

The Metaphysics of Artifacts: a critical rationalist approach

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ABSTRACT

Artifacts are ubiquitous and influential in our world, but their nature and existence are controversial. Several theories have been proposed to explain the ontology of artifacts. Drawing on *Popper's theory of three worlds*, this paper suggests a *metaphysics* for artifacts along the line of a *critical rationalist* (CR) approach. This theory distinguishes between three realms of reality: the physical world (World 1), the mental world (World 2), and the world of objective knowledge (World 3). The paper argues that artifacts have different ontological components that correspond to these three realms, and that each component is real and causal. The paper shows how this perspective can account for the *intentional* and *functional* aspects of artifacts, as well as their dependence on *plans* that influence different realms of reality. The paper explains how this pluralistic ontology, compared to the rival theories, enables one to explain the relevant ontological problems of artifacts. The paper also explores how this proposal can lead to a research program encompassing a broader range of technologies, such as social artifacts. In sum, the paper suggests that Popper's three worlds theory provides a rich and comprehensive framework for understanding the metaphysics of artifacts.

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1. Introduction

We often use technical artifacts such as computers, cars, mobiles, and the like, which play an essential role in our daily life. It seems their influence on our form of life is very different from the past (Winner, 2010, section 1). There have also emerged philosophical problems about the ontology of artifacts: Are artifacts ontologically different from physical and natural kinds? What is the difference between artifactual and natural kinds in formation and evolution? How are artifactual kinds classified? What is human intentions' role in inventing and evolution of artifacts? How is the intended function of artifacts related to their physical structure?

To answer these ontological problems, we need a theory about the ontology of artifacts, i.e., their *metaphysics*. There might be competing metaphysical views. Although these views are unfalsifiable, they need to be criticizable. They can be evaluated in terms of their ability to solve the problems which they are designed to solve. Moreover, one has to assess whether they conflict with our other metaphysical presuppositions. An adequate metaphysics has a heuristic role in formulating problems and suggesting future research programs (Popper, 1983a, Agassi, 1975a, Shearmur, 2010). Therefore, adequate metaphysics for technical artifacts is expected to explain the aforementioned ontological problems. It should also give an understanding of how to change and modify artifacts and especially should be able to determine the place of scientific theories in the criticism and modification of technologies.

In the past few decades, several theories have been presented about the metaphysics of artifacts, and new aspects of their ontology have been explored. Although these theories consider the various components of the ontology of artifacts, they do not present a coherent metaphysical structure that explains how these components are intertwined. Consequently, their explanatory power is undermined. This article aims to explain their intertwined ontological structure within the *critical rationalist* approach, especially with *Popper's theory of the three worlds*, and to point out some consequences.

The structure of this article is as follows. In section 2, we give an overview of the theories about the metaphysics of artifacts and briefly point out their explanatory shortcomings. Then, in section 3, we provide a brief explanation of Popper's theory of the three worlds, and using it in section 4, we discuss the ontological components of technical artifacts. In the fifth section, we explore the consequences of this ontology. The final part is the conclusion.

2. Metaphysics of Artifacts: An Overview

The metaphysics of artifacts and related problems have been considered a serious field of study since the end of the 20th century. At that time, the *philosophy of technical artifacts* (Houkes et al., 2011, 198) emerged as a field within the philosophy of technology. One of the reasons that many of these philosophical problems were ignored for years was that artifacts were not considered ontologically independent from natural objects.

Beth Preston (2022), in the “artefacts” entry of the *Stanford Encyclopedia of Philosophy*, points out that “skepticism about the existence of artifacts goes back to Aristotle.” Referring to some of

Aristotle's works, she says, for Aristotle *only* things that have an independent substance, such as animals and plants, exist by nature,¹ However artifacts do not exist in this sense; they need *intentional agency* (*Metaphysics* 1033a ff., 1043b15–25, *Nicomachean Ethics* 1140a ff., *Physics* 192b ff, 192b 8–39; *Physica*, Book II, 192b 9–18; 192b 28).

Although there is an agreement on the intentional aspect of artifacts, which also includes artworks (Davies, 1991, 120–141; Levinson, 2007, 81–82 & Hilpinen, 1993: 156–157), the ontological status of the artifacts has remained ambivalent until modern times. For example, As Preston (2022) explains, Peter van Inwagen (1990) thinks that determining the ontological status of artifacts requires an answer to “the Special Composition Question—under what conditions *do* unified wholes arise out of parts?” He maintains that a composition cannot be considered to really exist, unless something is added to the world. As Preston sums up “Considerations of this sort have been used by van Inwagen (1990, 124 ff.) and others to argue that there are no artifacts. [Artifact] makers do not bring anything new into existence; they merely move pre-existing elementary things around.”

