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Generation of digital value through dynamic material hermeneutics: A postphenomenological analysis of human-technology relations with digital goods

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Abstract

This paper examines how meaning and value are derived for digital goods from a consumer perspective. It applies a postphenomenological framework to analyze the relationships between humans, digital technologies, and digital goods/virtual worlds. Postphenomenology is expanded into the concept of "dynamic material hermeneutics" to account for the recursive, adaptive roles technologies and digital goods play in mediating experiences. Four postphenomenological relationship modes are identified - embodiment, hermeneutics, background, and alterity - and it is argued these relationships generate moments of meaning formation. By separating digital goods from the technologies used to access them, their potential for materialization and possession is explored. This involves four relationship modes: embodiment (where technologies merge with users' experiences), hermeneutics (interpretation of digital goods through technology), background (socio-cultural contexts of technologies), and alterity (distinctiveness of technologies). These interactions contribute to value creation by fostering interpretive dynamics and communal understanding within cultural-technical frameworks, emphasizing that meaning formation through these mediated experiences is central to the perceived worth of digital goods.

Keywords: Postphenomenology; Material Hermeneutics; Digital Goods; Virtual Goods; Virtual Worlds; Value Creation; Human-technology Relations

1. Introduction

As interactive digital technologies increasingly permeate aspects of modern life, shaping daily experiences through immersive virtual worlds, augmented overlay realities, expansive social media platforms, and more, fundamental questions emerge around how virtual entities that populate these domains accrue meaning and derive worth for their human users. Digital goods, defined here as information assets possessing economic potential value, serve as one type of virtual artifact created and distributed through interactive technological systems. However, as digital goods lack physical tangibility and consume experiences through complex cultural-technical mediation, comprehending how and why they take on significance and attract consumer valuation proves challenging. Traditional economic frameworks grounded in notions of utility fail to capture the dynamics of virtual objects worth construction. Given the fact that in such scenarios, mediation between technological dimensions and the interpretive, situationally contingent nature of meaning-making and value formation is done by goods, alternative theoretical lenses are required.

This research, therefore, aims to examine processes of meaning formation and value generation for digital goods through a novel, combined analytic framework drawing from postphenomenology and material hermeneutics. Postphenomenology explores human-technology relations in the sense that technology works as a mediator in human-world experience. Digital goods are a subset of virtual worlds since digital goods can be any form, content, or action—relationships and interpretation of the goods and relations become a key area in identifying how these goods can gain

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value in the consumer world [1]. Materialization (in a broad sense) can help gain virtual goods meaning and value. Hermeneutics is a philosophy of interpretation [2], and since most of philosophy is an intellectual activity, materiality or "valuation" is not a traditional area of hermeneutics. Thus, a different approach is applied to connect materiality and philosophy—material hermeneutics.

As the common meaning of hermeneutics is applied to the interpretation of text and their contexts, this approach is very rarely expanded to the interpretation of concepts other than text and, even more rarely—to the interpretation of material things [3]. However, the rise of material hermeneutics allows us to use the hermeneutics approach in interpreting material things, thus looking for value-creation mechanisms in meaning that arise from interpretation. The rise of material hermeneutics is supported by a stream of research [4], arguing in a broad sense that socially constituted understanding of science is not "objective and capable of representing reality as it is". However, the more popular concept of material hermeneutics is led by Idhe, who connects two properties of materiality in science: the target and physical instruments that are used in investigation [3]. Instrument-based analysis is expanded into the realm of humanities and social sciences and linked under the term "techno science".

As finding the meaning is the key objective of hermeneutics, it is safe to assume that within the horizon of an expanded hermeneutics approach like material hermeneutics, theories on what the hermeneutic relationships within technology and humans can be developed. This, in turn, means that one can also be moving into consumerism and expanding the concept of how the value of digital goods is understood when the "meaning" of the digital goods is realized via the said hermeneutic process [5].

