imposes specific values on human beings and causes alienation. The emergence of this contradiction is the core link of technological alienation in the digital age. The fundamental significance of technology is to liberate human beings. By replacing repetitive labor and expanding cognitive boundaries, technology enables human beings to break away from natural and physiological limitations and gain more freedom. However, the convenience of digital technology has a double-edged effect. The more extreme convenience it provides, the deeper human dependence on technology will be, and eventually human beings will shift from being liberated by technology to being restrained by technology.

From the perspective of the duality of technology, technological alienation in the digital age is not an accidental out-of-control of technology. As long as the duality of digital technology exists, the occurrence of technological alienation is inevitable. The core of human response to alienation is not to deny technology, but to establish a balanced mechanism between technological development and human needs on the basis of understanding the duality of technology, so that technology will always return to the track of serving human essence.

4. Practical Paths to Overcome Technological Alienation in the Digital Age

To overcome technological alienation in the digital age does not mean denying the progressive value of technology. Instead, it involves constructing a systematic solution on the basis of confronting core contradictions such as the dissolution of individual subjectivity, the profit-seeking logic of capital, and the duality of technology. This approach requires both breaking away from the one-sided perception of technology as either omnipotent or inherently sinful, and avoiding extreme tendencies such as individual powerlessness or unrestrained capital. Rather, through multi-dimensional coordination among individuals, capital, society, and the state, it aims to recalibrate the relationship between technology and humanity. Technology should be restored from a force that dominates human beings to a tool that serves them, and from a vehicle for capital accumulation to a support for the all-round development of human beings. Ultimately, a sound ecosystem of controllable technology, restrained capital, autonomous individuals, and a harmonious society should be established in the digital age.

4.1. Cultivating Autonomy and Reconstructing Critical Thinking

In the multiple dilemmas of technological alienation in the digital age, individuals are not passive victims, but the primary stakeholders in breaking the chain of alienation. When individuals lose their ability to make independent judgments and critical reflections on technology, they will be reduced to puppets of algorithms and objects of data. Therefore, cultivating individuals' sense of autonomy and reconstructing critical thinking can help individuals establish a healthy relationship with technology based on active use rather than passive dependence, and clarify whose tool technology is and whom it is intended to serve [22].

Firstly, at the cognitive level, it is necessary to break blind obedience to technology and establish an understanding of technology as a tool. The starting point of technological alienation is often individuals' irrational worship or unconscious dependence on technology, regarding technology as an omnipotent solution to all problems or equating technological rules with objective truth, and eventually losing a clear understanding of the essence of technology. Therefore, the primary task of cultivating autonomy is to guide individuals to disenchant technology at the cognitive level, establish a rational understanding of technology as a tool, and clarify that human beings are the masters of technology, not its slaves. In addition, individuals need to redefine the relationship between technology and life, distinguish between necessary use of technology and meaningless dependence on technology, and regain dominance over their time and attention by actively choosing scenarios of technology use.

At the behavioral level, it is necessary to take the initiative to break out of the cocoon and reflect, so as to resist cognitive manipulation by technology. People immerse themselves in the sensory pleasure and spiritual satisfaction brought by digital networks, without realizing that digital technology, through manipulating the dialectics of communication and commerce, freedom and control, imposes on the public a form of self-exploitation and intangible surveillance that is more efficient and freer than any external exploitation or physical domination. The willing surrender and unreserved devotion of the public prove that this dialectic of freedom is precisely the foundation of the surveillance society [23]. Therefore, to reconstruct critical thinking requires individuals to take the initiative to break the dilemma at the behavioral level, carry out active cognitive expansion and behavioral reflection, break through the cognitive boundaries set by technology, and avoid being kidnapped by the behavioral logic of technology.