On the other hand, Lynne Rudder Baker (2007, 32, 53–55) believes that the idea of 'composition' is that if a primary kind of something is combined with another kind in a specific arrangement, a new thing with new causal powers is created. For example, if a piece of metal is painted red in the form of the word 'stop', a traffic stop sign is constructed as a new reality with a new causal power. Therefore, according to Baker, artifacts are *intention-dependent* objects.

Amie Thomasson (2007, 2009) emphasizes the intentional component of artifacts by focusing on the importance of artifacts' 'application conditions.' For example, a 'screwdriver' refers to a tool intentionally made by humans to turn screws, consisting of a handle and a chamfered edge rod. A quick look at any workshop will assure you that this function is, in fact, satisfied and, therefore, the screwdrivers exist as an artifact. In her opinion, since the intentional states of makers play an indispensable role in the application conditions of the artifact, the nature of all kinds of artifacts cannot be determined independently of the makers' intentions (Thomasson, 2007, 58, 53).

Since the purpose of artifacts is to fulfil a *function*, many philosophers of technology have studied the concept of 'function' and its role in the ontological explanation of artifacts. *The causal role theory* and *intentional theory* have received more attention among them.

Causal role theories, like Cummins' theory (1975), analyze functions only in relation to interacting physical structures, in the sense that only causal interactions in the physical world determine the function of an object. For example, the function of holding food on a plate depends solely on its physical structure. These theories have no reference to intentional factors.

On the contrary, *intentional theories* consider objects as 'functional' to the extent that they participate in the realization of the agents' intention; that is, an object ontologically is considered

¹ Katayama (1999: 18–19) has argued that it is not entirely clear why Aristotle thinks artifacts are not substances, and different reasons can be found in different places of his works.

as an artifact, insofar as an agent has intended a function for it.¹ For example, a chair is considered as an artifact kind as long as it is intended as an implement for sitting; otherwise, it would be simply some pieces of wood or metal. For intentional theories, see Neander (1999), Dipert (1993), Searle (1995) and McLaughlin (2001).

The causal role and the intentional theories received criticism.² One specific context of this criticism was the Dual Nature of Technical Artifacts program, developed by several Dutch philosophers. This program starts from the observation that artifacts are described in terms of their structure as well as their function. This suggests that technical artifacts have a dual nature: designed physical structures, and functions intended by humans. As Kroes (2006, 2010) explained, a functional description is only a partial description of a technical artifact, because different physical structures may realize the same function (multiple realizability). On the other hand, a structural description that ignores the functional properties of artifacts does not specify what the technical artifact is intended for, and hence ignores its design properties. In addition, the functional aspect of artifacts cannot be reduced to the capacities of physical reality; for example, to the dispositions of physical reality. Because the functional aspect has an intentional component intimately related to human aims and values. Therefore, the description of an object as a technical artifact should comprehensively include both structural and functional descriptions, and none of them alone is sufficient (See: Perlman, 2004; Kroes and Meijers, 2006; Kroes, 2002, 2009, 2010; Meijers, 2011; Houkes & Vermaas, 2009, 2013; Vermaas & Houkes, 2003; Vermaas et al., 2011). Granted the role of artifacts' function, Houkes and Vermaas (2010) attempted to incorporate a concept that is called 'use plan' into their theory and conclude 'function' from it. According to them, the design process consists of making and interacting with use plans designed to fulfil a function. The artifact's function is not fulfilled by the causal relations in the physical structure, nor simply by the intentions of the agents; rather, their function is an utterly relational feature that supervenes on both the physical composition of the artifact and makers' actions and beliefs. (Houkes et al., 2002; Houkes & Vermaas, 2004: 67).

According to this theory, the design of a technical artifact includes the process of providing a *plan*. It also gives a description of the physical structure (the 'blueprint'). The design of a technical artifact identifies its *teleological nature*, which is an answer to the question what is it for? Design, in this sense, is a purposeful arrangement to fulfil a function in a *specific situation*. Therefore, the function has a *regulative role* for a designer. It guides the designer toward the appropriate choice of physical materials and design methods to fulfil the intended function. Accordingly, something cannot be considered an artifact unless we know what function it is to fulfil (Vermaas et al., 2011, 29-37).

¹ Agents need not be restricted to humans. For example, Popper and Miller take animal artifacts and constructions such as bee or chicken nests or spider webs, and beaver dams also as technology (Popper, 1979: 115).