2. Research Methodology

This study's methodology centers on an extensive literature review aimed at understanding and expanding upon philosophical concepts within the consumer field, specifically regarding digital goods and their valuation. The review critically examines foundational theories and recent advancements in postphenomenology and material hermeneutics, identifying how these frameworks can be applied to analyze digital goods. Postphenomenology, as a framework, explores the mediation of human experience through technologies, emphasizing how technologies shape perceptions, actions, and interactions. Material hermeneutics extends the traditional hermeneutics of text to the interpretation of material objects, including digital goods, within socio-cultural contexts. The literature review encompasses key texts in these fields to construct a comprehensive theoretical background for the study.

The integration of these philosophical concepts into the consumer field requires an understanding of how digital goods, defined as information assets with economic potential, derive value through complex cultural-technical mediation. Traditional economic frameworks fall short of capturing the dynamics of virtual objects worth construction. Thus, alternative lenses, such as postphenomenology and material hermeneutics, are necessary to explore these dynamics.

2.1. Theoretical Frameworks: Postphenomenology and Material Hermeneutics

Postphenomenology is a theoretical framework that focuses on the mediation of human experience through technologies. It recognizes that technologies shape our perceptions, actions, and interactions with the world. Postphenomenology identifies four key relationship modes: embodiment, hermeneutics, background, and alterity.

- Embodiment: This mode explores the ways in which technologies merge with our embodiment, going beyond the traditional understanding of technology as an external tool. It highlights the material dimensions of technology beyond mere perceptual fusion. In the context of value generation for digital goods, embodiment relations involve users interacting with these goods through the technologies they merge with, such as virtual reality headsets or gaming consoles. Understanding the embodied interactions with digital goods is crucial for comprehending the meanings and values attributed to them.
- Hermeneutics: This mode focuses on the interpretive aspects of human- technology interactions. It acknowledges that technologies are not neutral tools but have non-neutral affordances that shape how we interpret and understand the world. In the context of value generation, hermeneutic relations involve the interpretation of digital goods represented through mediating technologies. These interpretations are influenced by socio- cultural contexts, individual perspectives, and the technological constructions themselves. The hermeneutic dynamics of interpretation contribute to the formation of meanings and values for digital goods.
- Background: The background mode refers to the taken-for-granted aspects of technology that shape our experiences. It includes the social, cultural, and historical contexts in which technologies are embedded. In the context of value generation, the background mode helps us understand how socio- cultural contexts contribute

frameworks through which digital goods gain significance. The values and meanings attributed to digital goods are influenced by the cultural practices, norms, and discourses that surround them.

- Alterity: Alterity refers to the otherness or distinctiveness of technologies in relation to human experiences. Technologies have their own agency and influence on our perceptions and interactions. In the context of value generation, alterity highlights how technologies possess directive properties that shape our interpretations and experiences with digital goods. It recognizes that technologies are not passive mediums but actively participate in the co-construction of meanings and values.
- Material hermeneutics, on the other hand, explores the connections between objects' materiality and their socio-cultural meanings. While traditionally applied to textual understanding, material hermeneutics can be extended to examine the mediation of digital goods and the dynamics of collective interpretation. It recognizes that objects, including digital goods, gain significance through interpretive dynamics situated within cultural contexts and networks of meaning.

The integration of postphenomenology and material hermeneutics offers a synergistic analytical perspective for understanding the formation of value for digital goods. It acknowledges the situated, experience-shaping interpretive dynamics of cultural-material mediation.

3. Digital Value Creation Process Broken into Steps

This research breaks down the digital value creation process into the following conceptual steps to be analyzed:

- How can virtual worlds be "materialized" and deducted into digital goods?
- What is the material grounding in the world of digital goods, and how it constructs the virtual world?
- How do Materiality and Virtuality reference each other and set up the potential for postphenomenology relations?
- How do postphenomenology relations apply to digital goods?
- How can material hermeneutics help materialize digital goods?
- Where should meaning be found in relation to digital goods?
- How does meaning lead to value?

By examining these questions, insights will be generated regarding the translation of virtual environments to valued virtual objects, the material dimensions of digital artifacts, cultural-technical relationships mediating experiences, and processes linking significance derived through collaborative interpretation to comprehend the generated worth for digital goods.