At the capacity level, it is necessary to improve digital literacy and master the tools to resist alienation. In the digital age, individuals' ability to resist technological alienation depends largely on their digital literacy, that is, the ability to understand the principles of digital technology, identify technological risks, and regulate the use of technology. Individuals lacking digital literacy are prone to passively fall into alienation because they do not understand technological logic; individuals with digital literacy can take the initiative to use technological rules to protect themselves and even restrict improper domination by technology. Therefore, improving digital literacy provides the capacity support for cultivating autonomy and reconstructing critical thinking.

In the complex ecosystem of technological alienation in the digital age, individuals' sense of autonomy and critical thinking are by no means insignificant forces. When individuals can view technology rationally at the cognitive level, actively resist manipulation at the behavioral level, and master digital literacy at the capacity level, they can transform from passive recipients of technology into active controllers of technology. They will no longer be trapped in cognitive cocoons by algorithms, reduced to objects of exploitation by data, or kidnapped in self-cognition by social media. Such individual awakening can not only help individuals safeguard their subjectivity in the digital age, but also lay a solid individual foundation for building a sound digital ecosystem in which technology serves human beings.

4.2. Transcending Capital Logic and Improving Social Institutions

The deep-rooted cause of technological alienation in the digital age lies in the absolute domination of profit-seeking capital logic over technological development. As Marx pointed out, under the capitalist production system, capital logic is the "universal illumination dominating all other colours and modifying their specific nature. It is a specific ether which determines the weight of every existence that appears within it [24]." Capital alienates technology into a weapon of monopoly, causing it to deviate from the essence of serving human well-being and become a vassal of capital accumulation. Therefore, transcending the sole domination of capital logic and establishing a sound social institutional system is the key to systematically solving technological alienation.

Firstly, it is necessary to restrain the disorderly expansion of capital, draw boundaries between capital and technology, and prevent technology from being reduced to a tool for capital accumulation. The profit-driven nature of capital is the direct driving force of technological alienation. In pursuit of excess profits, capital pushes technology to break through the boundaries of privacy, fairness, and public interests, leading to various forms of alienation. Thus, the primary macro-task of overcoming technological alienation is to rein in capital through institutional means, clarify the scope of capital's activities in the technological field, and prevent excessive manipulation of technology by capital. In addition, the

network effects and scale effects of digital technology make it easy for capital to form monopolies through technological advantages, and then exploit users and small and medium-sized businesses by virtue of its monopoly position, intensifying technological alienation. To address this, it is necessary to dismantle monopolistic barriers through anti-monopoly institutions and maintain fair competition in the technological field.

Secondly, it is essential to improve the technology governance system, build a pluralistic co-governance framework, and calibrate the direction of technological development. Another important cause of technological alienation is the lack of constraints oriented by public values in technological development. Technology dominated by capital only focuses on efficiency and profit, while ignoring public goals such as fairness, security, and humanistic care. Therefore, it is necessary to embed public interests into the whole process of technological development through a sound technology governance system and a pluralistic co-governance structure, so as to ensure that technology always serves the overall well-being of humanity.

Finally, it is important to balance technological efficiency and social value, and use public policies to remedy the defects of capital-dominated technology. Technological development led by capital often takes efficiency as the priority and neglects social value, resulting in structural characteristics of technological alienation. Some groups not only fail to enjoy the dividends of technology, but also fall into the digital divide due to technological barriers. Therefore, public policies should be adopted to balance technological efficiency and social value, so that the dividends of technology can benefit all members of society and prevent technological alienation from exacerbating social inequality.

Marx pointed out: "Workers must learn to distinguish between machinery and its capitalist application [25]." The essence of technological alienation in the digital age is the suppression of human logic by capital logic and technological logic. It requires joint efforts of the government, enterprises, society, and individuals to build a benign digital ecosystem in which technology serves humanity through institutional innovation.