² For some related criticisms see (Preston, 2009).

Accordingly, in recent theories, it has been rightly emphasized that the function of technical artifacts is closely related to human intentions. Therefore, the agent's intention is relevant to artifacts' nature or metaphysical structure.

Although we expect metaphysics to explain how the ontological components are related, the theories thus far mentioned have some drawbacks in this regard. Firstly, they are unclear about the relationship between artifacts' physical and functional components. Therefore, they have not been able to explain these components in an integrated metaphysical structure. Secondly, although the importance of design has been more or less emphasized in these theories, the ontological status of the *plan* is ambiguous. It is, at most, an idea in the designer's mind. Moreover, the ontological difference between 'plan', which is objective, and 'intention', which is subjective, is unclear. This ontological ambiguity makes these theories unable to explain the causal role of 'plan', especially *unsuccessful plans*.

In addition, the dynamics and evolution of artifacts take place in their ontological framework. However, unclear metaphysics cannot provide adequate insight for change and modification of the artifact, and this inadequacy makes designers' interventions more unpredictable. In this way, metaphysics loses its *heuristic power*. Because when metaphysics ignores a realm of reality, or does not provide a correct description of how different realms of reality interact with each other, it is impossible to have a correct estimate of the amount of influence of artifacts on reality. For an adequate explanation, the ontological components of artifacts should be designed in a more comprehensive ontological framework. This article claims that Popper's three worlds theory can provide such a ground. In the next section, we briefly explain this theory.

3. Popper's theory of three worlds

Popper believes that "what is real or what exists is whatever may, directly or indirectly, have a causal effect upon physical things" (1978, 153). Through this, Popper defends a pluralistic view, in contrast to a monistic or dualistic view, of reality, where there are at least three different, but interacting worlds: World 1, World 2, World 3.

World 1 consists of physical bodies like stones and of stars, and of plants and of animals. It also consists of radiation, and of other forms of physical energy.

World 2 is the mental and psychological world. It is the world of our feelings, pain and pleasure; of our beliefs, desires, and intentions; of our perceptions and observations. In other words, it is the world of psychological processes, mental states, or of subjective experiences. For Popper, World 2 is immensely important, especially from a humanistic or moral point of view. Because "Human suffering belongs to world 2; and human suffering, especially avoidable suffering, is the central moral problem for all those who can help. World 2 could be subdivided in various ways" (1978, 143). If we wish, we can distinguish fully conscious experiences from subconscious experiences, or human consciousness from animal consciousness (1978).

World 3 is "the products of the human mind: such as languages; tales and stories and religious myths; scientific conjectures or theories, and mathematical constructions; songs and symphonies;

paintings and sculptures. But also, airplanes, airports and other engineering artifacts.” Moreover, Popper emphasizes that “not only maps and plans are world 3 objects: plans of action are too; and this may include computer programmes” (1978, 163).

Many of the World 3 objects, like books, drugs, computers or airplanes, are embodied in World 1 objects: they are material artifacts that belong to both World 3 and World 1 (Popper & Eccels, 1985, 41). Popper says (1978, 144-145):

“Michelangelo's sculpture *The Dying Slave* is both a block of marble, belonging to the physical world 1, and a creation of Michelangelo's mind, and as such belonging to world 3. The same holds of course for paintings [and other artifacts]. ... If we discuss the influence of the American Constitution on the life of the American people or its influence on the history of other peoples, then the object of our discussion is a world 3 object; similarly, if we compare the often very different performances of *one* dramatic work, say Shakespeare's *Hamlet*.”

Most of the inhabitants of World 3 are embodied in one or many physical objects of World 1. A great painting may exist only as a ‘unique’ physical object, although there may be some good copies of it. By contrast, *Hamlet* has been embodied in all those physical volumes that contain an edition of ‘*Hamlet*’. Likewise, technical artifacts, such as chairs, knives, and airplanes, are embodied in a physical object.

In other words, the objects of world 3 are not fictitious, they are *real*, and their physical embodiments or realizations are *concrete* objects. They are *real* because they can have a *causal effect* upon us; upon our World 2 experiences, and on our World 1 objects of our brains. They may have causal effects upon World 1 (physical objects) through World 2. Therefore, Worlds 1, 2, and 3 can interact, and none are causally closed.