The first set of questions deals with exploring the material dimensions of digital technologies and how they extend to digital goods. It aims to build upon the relationship between virtual and material aspects to understand how virtual worlds become translated into meaningful digital possessions for consumers. By examining materiality in virtual environments and how Virtuality relates back to material frameworks, this line of inquiry seeks to comprehend processes of "materializing" digital goods for consumer culture.

The second set of questions distinguishes different types of relationships that can form between humans, technologies, and digital goods, with a focus on exploring hermeneutics as a core avenue for meaning production. It expands on notions of material hermeneutics and how they can be applied to comprehend newly emerging technological contexts involving digital goods. This stream of inquiry aims to define an approach of "dynamic material hermeneutics" optimized for analyzing human-technology-digital good relationships within virtual worlds.

The final set of questions aims to link these postphenomenological relationship frameworks centering on hermeneutic modes of interaction to processes of fostering meaningfulness and potential instances of value creation. By examining where understandings are derived from within technological connections to virtual goods and tracing how meanings formed may then translate to value perceptions, this line of inquiry seeks conclusions regarding value generation mechanisms for digital commodities established through cultural-technical interpretation.

4. Virtual Worlds into Material Digital Goods

According to Quah, digital goods are bitstrings or sequences of 0s and 1s and are nonrival, infinitely expansible, discrete, aspatial, and recombinant [1, 6]. For the digital good to be a good, it has to have economic value. In a very radical way,

everything in the world can be digitized, or at least a look-a-like copy of the world can be stored in 1 and 0. So even when in the scope of this article, the focus is on digital goods, which is often understood only as a small portion or subset of the virtual world (for example, in the case of digital books, digital goods can be just e-book or even an online library of millions of the digital books) all ideas of the article can be expanded to virtual worlds as well. The virtual world can be understood as digital good or vice-versa digital good can be understood as a virtual world, since the world can have its own rules of behavior of 1's and 0's. In an exploration of the value of digital goods, it is paramount to recognize that people value digital goods less than physical goods [7], partly due to a state of lesser feeling of ownership. The psychological ownership is [8] driven by the ability to touch the digital good. However, one must point out that the materiality and intangibility [9] of digital goods are two different concepts. If digital goods are not transformed into physical goods (for example, by printing them), it is usually used in a virtual environment or virtual world. The ability of technologies to produce virtual worlds [10] leads to the attribution to the virtuality of the content that is produced by these technologies, thus raising intangibility, ownership, and questions of value – properties of technology being passed to the content.

In order to understand how the meaning of specific virtual goods is understood, one must separate virtual goods from the environment (hardware) in which these goods were created. To expand the concept of "virtual good," the idea of information is inherited from Hayles; for him, the information is an entity that is distinct from the environment it lives in [11]. To limit the scope of concepts, the assumption that digital goods are information is kept.

Thinking of the information (virtual goods or worlds) assumes separation from the technology that delivers or transmits information. Cybernetics employs this separation in regard to the fact that information is an independent entity that can circulate between different environments (hardware) and does not lose its main "core" or entity [12]. The "free" circulation via different environments (hardware) is the core property of digitality - this allows one to separate content from technology (or software from hardware). As Wellner states - this way of thinking leads to the ecosystem where hardware (environment) becomes invisible, leaving visible only the information / digital good [13]. Expanding properties of the technologies, we have to look into bodily aspects of digital technologies - with enormous material dimensions like optics, cables, servers etc.

Digitality increases the material infrastructure - thus creating a paradox. The more virtual worlds lead to more physical (and in this case, material) manifestations of the technologies (even accounting for the more effective computation, transfer, and calculation technologies). So even from the consumer point of view, digital goods do not have much tangibility [9]; they do have invisible materiality, which is manifested in the infrastructure "providing" these digital goods. The materiality in the sense of technology is a required condition for exploring digital good value through postphenomenology and material hermeneutics.