4.3. Strengthening Technological Reflection and Promoting Technology for Good

The absence of inherent value in technology itself is a key inducement of technological alienation in the digital age. When technology is regarded as a tool of oppression and domination, it ultimately "violates and negates the immanent end of technology [25]." If technological research and development (R&D) pursues only functional realization and efficiency improvement while neglecting the prediction of technological consequences and the integration of humanistic values, technology is liable to deviate from its track of serving humanity and degenerate into a tool that dominates human beings. Therefore, strengthening self-reflection in the technological field and embedding the concept of "Technology for Good" into the entire lifecycle of R&D, application, and iteration will "provide an expansion of life chances, alleviate the pains and difficulties of work, defend against natural disasters, conquer diseases, improve social security, expand communication, increase information, extend responsibilities, greatly augment material prosperity in harmony with mental health, and eliminate the alienation of nature, culture, and human beings [26]."

First, it is imperative to reshape the logic of technological R&D, shifting from efficiency priority to value priority, and embedding humanistic care at the source of technological design. Under the dominance of capital, technological R&D traditionally prioritizes efficiency enhancement, cost reduction, and profit growth as core objectives, while relegate humanistic issues—such as potential harm to individual rights or exacerbation of social injustice—to secondary positions. This results in technology being "born with alienation genes." Therefore, the primary task of promoting Technology for Good is to reshape the R&D logic, establishing humanistic values as a prerequisite for innovation, and enshrining non-maleficence, fairness, and respect as the fundamental principles of technological design.

Second, a technological ethics system should be constructed, transitioning from spontaneous adherence to institutionalized norms, thereby making "doing good" a common benchmark for the technology industry. Technology for Good cannot rely solely on the moral consciousness of developers. When capital interests conflict with ethical norms, mere moral appeals are often insufficient to resist the temptation of profit. Consequently, it is necessary to establish a technological ethics system that combines hard constraints with soft guidance, elevating "doing good" from an individual choice to an industry standard. This ensures that all technological actors must operate within an ethical framework, preventing technology from falling into alienation due to ethical anomie.

Third, the responsibility of technological subjects must be strengthened, transforming them from vassals of capital into bearers of responsibility, thus enabling tech practitioners to become the core force for good. The R&D and application of technology ultimately depend on people. Technological subjects—such as engineers, product managers, and corporate executives—are the key actors who determine the direction of technology. Under the dominance of capital logic, some technological subjects have been reduced to "instrumental beings" of capital, abandoning reflection on technological consequences and shirking their responsibilities.

To promote Technology for Good, it is essential to awaken the sense of responsibility among technological subjects, urging them to proactively assume ultimate responsibility for technological impacts and refuse to design alienating technologies for the sake of capital interests. Technology for Good is the fundamental force to overcome alienation. Technological alienation in the digital age may appear to be a result of technological out-of-control, but it is in fact a loss of technological value. When technology loses its core goal of serving humanity and becomes enslaved to efficiency and profit, alienation becomes inevitable. Strengthening technological reflection and promoting Technology for Good precisely involves reshaping the value orientation of technology, restoring it from a tool of capital to a tool of humanity. When every technological R&D initiative is judged by whether it contributes to the all-round development of human beings, and every tech practitioner upholds the safeguarding of human well-being as their professional responsibility, technological alienation in the digital age can be fundamentally resolved, ultimately realizing the ideal vision of harmonious coexistence between technology and humanity.

5. Conclusion

Technological alienation in the digital age is not an

inevitable destination of technological development, but a phased dilemma arising from the interaction between technology, individual subjectivity, capital logic, and the value orientation of technology. Various forms of alienation not only expose the value loss of technology under the expansion of instrumental rationality, but also reflect the insufficient control of human beings over technology in the process of digitalization. To resolve this dilemma, it is necessary to break through the one-sided domination of technology by capital under capitalist private ownership and establish a more public-oriented mechanism for technological development. It is also essential to reshape people-centered technological ethics, so that technological innovation is always anchored to the core goal of human emancipation and free all-round development. When we can examine technology with rationality, regulate technology with institutions, and guide technology with values, digital technology will no longer be an alien force that produces alienation, but will truly become an important support for empowering individuals, nourishing society, and promoting the progress of civilization. Only in this way can human beings achieve the harmonious coexistence of technology and humanity in the tide of the digital era, and embark on a path of development that combines efficiency with warmth.

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