Popper gives us an example to understand how the three worlds interact: We may say that, some physicists (Szilard, Fermi, and Einstein), based on their knowledge about World 1, suspected the physical possibility of making a nuclear bomb, and that their thoughts (in World 2) eventually brought about the realization of their conjectures. To Popper, such descriptions hide the fact that by ‘their knowledge about world 1’ are meant *theories* that can be objectively investigated from a logical and empirical point of view, and therefore they are World 3 objects rather than World 2 objects (though they can be grasped and thus have World 2 correlates). Similarly, ‘suspected the physical possibility’ refers to conjectures about physical theories - again World 3 objects which can be investigated objectively (Popper & Eccles, 1985, 47). In other words, physicists can learn about nature and reveal its capacities through the World 3 objects. Technologists interested in these capacities suggest plans to make use of these capacities for intended purposes. These technical plans are among World 3 objects that, through World 2, may bring about an atomic bomb that make a change in World 1. Therefore, even the unembodied World 3 objects may be the source of a causal effect in order to change World 1, and because of their indirect causal influence upon

material world 1 objects, we should regard world 3 objects as real. Popper maintains this *influence* is always *indirect* (1978, 164):

“World 3 theories and World 3 plans and programmes of action must always be *grasped* or *understood* by a *mind* before they lead to human actions, and to changes in our physical environment, such as the building of airports or of aeroplanes. ... Thus, in order that Special Relativity could have its influence upon the construction of the atom bomb, various physicists had to get interested in the theory, work out its consequences, and *grasp* these consequences. Human understanding, and thus the human mind, seems to be quite indispensable.”

World 3 may influence or *cause* people to think and criticize. In fact, critical cooperation in planning is one of the characteristics of World 3 objects. And this is another argument for the objectivity of world 3 objects. It is clear that plans, in this critical cooperation, mean the world 3 objects, rather than the concrete thought processes or mental states of the cooperating people. Therefore, critical cooperation in an abstract plan presupposes its objectivity. ‘Moreover, saying that a plan can be improved through criticism, refers to “an aspect of world 3 objects which makes them again similar to world 1 objects: it is possible to work on a world 3 object, almost as a mechanic works on an engine, and to improve its performance” (ibid, 163).

3.1 Some Historical Remarks

Considering abstract objects as real is not unprecedented in the history of philosophy. As Popper himself acknowledged, “Plato was the discoverer of the third world. Plato discovered not only the third world, but part of the influence or feed-back of the third world upon ourselves” (1979, 122). He also points out the similarity of Hegel's Ideas with his own world 3.

However, the differences between Popper's theory of three worlds and Plato and Hegel's theories are very serious and have significant consequences, especially in our discussion about artifacts.

Popper's World 3, unlike Plato's world, is man-made and changing. In addition, it contains not only true theories and successful plans, but also false theories and unsuccessful plans (1979, 122). The result is that unsuccessful plans are also real and can be the source of causal effects.

In addition, Popper emphasizes “the fact that Hegel's ‘Objective Spirit’ and ‘Absolute Spirit’ are subject to change is the only point in which his Spirits are more similar to my ‘third world’ than is Plato's world of Ideas” (125).

The differences between Popper's world 3 and Hegel's ‘objective spirit’ and ‘absolute spirit’ are serious: In Hegel's theory, “man is not creative. It is the hypostatized ‘Objective Spirit’, it is the divine self. consciousness of the Universe, that moves man. Thus, what I have called the autonomy of the third world, and its feed-back effect, becomes with Hegel omnipotent.” (ibid).

Marx, unlike Hegel and Plato, inspired Popper for the ontological primacy of World 1 over consciousness and Ideas (in addition to the influence of Darwin's theory of evolution). The

entanglement of artifacts in a critical labor praxis can be seen as an implicit continuation of Marxian approaches by Popper.¹ So for Popper “the individual creative element, the relation of give-and-take between a man and his work, is of the greatest importance.” (125-126).

But Popper went beyond the Marx's dualism, by taking the pluralistic approach, different from Plato, to retain the autonomy for both Worlds 2 and 3. “while Plato lets his hypostasized Ideas inhabit some divine heaven; Hegel personalizes his Spirit into some divine consciousness,” Popper’s World 3 “... has no similarity whatever to human consciousness; and though its first inmates are products of human consciousness, they are totally different from conscious ideas or from thoughts in the subjective sense” (126).