In order to understand why consumers (in a sense of the value of the digital good) do not feel this material property of technologies, I explore the concepts of embodiment and extensions of the human. We, human beings, define ourselves by the things we own and we don't own [14]. The extended self [15] was also updated with an extension to digital consumer goods. In a sense of materialism beyond the more conventional sense (consumer point of view) - materialism is defined as "the importance a consumer attaches to worldly possessions" [16]. So, in this sense, the human attachment to the information (digital good) is material in a sense of attachment. More and more, humans develop meaningful relationships with digital [17] goods. This establishes grounds for analyzing "meaning" in this technology-human relationship and looking for value. As our physical bodies continue to merge with various environments - digital entities populate virtual worlds and digital entities are taken back to the physical world [18] - embodiment relations emerge.

5. Digital Goods: Postphenomenological Relations

As described earlier, Postphenomenology identifies four key relationship modes: embodiment, hermeneutics, background, and alterity. I will now be applying these relationship modes to digital Goods to create a postphenomenological understanding of them.

5.1. Embodiment Relations for Digital Goods

Embodiment relations lay on the concept that processes involving thinking cannot be detached from our bodies and this way of thinking also applies to "digitality" where technologies cannot be detached from the material infrastructure they are produced by. People cannot make thinking processes outside of their bodies; thus, people are limited within their bodies. In a very broad understanding, this is what embodiment means [13]. Exploration of embodiment is important to explain why consumers do not feel "tangibility" when they use digital goods, even when the usage of those digital goods includes material mediators e.g. keyboards, screens, mouses, sound players etc. Postphenomenology [19] is used

to explore this relationship in a broader sense. Postphenomenological studies include the study of relationships between human beings and technological artifacts and focuses on how technologies shape relationships between human beings and the world. Technologies are studied as mediators of human experiences, which are supported with philosophical analyses and empirical investigations. Ihde [20] identifies four modes that apply to human's use of technology: embodiment, hermeneutic, background, alterity, these modes are expanded to virtual worlds and then deducted to the digital goods. Most common mode for human's use of technology is the embodiment relationship. Heidengger was expanding his abilities with simple technologies. If we are advanced technology users - our usage of technologies will be embodiment, that means that we will not feel "mediatieries" in the relationship with the world. So, in the case of an embodiment relation, we feel a like merging with the technology, even if this is a deceptive feeling, and relate to the world as one being. The common example is simple technology, like "blind person uses a stick to feel things" - he often forgets the stick, he just feels the world. "embodiment relationships" can also be felt as a change in the technology that appears in a human's body - like the body is conceived as a larger entity with the technological artifact. For example, driving and parking a car - we feel the free space around us [21]. Embodiment relationships are represented by the formula "I-technology-world". Permutation uses parentheses to denote this feeling of one body and arrow to denote the action in the world (I – technology) → world. In the case of the usage of digital goods, this can be transformed into a relationship:

$$(I – technology) \rightarrow digital\ good$$

Since some technologies can also alter bodily senses, for example special glasses can allow us to have extra information displayed on the good, so usage of the digital good changes by the technologies used to use that digital good. In the simpler way reading of the digital book has different experiences via desktop computer and a cell phone [12]. Embodiment relations have paradoxical desire for a "total transparency" on one hand and omnipotence on the other [20]. As it sounds troubling, the idea which applies to the usage of digital goods always will be mediated by technological artefact. In the example of the digital book, we might want to feel digital book as real as possible with any technological artifact, but it only will feel "same" real only with printed book. As defined by Ihde [20], this problematic desire can never be met, because human interaction with nonneutral artefacts is tied to the transformational effects having an essential magnification/reduction structure. So even going more radical and follow Chakrabarty [22] idea of to continue semi or quasi-transparent means of viewing the world, the "true" digital good cannot ever be experienced, since it is always mediated through semi or quasi-transparent view. One unique point of technologies is that they operate indirectly on the body [13]. That means that technology has to be understood by mind and then derivative to the body-derivatives of the effects of the mind [23]. Even the digital goods are presented via technology mediator, it still has to be understood by mind and translated into body actions. Here material hermeneutics comes into the mind: how the digital good is represented.

5.2. Hermeneutic Relations for Digital Goods

The notion embodiment relations are followed by hermeneutic relationships [20]. As the technology gets more complex or even abstract, it becomes hard to maintain embodiment relationships with the technology. For example, satellites can be controlled from a distance - monitored them via screens and send commands via control buttons. This distance is hermeneutic one, since people have to interpret the situation via technology. It is important to note, that the main act of hermeneutics - reading, meaning extraction and interpretation can be added to the embodiment aspects (embodiment hermeneutics), but in a sense of hermeneutic relation, the technology and world become one and we must read the technology to interact with the world. The typical relationships formula becomes: I → (technology–world), as in the case of the digital goods:

$$I \rightarrow (technology–digital\ good)$$

In embodiment relationship the "I" and the "technology" combine a unit that helps "read" the digital good. In hermeneutic relations the "technology" and the "digital good" combine a unit witch the "I" interacts. In the previous example of the digital book, the hermeneutic relations would include real-sound of flipping the page of the digital book or words of the digital book presenting in a "one word at the moment" sequence. The technology acts as a translator or interface between us and digital book, allowing us to access "translation" of the digital goods. However, hermeneutic relations are common to convey a certain view of the world and in the particular case, of the digital good. It can be a perspective, opinion or some different graphical representation of the digital good [12]. These types of technologies reveal aspects of technological non-neutraliness. Inclinations, underlying assumptions, potentially biases are inherent in hermeneutic relations. These biases are not represented by postphenomenological formula. The formula just represents the worldview that technology imposes on the user / human. In the case of digital goods, the traditional formula represents the view of digital good that technology imposes to the user (for example e-book is viewed as it is

displayed by some technology, for example e-reader: Kindle). Wellner [13] gives an example of non-neutral hermeneutic relations with a 3D globe representation mapped to the 2d (map) and it leads to relatively higher distances between the worlds. In the case of digital goods, this is also evident - slow connectivity and complicated interfaces might lead to hate of digital goods or complete misunderstanding of what digital goods represent (or means). In order to account for non-neutrality, the traditional formula has to be updated. I follow Peter-Paul Verbeek [19] variations of postphenomenlogical relationships. Key starting point - technologies always have a certain form of intentionality. How humans think (as technologies operate in the mind [23], is influenced or even directed by the technologies. The materialization (in the directing) is explained how material technologies can direct users/humans to a certain interpretation. The "composite intentionality" becomes a new form of relations in the background of technological intentionality. It theoretically explains situations where intentionality is not in the direction of a "truthful world", but rather to show a new way to look at the world. In the case of the digital good (as a subset of the virtual world) it refers to situations where digital goods are represented in new and novel ways. For example, digital books which were available through book, now being automatically translated in Latin and read in bright voices.

In order to represent relations between the technologies, the viewers-users and the world (arguments are made in art project case), Verbeek updates the postphenomenological formula - adding "composite intentionality". Hermeneutic relationships get adjusted by replacing the dash sign between "technology" and "word" with arrow: representation of how digital technologies create a trace in the world: $I \rightarrow (technology \rightarrow world)$. This represents the material aspect of hermeneutics. From the hermeneutics point of view, it reflects the active role of the text as the trace which the text implies exceeds the act of writing - the text becomes the trace. Since, in this article, digital goods viewed as a virtual world (digital copy of real or possible worlds) the "composite intentionality" represents semi-material (since not directly represents in real-world) effect of technologies into digital goods - or more simply, how technologies leave traces on digital goods, which are also presented with technologies: $I \rightarrow (technology \rightarrow digital\ good)$.

The non-neutrality in the typical $I \rightarrow (technology\text{-}digital\ good)$ or in our case: $I \rightarrow (technology \rightarrow digital\ good)$. relation serves as a materializing feature.

As noted before, "semi-materializing" effects on digital goods which is implied by technologies and digital goods also produced by technologies. It is important to note, that by focusing only on the technological component on updated postphonomenlogical formula is not enough to describe human-technology-digital goods relationships.

Stream of research focuses on the technology element of post phenomenological formula and discards digital goods as independent elements which might technologically respond to the technologies as well. In order to expand these relationships, firstly we have to explore how and why technology element is analyzed through postpheneomenological views.