Being man-made and objective are prominent features of Popper's ontology, which provide the capacity for inter-subjective criticizability of artifacts by individuals, while Plato and Hegel’s theories are poor and obsolete in this regard. The significance of this point in the discussion of artifacts lies in the fact that if we pursue democratic control of artifacts, we need an ontology that is open to change. According to Popper, “the *openness* of the material World 1 to influences from outside [World 2 and World 3] is just one of those things which experience shows us constantly. Thus, there is no reason to think that human brains have changed much in the last hundred years; but our material environment has changed beyond recognition both through our planned actions and through the unintended consequences of our planned actions” (1978, 165). Moreover, the suggested ontology should provide at least the objectivity of plans and designs in the sense provide the capacity for inter-subjective criticizability of them among individuals.

4. A critical rationalist’s conception of technical artifacts

Although there is no independent study about the ontological status of artifacts in Popper’s works, as we mentioned in the previous section, his view can be developed through the examples he provided in his illustrations for the theory of three worlds. First of all, it is worth noting that Popper had repeatedly warned that ‘what is’ questions could fall into the abyss of fruitless verbal and conceptual discussions (Popper, 2002, 24-25). Therefore, the main problem regarding artifacts is not the conceptual analysis of ‘artifact’, instead, we need a theory about artifacts to deal with their ontological problems.

In the critical rationalist approach, contrary to Peter Kroes² (2010, 52-53), we do not start from the *behavior* of engineers to discover what engineers think of a technical artifact. In his *The Logic of Scientific Discovery*, Popper has argued in detail against such a *naturalistic* approach (2005, 29-34). So, the theory we suggest here for the ontology of technology artifacts does not rely on

¹ We owe this point to the helpful comments of an anonymous referee.

² Kroes says: “The starting point for my analysis of the nature of technical artefacts is the way engineers describe and conceive of technical artefacts. The reason for turning to engineering practice is that engineers are experts in designing, making, analysing and describing technical artefacts and so their way of describing and conceiving technical artefacts may be taken to be a fruitful anchor point in our quest for the nature of technical artefacts.” (2010: 52)

engineers' behavior; It is ultimately a conjecture¹, which is presented and evaluated in relation to the intended function of artifacts.²

4.1 Interaction of the three worlds

The theories above are unclear regarding the relation between artifacts' physical and functional (or intentional) components. They give no account of this relation under a coherent theory. Kroes and Meijers also acknowledge that if we consider 'function' as a mental model, the relationship between these models and the physical structure is not clear (Kroes & Meijers, 2006, 2).

In addition, although the importance of planning and design is more or less emphasized in these theories, there is still an ontological ambiguity here. 'Plan', in these theories, is in the designer's mind, and there is no clear ontological distinction between 'plan', which is objective, and 'intention', which is subjective. This ontological ambiguity makes these theories unable to explain the causal role of plans, especially those plans that have not been successful.

There is an insightful explanation for the interactions between the three realms of reality in the three worlds theory: World 3 influences World 1 through World 2 (Popper, 1979, 155). If we apply this account in the context of artifacts, we could say that the intentional component related to world 2 can affect world 1 based on the plan designed in World 3. Indeed, not only embodied artifacts, also technological plans and designs that reside in World 3 affect the physical world through intention (which is in World 2).

Just physical reality and intention, without even a primitive plan, are not enough for something to be a technical artifact. Moreover, an intention may be realized through different plans; And through these different plans could have different causal consequences. Although plans are not implemented without the agent's intention (which is in World 2), they have a reality which is independent of the physical reality and the mind, because they have causal power.

Therefore, an artifact's function results from how physical reality is arranged, which is incorporated into the plan, which in its turn, is in World 3. So, the 'function' is a kind of abbreviation to express that this particular arrangement of physical reality in accordance with the plan, brings about a change in reality, provided there is a human intention to implement it.³

4.2 The reality of unsuccessful plans

It is not always the case that the aims of the designers come true. In many cases, plans are *not* successful and do *not* lead to the intended results. In this case, there is no artifact. So, Thomasson

¹ Being conjectural does not rule out the possibility that this conjecture might have been inspired by studying the behavior of engineers. It means that the behaviorism does not *justify* it. The main point is that this conjecture is presented and evaluated in the first place based on what is the purpose of making the artifacts.

² This is similar to Kant's *transcendental* approach. In fact, the problem is, what are the conditions for the existence of the artifact? If something has to be constructed to satisfy some specific needs, there need to be some *conditions* on their ontology, which we want to discover.

³ Houkes and Vermaas (2010) developed a similar idea in their theory of functions. However, they stated it in terms of 'beliefs', which, according to CR, are inmates of world 2.

(2003, 2007) refers to the importance of ‘success’ regarding artifacts. Although *unsuccessful* designs have the World 3 component and are (conjecturally) suggested to fulfil a function, they do not designate an artifact. Maybe later, after criticism and modification, they would be implemented as a successful plan and could be among the artifacts. Therefore, the ontological components of the artifact need to be coordinated in such a way that the aims of the designer to be ‘successfully’ realized; otherwise, they remain merely a plan. However, even unsuccessful designs, although they did not lead to the construction of the desired artifact, could have a causal effect, and in doing so they are part of the reality of the World 3. They influence other people's minds and can inspire new ideas or even lead to some reactions.

It is unclear how to explain their causal effect if we do not take 'unsuccessful' plans as *real*.¹ One may argue that an explanation could refer to the *memories* of unsuccessful past events. This response moves the debate to the materialist vs. dualist interactionist contentions, which Popper extensively argued about it in the *Self and its Brain*. But one of his arguments in his *Objective Knowledge* might be more relevant here. It is a thought experiment: Suppose a nuclear war occurs, and all humans die. So human memories also disappear. He proposes two hypothetical scenarios: In the first scenario, all libraries are also perished, and in the second one, the libraries remain. Popper argues that, in the second scenario, unlike the first, if intelligent beings come to the earth from outer space, human civilization could be reconstructed by reading and deciphering the books. In his view, the second scenario shows that the of the human mind's products, such as theories, problems, and technical plans, have an autonomous reality (1979, 116).

4.3. The relation of physical reality and artifact

Functional and physical characteristics are not independent, because the function and the structure of technical artifacts mutually restrict each other. In other words, every structure of reality cannot fulfil every function. A function cannot be realized if there is no capacity in reality for it. Science can show us new capacities of reality by a *description* of reality. Moreover, by discovering the *limitations* of reality, science can show the infeasibility of some technologies (Paya & Mansouri, 2018). For example, quantum mechanics reveals new capacities of reality, which can inspire the creation of new technologies such as nuclear power plants, and on the other hand, it also shows the limitations of our measurement with *the principle of uncertainty* and excludes the possibility of creating technologies beyond this limitation. As Popper explains, science, with laws such as energy conservation, identifies the limits of reality and undermines attempts to construct some technologies like the perpetual motion machine (Popper, 1944, §20; Miller, 2006, 119-121).

To sum up, Popper's theory of the three worlds includes all physical, intentional, and plan components, without which a technical artifact is not realized. Therefore, the technical artifact has a multiple nature, it is an intertwined reality of W1, W2, and W3.

¹. Ignoring ‘unsuccessful’ plans is similar to ignoring ‘falsified’ theories as part of *scientific* theories. As you know, unlike Whewell and others, Popper emphasized that falsified theories are also scientific, and as part of the third world, have causal power, so it is not correct to consider only true theories as scientific.

5. Consequences of the multifaceted nature of technical artifacts

Artifacts have no independent essence. The ‘mind-independent essence’ constitutes the existence of those entities that we have no role in their creation. For this reason, natural beings have ‘independent essences’. But artifacts are made to realize the functions we intended for our needs.¹ Therefore, their reality depends on the maker’s or user’s intention.² An object cannot be a technical artifact just because of its physical characteristics. A technical artifact usually requires functional aspects intended by humans. These functions are among the causal effects of artifacts, but since these causal effects depend on the human intention located in World 2, they act only through intentions. In this respect, they ontologically differ from natural and physical objects. Therefore, technical artifacts are relational entities, i.e., they are entities with ‘intention-independent essence’ (Meijers, 2001).

It may be argued that being *real* requires mind-independence, and therefore artifacts whose identities depend on the mind should not be considered real; they are merely *nominal* and *conventional* kinds (Schwartz, 1978). Their reality somehow depends on us. In this line of argument, the ontological status of artifacts (as well as social objects and institutions like money or marriage) has been challenged due to their dependence on intention (Wiggins, 2001, Zimmerman, 2002 & Lowe, 2014).

In response to such criticisms, there have been attempts to suggest mind-independent natures for artifacts (e.g., Elder, 2007). But such a stipulation for reality has been challenged in several ways, and we do not go into their details (see, for example, Baker, 2007; Thomasson, 2007; Juvshik, 2021a). It is sufficient to say that according to Popper’s theory of three worlds, the *mind independence* requirement for being *real* is *not* plausible. Both World 2 and World 3 are related to the mind, but they are real because they have *causal power*.

The problem of being a ‘kind of’ artifact. Now a question arises: if intrinsic artifacts are not independent of the agent’s intention, what makes them a special *kind of* artifact? What is the essence of the artifact as a ‘kind’? Whose intentions make the artifact belong to a particular ‘kind’?