As I demonstrated the physical (hardware) element of technologies, the technology element is also being analyzed in a similar sense. Two leading scientists in this area are Heather Wiltse and Nicola Liberati. Nicola Liberati [24] examines augmented reality (AR) and its relationships to the users. Liberati focus on the physical aspects which are combined to the virtual. He describes "technology" as a technological artifact and "object" as information. The user's attention is represented by curly brackets in postphenomenological formula. Attention can be directed either to the "object" (information) or to the "technology" (hardware): Subject -> ({Object} - Technology) or Subject -> (Object - {Technology})

For example, in the first when reading your digital e-book, you are focusing on the file (pub) - you have the first instance of Liberati's formula, but when you switch your focus into Kindle (reader tech), you have the second instance of Liberati's formula. Liberati's scheme does not have "world" or in our article scope - "digital good" component, so in Liberati's scheme the digital good would fall under the "object" (information) part. The lack of "word" component could be explained by lack of clear distinction between world and information. Liberati chooses to eliminate it from traditional postphenomenological formula. However, it's a must remain in order to examine complex relationships between human, technology and digital goods.

As noted, before, another attempt to break technology components comes from Heather Wiltse [25] - the "technology" element is split into "substrate" and "trace". As some inspiration visible from Cybernetics, Wiltse argues hat's the best way to deal with "digital materials". The easiest way to understand this split - thinking of "device" and "content". Device is a substrate and content is trace. Substrate enables the medium on which the text (content) is written (or inscribed) and trace indicates a text (or any other content, that can be interpreted). Wiltse argues that different technologies participate in the production of information and displaying. In the case of a thermometer, a weather online website is a

trace and a real thermometer which gives data to the website is a substrate, with a formula:I → ([trace | substrate] → world). However, in the Wiltse definition again information is understood very statically and relationships evolve on the basic conception - "something is read" and "something is displayed" somewhere. This does not fit broad digital goods view - digital goods often are not static and more often have interactional properties.

In order to solve this limitation of all digital goods Lev Manovich [26] proposes some insights of digitalization of the content. The distinction between document and performance is made - a) document is fixed and can be accessed over and over again in a completely identical way and b) a performance is the way we receive information - and it's an unstable representation, which keeps changing. The example of performance - algorithms produce information and decide how they will be presented to the users - Facebook news feeds, navigation and etc. Under performance regime information cannot be reread. The information always will change next time it gets read.

This concept gives more insight on how technologies operate; however, the implication of these insights is proposed by Wellner by introducing - digital material hermeneutics [13]. Wellners try to work with technological advancements - like artificial intelligence (AI), which in most of the cases have hermeneutical capabilities implemented in them. Wellner proposes that this "digital material hermeneutics" term includes the constant dynamics of a "Performance Regime" (defined by Manovich [26])) and cognitive capabilities of AI [11]. Wellners dismissed common references of "digital", which represent digital presentation of something which existed in analog form.

In order to represent digital goods and technologies how they are created, more correct way of describing material hermeneutics, which included embedded hermeneutics of technologies themselves (artificial intelligence and similar technologies) would be keeping the "dynamic" element in the definition. Wellner [13] states, that digital material hermeneutics need to deal with meaning extraction in a highly dynamic environment and proposes extension of postphenomonical formula: I → tech → information → world

Following ideas of Wiltse [25] and Liberati [24] technology component expanded into tech (the algorithm ("tech") performs the interpretation of the information and directs the "I" what to read) and information (information which is read and interpreted by algorithm). The separate arrow represents autonomy of algorithms [27]. Cognition is required for autonomy and intentionality - the third non-anthropocentric arrow between "information" and "world" represents the creation of a trace in the world and represents the increasingly important role of AI algorithms in our everydayness. In a case of digital goods, the world component gets exchanged with virtual world and in turn, digital good:

$$I → tech → information → digital\ good\ (as\ a\ virtual\ world)$$

5.3. Dynamic Material Hermeneutics for Digital Goods

Wiltse, Liberati and Wellner all are separating "technology" components and adding "trace" elements at the technology level. However, to capture new elements of highly dynamic virtual environments and their effects moving back to simple representation of material hermeneutics within postphenomenology could be even more accurate way to analyze these relationships and to capture to properties like dynamic (same content does not get presented to the viewer) and recursiveness (the technologies learn from themselves, AI). Dynamics and recursiveness are properties of the real world [28], thus components which are usually spitted from the "technology" component in postpheunomonical formulas might be well incorporated into the "world" component. However, to represent recursiveness and dynamics of the digital technologies, the arrow should be updated into left right arrow: I → (technology ⇄ world). In this case the non-neutrality "intentionality composite" is maintained - the world is represented in new ways; however, the world also manifests in new ways through technologies.

As new technologies interpret the world themselves - recursiveness and dynamics are maintained in this relationship. These material hermeneutic relations include other forms of cognitive interpretations. Wellner [13] proposed that the term of digital material hermeneutics is expanded to dynamic material hermeneutics, allowing one to apply these types of hermeneutics for broader options. As for digital goods, this dynamic material hermeneutics becomes:

$$I → (technology ⇄ digital\ goods)$$

This dynamic material hermeneutics in a case of digital goods capture embedded cognitive capabilities into digital goods as with these capabilities digital goods can adapt and improve (in a sense of objective) to give the most meaning for the humans. Technologies cannot be regarded as culture [29] or perception transforming "lenses", since they serve as meaning extracting actors which transform the world around us and reflect our hermeneutics [13].

5.4. Background and Alterity Relations for Digital Goods

Two other postphenomenological relations are usually forgotten within applied technology sciences, and rarely for the digital goods. In these relations [30] technology either is too far or too close that users can acknowledge technology external agents. In a case where technology is too far - the relation becomes "a background" relation. In such a relation, the User barely notices the technology, but instead focus on the world in postphenomenological view. The relation looks like: I technology (world)

The typical example - temperature controls of the system operating our heating and cooling at home. We forget that it exists and notice only when something happens to "break the spell". In the case of digital goods, this would look like: I technology (digital good)

The typical example would be using an operational system in a computer. We do not notice it, until something goes wrong.

The last relation in the postphenomenology field is alterity. The technology gets too close, the postphenomenology formula becomes: I (technology) world. Using the famous Heidegger hammer example, when the hammer slips [31] - and our finger gets hit, we recognize it as an agent. The technology draws so close, that we notice only it. In a case of digital goods, it becomes: I (technology) digital good

5.5. Meaning and Value of Digital Goods

One of key prerequisites for digital entities (information) to become digital goods - to have value for consumers / humans - by value meaning not only monetary value, but value in general. If an item (informational entity as defined above) includes some value, by definition it becomes wanted or in broader sense - material as materialism is defined as "the importance a consumer attaches to worldly possessions" [16].

As meaning is one of key prerequisites for value (consumer point of view), then moments when meaning is perceived - at the same moment prerequisite for value is created as well. Following postphenomenological view of human-technology relations and expansion this view to digital goods, each postphenomenological relation creates meaning and in turn value of the digital goods.

As proven by Kujala [32] and Norman [33] within design cases value creation moments are expected in usage of digital goods with postphenomenological perspective as well and these will serve as mediators, since technology in a broader sense is mediating our experience of the digital good. Each of the posphenomenological relations can be used to create meaning for the consumers by correctly shaping and controlling human-technology relation. It is quite common to explore value of digital goods as static with intrinsic value [34], however postphenomenological perspective gives grounds for broad areas research – how value of digital goods (virtual worlds) transforms in the various technology-human-information relationships. Meaningful postphenomenological relationships will help digital goods to materialize in our society and help extend our identities [8].

6. Discussion

This study sought to address gaps in understanding how virtual objects accrue meaning and economic value for human users through a novel analytical framework integrating postphenomenology and material hermeneutics. By examining the dynamics of ongoing human-technology-digital object relations, insights regarding value emergence were generated through socially situated interpretive engagement.