Assume a person sees an object, thinks he has a good screwdriver, and uses it well to turn a screw. Therefore, the object has the physical capacity to turn the screw. Do the physical capacities of the object and user’s mental state alone suffice to transform this object into a screwdriver and categorize it as a ‘screwdriver kind’? While the object in question may actually be a knife that happens to be used as a screwdriver.

Therefore, an artificial device designed to realize a specific function may be used by an individual or a community of users to fulfil another function. For example, chairs can be used as a stepladder, anvils can be used as a doorstop, and a knife may be used to turn a screw. Therefore,

¹. For discussion on the state of the artifact function literature, see Preston (2009), Koslicki (2018, ch. 8), Olivero (2019), and Juvshik (2021a, b).

². According to critical rationalists, ‘essence’ is a category that we *conjecture* to identify what constitutes the existential capacities of natural entities. Thus, they labelled it ‘conjectural essentialism’ or ‘modified essentialism’. (Agassi, 1974, 1975b; Maxwell, 1993).

although the function of artifacts makes them unique, it is not their essence. It is even possible that some artifacts, like the artworks in the arts, especially in modern or conceptual arts, are made without intending a *function* for them; they are not for anything, but are instead 'art for art's sake' (Juvshik, 2021b). Therefore, the intention-dependent essence of the artifact is not reducible to a specific function, and *functional essentialism* about artifacts is not defensible (Houkes and Vermaas, 2004; Juvshik, 2021b).

Kroes (2010) believes that in these situations, it seems complicated to defend that the psychological conditions of this user are ontologically relevant. According to him, the user's mental states cannot transform the object (i.e., the knife) into a screwdriver. Such a position seems to result from the functional essentialism we argued against. Also, what makes an artifact a *kind of* 'knife' in the first place? Is it because it is used as a knife in a particular society, or because a group designed and made it as a knife? In the first case, the users' intention is ontologically relevant, and in the second case, the intention of the designers and makers.

For example, some users use a knife to turn screws. Is the existence of a standard form of collective use sufficient to create an ontological difference? In other words, should there be an essence for 'screwdriver-ness', or is the intention of a specific person (or persons) relevant in determining the essence of the artifact?

In this controversy, we should not conflate ontology and semantics if we want to proceed according to critical rationalism (CR). 'Knife' as an ontological artifact has ontological components in Worlds 1, 2 and 3. But what gave the name of the object 'knife', or classified it under a category called 'knife', traces back to the naming ceremony of that object through a causal chain. Neither a knife nor a screwdriver, as a technical artifact, has an ontologically intention-independent nature. But calling something 'knife' or 'screwdriver' is a linguistic matter related to the semantic network that the speakers of a language (both the manufacturers and the users) agreed upon. Artifact ontology is indifferent to who intended an object to be an instance of a particular kind of artifact. This thesis just asserts that human intentions are related to that object and that its essence is mind-dependent.

It might be said that there is a difference between 'creating' (i.e., designing and making) and 'using' a kind of technical artifact. Invention of an artifact, whether as a new instance of an already existing kind or the first instance of a new kind of artifact, has ontological significance because new objects enter the world in this process. According to CR, a plan or model presented as a conjecture, at the first stage, is created in World 3, and then is executed and implemented. These objects are individually or socially constructed, they are not intention-independent entities. The manufacturer or designer intends them to fulfil a function.

In the 'use' phase, the conditions are slightly different. No new technical artifact is created when someone uses a screwdriver to turn a screw, but he may use an already existing artifact in the context of another plan. For example, he may creatively use an existing natural or artificial object: a coconut shell may be used as a drinking cup, or a piece of wood may be used as a lever, or a knife may be used as a screwdriver. In these cases, creativity is limited to assigning new functions to

existing objects, but no new physical objects or artifacts are created. 'Creativity' also refers to comparing designs in the world of artifacts and discovering similarities for using an artifact in the place of another one.

Although these explanations show the importance of design and its autonomous reality in the World 3 and the intertwining of different components of reality in the ontological constitution of artifact, however, naming an object as a special 'kind' of artifact, traces back to the semantic network of its designers and users. This semantic network is affected by the ontology of the artifact, that is, the members of the semantic network, based on the intentional aspects and history, connect the artifact, through a causal chain, to an event (similar to the naming ceremony) that the artifact for the first time designed for the purpose realizing a function, and there is an agreement regarding the 'kind' of the artifact.