The analysis of digital goods reveals that value generation is closely tied to the interpretive dynamics facilitated by technological mediation. Embodiment relations, where technologies merge seamlessly with users' experiences, play a crucial role. For example, users interacting with digital goods through virtual reality headsets or gaming consoles experience these goods as extensions of their own bodies. This embodied interaction allows users to perceive digital goods as tangible and meaningful, enhancing their perceived value. The physical engagement with technology, such as the immersive experience of a virtual environment, creates a sense of presence and ownership, which are critical to value perception [13].

Hermeneutic relations further elucidate how digital goods acquire value through interpretive processes. Technologies serve as non-neutral mediators that shape users' understanding and interpretation of digital goods. The study highlights that these interpretive activities are influenced by socio-cultural contexts and individual perspectives. For instance, the

way an e-book is presented through different devices, such as a Kindle or a smartphone, can alter the reading experience and thus the perceived value of the digital good. The non-neutral affordances of technologies, such as user interface design and content presentation, guide users in deriving meaning from digital goods, which subsequently translates into value [12, 19].

The background mode of postphenomenological relations underscores the importance of socio-cultural contexts in value formation. Digital goods gain significance within the frameworks provided by cultural practices, norms, and discourses. For example, the social validation of owning digital goods, such as virtual items in online games or digital collectibles, is rooted in the cultural and community contexts that value these possessions. The study found that these socio-cultural backgrounds provide the necessary context for digital goods to be perceived as valuable, as they shape the collective understanding and significance attributed to these goods [29].

Alterity relations highlight the distinctiveness and agency of technologies in shaping user interactions and perceptions. Technologies possess directive properties that influence how users interact with and interpret digital goods. For instance, the algorithms used in social media platforms to recommend content or the personalization features in digital marketplaces can direct users' attention and enhance the perceived relevance and value of digital goods. The study demonstrates that the active role of technologies in mediating experiences and interactions with digital goods is pivotal in creating value, as it directs and shapes the user's interpretive journey [27].

Material hermeneutics, which explores the connections between the materiality of digital goods and their socio-cultural meanings, provides a comprehensive understanding of value creation. The study found that the recursive and dynamic interactions between users and digital goods, facilitated by advanced technologies such as artificial intelligence, are central to value generation. For example, AI-driven personalization and adaptive content delivery create a continuously evolving user experience, making digital goods more engaging and valuable. The ability of technologies to adapt and respond to user preferences and behaviors enhances the meaning and relevance of digital goods, thereby increasing their perceived value [13, 28].

7. Conclusion

The research reveals that the value of digital goods is generated through a complex interplay of human-technology relations characterized by embodiment, hermeneutics, background, and alterity. These relations mediate the user experience, facilitating interpretive dynamics and meaning formation within socio-cultural contexts. Technologies' non-neutral affordances and directive properties play a critical role in shaping perceptions and interactions with digital goods. The study highlights the importance of dynamic and recursive interactions, supported by advanced technologies, in enhancing the engagement and perceived value of digital goods. Ultimately, the value of digital goods emerges from the meaningful experiences and socio-cultural significance constructed through these mediated interactions.

However, opportunities remain to build upon these foundations. While offering conceptual rigor, empirical testing could strengthen validity and identify context-contingent factors. Comparative case analyses evaluating framework generalizability across virtual genres, communities and cultures would add depth. Longitudinal observations of value fluctuations could reveal framework limitations as technologies evolve. Mixed methods designs quantitatively measuring worth indicators may complement qualitative work. Interdisciplinary expansion incorporating fields like economics, marketing and design broadens impact.

Future prospects in augmented and virtual realities, artificial agents, blockchain integration and metaverse developments present novel analytical contexts. Continued reexamination maintains frameworks' adaptive relevance. Collaborations linking micro-level interaction dynamics to macro influences on valuation systems also hold potential. Eventually, this newly integrated theoretical lens presents a starting point deserving of further refinement and application. Continued socio-technical study of virtual worth creation processes remains an imperative as digitality transforms human experience, relationships and economies. Pursuing these avenues strengthens comprehending value's evolving cultural dimensions in an increasingly virtual world.

Compliance with ethical standards

Disclosure of conflict of interest

No potential conflicts of interest.

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