Therefore, artifact kinds have no 'intrinsic essence' common to all artifact kind members. Instead, the construction of the semantic network determines the artifact's membership in a particular kind. For 'artifact' to be considered a specific kind, a semantic network must be created about it. Those who have access to this semantic network see the desired 'artifact' as the kind that this semantic network considers, or they see it as another artifact kind according to their own semantic network, or, in the absence of a semantic network that can adapting to it, they see it as just a 'thing'. This is also the case for 'knife' and 'screwdriver'. Therefore, it cannot be said that the criteria for belonging to a certain kind of artifact are determined by the person (or persons) who made the first product. As Thomasson emphasizes, artifact kinds 'are notoriously malleable and historical in nature' (Thomasson, 2007, 62).

This problem also relates to the identity conditions of artifacts. The *kind* of artifact that two manufactured products belong to may depend on the semantic network and the context, and may not have a decisive answer. We rejected functional essentialism. Therefore, we cannot say that an artifact remains the same *kind* just because its function does not change when some or many of its parts are changed. In complex cases, even when two products have the same shape, fit and function, they may be made based on different plans and therefore be considered examples of different kinds of artifacts. This problem leads us to say that being a member of a kind depends not only on the structural features of the artifact but also on its semantic network and intentional history.

The unintended consequences. In addition to their intentional component, artefacts, such as plastic bottles, can have unintended causal effects on the ecosystem, such as pollution.

But the unintended consequences are not only limited to the material and physical components. Constructing an artifact may lead to reactions, from other intentional organisms in the environment, that the designer did not intend. These cases illustrate the extent to which technical artifacts are apt to have unintended and unpredictable causal effects—especially if they are placed in an environment that includes other intentional minds. In his works, Popper repeatedly emphasized the influence of World 3, through World 2, on World 1 and considered it as one of the reasons for the openness and uncertainty of the world we live in (Popper, 1973, 1979: 206, 1985). The openness of the world and the emergence of unintended consequences can be explained through the causal

relations of the three worlds. This metaphysics demonstrates that we need institutionalized criticism in all stages and processes of planning, implementing, and developing artifacts to reduce and control unintended consequences.

6. Conclusion

This paper presents different ontological components of artifacts in light of Popper's three worlds theory. Each of the ontological components is real because it has a causal effect on reality. Therefore, the metaphysics of artifacts is an intertwined ontology that includes different realms of reality: Worlds 1, 2, and 3. This metaphysics seems to provide an adequate ground to account for the ontological problems of artifacts in several ways:

First, it suggests a rich enough ontology for accounting artifacts' intentional and functional components and their related problems.

Secondly, it has the capacity to explain the causal influence of plans on different realms of reality. Moreover, it suggests an intermediary role for World 2.

Third, CR leads to a research program that can encompass a broader range of technologies, because it does not limit the realm of reality that technology can intervene in to the physical reality. Reality can be physical (World 1), mental (World 2), or abstract (World 3). For instance, some technologies are designed to fulfil a function by manipulating mental states or intercepting some ideas in the mind.¹ Therefore, this ontology can be extended to social technologies such as propaganda, advertising, media, and legal infrastructure. For example, 'money' can be considered a kind of technological product whose reality does not rely only on physical reality, and as Searle (1995) shows, it fulfils the intended function by the legal rules that rely on collective intentionality.

Fourth, metaphysical theories that only recognize the physical and mental worlds as reality have trouble explaining the objective aspect of plans. In contrast, by distinguishing between Worlds 2 and 3, CR offers a suitable framework for the critical dialogue among actors in different situations and the intersubjective evaluation of technologies, which is crucial for the democratic oversight of technologies.²

The fact that (social) artifacts have an intentional component makes them liable for applying Popper's *situational analysis*. Popper used this methodological tool to analyze institutions (as social artifacts) in social sciences and historiography. Moreover, his approach was an application of *methodological individualism*.³ We limit our discussion here to the metaphysics of artifacts and leave out these epistemological aspects, which are beyond the scope of this paper. However, we think employing these epistemological considerations regarding the artifacts could bring about a

¹. For example, *Inception* and *Matrix* are two films sketching the manipulation of mental states. However, the feasibility of implementing these technologies depends on whether reality has such a capacity. Propaganda or brainwashing projects also indoctrinate ideas by which affect future behaviors of people.

² For the importance of democratic control of technology in the critical rationalist approach, see: (Agassi, 2005).

³ For Popper's *situational analysis* and *methodological individualism* see: (Popper 1976: 102; 1950: 288-289; 1957:149;1983b; Koertge 1979: 87)

new research program about the evolution and development of artifacts in the philosophy of technology.

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